SPERMATOPHYTIC FLORA OF GORUMARA NATIONAL PARK IN THE DUARS OF WEST BENGAL, INDIA

A THESIS SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN SCIENCE (BOTANY) UNDER THE UNIVERSITY OF NORTH BENGAL

Submitted By

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August, 2017

This small piece of work is dedicated to my family

Declaration

I, Goutam Saha, hereby declare that the work embodied in my thesis entitled "SPERMATOPHYTIC FLORA OF GORUMARA NATIONAL PARK IN THE DUARS OF WEST BENGAL, INDIA" has been carried out by me under the supervision of Dr. A.P. Das, Retired Professor, Department of Botany, University of North Bengal for the award of the degree of Doctor of Philosophy in Botany. I also declare that, the Thesis or any part of thereof has not been submitted for any other Degree/ Diploma either to this or other University.

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17.07.2017.

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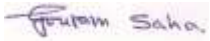

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Place: Taxonomy of Environmental Biology Laboratory

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Abstract

Gorumara National Park is located in Duars and is falling within the territory of Jalpaiguri District of West Bengal. The entire forest tract of Gorumara National Park comes under the North Indian moist tropical forest. The species those are commonly found within the forest and are most important from the economic and ecological stand points is *Shorea robusta.* Gorumara National Park (GNP) is geographically located between 88º 45' 19" to 88º 51' 18" E Longitudes and between 26º 48' 05" to 26º 41' 20" N Latitudes. The National Park is presently consists of two territorial Forest Ranges (North and South), one mobile Forest Range, six Beats (Dhup Jhora, Gorumara, Bichhabhanga, Budhuram, Murti and Khunia) and three camps. The main and most important river running at the boundary or through the National Park is Jaldhaka. It becomes shallow and remain almost with no surface water during dry season and remains full and fierce during monsoon. Other rivers passing through GNP include Murti, Garati and Indong. Few other rivulets and streams are also passing through this Park. Some of these rivulets and streams passing through GNP are seasonal in nature, carrying water only during monsoon and remain dry for rest of the year. Gorumara National Park falls under the 2B/25 (Sal dominated mixed forests), 5B/152 (Sal, Khayer, Sissoo associated deciduous forest), 3C/C1b and 3C/C1c (Sal dominated deciduous forest). The species which is commonly found within the forest and is most important from the economic and ecological standpoint is Sal (*Shorea robusta*). This species occurs with its usual associates, namely Chilauni (*Schima wallichii*), Chikrasi (*Chukrassia tabularis*), Champ (*Magnolia champaca*) and Bahera (*Terminalia bellirica*). The other important tree species of the area are Sidha (*Lagerstroemia parviflora*), Panisaj (*Amoora rohituka*), Kainjal (*Bischofia javanica*), Simul (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Siris (*Albizia* spp.). Primary grassland vegetation is invaded first by Khair and Sissoo, and create home for the entry of Simul, Sidha and many other seral species like Toon (*Toona ciliata*), Gamar (*Gmelina arborea*), Kainjal (*Bischofia javanica*), Pithali (*Mallotus nudiflorus*) and Kadam (*Neolamarckia cadamba*) etc. with successive changes in edaphic conditions and progressive stability as one moves away from the river front. Sal Forests (3C/C1) include both Eastern Bhabar (3C/C1b) and Eastern Terai sal (3C/C1c). Sal forests occur on the well drained alluvial soil. The average day temperature varies from 10º C to 25º C from November to February, between 25p C to30P C during May to September and between 22p C to 27p C during the rest of the year. South-west monsoon is the main source of rainfall. Maximum rainfall occurs from mid-June to September, July and August usually are the wettest months. Maximum rainfall occurred from mid-June to September and July-August usually is the wettest months. The average annual rainfall is about 260 to 340 cm per year. Maximum relative humidity varies between 85 % - 95 %, seldom below 75 % with a maximum during June to September and minimum during December to February.

The entire area of Gorumara National Park (GNP) was surveyed during the years 2007 to 2013 with the assistance of Wildlife Wing of Forest Department, Government of West Bengal. During this survey 40 randomly distributed quadrates of 20 m x 20 m has been taken from different Beat areas in three different seasons, namely designated as *pre-monsoon* [March – April], *monsoon* [May – July]

and *post-monsoon* [September – November]. Nested Quadrate technique has been used with 20m x 20m quadrates for trees and 5m x 5m quadrates for shrubs and 1m x 1m quadrates for ground covering herbaceous plants. Recorded data were transferred to MS Excel worksheet and different parameters like Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Importance Value Index (IVI) of each and every species were determined using appropriate formulae. A total of 876 species of spermatophytes has been recorded from the intensive survey since the year 2006. Of these, angiosperms are represented by 872 species under 521 genera belonging to 155 families . In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP during the present exploration. The largest genus is *Ficus* of Moraceae with 10 species and is followed by *Cyperus* of Cyperaceae, *Litsea* of Lauraceae, *Dioscorea* of Dioscoreaceae, *Cissus* of Vitaceae, *Desmodium* of Fabaceae etc. Out of the recorded flora, 89 species has been recognized as exotics. Out of these 63 has been naturalized, 25 species came from Tropical America, 15 from South America, 12 from Brazil and Mexico and only 6 species are of Asian origin.

April, May, June and July and later September to October may be called as nature's flower festival in GNP flora, because maximum flowering species found to bloom during these two periods every year. December to January appears to be the resting month.

In premonsoon ground covers, *Commelina sufruticosa* (95.54) emerged with highest frequency in Murti, whereas *Ichnocarpus frutescens* (92.86) leads the frequency in Dhupjhora. *Axonopus compressus* (97.33) presented maximum frequency in Gorumara, *Pupalia lappacea* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Ageratum conyzoides* (97.78) in Budhuram. *Achyrospermum wallichianum, Diplazium esculentum, Oplismenus burmannii* etc. grow with very high frequency in all over the study area. Similarly, highest abandance presented in Murti by *Centella asiatica* (6.47). Whereas *Axonopus compressus* (6.12) presented maximum abundance in Dhupjhora, *Elatostema monandrum* (5.17) in Gorumara, *Ichnocarpus frutescens* (3.46) in Khunia, *Globba racemosa* (11.92) in Bichhabhanga, *Molineria capitulata* (6.00) in Budhuram. *Oplismenus burmannii* (2.10) presented maximum density in Murti whereas maximum density of Dhupjhora presented by *Axonopus compressus* (3.59), *Elatostema monandrum* (2.89) in Gorumara, *Ichnocarpus frutescens* (3.18) in Khunia. Murti Beat presented a maximum IVI values by *Oplismenus burmannii* (15.04), *Centella asiatica* (12.97), *Natsiatum herpeticum* (12.27) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study area. Similarly, a few species like *Chloranthus erectus, Pupalia lappacea, Rungia pectinata, Achyrospermum wallichianum* etc presented the maximum SDI value 1. Simpson's Index (EH) maximum recorded in Murti by *Acacia pennata* (56.59), Dhupjhora by *Pronephreum nudatum* (161.6562), Gorumara by *Achyrospermum wallichianum* (59.79836), Khunia by *Acacia pennata* (116.6408), Bichhabhanga by *Achyranthes bidentata* (86.55733), and in Budhuram by *Anisomeles indica* (154.678). other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Clerodendrum infortunatum, Persicaria chinensis*etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.571629, Dhupjhoran 0.510899, Gorumara 0.465165, Khunia 0.655970, Bichhabhanga 0.631930 and Budhuram 0.564817. Similarly Murti Beat presented the Margalef Richness Indices (RI) 30.8748, where, Dhupjhora 28.8762, Gorumara 23.8732, Khunia 27.8668, Bichhabhanga 28.8693 and Budhram 25.8694. In monsoon ground covers, *Axonopus compressus*(98.89) emerged with highest frequency in Murti where, *Achyrospermum wallichianum* (97.14) in Dhupjhora, *Ageratum conyzoides*(94.67) in

Gorumara, *Coffea bengalensis* (96.00) in Khunia, *Ageratum conyzoides*(96.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. During monsoon season, *Acmella calva* (15.50), *Mikania micrantha* (15.23), *Chloranthuserectus* (13.02) etc. presented maximum IVI in Murti, but, *Mikania micrantha* (17.06), *Achyrospermum wallichianum* (13.13), *Piper sylvaticum* (13.05), *Oplismenus burmannii* (12.16) etc. in Dhupjhora, *Axonopus compressus* (17.20), *Mikania micrantha* (13.16)etc. in Gorumara, *Achyrospermum wallichianum* (22.30), *Pronephreum nudatum* (13.91) etc. in Khunia, *Achyrospermum wallichianum* (30.48), *Elatostema monandrum* (13.69), *Piper sylvaticum* (12.71), *Ageratum conyzoides*(12.22)etc. in Bichhabhanga and *Oplismenus compositus* (18.86), *Pronephreum nudatum* (14.52) etc. in Budhuram recorded maximum IVI. Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata*(63.94906), Dhupjhora by *Youngia japonica* (211.7118), Gorumara by *Molineriacapitulata* (133.4294), Khunia by *Amerimnon stipulatum* (187.9153), Bichhabhanga by *Drymaria cordata* (124.1942), and in Budhuram by *Achyranthes bidentata*(212.4392). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.541158, Gorumara 0.553660, Khunia 0.617780, Bichhabhanga 0.670355 and Budhuram 0.639351. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8801, Gorumara 29.8748, Khunia 30.8723, Bichhabhanga 34.8736 and Budhram 33.8742. In Postmonsoon ground covers, *Axonopus compressus*(98.89, 97.33) emerged with highest frequency in Murti, Gorumara where, *Ichnocarpus frutescens* (97.14) in Dhupjhora, *Coffea bengalensis* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. *Chloranthus erectus* (5.51, 8.18) in Dhupjhora and Budhuram, *Elatostema monandrum* (5.15, 6.30) in Gorumara and Bichhabhanga, *Achyrospermumwallichianum* (5.08) in Khuniapresented highiest density. *Chloranthus erectus* (22.18), *Axonopus compressus* (21.20), *Oplismenus burmannii* (17.01) etc.in Budhuram recorded maximum IVI. Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata* (63.94906), Dhupjhora by *Rumex dentatus* (277.1452), Gorumara by *Molineriacapitulata* (185.58), Khunia by *Blumea lacera* (210.3026), Bichhabhanga by *Saccharum spontaneum* (145.8058), and in Budhuram by *Prunella vulgaris* (257.6947). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.460447, Gorumara 0.452730, Khunia 0.710096, Bichhabhanga 0.607251 and Budhuram 0.569362. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8846, Gorumara 29.8808, Khunia 36.8735, Bichhabhanga 34.8767 and Budhram 33.8777. Murti Beat presented a maximum IVI values by *Maesa indica* (17.15), *Alpinia nigra* (16.66), *Litseaglutinosa*(16.47), *Ichnocarpus frutescens* (11.82) etc. where Dhupjhora by *Ichnocarpus frutescens* (18.58), *Chromolaena odorata* (16.39), *Argyreia roxburghii* (15.89), *Alpinia nigra* (15.59)etc. Gorumara presented by *Argyreia roxburghii* (21.60), *Chromolaena odorata* (17.18)etc., Khunia by *Alpinia nigra* (27.21), *Argyreia roxburghii* (16.90), *Mikania micrantha* (15.16), *Chromolaenaodorata* (13.23) etc., Bichhabhanga by *Mikania micrantha* (19.52), *Parabaena sagittata* (18.59), *Chromolaena odorata* (17.38) etc.and *Mikania micrantha* (26.15), *Ichnocarpus frutescens* (21.33), *Chromolaena odorata* (19.29), *Tetrastigma serrulatum* (17.79) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas. Simpson's Index (EH) maximum recorded in Murti by *Streblus asper*(611.4638), Dhupjhora by *Zizyphus mauritiana* (365.5565), Gorumara by *Abrus pulchellus* (413.3263), Khunia by *Toddalia asiatica*(469.2142), Bichhabhanga by *Actinodaphne obovata* (142.9482), and in Budhuram by *Pterocarpus acerifolius* (161.4426). Incase of Species Richness in premonsoon ground cover of Murti

Beat presented Menhinick Richness Indices (D)1.143027, Dhupjhoran 0.939123, Gorumara 0.919757, Khunia 1.049093, Bichhabhanga 0.939384 and Budhuram 0.955192. Similarly Murti Beat presented the Margalef Richness Indices (RI) 52.8697, where, Dhupjhora 40.8676, Gorumara 35.8637, Khunia 42.8653, Bichhabhanga 33.8607 and Budhram 33.8600. In monsoon ground covers, *Argyreia roxburghii* (100.00, 100.00 & 93.33) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100) in Khunia, *Pueraria phaseoloides* (100.00) in Bichhabhanga and *Chromolaena odorata* (94.44) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Mikania micrantha* (100.00). Simpson's Index (EH) maximum recorded in Murti by *Glycosmis pentaphylla*(610.1924), Dhupjhora by *Zizyphus mauritiana*(515.5455), Gorumara by *Pterocarpus acerifolius* (568.7283), Khunia by *Abrus pulchellus* (298.1147), Bichhabhanga by *Actinodaphne obovata* (203.4955), and in Budhuram by *Pterocarpus acerifolius* (199.4133). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.853887, Dhupjhoran 0.788811, Gorumara 0.787591, Khunia 0.774749, Bichhabhanga 0.810063 and Budhuram 0.898317. Similarly Murti Beat presented the Margalef Richness Indices (RI) 48.8765, where, Dhupjhora 41.8742, Gorumara 36.8701, Khunia 38.8724, Bichhabhanga 35.8682 and Budhram 35.8645. In Postmonsoon ground covers, *Argyreia roxburghii* (100.00) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100.00) inKhunia, *Bridelia retusa* (100.00) in Bichhabhanga and *Mikania micrantha* (100.00) in Budhuram presented the maximum frequency. Simpson's Index (EH) maximum recorded in Murti by *Streblus asper* (761.0204), Dhupjhora by *Zizyphus mauritiana* (529.6169), Gorumara by *Pterocarpus* 570.9368), Khunia by *Toddalia asiatica* (600.7942), Bichhabhanga by *Actinodaphne obovata* (195.7899), and in Budhuram by *Pterocarpus acerifolius* (213.4993). Other recorded species cotain maximum EH values in all of the areas are *Streblus asper, Premna latifolia, Abrus pulchellus, Actinodaphne obovata* etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.898177, Dhupjhoran 0.755127, Gorumara 0.785812, Khunia 0.883477, Bichhabhanga 0.802322 and Budhuram 0.862044. Similarly Murti Beat presented the Margalef Richness Indices (RI) 47.8743, where, Dhupjhora 40.8748, Gorumara 36.8702, Khunia 41.8705, Bichhabhanga 34.8676 and Budhram 35.8660. In the tree layer, *Actinidaphne obovata* (100.00) emerged with highest frequency in Murti and Gorumara, where, *Alangium chinensis* (100.00) leads the frequency in Dhupjhora, *Alstonia scholaris* (100.00) in Budhuram and Khunia, *Casaeria vareca* (100.00) in Bichhabhanga. The maximum IVI value leads by *Shorea robusta* in allover the study areas. Simpson's Index (EH) maximum recorded in Murti by *Castanopsis indica* (405.99863), Dhupjhora by *Terminalia belirica* (673.8532), Gorumara by *Ficus benghalensis* (465.3478), Khunia by *Aegle marmelos* (430.883), Bichhabhanga by *Artocarpus chaplasa* (494.5687), and in Budhuram by *Ficus benghalensis* (392.5362). Incase of Species Richness in canopy covers of Murti Beat presented Menhinick Richness Indices (D) 0.783519, Dhupjhoran 0.62, Gorumara 0.72, Khunia 0.66, Bichhabhanga 0.70 and Budhuram 0.70. Similarly Murti Beat presented the Margalef Richness Indices (RI) 36.8703, where, Dhupjhora 32.87, Gorumara 36.87, Khunia 32.87, Bichhabhanga 30.87 and Budhram 32.87.

Total 127 species traditionally used as medicinal plant species has been recorded from GNP and enumerated. From the present survey, a total of 335 species of useful plants has been recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or riped fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals. 39 percent plants collected by the local villagers for their won domestic animals fodder. 8 percent of the total collected species has used as fuel wood in their

earthen oven. A total 127 species of medicinal plants i.e. 19 percent plants collected by few person for medicin purpose. They also collected and use 45 species of medicinal plants to cure their pets from various diseases and disorder. 13 percent of total NTFPs species collected or planted for ornamental or decorative purpose. Out of 82 species i.e. 8 percent of the total NTFPs plants, 20 species used as plant vegetable where whole plants has used to cook. Leaves of 13 species has used as vegetable. 28 species fruits used as vegetable of edible fruits.

20 species of plants i.e. 3 percent of the total NTFPs recorded species has use by the local villagers in their daily cultural and ritual life like marrage, puja or other social programme.

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Chapter 1

INTRODUCTION

INTRODUCTION

Forest is one of the most important components of the life support system of our environment (Rai 2006). The technological society produced spite for the past 200 years, which can change the course of evolution processes of nature. As part of the biosphere, we are directly under the influence of the global changes, which has generated through our own activities (Hargrove 1994). The survival of all species in our ecosystem depends on the consumption and use of other species. As natural systems evolved, humanity learned to dominate by their way of life drastically by adopting land intensive systems of food production such as cropping and animal breeding. The superior human brain allowed the evolution of intelligence and inventions which led to the development of a changeable culture to generated high levels of demand on their environment.

As the so-called modern technology advances, so does our ability to change our surroundings, changes were made on the surface of earth today are more extensive and occurring more rapidly than ever before. The ramifications of these changes have become more significant with the increase in world population, resulting in the decline of available per capita land. Environment is losing its resilience where the intensity of human interventions is high (Rai 2006).

The Himalayan range created conditions favourable for migration of temperate species from mainland Asia in the rising altitude (Lakhanpal 1988). In the lower reaches of the Himalayas warm and humid climate with high precipitation prevailed. Numerous tropical to semi-evergreen taxa from Southeast Asia migrated, differentiated and produced new elements (Awasthi 1992; Sharma 2000). Palynological evidences from various places of the Himalayan region indicated sub-tropical to temperate vegetation in upper region of the newly formed mountain ranges, which had later developed cooler climate depending on the altitude and depth of the hill system (Sharma 2000; Sharma and Chauhan 1988; Lukose 1968; Nandi 1975; Singh and Saxena 1981). High degree of precipitation and atmospheric humidity supported by the topography and location of the different mountain ranges provided perfect situation along with the migration and mixing of different floras has facilitated the development and evolution of a rich and significantly original East Himalayan flora (Das 2004).

1.1 NORTH BENGAL FLORA

Both flora and ethnobotanical heritage of North Bengal is very rich. Recognition of as much as five National Parks has represented huge diversity of North Bengal those mainly belong to the Sal dominated tropical dry deciduous type of forests (Champion and Seth 1968). Workers like A.M Cowan and J. M. Cowan (1929), H. Ohashi (1975), A.J.C. Grierson and D.G. Long (1979, 1983 – 1991, 1999 – 2001, 1994 - 2000), Das (1986, 1995, 2004) intensively studied the flora of this region. Mukherjee (1965) prepared a sketch of the vegetation of Jalpaiguri District. Sikdar (1984) worked on Baikunthapur Forest division; Banerjee (1993), Pandit (1996), Das *et al.* (2003) and Pandit *et al*. (2004) worked on Jaldapara Wildlife Sanctuary that is now upgraded to Jaldapara National Park; Pandit *et al*. (2004) estimated the value of NTFP plants in Jaldapara Wildlife Sanctuary (JWLS), Sarkar (2014) worked on the NTFP plants of Buxa Tiger Reserve (BTR), Saha *et al*. (2013) worked on the medicinal plants of Gorumara National Park. Das *et al*. (2010) prepare a detailed list of medicinal plants in three MPCAs of Terai and Duars. Saha *et al*. (2015) worked on NTFPs of Gorumara National Park (GNP) and has recognized the occurrence of at least 335 species those can be treated as NTFPs and of which 58 species are used as food plants (commercial and non-commercial). However, till date, no attempt has taken to prepare the detail flora of Gorumara National Park.

Geographically, North Bengal can be divided into three prominent vegetational zones. The rolling plains extending from Dinajpur to the north bank of Ganga River, Terai-Duars region and Darjeeling Hills. All these three zones have their own characteristic features and are extremely rich in flora and fauna. GNP is located in the Duars region where the concentration of Protected Areas (PA) is maximum for the country. Apart from GNP other PAs located in Duars region include Jaldapara National Park, Buxa Tiger Reserve, Chapramari Wildlife Sanctuary, Buxa National Park, Sursuti Reserve Forests, etc. But, our knowledge on the flora and fauna of these PAs is extremely poor.

1.2 FLORA OF GORUMARA NATIONAL PARK

India is one of the 17 mega-diverse countries of the world covering only 2.4 % of the world's land area, 16.7 % of the world's human population and 18 % livestock, and it contributes about 8 % of the known global biodiversity (Olson *et al.* 2001; Olson and Dinerstein 2002). Gorumara National Park is located at the feet of the IUCN recognized Himalaya Biodiversity Hotspot and administratively falling in the Jalpaiguri District of West Bengal. Though this is a comparatively smaller national park (7945.28 hectare) but its location is very critical (Saha *et al*. 2013). The Park also belongs to the Bio-Geographical zone 7B (Lower Gangetic Plain) as recognized by Rodgers and Panwar (1990). Ecological boundary of this park extends up to Sibchu, Khumani and Jaldhaka blocks of Jalpaiguri and Kalimpong Forest Divisions respectively. The ecological boundary in the eastern fringe extends well beyond Gairkata, Central Diana upto Moraghat blocks of Jalpaiguri forest division whereas in the western part it assumes an area beyond Sursuti, Lataguri blocks of Jalpaiguri forest division, extending up to Apalchand and Kathambari forests of Baikunthapur forest division. Major significance of the national parks being the habitat of a number of schedule 1 animals, which are given maximum protection at the national level. The main endangered animal in GNP is Indian one horned rhinoceros (*Rhinoceros unicornis* L.). And, in addition, other giants like elephant, bison, Rock-Python are surviving here as co-inhabitants with quite high population structure. The Forest Action Plan (2002) for GNP has recorded the occurrence of only 326 identified plant species that include 158 species of trees, 35 herbs, 77 shrubs, 32 species of grasses, 15 species of climbers and 9 species of orchid. All Eco-Development Committees of the surrounding area are rendering protection of this forest as part of their agreement with the Forest Department (FD) during the implementation of Joint Forest management (JFM) program (Sarkar *et al.* 2009). Murti, Jaldhaka, Garati and Indong are the main rivers passing through this important Protected Area (Saha *et al.* 2013). The entire forest tract of GNP comes under the North Indian moist tropical forest type in Champion and Seth's (1968) classification. Average elevation of the park area is 90 m AMSL and chiefly covered with alluvial soil (Sarkar *et al.* 2009).

1.3 AMELIORATION OF FLORISTIC ELEMENTS

Article 2 of the CBD (2012), defines biodiversity as "variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part". In other words biodiversity refers to the variety and variability among living organisms and the ecosystem complexes in which they occur. Also, Biodiversity can be defined as sum of the species richness, i.e. number of species of plants, animals and microorganisms occurring in a given habitat.

As per WCMC, India is one of the 17 mega-diversity countries in the world. India possesses 10.78 % of flora in the world, which is the second richest country in the world after Brazil in concern of plant species. The family is one of the largest among angiosperm comprising 37 genera and ca. 1100 species distributed across the tropical and temperate regions of the world (Corner 1962; Berg *et al.* 2006). The MoEF (2009) have reported that in India, there are 45,364 plant species identified so far, of which 17,564 are of flowering plants belonging to 2,250 genera and 315 families. The vascular flora which covers different forest types in India, consist about 40 percent endemic plant wealth (Khoshoo 1984, 1986). Hooker (1904) remarked "the Indian flora is more varied than that of any other country of equal area in the Eastern Hemisphere, if not in the globe". Not only this, the presence

of a large number of primitive flowering plants in India led Takhtajan (1969) to render the north-eastern region of India to consider as "a cradle of flowering plants".

India holds about 11 percent of world's recorded plant species, making it the 10th country in floral diversity [http://www.hindustantimes.com/india/india-ranks-10th-in-world-in-plant-diversity/story-SKwpVETr40aJWr64lh81sO.html]. India has a total of 17527 angiosperm species representing 7 percent of the global angiosperm (flowering plants) diversity (Karthikeyan 2009; Singh et al. 2014). There are apparently many more species to be recorded especially in the lower plant groups and in the more inaccessible areas.

India with a total geographical area of 329 million hectares is one of the rich floristic regions of the world. Due to the diverse type of eco-climatic conditions and altitudinal variations, the region harbours a rich biodiversity. It is recognized as one of the megabiodiversity hotspots of the world representing about 18000 angiospermic species with 33 % endemism comprising ca. 5500 species under 140 genera and total 11,058 plant species are endemic to the country (MoEF 2009).

Hooker and his associates described 14,900 species of Angiosperms in his '*The Flora of British India'* (1872 – 1897). Talbot (1894) collected plants largely from southern part of Bombay Presidency and reported systematic list of trees, shrubs and woody climbers of the Bombay Presidency, which included 497 trees, 346 shrubs and 126 woody climbers. Cooke published '*Flora of the Bombay Presidency'* (1901-1908). Bor (1960) deals with the '*Grasses of Burma, Ceylon, India & Pakistan'*, reported around 1,243 species belongs to 247 genera. The Northeast region of the country is a rich floristic region with two biodiversity Hotpots - the 'Himalaya' and the 'Indo-Burma' diversity centers. It forms a unique biogeographic province encompassing major biomes recognized in the world with about 8,000 flowering plant species that nearly represents 50 % flora of the country (Babu and Arora 1999). It covers an area of 2,62,060 sq km constituting about 8 % of the country's total geographical area. All types, right from the grassland meadows, swamps, scrub forests, mixed deciduous forests, humid evergreen forests, temperate and alpine vegetation are found here. The varied forest types found in the region are home to numerous species of plants and animals. Specially, the region exhibits the richest diversity of various plant groups like Orchids, Pipers, Primulas, Bamboos, Canes, Zingibers, Yams, Figs, Legumes, Ferns, Rhododendrons, etc. Many primitive plant families such as Magnoliaceae, Illiciaceae, Lauraceae, Hamamelidaceae, Degeneriaceae, Tetracentraceae and Lardizabalaceae are well represented in the region. Besides the rich floristic diversity, the region also represents the high degree of endemism with nearly 40 % endemic taxa (Mao *et al*. 2009). A large number of wild relatives of economically important crop species that includes Citrus, Banana, Rice, Sugarcane, Pulses etc. have originated in this region (Mao *et al*. 2009).

Arunachal Pradesh is the largest state in Northeastern region of the country and comprises major part of the Eastern Himalaya with an area of 83,743 sq km. The total forest cover is about 67,410 sq km that is accounting for 80.50 % of total geographical area (FSI 2011). The state by virtue of its geographical position, climatic condition and altitudinal variation, is regarded as most biodiversity rich region in the whole of Northeast India with large tracts of tropical, sub-tropical, temperate and alpine forests housing rich floristic diversity with 4,117 species of flowering plants (Hajra and Mudgal 1997). Apart from the rich diversity in flora and fauna it also exhibits high degree of endemism with about 220 endemic species (Anonymous 1999) and is comparatively endowed with diverse vegetation having rich gene pool of both wild and domesticated plants.

Sharma *et al*. (1984) documented 3,924 species, 1,323 genera from 199 families, based on herbarium specimens and secondary literature. Nayar and Sastry (1987 – 1990) made intensive study on threatened plants of India and have reported 814 such taxa. They considered about 10 % of flowering plants of the Indian territory are threatened. Based on the floristic studies it reveals that the Angiospermic flora of West Bengal state harbours about 3580 species under 1333 genera in 200 families (Chakraverty *et al.* 1999). Besides, the state supports 21 species of Gymnosperms, 416 species of Pteridophytes, 771 species of Bryophytes, 873 species of Algae, 539 species of Fungi and 329 species of Lichens. There are 37 rare and threatened taxa in the state (Chakraverty *et al*. 1999) and 19 taxa have been described from West Bengal, which are not collected after their type collection

(Sanjappa *et al*. 2012). There are about 850 species of medicinal plants in the state and about 1600 species are used by various tribal communities in the state (Chakraverty *et al*. 1999). Jain and Sastry (1980) were first to list 17 rare and endangered pteridophytes from India while Dixit (1983) and Datta (1983) listed 25 rare and interesting and 5 rare pteridophytes respectively. Nayar and Sastry (1987, 1988, 1990) included 31 threatened pteridophytes in the volumes of the Botanical Survey of India's *Red Data Book of Indian Plants*. Bhardwaj *et al.* (1987) enumerated 36 endangered species belonging to 21 genera of ferns and fern-allies from Rajasthan. Bir (1988) listed 49 endangered species. Chandra *et al.* (2008) evaluated the status of 400 threatened pteridophytic taxa of India.

1.4 STATUS OF WETLANDS IN INDIA

According to the Ministry of Environment and Forests, Govt. of India (MoEF 2009), the total wetland area in India is amounts to 4.7 million ha; of which 1.5 Mha are natural, 2.6 Mha are man-made and 0.6 Mha is the house of mangrove vegetation (MoEF 1990). The survey of the nationwide wetland inventory (Garg *et al*. 1998) reveals that there are 27,403 wetland units in the country occupying 7.6 Mha, of which coastal wetlands are constituted by 3959 units with an aerial extent of 4.0 Mha, whereas inland wetlands represent 23444 units with a total area of 3.6 Mha. Recently, National Wetland Inventory (2011) Assessment by the Space Application Centre, ISRO, Ahmedabad estimated 15.260 Mha wetland areas, which is around 4.63 % geographic area of the country. Of these Inland-Natural wetlands accounted for around 43.4 % of the total area, while Coastal – Natural wetlands account for 24.3 %. The major wetland types in inland category are river/stream, reservoir, tank/ pond and lake/pond. In coastal wetland category major types are inter-tidal mudflat, lagoon, and creek. Among all the wetland types, river/stream is the major type, occupying an area of 5.26 Mha (34.46 %); reservoirs occupy 2.48 Mha (16.26 %), inter-tidal mudflats occupy 2.41 Mha (15.82 %), tanks/ponds occupy 1.31 Mha (8.6 %), and lakes/ponds occupy 0.71 Mha (4.78 %). Mangroves, Coral reefs, Beach and High altitude lakes (>3000 m elevation), though contribute very small percentage to total wetlands, are some of the unique wetland types of India. There are 178 Lagoons and 4703 high altitude lakes in the country. So far India has designated 26 wetland sites as Ramsar sites of international importance (ISRO, 2013).

According to a comprehensive study by the Salim Ali Centre for Ornithology and Natural History (SACON), India lost about 38 % of its wetlands during the 1990s; in some districts, the loss is as high as 88 %. The wetland loss in India can be *acute* and *chronic* losses. The filling up of wet areas with soil constitutes acute loss, whereas the gradual elimination of vegetation cover with subsequent erosion and sedimentation of the wetlands over many decades is termed as chronic loss. Wetland loss refers to physical loss in the spatial extent or loss in the wetland functions/services. The loss of one km^2 of wetlands in India will have much greater impacts than the loss of same of wetlands in low population countries with abundant wetlands. Restoration of these converted wetlands is quite difficult once these sites are occupied for non-wetland uses.

1.5 CONSERVATION OF FLORA

A network of 668 Protected Areas (PAs) has been established throughout India, extending over 1,61,221.57 sq km (i.e. 4.90 % of total geographic area), with 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves. The State/Union Territory wise details of PAs in the country with year of notification and area is given at Annexure – I. There are 39 Tiger Reserves (Annexure – II) and 28 Elephant Reserves (Annexure – III) designated so far for species specific management of tiger and elephant habitats. UNESCO (2005) has designated 5 Protected Areas as World Heritage Sites. The Convention on Biological Diversity's Programme of Work on Protected Areas, IUCN categorized the protected areas in major six classes:

(Ia) Strict Nature Reserve, (Ib) Wilderness Area, (II) National Park, (III) Natural Monument or Feature, (IV) Habitat/Species Management Area, (V) Protected Landscape/Seascape and (VI) Protected Area with Sustainable Use of Natural Resources (IUCN and UNEP-WCMC 2014).

1.5.1. Sanctuary is an area of adequate ecological, faunal, floral, geomorphological, natural or botanical or zoological significance. The Sanctuary is declared for the purpose of protecting, propagating or developing wildlife or its environment. Certain rights of people living inside the Sanctuary could be permitted.

1.5.2. National Park is an area having adequate ecological, faunal, floral, geomorphological, natural or zoological significance. The National Park is declared for the purpose of protecting, propagating or developing wildlife or its environment, like that of a Sanctuary but that must be naturally. The difference between a Sanctuary and a National Park mainly lies in the vesting of rights of people living inside. Unlike a Sanctuary, where certain rights can be allowed, in a National Park, no rights are allowed. No grazing of any livestock shall also be permitted inside a National Park while in a Sanctuary, the Chief Wildlife Warden may regulate, control or prohibit it. In addition, while any removal or exploitation of wildlife or forest produce from a Sanctuary requires the recommendation of the State Board for Wildlife, removal etc., from a National Park requires recommendation of the National Board for Wildlife (*However, as per orders of Hon'ble Supreme Court dated 9th May 2002 in Writ Petition (Civil) No. 337 of 1995, such removal/ exploitation from a Sanctuary also requires recommendation of the Standing Committee of National Board for Wildlife*).

1.5.3. Conservation Reserves can be declared by the State Governments in any area owned by the Government, particularly the areas adjacent to National Parks and Sanctuaries and those areas which link one Protected Area with another and behave like a corridor (Das *et al*. 2008). Such declaration should be made after having consultations with the local communities. Conservation Reserves are declared for the purpose of protecting landscapes, seascapes, flora and fauna and their habitat. The rights of people living inside a Conservation Reserve are not affected.

1.5.4. Community Reserves can be declared by the State Government in any private or community land, not comprised within a National Park, Sanctuary or a Conservation Reserve, where an individual or a community has volunteered to conserve wildlife and its habitat. Community Reserves are declared for the purpose of protecting fauna, flora and traditional or cultural practices and values. As in the case of a Conservation Reserve, the rights of people living inside a Community Reserve are not affected.

1.5.5. Regulations/ laws relating to Protected Areas (PAs): The PAs in India are constituted and governed under the provisions of the Wild Life (Protection) Act, 1972, which has been amended from time to time, with the changing ground realities concerning wildlife crime control and PAs management. Indian Forest Act, 1927, Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 and Biological Diversity Act, 2002 and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 are quite strong and implemented strictly then the biodiversity conservation in India will remain best in the world. The Wildlife Crime Control Bureau of the Central Government supplements the efforts of provincial governments in wildlife crime control through enforcement of CITES and control of wildlife crimes having cross-border, interstate and international ramifications. India is a party to major international conventions viz. Convention on International Trade in Endangered Species of wild fauna and flora (CITES), International Union for Conservation of Nature (IUCN), International Convention for the Regulation of Whaling, UNESCO-World Heritage Committee and Convention on Migratory Species (CMS).

1.6 FLORISTIC STRUCTURE IN INDIA

So far 35 such hotspots has been recognized distributed round the world that includes Himalaya which covers an area extending from Afghanistan-Pakistan border to Arunachal Pradesh in India (Mittermeier *et al*. 2004; Holsinger 2005). Biodiversity Hotspots are defined as areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat (Myers *et al*. 1988).

India is one of the 17 mega-diversity countries as recognized by IUCN (The World Conservation Union). This is the recognition to the country's extremely rich and diverse Biodiversity. At the same

time, like most other Biodiversity rich countries of the World this natural gift cum resource is under tremendous pressure and innumerable species are now under intolerable threat against their survival (WCMC 1992; Chowdhury 2009). India is among the leading countries in terms of endemics. The determining criteria for a Hotspot is that an area must contain at least 0.5 % or 1,500 of the world's 300,000 plant species and 27,298 vertebrates (including mammals, birds, reptiles and amphibians) as endemics, and the remaining primary vegetation is less than 30 % of its extant area (Sala *et al*. 2000). Three mega centers of endemic plants in India are (i) Eastern Himalaya harboring 10,000 species of plants with 3500 endemic species; (ii) Western Ghats possessing 5800 plant species with about 2000 endemics; and (iii) Western Himalaya with 1195 endemic species of plants. The Andaman and Nicobar Islands harbor about 83 % endemic species (Mayer 1996). The vegetation and forest types in India have been analyzed by Champion and Seth (1968), National Remote Sensing Agency (NRSA) (Anonymous 1979), Forest Survey of India (FSI) (Anonymous 2003), and Indian Institute of Remote Sensing (IIRS 2003).

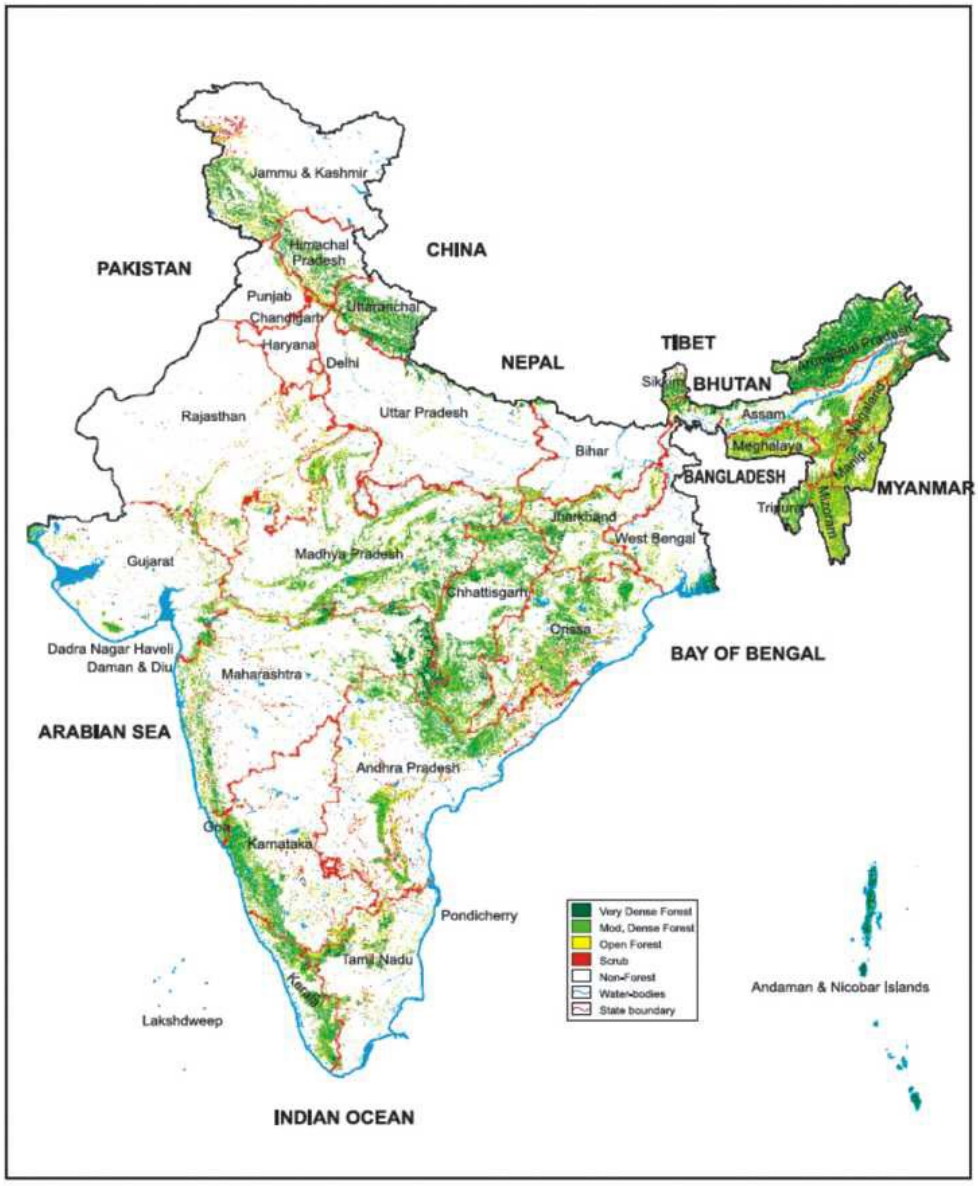

Fig.1.1: Vegetation map of India [after FSI 2003]

The FSI defines forest cover as 'all lands more than one hectare in area, with a tree canopy density of more than 10 %, irrespective of ownership and legal status'. For the present purpose, the terms 'forest area' and 'forest cover' (Fig.1.1) are used synonymously (SFR 1987).

Table 1.1: States wise forest cover in India (FSI 2007)

States/ UTs	Geographical areas (GA)	Forest Cover				Percent of GA	Change in forest cover	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Andhra Pradesh	275,069	820	24,757	19,525	45,102	16.40	-129	10,372
Arunachal Pradesh	83,743	20,858	31,556	14,939	67,353	80.43	-119	111
Assam	78,438	1,461	11,558	14,673	27,692	35.30	-66	179
Bihar	94,163	231	3,248	3,325	6,804	7.23	-3	134
Chhattisgarh	135,191	4,162	35,038	16,670	55,870	41.33	-59	107
Delhi	1,483	7	50	120	177	11.94	0	1
Goa	3,702	511	624	1,016	2,151	58.10	-5	1
Gujrat	196,022	376	5,249	8,995	14,620	7.46	16	1,463
Haryana	44,212	27	463	1,104	1,594	3.61	-10	145
Himachal Pradesh	55,673	3,224	6,383	5,061	14,668	26.35	2	327
Jammu & Kashmir	222,236	4,298	8,977	9,411	22,686	10.21	-3	2,036
Jharkhand	79,714	2,590	9,899	10,405	22,894	28.72	172	683
Karnataka	191,791	1,777	20,181	14,232	36,190	18.87	-10	3,176
Kerala	38,863	1,443	9,410	6,471	17,324	44.58	40	58
Madhya Pradesh	308,245	6,647	35,007	36,046	77,700	25.21	-39	6,401
Maharashtra	307,713	8,739	20,834	21,077	50,650	16.46	-11	4,157
Manipur	22,327	701	5,474	11,105	17,280	77.40	328	1
Meghalaya	22,429	410	9,501	7,410	17,321	77.23	116	211
Mizoram	21,081	134	6,251	12,855	19,240	91.27	640	1
Nagaland	16,579	1,274	4,897	7,293	13,464	81.21	-201	2
Orissa	155,707	7,073	21,394	20,388	48,855	31.38	100	4,852
Punjab	50,362	0	733	931	1,664	3.30	4	20
Rajasthan	342,239	72	4,450	11,514	16,036	4.69	24	4,347
Sikkim	7,096	500	2,161	696	3,357	47.31	0	356
Tamil Nadu	130,058	2,926	10,216	10,196	23,338	17.94	24	1,206
Tripura	10,486	111	4,770	3,192	8,073	76.99	-100	75
Uttar Pradesh	240,928	1,626	4,563	8,152	14,341	5.95	-5	745
Uttarakhand	53,483	4,762	14,165	5,568	24,495	45.80	2	271
West Bengal	88,752	2,987	4,644	5,363	12,994	14.64	24	29
Andaman & Nicobar	8,249	3,762	2,405	495	6,662	80.76	-1	53
Chandigarh	114	1	10	6	17	14.91	0	1
Dadra & Nagar Haveli	491	0	114	97	211	42.97	-5	1
Daman & Diu	112	0	1	5	6	5.36	0	3
Lakshadweep	32	0	16	10	26	81.25	0	0
Pundicherry	480	0	13	31	44	9.17	2	0
Grand Total	**3,287,263**	**83,510**	**319,012**	**288,377**	**690,899**	**21.02**	**728**	**41,525**

India's forest cover in 2007 was 69.09 million ha which is 21.02 % of the geographical area (MoEF 2010). Of this, 8.35 million ha (2.54 %) is very dense forest, 31.90 million ha (9.71 %) is moderately dense forest, the rest 28.84 million ha (8.77 %) is open forest, and 0.46 million ha of mangrove vegetation. This data is excluding the 18.31 million ha of area situated above tree line and with this the forest cover of the country comes of 22.26 % (Table 1.1) (MoEF 2010).

In India there are many ecological studies on floristic and biodiversity. Ghate *et al.* (1997) assessed the plant diversity in Western Ghats, while Jhosi and Suresh (1997) carried out the diversity analysis in Nilgiri Biosphere Reserve. Adhikari *et al.* (1991) investigated the species composition and diversity in high altitude forests of Kumaon region (Western Himalaya). P. S. Ramakhrisnan and his associates (1980) (Singh and Mudgal, 1998; Saxena and Singh 1982) initiated ecological studies on the forests of Meghalaya in the 1980's.

Further studies on forest ecosystem of northeast India were carried out by Singh (1980), Khan *et al.* (1986, 1987), Barik *et al.*(1992), Rao (1992), Rao and Hajra (1986) and Rao *et al*. (1990). Barik *et al.* (1992) studied the species diversity in the sub-tropical forest of Meghalaya. Ganesh *et al.* (1996) studied plant diversity in mid-elevation evergreen forest of Western Ghats. Takhtajan (1969) considered northeast India as "*The cradle of ancient angiosperms*" due to the occurrence of large number of primitive and ancient flowering plant in the region.

Eastern Himalaya, including Sikkim, Darjeeling (of West Bengal) and Arunachal Pradesh is considered as a distinct phytogeographical region (Clarke 1885; Hooker 1907; Chatterjee 1940). Hooker (1904) commented, "The flora of British India is more varied than that of any other country of equal area in the Eastern hemisphere, if not in the globe". As such, being an integral part of the Eastern Himalaya and due to its immensely rich flora and fauna, this tiny Himalayan state of India is generally regarded as a "hotspot" of biodiversity. Its unique geographical position, varied topography, high annual precipitation, and maximum demographic pressure makes the area one of the richest botanical treasure house of the country (Singh and Chauhan 1998). Nearly 46 % of the total geographical area of the state is forest covered (FSI 2001).

Different groups of plants have invaded the region from numerous far and near localities and many of those, subsequently, have successfully been established in Eastern Himalaya (Das 2002). Today flora of the East Himalayan region is an admixture of taxa drawn from various countries. The great floristic diversity is largely attributed to its geographical and climatic factors that have helped not only the local flora to evolve but also plant species from surrounding places like China, Malaysia, Africa, Europe etc. to migrate and successfully established in the region (Brandis 1978; Das 1995, 2002; Bhujel and Das 2002; Moktan and Das 2013). A wide spectrum of climatic and ecological conditions within the region has supported plants of diverse floristic affinities to migrate, introduced and subsequently naturalized here.

Most importantly, orchid resources and its distribution is exceptionally distinct and deserves appreciations, as out of around 1200 species of the country (Misra 2007), it alone contributes for not less than 550 species (Lucksom 2008). Therefore, due to its sheer location and complex inter-relationship and species composition, Eastern Himalaya attracted a large number of researchers from different parts of the world. It arouses largely of interest among scientists and researchers (Rai *et al*. 1998).

1.7 FLORISTIC STRUCTURE OF WEST BENGAL

West Bengal is the only Indian state that is with marine-coast and mangroves (Sundarbans) in one side, semi-xeric hot habitat over a considerable area in the West, wide inland wetland vegetation, and then gradually extending to temperate and sub-alpine vegetation on high mountain Himalayan ranges reaching up to 3660 m AMSL on the northern extreme. This northern hilly part is the extension of the outer fringes of the Singalila Range of the Eastern Himalaya. The district of Darjeeling is forming such a Himalayan cap over the state of West Bengal. Major part of this district is hilly and the altitude ranges from 120 m to 3660 m in its different parts. This distribution of extreme ecological conditions within West Bengal helped it to support very wide range of vegetation structure supporting ever wider range of flora in its different corner. Terai and Duars region located at the feet of Darjeeling Hills is unique at it keeping close similarities with both, hill and pain-land vegetation and flora. West Bengal is classified in to five phyto-ecological zones (Anonymous 1997). These are:

(i) The Himalayan zone of Darjeeling

(ii) Sub-montane Terai region and the adjacent plains

(iii) Vast Alluvial plain on both sides of the Bhagirathi (Ganga) and its Northern and Western tributaries,

(iv) The Western dry flanks of Chotonagpur plateau, and

(v) Mangrove forests of Sundarbans.

Other than the broad outline, Gamble (1875), Malick (1966), Champion and Seth (1968), Naskar and Guha Bakshi (1987) classified the vegetation and forests of West Bengal on the basis of ecological and sociological structure of forests. There is large *Hijal* forest at the middle part of the state showing the continuation of riverine vegetation between the Rivers Mahananda and Kalindi and between Punarbhaba and Tangon up to Bihar (Anonymous 1997; Chowdhury 2009). Hooker (1904) described that apart from the Himalayan elements, West Bengal falls in to two provinces, *Bengal proper* and *Sundarbans*. Gamble (1875) considered "The forests of Darjeeling District .... more varied probably than those of any other district in India". In 1849 Hooker prepared an excellent narrative about the Himalayan vegetation in Darjeeling Himalaya. Depends on the floristic components, Gamble (1896) classified the vegetation of West Bengal in to eight classes. Those are –

i. *Acacia catechu – Dalbergia sisso forest of the Tropical Plains (Khair – Sissoo Forest)*

ii. *Savannah Forest in the Tropical Plains of Darjeeling (Shorea robusta* and *Dalbergia sissoo dominated),*

iii. *Mixed Plain Forest of the Tropical Plain (Shorea robusta dominated),*

iv. *Tropical Sal Forest of the plains of Darjeeling*

v. *Tropical lower Hill Forests of Darjeeling and their vegetational composition*

vi. *Subtropical Middle Hill Forests of Darjeeling and their composition*

vii. *Temperate Upper Hill Forest and vegetation of Darjeeling District,* and

viii. *The Conifer – Rhododendron Forests.*

1.8 FLORISTIC STRUCTURE OF DUARS

Out of its total geographical area of the state, 13.38 % comes under the recorded forest category compared to the national figure of 23.38 %. Of the total forest area of West Bengal, 59.38 %, 31.75 % and 8.87 % are categorised under reserved, protected and un-classed forests respectively. Furthermore, protected areas comprise 3.26 % of its geographical area consisting of 15 Wildlife Sanctuaries and 5 National Parks (Manoj 2013). Jalpaiguri has more recorded forest area (1,790 sq km) than Darjeeling (1,204 sq km) in terms of their respective geographical areas (Table 1.2). The district of Darjeeling is more forested (38.23 %) as compared to Jalpaiguri (28.75 %). More distinctively the data show that although Jalpaiguri is almost double the size of Darjeeling it lags behind the former by about 10 percentage points in terms of recorded forests. More disturbing scenario is observed for the Cooch Behar district, which is almost similar in size to Darjeeling but lags way behind in terms of the area under forest cover.

Table 1.2: Current status of forest areas in three districts of northern West Bengal (State Forest Report 2010 – 2011)

Forest Areas	3 Districts of North Bengal			West Bengal	India
	Jalpaiguri	Darjeeling	Coochbehar		
Geographical Area	6227	3149	3387	88752	3287240
Reserve forests	1483	1115	-	7054	423311
Protected Forests	217	-	42	3772	217245
Unclassified state forests and others	90	89	15	1053	127881
Total recorded forests areas	1790	1204	57	11879	768437
Recorded forest area in %	28.75	38.23	1.68	13.38	23.38

The Northern part of the state of West Bengal, covering six Districts located north of the River Ganga, is popularly referred as 'North Bengal'. State's major Biodiversity rich regions are located here and these include Terai, Duars and the Hills of Darjeeling. And, most of the protected areas of the state are located in these three areas. These include *Neora Valley National Park, Singalila National Park, Gorumara National Park, Mahananda Wildlife Sanctuary, Senchal Wildlife Sanctuary, Jaldapara National Park, Chapramari Wildlife Sanctuary*, *Buxa Tiger Reserve*, etc (Rodgers *et al.* 2000).

Out of the five vegetation zones (Anonymous 1997), the forest types and its floristic composition are most diverse and richest in Darjeeling Hills. This includes also the plain areas of the district that being greatly influenced by the Himalayan elements (Anonymous 1997). Mukherjee (1965) mentioned that the fascinating orchid flora of the Duars region also attracted his attention and then he worked out the fern flora of Jalpaiguri District. In 1984, Sikdar give a picture on floristic elements of Baikunthapur forest division of Jalpaiguri district and based on these elements, he described five forests types for the region –

i. *Semi-evergreen forest*

ii. *Moist deciduous forest*

iii. *Dry deciduous forests*

iv. *Sal forest* and

v. *Grasslands.*

Gorumara National Park is located in Duars and is falling within the territory of Jalpaiguri District of West Bengal. The entire forest tract of Gorumara National Park comes under the North Indian moist tropical forest of Champion and Seth's (1968) classification. The species which is commonly found within the forest and is most important from the economic and ecological stand points is *Shorea robusta.* This species occurs here with its usual associates like *Schima wallichii, Chukrasia tabularis, Magnolia champaca*, and *Terminalia bellirica*. The other important species which are also commonly seen in this park includes *Lagerstroemia parviflora, Terminalia myriocarpa, Duabanga grandiflora, Amoora wallichii, Aglaia wallichii, Bischofia javanica, Bombax ceiba, Acacia catechu, Dalbergia sisso, Albizia spp.,* etc.

Though this is a comparatively smaller park (7945.28 hectare) but its location is very critical and is forming a part of the chain of protected areas of different types in this region. It is connected to other protected areas like *Chapramari Wildlife Sanctuary* and *Jaldapara National Park* in Duars. Not only the plant diversity of the area is very rich but also the animal diversity is also unique and important. The gem animals in the park include Indian one-horned Rhino, Elephant, India Bison, Royal Bengal Tiger, Leopard, etc.

1.9 PREVIOUS FLORISTIC WORKS

The green diversity of Darjeeling Hills, Terai and Duars has attracted a large number of researchers and plant collectors from different parts of the world at least for the last three centuries (Don 1823, 1825; Das 1995, 2004). Soon after, the famous naturalist Griffith also explored Terai green belt in 1847. The famous botanist Sir J.D. Hooker made his visit to this area sometime during 1848 – '49 (Hooker 1849, 1904). Immediately after J.D. Hooker, no other botanist took up intensive floristic study of the Duars region. He explored the entire region and made a historic collection of approximately 2500 specimen of plants. His expedition and the account published by him include the *Flora of British India* (Hooker 1854, 1872 - 1897, 1904) is still one of the most comprehensive descriptions of botanical splendors for this region.

Significantly, botanists from different other parts of the world has latter made considerable contributions to the flora of Terai and Doors region of Jalpaiguri. They include Cowan and Cowan (1929), Ohashi (1975), Grierson and Long (1979, 1983 – 1991, 1999 – 2001, 1994 - 2000).

Champion and Seth (1968) also surveyed this region. Mukherjee (1965) prepared a sketch of

the vegetation of Jalpaiguri District. Sikdar (1984) worked on Baikunthapur Forest division, Banerjee (1993), Pandit (1996), Pandit *et al*. (2004) and Das *et al*. (2003) worked on the Jaldapara Wildlife Sanctuary (now Jaldapara National Park), and Biswas *et al*. (2012) published a detailed Dicotyledonous flora of Gossain Hat Beel. Wetlands of India was explored by Biswas and Calder (1937), Subramanyam (1962), Deb (1976), Cook (1996) and Fassett (2000). Pal *et al.* (2010) and Das (2013) worked on wetland of Assam. For Wetlands and their conservation, wetland macrophytes etc. of India are also reviewed by IUCN (1971), Gopal (1973), Wells (1992), WWF India (1993) and Williams (1997). Bandyopadhyay *et al.* (2005) listed aquatic and wetland vascular plants of Cooch Behar district. But, a detail study on Rasik Beel area was not done previously. Saha *et al*. (2013) worked on the medicinal plants of Gorumara National Park. Das *et al*. (2010) prepare a detail sketch of three MPCAs of Terai and Duars. These selected publications, on the other hand, showed the attractiveness of the plant diversity of this region. At the same time it is also clear that none of these works is complete and much more intensive explorations are essential for proper documentation from different aspects. Chowdhury (2009), explore the wetland vegetation of Malda district; Ghosh (2006), Sarkar (2011), Biswas (2015), Chowdhury (2015), Choudhury (2015) has explore the forest and wetland flora of Northern four district of West Bengal. Terai and Duars of Sub-Himalayan West Bengal are falling under 'Himalaya' Biodiversity Hotspot (Conservational International, 2005). The study area is harbouring a large number of floral species (Choudhuri, 1969; Das, 1995, 2004; Das and Chanda, 1987; Rai, 2001) in its wide range of habitat providing ample opportunity for ecological diversity (Champion and Seth 1968; Kadir 2001; Ghosh 2007; Sarkar 2011). High degree of endemism is the characteristic of its vegetation (Bhujel and Das 2002). But, continuous physical threats in very drastic manner, forced the indigenous floras to their extinction is imminent for the region (Das 1995, 2004; Bhujel and Das 2002). Sub-Himalayan wetlands are extending from Darjeeling to East bank of the River Ganga. The Terai and Duars region of West Bengal, Koch Behar district and low floodplains, lakes, streams, beels, seasonal waterlogged areas etc. (IWMED 1997) biodiversity rich areas. Highly favourable tropical to temperate climatic conditions, coupled with heavy rainfall, made these areas to support a large number of seasonal wetlands, covering wide areas, which are inhabited by diverse wet-loving aquatic or semi-aquatic plants. Innumerable anthropological activities like rapid expansion of civilization, construction of road, rail, increase of automobiles, implementation of mega-projects, population explosion, tourism related exploitation, rapid extension of crop field etc. are very rapidly converting these areas into fragmented wetlands and finally leading to the extinction of numerous wetlands. Random collection of wide array of useful plants, excessive agricultural activities, urbanization, pollution, filling for settlement areas and excessive tourism are causing the destruction of fertile and virgin wetlands. The rate and amount of exploitation of wetland areas are much above the sustainability limit (Sarkar 2014). Floristic survey of plant community provides information for analysing the diversity dynamics and structures of the vegetation. Wetland plants quickly respond to changes in water quality and have been used as bio-indicator for pollution (Tripathi and Shukla 1991).

Chapter 2

STUDY AREA

STUDY AREA

An important inclusion in the National Parks family, **Gorumara National Park** (GNP) is famous for its prestigious inhabitant one-horned great Indian Rhino. This is one of the last few small pockets in Eastern India harboring natural population of *Rhinoceros unicornis* L., along with other mega and majestic herbivores like Indian Elephant, Gaur or Indian Bison and is covered with rich vegetation. GNP had been a wild land sanctuary (Vide notification no. 5181-FOR, date: 02.08.1949) and a reserved forest since 1895 (notification no. 3147- FOR, date: 2nd July, 1895 with corrections later on), under the Indian forest act (VII of 1878). Formerly, an area of 2129 acre was first declared as Gorumara Wild Life Sanctuary (GWLS) vide Gov. Notification no. 5181-For, date: 02.08.1949. Subsequently, the notification under the Wildlife (protection) act, 1972, [vide no. 5400- For, date: 24th June, 1976] covering a total area of 8.62 sq km declaring the area as GWLS. In 1994, with Govt. notification no. 319_ For, dated 31st January, 1994 was issued with the intention of declaring the area as GNP, with major extension of the existing GWLS and now it covered a total area of 79.99 sq km. On 21st November, 1995, following a reorganization of the forest directorate of West Bengal, the total area of the GNP, curved out of the Jalpaiguri forest division was handed over to the Wild Life Division – II under the Conservator of Forest, Wild Life Circle [vide GOV. of West Bengal notification no. 4983-For, date 25th September, 1995]. The National Park presently consists of two territorial ranges, one mobile range, six beats and three camps.

2.1 THE LOCATION AND SIZE OF THE STUDY AREA

Gorumara National Park is one of the recent introductions to the National Parks map of India. Through the memo number 413/1 L.A. dated 12.07.1996, principal secretary, Department of Forests and Environment, Government of West Bengal declared the area as an *in situ* conservatory.

The National Park is presently consists of two territorial Forest Ranges (North and South), one mobile Forest Range, six Beats (Dhup Jhora, Gorumara, Bichhabhanga, Ramsai, Murti and Khunia) and three camps (Fig. 2.1).

In one earlier memo, G.O. No. 319 – For dated 31.01.1994, Department of forest, Government of West Bengal declared that the then proposed Gorumara National Park is covering an area of 7945.28 hectares. The boundaries of the Park are as follows:

North: Batabari – Nagrakata Public Works Department road and Selka line.

East: Jaldhaka River belt up to the Eastern boundary of North–Eastern junction with Gorumara 2 and then Eastern boundary of Madla Jhora 3 and Batabari 3.

South: Bichhabhanga road.

West: Lataguri Chalsa Public Works Department road, Baradighi Tea garden and Dakshin Dhup Jhora private lands and West bank of Murti River.

The GNP bears its significance in the international context for providing shelter and protection to various species of wild life included in the Red Data Book (RDB) of the IUCN and the appendices of CITES (Convention of International Trade in Endangered Species of wild flora and fauna).

The Park belongs to the Bio-Geographical zone 7B (Lower Gangetic Plain) as recognized by Rodgers and Panwar (1988). Total area of this bottle shaped National Park is 79.99 sq km. It is

located in the flood plains of Jaldhaka and Murti rivers and other medium and small rivers and rivulets those have created a pocket of grassland (Figs. 2.1 & 2.2). Gorumara National Park is located in the district of Jalpaiguri in the Northern part of West Bengal and geographically it is located at 88º 45' 19" to 88º 51' 18" E Longitudes and 26º 48' 05" to 26º 41' 20" N Latitudes. It is nearly a flat area with few small undulations which is the characteristic of this region and covering an altitude of 100 m to 136 m only. The National Park spreads in between the prominent localities like Lataguri, Chalsa and Nagrakata beside the National high way 31 that connects Siliguri with Guwahati. Siliguri (Airport: Bagdogra) is well connected by air from Kolkata, Delhi and Guwahati. And, from Siliguri GNP can be approached by Rail or road. The distance by road is only about 70 km.

The GNP and its nearby reserve forests [Lataguri, Sursuti, etc.] are very popular tourist destinations in Duars and numerous visitors enter its permitted areas almost round the year.

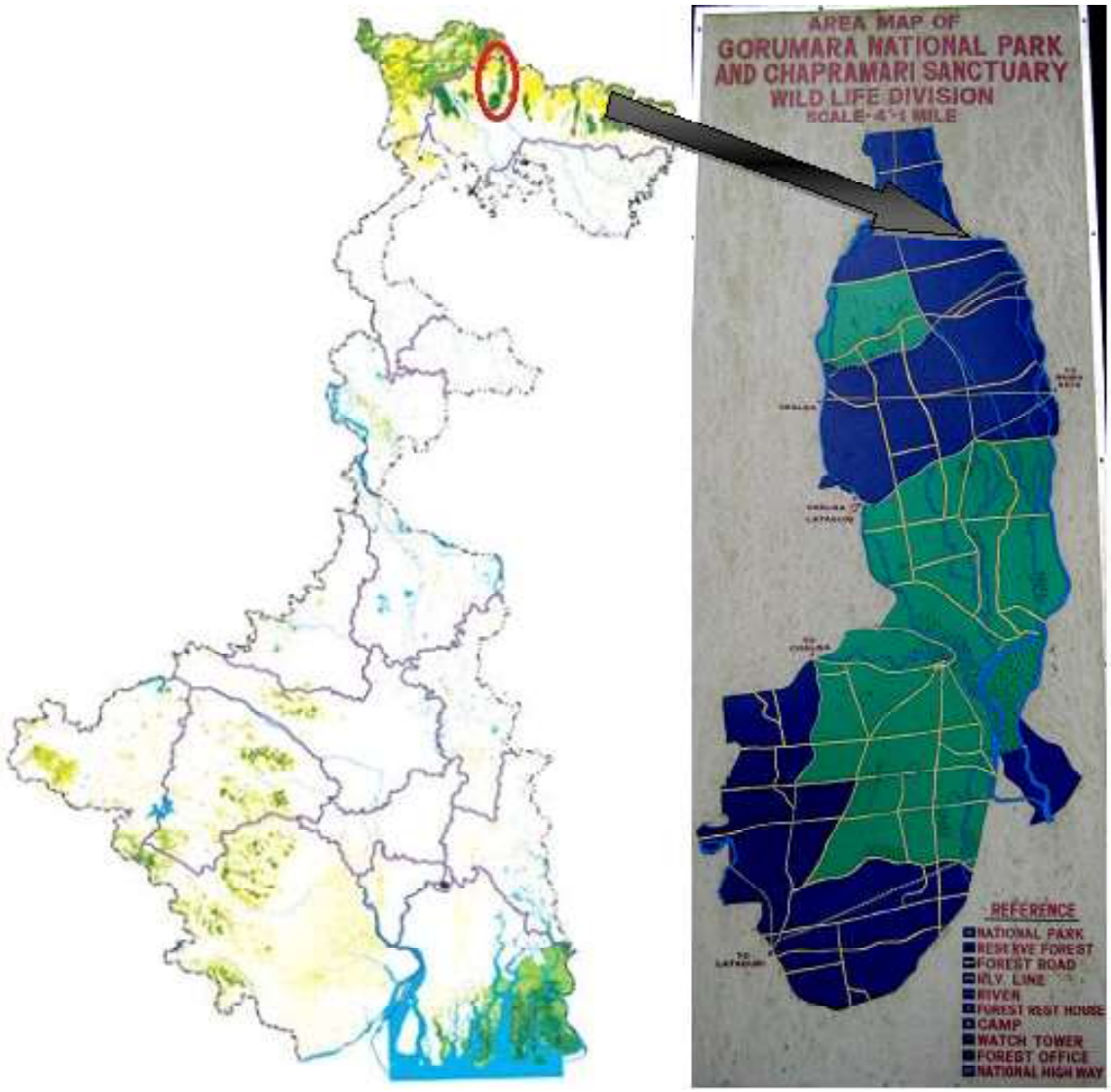

Fig. 2.1. Location of Gorumara National Park (GNP)

2.2 BOUNDARY AND DEMARCATION OF THE NATIONAL PARK

As presented under 2.1, the National Park is demarcated on North by the Batabari-Nagrakata PWD Road. The southern boundary runs along the compartment boundary between Batabari and Bichhabhanga compartments i.e. the Bichhabhanga Road. In the eastern side it is the Jaldhaka River, however, there is some land beyond Jaldhaka River adjacent to the Jadabpur Bamandanga and Tondu Tea Gardens. Towards the west, National Highway 31 acts as the boundary upto South Indong 2

compartment and boundary runs across Dakshin Dhupjhora mouja and meets the Batabari-Nagrakata PWD road.

2.2.1 Ecological Boundaries

Practically, it is not possible to restrict the movement of wild animals like Rhinos, Gaurs and Elephants within the legally demarcated boundary of the National Park. It is seen that the ecological boundary extends up to the Sibchu, Khumani and Jaldhaka blocks of Jalpaiguri and Kalimpong Forest Divisions. In the South too, it extends into the Bichhabhanga, Lataguri and Ramsai areas of Jalpaiguri Forest Division. The ecological boundary in the eastern fringe extends well beyond Gairkata, Central Diana upto Moraghat blocks of Jalpaiguri forest division whereas in the western part it assumes an area beyond Sursuti, Lataguri blocks of Jalpaiguri forest division and up to the Apalchand and Kathambari forests of Baikunthapur forest division.

Fig.: 2.2. GNP area showing in Google Earth Imagery

2.3 TOPOGRAPHY

The geological formations normally encountered in this tract are one of sub-recent to recent origin and comprise of the following-

a. *Alluvial Formation*: It is mainly represented by slit and clay without much gravel or boulder and constitute the flat plains under extensive cultivation outside the National park.

b. *Bhabar Formation*: This formation is represented by loose gravels, boulders and river deposits and are highly variable in composition and texture. This is also known as older alluvium. Sub-surface data indicate that clay is mixed in varying proportion and the demarcation of distinct clay bed cannot be made. Except during monsoon, the formation is apparently devoid of water and the streams carrying volume of water disappear within the porous structure of the formation and reappear towards south in the form of springs.

2.4 DRAINAGE

The main important river running at the boundary or through the National Park is Jaldhaka. It becomes shallow and remain almost with no water during dry season and remains full and fierce during monsoon. The river-bed is rising continuously as a result of the deposition of large quantity of slit, pebbles, boulders and detritus material carrying from the hills. However, sometimes Jaldhaka maintain a flow throughout the year. Other rivers passing through GNP include Murti, Garati and Indong (Fig.2.3). Few other rivulets and streams are also passing through this Park. Some of these rivulets and streams passing through GNP are seasonal in nature, carrying water only during monsoon and remain dry for rest of the year.

Though not of regular occurrence but floods do sometimes affect the National Park. In recent times, severe rainfall on 12th July, 1996 caused substantial damage to the natural habitat, wild animals and plants of the National Park.

Fig. 2.3: Drainage map of Gorumara National Park
Source: http://Google map//Gorumara National Park

2.5 SIGNIFICANCE OF THE STUDY AREA

2.5.1 General significance

In view of the ever dwindling number of great Indian one-horned rhinoceros, any area harbouring its natural population assumes immense significance, even if the population is small. The increasing population of rhinoceroses in west Bengal is taking place mostly in Jaldapara National Park (JNP) with over a population of 200, and is followed by GNP (over 50) and Chapramari Wildlife Sanctuary (recent personal communication with senior forest officials). Besides rhinos, GNP serves as an important corridor between Teesta and Torsa rivers for sustaining the population of wild elephants in north Bengal. A large number (over a thousand) of Indian bison also utilize this national park along with other herbivore species. Though the number of Royal Bengal Tigers is not much but the national park is the home of a good population of leopards and few other small carnivores. The area also has a great significance in the forested landscape of the district of Jalpaiguri along with its forest and riverine ecosystem.

2.5.2 National level significance

GNP belongs to the Biogeographical zone 7B (lower Gangetic plain) as recognized by Rodgers and Panwar (1988). Major significance of the national parks being the habitat for a number of schedule 1 animals which are given maximum protection in the national and international levels. The main protected animal of the park is rhinoceros. Some of the animals belonging to the schedule 1 of the wild life (protection) act, 1972 found in this National Park.

Apart from these Working Plan for GNP has recorded the occurrence of a rich flora in Gorumara National Park.

2.5.3 Significance at international level

The GNP bears its significance in the international context for providing shelter and protection to various species of wild life included in the Red Data Book of the IUCN and in the appendices of CITES. Das and Yadav (2011) recorded the occurrence of *Gnetum montanum*, both male and female plants, in Gorumara National Park.

2.5.4 Significance at local level

The GNP has immense significance in view of it being situated in the middle of the elephant migratory route between the rivers Teesta and Torsa in North Bengal. Gorumara can become one part of the Managed Elephant ranges for hosting and sustaining the wild elephant population of North Bengal. Especially, the Tondu, Selka, Gorumara, Panjhora and Indong blocks serve as their major habitat areas. With more scientific management on the peripheral regions for developing better wilderness and improved fodder supply, which, in turn, also improve the water relation of the habitat. Man – animal conflict is a major problem in this area and the presence of such sustainable habitat is showing positive effects on elephant depredation problem in the entire region.

The same is true for the ever increasing population of gaurs in the area. However, inspire of having a good habitat for large carnivores, with plenty of food, water and covered habitat in the area and not having many tigers, which was quite high earlier, helping the increase of their population. Though, even today, the herbivore population is controlled by the good Leopard population in these Protected Areas.

2.5.5 Scientific significance

Being one of the few pockets with natural population of great Indian one-horn Rhinoceros (besides Nepal, Assam and Jaldapara National Park of west Bengal), GNP provides an excellent opportunity for studying the habitat, behavior, food, population genetics, and reproductive biology of the this unique and endangered animal. However, the major component of a habitat is its vegetation and flora. And, so far, no appreciable data is available to us on these aspects. National Parks are meant for

the conservation of the habitat as well as all the biological elements living in it. For the conservation of all such elements the first requirement is a near complete knowledge on the flora, different formations, their societal aspects and importance in the vegetation.

GNP has approximately 48 species of carnivores and herbivores, approximately 193 species of birds, 22 species of reptiles, 7 species of turtles, 27 species of fishes and other macro and micro fauna (Forest Working Plan, 2005). However, for the survival of all these animal species, proper knowledge on their close interaction with different plant species and vegetation is the first requirement.

2.5.6 Economic significance

The Government is trying to develop the area as one intensive hub for tourism that will improve the economy of the local people. Moreover, conservation activities related mainly to Rhino and Elephant and different other maintenance works inside the National Park as well as in the fringe areas will certainly uplift living status and benefit the local people. Local people of the fringe areas are taking part in such works as per the present practice of Participatory Forest Management (PFM).

Inhabitants of the fringe areas of the National Park who have become the members of the Eco-Development Committees (EDCs) have started getting NTFPs like thach, semul floss, fodder-grass, fire wood etc. in recognition of their voluntary services rendered to protect and conserve the flora and fauna of this important Biodiversity Protected Area.

In the Bio-geographical zone 7B (Lower Gangetic plain) as recognized by Wildlife institute of India, Dehradun (Rodgers and Panwar,1988, subsequently revised in 2000).

2.6.2 The Forest Types

The entire forest tract of Gorumara National Park comes under the North Indian Moist Tropical forest of Champion and Seth's (1968) Indian Forest Type classification. Gorumara National Park falls under the 2B/25 (Sal dominated mixed forests),5B/152 (Sal, Khayer, Sissoo associated deciduous forest), 3C/C1b and 3C/C1c (Sal dominated deciduous forest). The species which is commonly found within the forest and is most important from the economic and ecological standpoint is Sal (*Shorea robusta*). This species occurs with its usual associates, namely chilauni (*Schima wallichii*), Chikrasi (*Chukrassia tabularis*) Champ (*Magnolia champaka*) and Bahera (*Terminalia bellirica*).

The other important species which are also seen are Sidha (*Lagerstroemia parviflora*), Panisaj (*Amoora rohituka*), Kainjal (*Bischofia javanica*), Simul (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Siris (*Albizia* spp.)

The working plan for the Gorumara National Park has recorded a total of 326 identified plant species that includes 158 species of trees, 35 species of herbs, 77 shrubs, 32 grasses, 15 species of climbers and 9 orchid species [Forest Working Plan, 2005].

Table 2.1. Major Forests types in Gorumara National Park

Types	Champion and Seth's classification (1968)	Principal localities
Riverine forests	Northern dry deciduous Seral Sal Khair Sissoo Association (5B/152)	Tondu – 1, 2, 3, 4a, 4b, Selkapara – 1b.
Sal Forests	Eastern Bhabar Sal and Eastern terai Sal (3C/C1 b and 3C/C1c)	Gorumara, South Indong 1, 2, 3, Bhogolmardi.
Wet mixed forests	Sub – Himalayan Secondary Wet mixed Forests (2B/25)	Barahati – 1, 3, Central – 1, Medlajhora – 1, Dhup Jhora – 1b, 2, Kakur Jhora 2.
Savannah forests: Lower alluvial Savannah	Sal Savannah (3C/DS)	Jadhaka – 1b, Dhup Jhora 1a, 1b, 1c.

Source: Forest Action Plan, 2002

Riverine Forests (5B/152) are seen on the bank of river Jaldhaka and other parts of the National Park. It is a deciduous forest and is dominated by Khair, Sissoo and grasslands. Primary grassland vegetation is invaded first by Khair and Sissoo, and create home for the entry of Simul, Sidha and many other seral species likw Toon (*Toona ciliata*), Gamar (*Gmelina arborea*), Kainjal (*Bischofia javanica*) Pithali (*Mallotus nudiflorus*) and Kadam (*Neolamarckia cadamba*) etc. with successive changes in edaphic conditions and progressive stability as one moves away from the river front.

Tanki (*Bauhinia purpurea*) is fairly common in the neighborhood of river beds where the permanent water table is quite deep. Harra (*Grewia asiatica*),Kainjal, Chalta (*Dillenia indica*) and some other seral species like Toon, Gamar etc. appear to do well where the water table is not low.

Sal Forests (3C/C1) includes both Eastern Bhabar (3C/C1b) and Eastern Terai sal (3C/C1c). Sal forests occur on the well drained alluvial soil. Course gravels and boulders in the bhabar area carry a fair percentage of sal in admixture of various deciduous species chiefly by Bahera, Sidha, Tartari, (*Dillenia pentagyna*), Odal, (*Sterculia villosa*), Kumbhi (*Careya arborea*) and Chilaune. The numerous other species those are found there include Parari (*Stereospermum tetragonum*), Kowla (*Machilus villosa*), Angari (*Phoebe attenuata*) and Bahera (*Terminalia bellirica*).

Chapter 3

CLIMATE

CLIMATE

Gorumara National Park is situated in the heart of Duars in the northern part of West Bengal. The tract lies in the moist tropical zone where the climatic condition is very much suitable for the diversification of flora. Four distinct climatic conditions are recognized in this region, but the summer, monsoon and winter are prominent. South West Monsoon is the main source of precipitation.

3.1. TEMPERATURE

The average day temperature varies from 10° C to 25° C from November to February, between 25p C to30p C during May to September and between 22p C to 27p C during the rest of the year (Figure 3.1). The Temperature of Duars region recorded from the Central Tobacco Research Institute at Dinhata, Cooch Behar is given in Table 3.1. In the Duars, there is an appreciable variation between day and night temperatures throughout the year and sometimes the winter nights are severe and it comes down to 3° C. During the months from June to September, sultry heat prevails during day time and early part of evening, but the nights are usually cooler.

Table 3.1. Average monthly maximum and minimum temperature during 2000 to 2013

Month		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
January	Max	22.7	22.8	23.2	22.1	22.6	23.8	22.4	22.1	24.5	23.6	23.5	22.8	22.6	23.7	**23.03**
	Min	10.0	8.7	10.7	8.4	9.3	8.5	10.9	8.9	10.6	11.6	9.8	10.2	10.6	10.4	**9.90**
February	Max	24.4	25.0	26.6	22.5	26.0	26.2	27.2	23.5	23.7	27.7	26.7	26.9	24.4	23.8	**25.33**
	Min	10.5	11.9	11.5	9.9	11.0	13.1	15.4	13.2	10.4	13.1	12.1	10.5	11.3	12.1	**11.86**
March	Max	28.2	30.6	29.3	27.7	30.8	29.3	30.8	28.3	28.4	31.0	30.2	28.9	29.5	29.4	**29.46**
	Min	15.8	15.1	15.6	13.6	17.2	15.2	16.0	15.2	16.8	15.5	15.7	17.2	16.5	16.1	**15.82**
April	Max	30.8	31.7	28.8	30.5	28.5	31.0	30.8	29.6	30.0	29.3	29.7	28.9	30.2	28.8	**29.90**
	Min	20.7	20.2	17.6	19.5	19.3	17.5	20.5	20.1	20.2	18.0	19.4	18.9	20.6	19.8	**19.45**
May	Max	31.0	31.2	30.1	32.1	31.9	30.6	27.2	32.5	31.2	31.6	30.2	32.5	32.1	31.9	**31.15**
	Min	22.5	22.4	21.7	21.1	21.3	18.7	22.7	23.2	22.2	18.9	22.4	22.7	23.2	21.3	**21.74**
June	Max	31.6	31.6	31.0	33.9	32.1	31.6	30.9	30.7	30.6	32.6	31.6	31.0	31.5	33.9	**31.76**
	Min	23.7	23.7	24.0	22.6	22.7	22.6	24.4	24.3	24.2	21.8	24.4	24.5	22.6	22.7	**23.44**
July	Max	31.7	31.7	30.4	32.7	31.3	29.5	32.1	30.5	30.9	32.7	31.6	30.4	29.8	31.2	**31.18**
	Min	25.2	25.2	24.2	24.2	23.0	25.2	25.6	24.8	25.1	24.1	23.6	24.1	23.5	22.8	**24.33**
August	Max	31.4	31.4	30.0	34.4	33.9	32.1	32.7	32.0	30.7	31.5	31.4	31.4	30.0	34.4	**31.95**
	Min	25.2	25.2	22.4	25.6	24.9	25.0	25.6	25.8	24.6	24.2	25.2	23.1	25.0	23.6	**24.67**
September	Max	31.1	31.1	32.0	34.5	32.1	33.2	31.0	30.9	31.6	33.1	31.2	33.6	31.2	34.1	**32.19**
	Min	24.0	24.0	23.6	24.5	23.6	24.8	24.2	24.5	24.3	23.6	22.6	23.2	24.8	23.7	**23.96**
October	Max	31.6	31.6	30.8	31.3	30.2	29.4	30.9	30.7	31.2	31.2	29.9	30.1	29.4	31.2	**30.68**
	Min	22.4	22.4	21.3	21.6	19.6	20.8	21.1	22.0	21.5	20.1	19.6	20.8	21.1	22.0	**21.16**
November	Max	27.5	27.5	28.0	28.9	29.0	27.9	26.8	28.7	28.0	27.8	28.7	26.8	27.9	27.7	**27.94**
	Min	17.1	17.1	16.4	17.2	14.6	15.4	16.5	16.9	15.1	14.8	15.7	17.0	15.4	16.3	**16.11**
December	Max	24.7	24.7	24.3	25.6	27.2	25.9	24.5	24.6	24.5	24.0	25.1	24.1	25.9	24.4	**24.96**
	Min	10.9	10.9	12.6	12.6	11.3	11.6	12.3	11.1	14.0	11.2	11.8	12.6	12.3	14.1	**12.09**

***Source*:** Central Tobacco Research Institute, Dinhata, Cooch Behar

3.2 PRECIPITATION

South west monsoon is the main source of rainfall. Maximum rainfall occurs from mid-June to September, July and August usually are the wettest months. Generally some amount of rain occurs in each month but March receives maximum winter rain. December is the driest month with minimum

rainfall. Pre-monsoon showers mostly accompany frequent powerful thunders sometimes with hails which occur during the months of April and May. Maximum rainfall occurred from mid-June to September and July-August usually is the wettest months (Figure 3.2). The average annual rainfall is about 260 to 340 cm per year.

The Precipitation of Duars region recorded from Central Tobacco Research Institute, Dinhata, Cooch Behar is given in the Table 3.2.

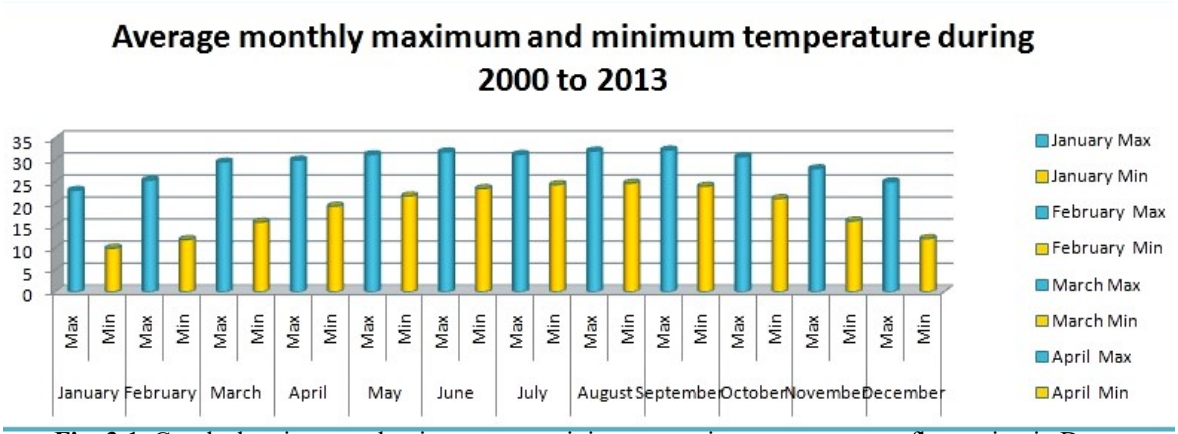

Fig. 3.1. Graph showing month-wise average minimum–maximum temperature fluctuation in Duars

Table 3.2. Average yearly rainfall data for the period 2000 to 2013

Average Yearly Rainfall (mm): 2000 to 2013													
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
2000	0	48	20	259.5	300	719	361	522	384	78	0	0	4691.5
2001	0	17	6	86	362.5	719	361	522	384	78	0	0	4536.5
2002	26.3	0	124.1	353.9	143	442.5	926	84.5	446.5	39.5	0	0	4588.3
2003	0	19	95	225	344.6	689	734	269	112	211.1	0	41	4742.7
2004	0	0	16	216	296	444	892	144	656.4	306	0	0	4974.4
2005	0.5	3	70	18.7	230.5	316.1	807.6	824	86	504.2	0	0	5365.6
2006	0	13	1.3	61.3	282.1	534.1	340.6	141.6	461.7	212	18.2	14	4185.9
2007	0	73	12.6	162.2	262.4	536.1	448.6	414.7	437.9	131.8	0	0	4586.3
2008	26	4.4	81.5	184.2	290.1	580.6	557.2	1044.8	423.6	239.6	0	3.2	5443.2
2009	0	0	25.8	91.1	246.7	770.2	244	519	249.6	250.1	0	0	4405.5
2010	0	3	17	98	289	635	889	312	376	86	3.8	0	4718.8
2011	0.4	0	56	210.5	223.6	540.5	769.7	287.6	214	231.5	0	12	4556.8
2012	0.5	11	1.8	121	213.8	789	812.3	736	452.6	301.4	0	0	5451.4
2013	0	5	18	127.3	300	687	589.8	256.6	348.6	93	0	0	4438.3
Average	5.28	17.7	45.2	165.8	275.8	545.1	567.2	448.6	364.2	205	1.8	5.8	2747.48

***Source*:** Central Tobacco Research Institute, Dinhata, Cooch Behar

3.3 RELATIVE HUMIDITY

Since the National park is located towards the foothills of the Eastern Himalaya, it remains adequately humid throughout the year. Maximum Relative Humidity varies between 85 % - 95 %, seldom below 75 %, with a maximum during June to September and minimum during December to February. The annual average humidity also remain quite high, i.e. 90.52 % in the morning and 74.27 % in the afternoon. The maintenance of such type of humidity round the year is very much suitable for the constant growth of vegetation, which, in other hand, is controlled mainly by low or high temperature and availability water in the soil.

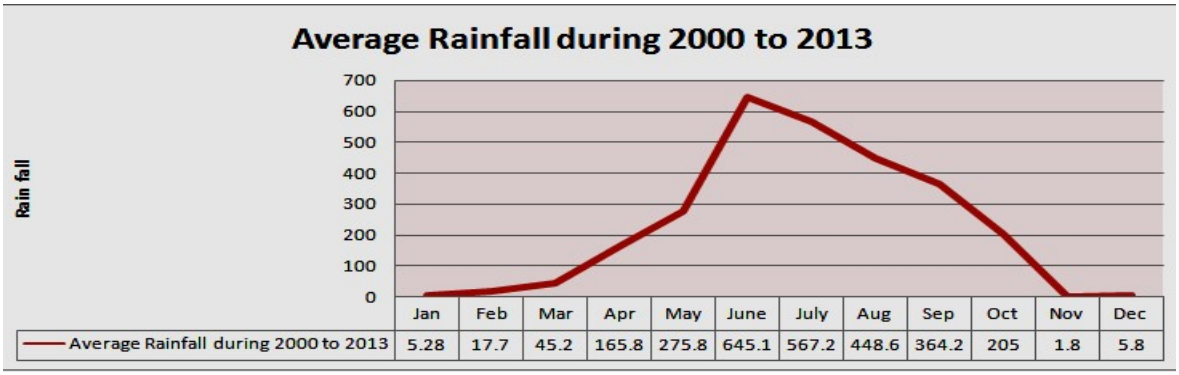

Fig. 3.2. Graph showing month-wise average Rainfall in Duars during the year 2000 to 2009

Table 3.3. Relative humidity (RH %) during 2000 to 2013

Year	Average Relative Humidity (%)	
	Maximum (at 06:32 hrs.)	**Minimum (at 13:32 hrs.)**
2000	94.00	79.33
2001	82.48	77.25
2002	89.67	76.92
2003	90.50	75.67
2004	90.08	71.00
2005	90.67	76.08
2006	93.33	75.17
2007	92.67	69.33
2008	92.42	70.83
2009	88.58	73.58
2010	91.71	75.20
2011	90.40	72.11
2012	88.62	72.30
2013	92.1	75.00
Average	**90.52**	**74.27**

***Source*:** Central Tobacco Research Institute, Dinhata, Cooch Behar

3.4 SUNSHINE BRIGHTNESS

The Sun-shine begins to rise from October and maximum Sum-shine is received up to November (Table 3.4). After November, the Sun-shine start to decrease (Figure 3.3) and during December to February the nights remain very cold with much fog and dew formations. In most of the low lying areas dense fog often lingers after 9.00 A.M. in the morning. From March till the onset of monsoon, fog and frost remain absent but some amount of dew is deposited until April. The annual average data on sun-shine shows that in some years like 2002 – 2004 and 2007 – 2009 were more foggy and/ or cloudy.

3.5 WIND SPEED

From September to October the wind blows pleasantly over the foothills. During the hot months April to June, hot wind blows up the foothills from 11.00 A.M. to 9.00 P.M. and the air becomes dry and carry good amount of dust which is frequently interrupted with thunder storms in the afternoon. Severe storms, sometimes accompanied by hail occur almost every year, especially during April – May and sometimes in September and October. During February – March a strong wing, generally referred as March-wind, blows over the area.

Table 3.4. Relative sun-shine during the year 2000 to 2013 in Duars

Month	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
January	6.5	5.6	6.1	4.0	5.9	6.2	4.9	5.8	4.1	4.4	7.2	5.8	5.6	6.4	**5.61**
February	7.9	6.6	8.0	6.0	7.6	7.6	5.6	5.4	7.6	6.0	5.3	7.6	5.1	5.8	**6.58**
March	7.0	8.2	7.8	6.8	6.6	6.9	8.4	8.1	6.3	5.8	6.7	7.1	8.2	6.8	**7.19**
April	6.6	7.0	5.3	5.0	4.3	7.0	5.7	6.5	6.3	6.8	5.8	6.9	7.2	6.8	**6.23**
May	6.1	6.9	5.7	7.2	5.8	5.6	6.4	7.7	6.4	6.3	5.8	6.6	7.2	5.6	**6.38**
June	4.2	4.2	3.4	4.0	4.0	5.3	3.4	3.9	4.0	4.8	4.2	3.9	3.9	4.6	**4.13**
July	4.3	4.3	1.6	5.1	3.8	3.9	5.3	2.8	3.8	4.7	4.7	3.6	5.1	3.4	**4.03**
August	4.1	4.1	4.2	6.9	6.8	3.3	6.8	5.0	2.6	3.8	7.2	5.8	5.6	6.4	**5.19**
September	4.1	4.1	5.3	5.6	3.2	6.3	5.1	3.6	5.0	5.9	5.3	5.2	3.4	6.1	**4.87**
October	7.4	7.4	8.4	4.4	7.5	5.6	8.2	7.2	7.0	7.1	6.2	5.7	7.3	7.2	**6.90**
November	6.5	6.5	8.6	6.8	8.7	8.4	6.0	8.9	8.8	6.3	6.6	7.4	8.3	8.1	**7.56**
December	8.7	8.7	5.5	8.1	7.3	8.6	7.9	6.9	4.6	3.4	8.4	7.6	8.2	5.9	**7.13**
Average	**6.11**	**6.13**	**5.83**	**5.83**	**5.96**	**6.23**	**6.14**	**5.98**	**5.54**	**5.44**	**6.12**	**6.1**	**6.26**	**6.09**	**5.98**

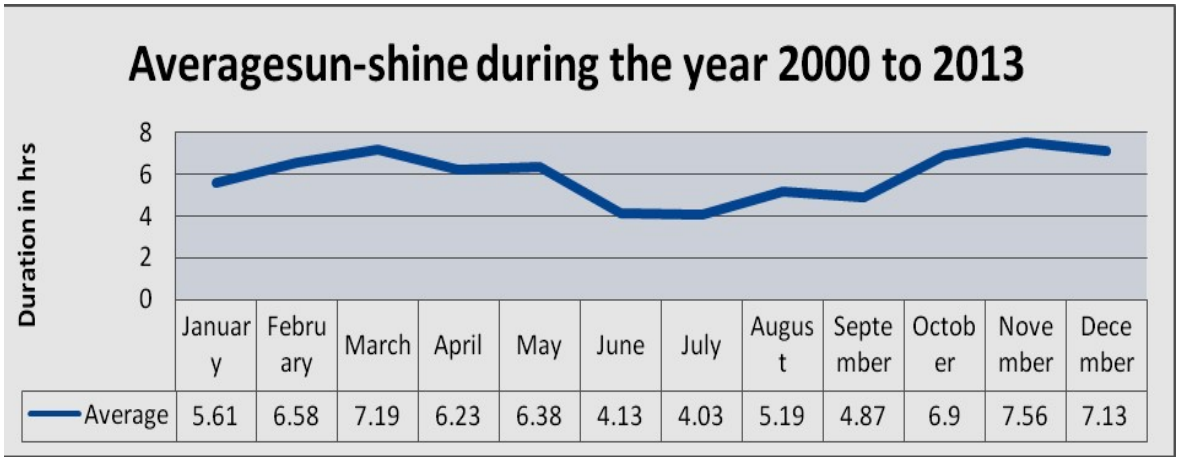

Fig. 3.3. Graph showing average Sun-shine in different months in Duars

Gorumara National Park is dominated by broad leaved mixed deciduous forests and with the prevailing climatic conditions very dense and multi-strata vegetation has been formed. The rainfall is quite high and widely distributed along with high humidity makes the habitat suitable for the occurrence of epiphytes and ground cover sciophytic vegetation. Though, the rivers like Jaldhaka and Murti those flowing through the National park receive some amount glacier water from the Himalayas, but the local nalahs and canals supply huge rain water to the rivers whenever there is some amount of rain. Again, during dry period, especially after a dry spell good amount of water is absorbed easily by the highly porous and sandy soil of the park area. As a whole, all the aspects of local climate are favourable and are inductive for the development of a dense and tree dominating vegetation with thick undergrowth and tree-trunks and main thick branches remain densely clothed with epiphytes. Epiphytes in GNP represent most of the major groups of plant kingdom like Algae, Bryophytes, Pteridophytes, Dicotyledons and Monocotyledons.

Chapter 4

PREVIOUS FLORISTIC WORKS

PREVIOUS FLORISTIC WORKS

After Sir J.D. Hooker (1849 - 1904), no other important botanist seriously worked on the Duars region. Hooker explored the entire region and made a historic collection of approximately 2500 plant specimens. His expedition and the account were published by him in different forms those include *The Flora of British India* (1872 - 1897), *A Sketch of the Flora of British India* (Hooker 1904) and a series of publications in *Hooker Journal of Botany* (1852 – 1854) are still most comprehensive descriptions of botanical splendors of the region. Significantly, botanists from various parts of the world latter made significant contributions to the flora of Terai and Duars of Jalpaiguri. Prain (1903) established a significant structure of the plants of this region in his famous two volume publication *Bengal Plants*. Other important works covered Terai-Duars region include Cowan & Cowan (1929), Ohashi (1975), and Grierson & Long (1979, 1983 – 1991, 1999 – 2001, 1994 – 2000). Champion and Seth (1968) also surveyed this region for his forest type classification. Mukherjee (1965) prepare a sketch of the vegetation of Jalpaiguri District and Sikdar (1984) worked on Baikunthapur Forest division. Banerjee (1993), Pandit (1995), Das *et al*. (2003), and Pandit et al. (2004) contributed on the flora of Jaldapara Natinal Park. Sarkar (2014) worked on the NTFP plants of Buxa Tiger Reserve, Saha *et al.* (2013) recorded the medicinal plants of Gorumara National Park. Das *et al*. (2010) prepared a detailed sketch of three MPCAs of Terai and Duars are some other important contributions. Saha *et al*. (2015) also recorded the NTFPs of Gorumara National Parks.

However, even after so many sporadic publications, no any concise account of flora neither for Terai – Duars region nor for the Gorumara National Park is available even today. Some forest beat areas were never given any attention by any botanist before the present exploration. This include Khunia, Murti, Dhupjhora, Budhuram and Bichhabhanga forest beats.

4.1 IMPORTANCE OF THE PRESENT WORK

Broadleaf forests of West Bengal Duars are situated very near to the foothills of Eastern Himalaya and formed part of the IUCN recognized Himalaya Biodiversity Hotspot. The entire Landscape of the region is housing significantly rich botanical diversity, occupied an important platform for huge inflow of tourists, researchers and also for the botanists, mainly taxonomists. The flora is represented by all the major groups of plant kingdom. The migration of plants from widely different localities since the upheaval of the Himalayas during Triassic from the bordering as well as from distant land masses is continuously enriching the flora. Important countries or places include China and Malaysian in the east and south of Oriental lands, Europe, America and Africa on the west and of Tibet and Siberia on the North have contributed to the floristic diversity of Terai-Duars region (Hooker 1904; Das 2004).

Gorumara National Park is located in Duars and falling in the Jalpaiguri District of West Bengal. Though this is a comparatively smaller park (7945.28 hectare) but its location is quite critical (Saha *et al*, 2013). The Park also belongs to the Bio-Geographical zone 7B (Lower Gangetic Plain) as recognized by Rodgers and Panwar (1988). Its Ecological boundary extends up to the Sibchu, Khumani and Jaldhaka blocks of Jalpaiguri and Kalimpong Forest Divisions situated both in plains and lower hills. The ecological boundary in the eastern fringe extends well beyond Gairkata, Central

Diana upto Moraghat blocks of Jalpaiguri forest division whereas in the western part it assumes an area beyond Sursuti and Lataguri blocks of Jalpaiguri forest division up to the Apalchand and Kathambari forests of Baikunthapur forest division. Major significance of the national parks being the natural habitat for a number of schedule 1 animals those are given maximum protection at the national level. Gorumara National Park has a total no. of 326 identified plant species that includes 158 species of trees, 35 species of herbs, 77 species of shrubs, 32 species of grasses, 15 species of climbers and 9 orchid species (Forest Action Plan, 2002). All Eco-Development Committees (EDC) are rendering protection to this forest as part of their agreement with the Forest Department (FD) during the implementation of Joint Forest management (JFM) programs (Sarkar *et al.*, 2009).

Saha *et al*. (2015) has recorded 335 NTFP species of plants which include 58 edible species with commercial and non-commercial local importance. The record shows that there are 28 species fruits of which are consumed by the forest villagers directly or as vegetable. Young plants or twigs of 20 species are used as vegetable and, in addition, 13 other species used as leaf vegetables. Saha *et al*. (2013) recorded the medicinal plants of Gorumara National Park. But no one prepared a flora of Gorumara National Park previously.

4.2 OBJECTIVES OF THE PRESENT WORK

Considering the importance of the Gorumara National Park from the ecological, conservational and economic points of view the absence of a detailed flora, mainly of vascular plants was felt seriously. However, the present exploration of GNP covered only the Spermatophytes, i.e. Gymnosperms and Angiosperms. The objectives of the present work can the summarized –

i. To prepare a detailed spermatophytic flora of Gorumara National Park

ii. To prepare flowering and fruiting calendars of its floristic elements, this will be useful to the future workers in numerous other branches of science including medicine, reproductive biology, crop improvement programs, etc.

iii. To evaluate the recorded taxa for their endemic/ rare/ threatened status and to determine their population structure and distribution pattern

iv. To recognize the disturbances created by various anthropogenic and/or physical agents on local vegetation

v. To prepare a detailed data base on the exotic plants growing in the park

vi. To understand the pattern of diversity of flora in the park

vii. To record the NTFP potential of the park and their substantial utilization

viii. To understand the key points of conservation of flora and vegetation of the park; etc.

Chapter 5

MATERIALS AND METHODS

MATERIALS AND METHODS

5.1 THE FIELD WORKS

The entire area of Gorumara National Park (GNP) was surveyed during the years 2005 to 2009 with the assistance of Wildlife Wing of Forest Department, Government of West Bengal. Based on the available few literature, records, publications on the status of flora and fauna, it has been assumed that the Gorumara National Park (GNP) is certainly been not visited so far by any individual or group for floristic studies point of view. Probably the area is totally virgin. After thorough consultation with officials of forest department, local people and tourist guides were made to recognize dense neches in deep forests in all parts of the Gorumara National Park (GNP).

5.1.1. Movement: The Gorumara National Park is located at the Middle Duars, with Seven Beats under North and South Ranges. Beats under North Range are Chapramari, Khunia and Murti; and Dhup Jhora, Gorumara, Budhuram and Bichha Bhanga Beats are under the South Range. Range Officers and Beat Officers arranged my night shelter during the field survey. Target areas were approached either in small vehicles or on elephants.

Forests in Gorumara National Park are most dense ones in Duars and practically inaccessible to its interior without the help of the Forest Guards and local people. Therefore, the progress of every activities of the field were proportional to the availability and nature of available assistance. Significantly, the minimum time spent every day in the field was not less than seven hours and were mostly on foot. Since, GNP is the homeland of many furious wild animals like Rhinos, Leopards, Elephants, Tigers, Gour and Wild boars and the alternative security system was provided by the department of forest, wherever it was practically necessary.

The field surveys were initiated at Khunia beat with a minimum knowledge about the area including methods of collecting plant samples in the field. Forest personnel from department of forest were officially deputed as field guide during the entire survey.

5.1.2. Collection of specimens: During the survey, the plant samples were collected in duplicates or triplicates and kept in air-tight polythene bags. It was always tried to collect specimens with reproductive structures, i.e. flowers and fruits but in many cases sterile specimens were also collected. Herbaceous plants are generally collected in full with roots. Appropriate field characters are noted properly in the field notebooks.

5.1.3 Processing of Specimens: The methodology as suggested by Jain and Rao (1977) was followed in general for this work with minor modifications wherever it was essential. Generally, specimens were collected 2 – 3 copies per plant preferably in their flowering as well as in fruiting stages, but rarely in vegetative stage. With the complete recording of field-characters in field notebooks, the specimens were temporarily preserved in polythene bags in the field, with the mouth being kept air tight. The specimens collected in the field were further processed with trimming of infected parts

and selection of better and younger parts, cleaned and placed in old news prints after returning to the camp every day. Specimens were tagged with the field numbers as reference to the Field Note Book. Drops of diluted formalin were added in different parts of specimens to check decomposition and fragmentation.

5.1.4 Drying specimens: Old news prints were used to rap the specimens and then put into a light herbarium press and tied tightly with rope. The old news papers used in the herbarium press were changed regularly along with the repositioned of each specimen continuously with regular interval of one to two days in field camp.

However, the specimens after bringing back to the laboratory were transferred to a heavy plant press, changed news paper in regular interval of three to five days until dried properly.

5.1.5 Poisoning of specimens: All the specimens were properly poisoned by dipping in 6 % solution of $HgCl_2$ in rectified spirit (ethanol), decanting and then again placing within the blotters and in the press.

5.1.6 Mounting of specimens: Properly dried specimens were mounted on standard herbarium sheets (41.5 x 28 cm) using glue and stitched with threads. There after the herbarium labels (15.5 x 10 cm) with important information recorded in the field were fixed on the right hand bottom corner of each herbarium-sheet.

These labels contained the following important information: (a) Area under exploration, (b) Field number, (c) Date of collection, (d) Name, (e) Family, (f) Vernacular names, (e) Locality, (f) Altitudes, (g) Habit and habitat, (h) Flowers and fruits, (j) Notes, (k) Name of collector and determinator, etc.

The specimens were then temporarily stored in a Herbarium cabinets in the NBU Herbarium for further study.

5.2 IDENTIFICATION OF SPECIMENS

The specimens were initially identified in the Taxonomy & Environmental Biology Laboratory of the Department of Botany, North Bengal University and in the NBU herbarium. For this wide range of literature (floras, monographs, revisions, thesis etc.) were consulted including Hooker (1872 – 1897), Prain (1903), Hara (1966, 1971), Hara *et al* (1978, 1979, 1982), Ohashi (1975), Grierson & Long (1983, 1984, 1987, 1991, 1999, 2001), Hajra & Verma (1996) and Noltie (1994, 2000). After identification in the laboratory the specimens were then matched for verification at CAL.

5.3 STORING OF SPECIMENS

After completion of the identification work, all sets of the specimens will be deposited in the NBU-Herbarium.

5.4 STUDY OF SPECIMENS

Detail morphological studies of the specimen were undertaken at the Environmental Biology Laboratory of the Department of Botany, University of North Bengal. Specimens were described mostly using common technical terminology. The description of the specimens was supported with the proper measurements and with the recognition of some special characters; those differentiate between different taxa recorded from GNP.

5.5 ENUMERATION

The basis of framing up of the present Flora of Gorumara National Park is the classification presented by APG III (2009). However, with the availability of recent literature including *Flora of Bhutan* (Long & Grierson 1983, 1984, 1987, 1991, 1999, 2001) and *Flora of West Bengal* (Anonymous 1996) facilitated the work. For the up-to-date correct name *The Plant Lists* [http://www.theplantlist.org/

] and *Flora of China* [http://www.efloras.org/flora_page.aspx?flora_id=2] were followed extensively. As far as possible up-to-date nomenclature of plants has been used in terms of the provisions of ICN. However, genera within a family and the species within a genus were arranged alphabetically. Proper artificial dichotomous Keys were provided for the identification of families, genera, species and infra-specific categories using as far as possible easily observable characters. The legitimate correct name of the species is printed in italic-bold and basionym and selected synonym(s) are printed in italics. The local and vernacular names recorded for different species of plant from the field through interaction with the people of local community residing in periphery of the park and the forest department workers have been clearly mentioned in the profile of each species. The local names of the species are in the Bengali, Nepali and/or Local Tribal languages as per their availability.

The present status of the species in its natural habitat, date of collection and the local and general distribution for each taxa have also been clearly indicated.

5.6 FLOWERING AND FRUITING CALENDAR

The flowering and fruiting calendar for the recorded flora has been prepared by regular monitoring of the vegetation and recorded the flowering and fruiting of different species. All data had been derived from direct observation only as the flowering period varies in different species with the change of habitat, longitude, latitude etc. For detailed methodology Das & Chanda (1987) and Panda *et al.* (1992) were followed seriously.

5.7 RECOGNITION OF ENDEMIC/ RARE/ THREATENED/ EXOTIC ELEMENTS

Endemic, rare and endangered plants were recognized with the help of Red Data Book for Indian flora (Nayar & Sastry 1987, 1988, 1990; Ahmedulla 2000; Ahmedulla & Nayar 1987; Bhujei 1996; Bhujel & Das 2002), published floras like Flora of India (BSI) and following IUCN [http://www.iucnredlist.org/] guidelines for the determination of different classes of threatened plants. Different floras, websites and other publications including Das (2002) and Khuroo et al. (2012) were, however, consulted for the recognition of exotic elements in the flora of GNP.

5.8 PHYTOSOCIOLOGY

***Sampling*:** For the phytosociological understanding of the GNP vegetation, basic data were recorded through the application of quadrate sampling technique as suggested and/or used by Misra (1968), Shimwell (1971), Tripathi & Misra (1971), Phillip (1959), Das & Lahiri (1997), Kadir (2001), Rai (2006), Ghosh (2006) and Sarkar (2014). During this survey 40 randomly distributed quadrates of 20m x 20m has been taken from different Beat areas in three different seasons, namely designated as *pre-monsoon* [March – April], *monsoon* [May – July] and *post-monsoon* [September – November]. Nested Quadrate technique has been used with 20m x 20m quadrates for trees and 5m x 5m quadrates for shrubs and 1m x 1m quadrates for ground covering herbaceous plants [Fig. 5.1]. The smaller quadrates were nested within the large [i.e. 20m x 20m] quadrates as shown in the figure. The List-Count data was recorded from each quadrate in three different seasons.

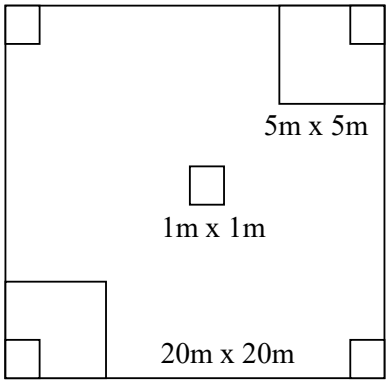

Fig. 5.1. Nested Quadrate Model Sketch for the collection of phytosociological data

***Data processing*:** Recorded data were transferred to MS Excel worksheet and different parameters like Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI) of each and every species were determined using appropriate formulae. The following formulas were used for the analysis of data as suggested by Misra (1968) and Phillips (1959), Shimwell (1971), Tripathi & Misra (1971), Malhotra (1973), Das & Lahiri (1997), Kadir (2001), Rai (2006), Ghosh (2006) and Chowdhury (2009):

Frequency (F%) = Number of quadrates in which the species occurred x 100/ Total number of quadrates examined

Density (D) = Total number of individuals of a species in all the quadrates/ Number of quadrates examined

Abundance (A) = Total number of plants of a species in all the quadrates/ Number of quadrates in which the species occurred

Relative Frequency (RF) = (Frequency of a species/ Σ of the frequencies of all species) x 100

Relative Density (RD) = Total number of individuals of a species in all quadrates x 100/ Total number of individuals of all species in all quadrates

Relative Abundance (RA) = Abundance of a species x100/ Σ of abundance of all species.

Importance Value Index (IVI) or Species Importance Value Index (SIVI): This index is generally used to determine the overall importance of each individual species in a particular community of ecosystem. The Importance Value Index is calculated by summing up the values of RF, RD and RA.

$$IVI = RF + RD + RA$$

5.8.1 Diversity indices:

Biological Diversity Indices can be quantified in many different ways. For this, two main indices, Richness and Evenness of a particular species have been measured in a unit area. Richness is a measure of the number of different kinds of organisms present in a particular area whereas Evenness is a measure of the relative abundance of the different species making up the richness of an area.

Species Diversity Indices

These are mathematical measures which shows the proper information about composition in a particular community, species wise. Diversity indices provide important information about the rarity and commonness of different species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community different structure under same and/ or diverse habitat conditions.

The actual scenario of plant species complexity in community structure of a particular season or in yearly basis, following two different standard indices are generally used:

Shannon-Weiner Index (H'): as suggested by Shannon – Weiner (1963) this Index is used to understand the proper plant diversity of a community and is calculated using the formula:

$$H' = - \Sigma [(ni/N) \ln (ni/N)]$$

Where, H' is the index value

'ni' is the number of individuals of a species

'N' is the total number of species in the habitat studied

Simpson's Index (λ): Simpson's index is another mathematical tool for understanding the concentration of dominance of particular species in the community or to identify the dominating species. Its value ranges between 0 – 1. Simpson index is a measure of diversity that takes into

accounts both the richness and evenness. Simpson (1949) suggested the following formula for its calculation:

$\lambda = \Sigma pi^2$

Where, 'pi' is the proportional abundance of the 'i^{th}' species.

$pi = ni/N$

Species Richness Indices

Species richness means the measurement of number of species per sample. Species richness is the mode of determination of species diversity of an area based on the number of species occur in the habitat per unit area or sample plot. For determining the species richness standard and widely used indices adopted are:

Menhinick Index (D): Menhinick (1964) provided the following formula for the calculation of Species Richness in a community -

$D = S/ \text{“}N$

Where, S = Total number of species observed.

N= Total number of individuals of all species

Margalef Index (R1): Margalef (1968) provided the following formula for to calculate the Species Richness in a community -

$R1 = s\text{-}1/\ln (n)$

Where, s = number of species.

n = number of individuals of a species.

Apart from these, some other minor methodology might have been adopted for the better and/or proper presentation or analysis of the result those are mostly self-explanatory and are generally supported with proper references.

Chapter 6

ENUMERATION

ENUMERATION

The spermatophytic plants with their accepted names as per *The Plant List* [http://www.theplantlist.org/], through proper taxonomic treatments of recorded species and infra-specific taxa, collected from Gorumara National Park has been arranged in compliance with the presently accepted APG-III (Chase & Reveal, 2009) system of classification. Further, for better convenience the presentation of each species in the enumeration the genera and species under the families are arranged in alphabetical order. In case of Gymnosperms, four families with their genera and species also arranged in alphabetical order.

The following sequence of enumeration is taken into consideration while enumerating each identified plants.

(a) Accepted name, (b) Basionym if any, (c) Synonyms if any, (d) Homonym if any, (e) Vernacular name if any, (f) Description, (g) Flowering and fruiting periods, (h) Specimen cited, (i) Local distribution, and (j) General distribution.

Each individual taxon is being treated here with the protologue at first along with the author citation and then referring the available important references for overall and/or adjacent floras and taxonomic treatments. Mentioned below is the list of important books, selected scientific journals, papers, newsletters and periodicals those have been referred during the citation of references.

Chronicles of literature of reference:

Names of the important books referred:

Beng. Pl.	: Bengal Plants
En. Fl .Pl. Nepal	: An Enumeration of the Flowering Plants of Nepal
Fasc.Fl.India	: Fascicles of Flora of India
Fl.Brit.India	: The Flora of British India
Fl.Bhutan	: Flora of Bhutan
Fl.E.Him.	: Flora of Eastern Himalaya
Fl.India	: Flora of India
Fl Indi.	: Flora Indica
Fl.West Bengal	: Flora of West Bengal
Prodr.Fl.Nepal	: Prodromus florae Nepalensis
Pl.As.Rar.	: Plantae Asiaticae Rariores
Pl.Wilson	: Plantae Wilsonianae
Tr. Nor. Bengal	: The Trees of Northern Bengal

FOC : e-Flora of China

Nam. Change. Flr. Pl. : Name changes in flowering plants by S. S. R. Bennett.

Names of the journal referred:

Bull.As.Soc.Beng. : Bulletin of Asiatic Society of Bengal

Bull.Bot.Sur.Ind. : Bulletin of Botanical Survey of India

Jour.Arn.Arb. : Journal of Arnold Arboretum

Jour.Beng.Nat.Hist.Soc. : Journal of Bengal Natural History Society

Jour.Bomb.Nat.Hist.Soc. : Journal of Bombay Natural History Society

Jour.Econ.Tax.Bot. : Journal of Economic and Taxonomic Botany

Jour.Jap.Bot : Journal of Japanese Botany

Jour. R.A.S. Beng. Sci : Journal of Royal Asiatic Society of Bengal

Kew.Bull. : Kew Bulletin

Jour. Ind. For. : Indian forester, Dehradun.

Pleione : Pleione

Abbreviation used in Enumeration:

agg. : aggregated species

auct. : of various authors (*auctorum*)

Cf. : compare (*Confer*)

f. : form (*forma*)

nom.illeg. : Illegitimate name (*Nomen illegitimum*)

nom.nud. : *Nomen nodum*

p.p. : In Part (*pro parte*)

Sensu. : In the sense of author indicated and not as originally intended

ssp.. : Sub-species

Var. : Variety

Var. nov. : New variety

Other abbreviations commonly used in enumeration:

Acad.	: Academy	J.	: Journal
Bull.	: Bulletin	no.	: Number
Cat.	: Catalogue	Pl.	: Plant
Contr.	: Contribution	Rep.	: Report
Faun.	: Fauna	Repert.	: Repertorium
Fl.	: Flora	Soc.	: Society
Ic.	: Icones		
Ill.	: Illustration		

Authorities of botanical names:

Throughout this work authors of Botanical names were used following Brumitt and Powell's (1992) *Authors of Plant Names* and as provided in the Kew list (www.theplantlist.org).

Local (Common) names:

Bengali, Nepali and Local tribal common name of plants used as vernacular names.

Description:

cm : Centemeter

mm : Millimiter

Fig. : Figure

Distributions:

C. : Central

E. : Eastern

S. : Southern

W. : Western

N. : North

NE. : North-eastern

Measurements:

The measurement of the specimens during the study was made through metric unit system (m, cm & mm) for e.g. the dimensions of leaves are given as 2 – 3 x 1 – 1.5 cm, the first figure indicating the length and the second breadth.

6.1. GYMNOSPERMS

The Gymnospermic plants family, genera and species with the accepted name as per the Plant List [http://www.theplantlist.org/1.1/browse/G/], through proper taxonomic treatments of species, collected from the Gorumara National Park has been arranged in alphabetic order. The following sequence of enumeration is taken into consideration while enumerating each identified plants- (a) Accepted names, (b) Basionyms, (c) Synonyms if any, (d) Vernacular name, (e) Description, (f) Cone formation time, (g) Specimen cited, (h) Local distribution, and (i) General distribution.

Family Key of Gymnosperm:

1a. Lianas with hanging branch …….... Gnetaceae

1b. Trees …… 2

2a. Palm-like, generally monopodial or dichotomously branch …… Cycadaceae

2b. Pyramidal with numerous branch ……. 3

3a. Leaves rhomboid; boat-shaped, ridged ……...…. Cupressaceae

3b. Leaves needlelike; slightly curved, base wide ……. Araucariaceae

Araucariaceae Henkelet W. Hochstetter, Syn. Nadelholz. xvii, 1. 1865; *nom. cons*.

ARAUCARIA Juss., Gen. Pl. 413. 1789.

Araucaria columnaris (G. Forst.) Hook. *f.*, Bot. Mag. 78: t. 4635 1852. *Araucaria cookii* R.Br. *ex* Endl., Syn. Conif. 188. 1847.

Vernacular name: Jhau.

Large trees, up to 20 m high; crown conical tower-shaped, becoming flat topped; lateral branches in whorls, dense, final branchlets drooping, pinnately arranged. Leaves dimorphic loosely arranged in lateral branchlets, needlelike, slightly curved, acute or acuminate, base x 0.4 – 0.55 cm, branches few, stalks up to 3 cm; female catkins much branched cymose panicles, up to 25 cm, branches up to 13 cm with stalks up to 3 cm, internodes up to 6 cm long; ovules ± 7, up to 0.4 cm, green, glabrous, shiny; mature seeds not seen here.

Flowers & Fruits: Throughout the year.
Specimen Cited: Gorumara, *Goutam & AP Das 0921*, dated 19. 02. 2009.
Local Distribution: Extremely rare but found in different corners of Gorumara National Park
General Distribution: Pantropical.
Note: Preferred fodder for elephants; local people use paste of inflorescence in skin diseases and seeds against fever.

Cupressaceae Gray, Nat. Arr. Brit. Pl. 2: 222, 225. 1822; *nom. cons*.

PLATYCLADUS Spach, Hist. Nat. Vıg. Phan. 11: 333. 1841.

Platycladus orientalis (L.) Franc., Portugaliae Acta Biol., ser. B, Sist. Vol. "Jïlio Henriques": 33. 1949. *Thuja orientalis* L., Sp. Pl. 2: 1002. 1753; Grierson *et* Long, Fl. Bhutan 1(1): 54. 1983. *Thuja decora* Salisb., Prodr. Stirp. Chap. Allerton 398. 1796.

Vernacular name: Jhau.

Small trees, up to 5 m high; crown ovoid-pyramidal, broadly rounded, branches flattened. Leaves 1–2 mm; facial leaves rhomboid; lateral leaves overlapping facial ones, boat-shaped, ridged. Male strobili yellowish-green, ovoid, nodding. Seed cones bluish green, subglobose.

Cone formation: March to October.
Specimen Cited: Gorumara, *Goutam & AP Das 0828*, dated 09. 07. 2009.
Local Distribution: Planted in Gorumara, Dhupjhora and Murti Beat Office ground.
General Distribution: Cultivated in Tropical and Pantropical Asia.
Note: Common fascinating garden plant.

Cycadaceae Pers., Syn. Pl. 2: 630. 1807; *nom. cons*.

CYCAS L., Sp. Pl. 2: 1188. 1753.

Cycas pectinata Buch.-Ham., Mem. Wern. Nat. Hist. Soc. 5: 322. 1826; Grierson *et* Long in Fl. Bhutan 1(1): 44. 1983; Prain, Beng. Pl. 2: 993. 1903. *Cycas jenkinsiana* Griff., Not. Pl. Asiat. 4: 9. 1854.

Vernacular name: Cycas.

Small dioecious trees, palm-like, generally monopodial or dichotomously branched when old, up to 6 m high. Leaves 50 – 90 crowning the top, pinnate; petiole 10–30 cm, with few blunt spines; leaflets in 50 – 100 pairs, narrowly oblong-lanceolate, entire, acute, thickly leathery, slightly recurved, base decurrent. Cataphylls brown tomentose, triangular. Male cones large fusiform; microsporophylls cuneate, densely tomentose, pale brown. Megasporophylls more than 30 – numerous, tightly grouped to form a large oblet cone. Seeds 2 to 4, orange, becoming dark brown after ripening.

Cone formation: June to March.
Specimen Cited: Gorumara, *Goutam & AP Das 0719*, dated 30. 09. 2008.
Local Distribution: Planted in Lataguri Tourist Resort complex.
General Distribution: India: cultivated throughout; Bhutan, Nepal, Bangladesh, Cambodia, Laos, Myanmar, Thailand, Vietnam.
Note: Common fascinating garden plant.

Gnetaceae Blume, Nov. Pl. Expos. 23. 1833 [Aug-Dec 1833]; *nom. cons*.

GNETUM L., Syst. Nat., ed. 12, 2: 612, 637; Mant. Pl. 1: 18, 125. 1767.

Gnetum montanum Markgraf, Bull. Jard. Bot. Buitenz. ser. 3, 10: 466, tab. 8. 1930. Hara in Fl. E. Himal. 2: 13. 1971. Grierson *et* Long in Fl. Bhutan 1(1): 57. 1983; Das *et* Yadav in *Pleione* 5(1): 205 – 207. 2011. *Gnetum scandens sensu* Hook. *f.* , Fl. Brit. India 5. 643. 1888; Prain, Beng. Pl. 2: 991. 1903.

Vernacular name: Pagrhi Lata

Large liana, weakly twining up to the top of tall trees with numerous hanging branches; old nodes swollen; petiole short, 1 – 3 cm; lamina elliptic-ovate, up to 22 x 8 cm, sometimes larger in sterile plants; catkins from old nodes or terminal on new shoots; male catkins 3 – 5 x 0.4 – 0.55 cm, branches few, stalks up to 3 cm; female catkins much branched cymose panicles, up to 25 cm, branches up to 13 cm with stalks up to 3 cm, internodes up to 6 cm long; ovules ± 7, up to 0.4 cm, green, glabrous, shiny; mature seeds not seen here.

Flowers & Fruits: Throughout the year.
Specimen Cited: Gorumara, *Goutam & AP Das 0921*, dated 19. 02. 2009.
Local Distribution: Extremely rare but found in different corners of Gorumara National Park
General Distribution: Pantropical.
Note: Preferred fodder for elephants; local people use paste of inflorescence in skin diseases and seeds against fever.

6.2. ANGIOSPERMS

Basal Angiosperms

The Botanical Classification of Angiospermae by APG III, 2009

[The Angiosperm Phylogeny Group, http://www.theplantlist.org/]

Orders and families of flowering plants are arranged according to APG III system of classification

Order 2: Nymphaeales Salisb. *ex* Bercht. & J.Presl (1820)

Nymphaeaceae Salisb., Ann. Bot. 2: 70. 1805; *nom. cons*.

NYMPHAEA L., Sp. Pl. 1: 510. 1753, *nom. cons*.

Key to the Species:

1a. Lamina entire Anther with appendages ……...…… 2

1b. Lamina margin toothed; anther without appendages…….....…. 3

2a. Flowers not submerged, appendages yellow, stigma rays 8 – 30 …..…….. *N. nouchali*

2b. Flowers slightly submerged, appendages blue, stigma rays 7…….…..... *N. abhayana*

3a. Flowers white ……...……...…. *N. pubescens*

3b. Flowers red …….....……..…..… *N. rubra*

Nymphaea abhayana A. Chowdhury & M. Chowdhury, sp. nov.

Annual submerged. Lamina round-ovate; base peltate, notch not riched to petiole, margin entire; lamina; shape & size: Round-Ovate & 13 x16 (18) cm. base deeply cordate and basal lobes parallel to contiguous. Texture: Thin, delicate, abaxially glabrous, siny scarcely peltate. Colour: Bluish-purple. Flowers floating, 5 – 6 cm in diam. Sepals 4; 3.7 – 4 cm, x 0.8 – 1.2 cm, prominently veined. Petals 7; transition to stamens regular, Bluish-purple, broadly lanceolate, oblong, or obovate, 2.9 (3.5) x 0.5(0.7) cm. Stamens; filament of inner & outer stamens slightly wider than anther, 13 (5+4+4), 0.5 cm large, outer stamen, 0.8 cm inner stamen. Appendage; anthers connective apically appendaged, elongatel, deep blue, 0.01 – 0.6cm. Carpels completely united, walls between locules of ovary single. Stigma rays 7.

Flowers & Fruits: October to December.

Specimen Cited: Indong Beel, *Goutam & AP Das 01409*, dated 21.07.2009.

Local Distribution: Indong Beel.

General Distribution: India.

Nymphaea nouchali Burm. *f*., Fl.Ind.120.1768; Van Royen in Nova Guinea 8: 110. f. 1962 *p p*; Sharma *et al*, Fl. Ind. 430. 1993. *Nymphaea stellata* Willd., Sp. Pl. 2:1153. 1799; Hook. *f. et* Thomson in Hook. *f.,* Fl. Brit. Ind. 1:114. 1872. *Nymphaea madagascariensis* DC., Syst. Nat. 2: 50 50 1821. *Nymphaea emirnensis* Planch., Rev. Hort. 2: 65 65 1853.

Rhizomes erect, unbranched. Lamina elliptic-orbicular to orbicular, 8 – 20 cm, papery, abaxially glabrous, peltate a few mm from base of sinus, subentire to deeply crenate, base cordate, basal lobes parallel. Flowers slightly emergent, 3–10 cm in diam. Calyx inserted on receptacle; sepals lanceolate to oblong-lanceolate, slightly veined, persistent; petals 15 – 25, white. Carpels only partially united, walls between locules of ovary double. Fruits globose. Seeds ellipsoid-globose.

Flowers & Fruits: June to November.

Specimen Cited: Garati Beel, *Goutam & AP Das 0336*, dated 21.07.2009.

Local Distribution: In most of the beels.

General Distribution: India, Bangladesh, Nepal, Afghanistan, Indonesia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam, Australia, New Guinea.

Nymphaea pubescens Willd., Sp. Pl. 2: 1154. 1799; Sharma *et al*, Fl. Ind., 431. 1993. *Nymphaea lotus* var. *pubescens* (Willd.) Hook. *f. et* Thom., Fl. Indica. 1: 241. 1855. Hook. *f. et* Thom. in Hook. *f*., Fl. Brit. Ind. 1:114. 1872.

Rhizomes erect, producing slender stolons. Lamina ovate – elliptic to suborbicular, 15 – 20 cm, papery, abaxially densely pubescent, peltate more than 5 mm from base of sinus, base deeply cordate and basal lobes subparallel, margin dentate and teeth acute to subspinose. Flowers emergent, 5 – 8 cm in diam. Calyx inserted on receptacle; sepals oblong, conspicuously veined, caducous or decaying after anthesis. Petals 12 – 16, white, red, or pink, oblong. Filament of inner stamens only slightly wider than anther; connective apically unappendaged. Carpels completely united, walls between locules of ovary single. Fruits ovoid to subglobose. Seeds ellipsoid to globose.

Flowers & Fruits: July to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0402*, dated 22. 07. 2009.

Local Distribution: In most of the beels.

General Distribution: India: throughout the plains; Bangladesh, Malaysia, Africa, Java, Philippines and Hungary.

Nympheae rubra Roxb. *ex* Andr., Bot. Rep. 8 (104): t. 503.1808; Prain, Beng. Pl. 1: 213. 1903; Sharma *et al*, Fl. Ind., 431. 1993. *Nymphaea lotus auct. non*. L., Hook. *f. et* Thom. in Hook. *f*., Fl. Brit. Ind.1: 114. 1872; Grierson *et* Long, Fl. Bhut. 1(2): 341. 1984.

Rhizomes erect. Lamina ovate to suborbicular, 15 – 30 cm, papery, abaxially densely pubescent, peltate more than 5 mm from base of sinus, margin dentate and teeth acute, base deeply cordate. Flowers emergent, 5 – 9 cm in diameter. Calyx inserted on receptacle, circular; sepals oblong, conspicuously veined, caducous or decaying after anthesis; petals 12–18, red, oblong. Filaments of inner stamens only slightly wider than anther; connective apically unappendaged. Carpels completely united, walls between locules of ovary single. Fruits ovoid to subglobose. Seeds ellipsoid to globose.

Flowers & Fruits: July to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0251*, dated 10. 02. 2009.

Local Distribution: In most of the beels.

General Distribution: India: throughout the plains; Sri Lanka, Myanmar, Taiwan, Thailand, Loas, Cambodia, Vietnam, Malaysia, Indonesia and Philippines.

Order 4: Chloranthales R. Br. (1835)

Chloranthaceae R. Br. *ex* Sims, Bot. Mag. 48: ad t. 2190. 1820; *nom. cons*.

CHLORANTHUS Sw., Philos. Trans. 77: 359. 1787.

Chloranthus erectus Sweet**,** Hort. Suburb. London 28. 1818. *Chloranthus elatior* Link**,** Enum. Hort. Berol. Alt. 1: 140. 1821; H. Hara in Hara, Fl. E. Himal. 2: 14. 1971; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(2): 351. 1984. *Chloranthus erectus* (Buch.-Ham.) Verdcourt, Kew Bull. 40: 217. 1985. *Cryphaea erecta* Buch.-Ham., Edinburgh Jour. Sci. 2: 11. 1825. *Chloranthus officinalis* Bl., Enum. Pl. Javae 79. 1827.

Subshrubs up to 2 m. Stems terete, glabrous. Leaves opposite; leaf blade broadly elliptic or obovate to oblanceolate, 10 – 18 × 4 – 7 cm, serrate, caudate, base cuneate, rigidly papery, glandular, glabrous; lateral veins 5 – 9 pairs. Spikes terminal, dichotomously or racemosely branched; bracts triangular to ovate. Flowers white, small. Stamens 3; 2-loculed; lateral lobes smaller, with a 1-loculed anther each. Ovary ovoid. Young fruits green, white at maturity.

Flowers & Fruits: April to September.

Specimen Cited: Gorumara, *Goutam & AP Das 0188*, dated 09. 02. 2009.

Local Distribution: Forest areas.

General Distribution: India: West Bengal, Sikkim, Assam, Nagaland, Arunachal Pradesh; Bhutan, Nepal, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Magnoliids (fr.: Magnoliidées)

Order: Laurales Perleb (1826)

Lauraceae Juss., Gen. Pl. 80. 1789; *nom. cons*.

Key to the Genera:

1a. Leaves crowded at apex of each branchlet ……..…… ***Actinodaphne***

1b. Leaves not clustered at the branch end …….. 2

2a. Perianth segments rigid, erect ……. ***Phoebe***

2b. Perianth segments soft, often spreding …….. 3

3a. Flowers unisexual, rarely bisexual, in pseudoumbels or racemes; bracts large, forming an involucres ..... ***Litsea***

3b. Flowers bisexual, rarely unisexual, in panicles or clusters, rarely in pseudoumbels; bracts small, not forming an involucres ..... ***Cinnamomum***

ACTINODAPHNE Nees in Wallich, Pl. Asiat. Rar. 2: 61, 68. 1831

Key to the species:

1a. Lamina obovate-oblong to elliptic-oblong ……...……. *A. obovata*

1b. Lamina oblanceolate to obovate-lanceolate ……..……..….. *A. sikkimensis*

Actinodaphne obovata (Nees) Bl., Mus. Bot. 1: 342. 1851; Grierson *et* Long, Fl. Bhut. 1(2): 280. 1984.

Tetradenia obovata Nees in Wallich, Pl. Asiat. Rar. 2: 64. 1831.

Trees, up to 18m. Branchlets densely ferruginous pubescent. Leaves clustered, 3–5 at apex of branchlet; petiole 3–6cm; leaf blade obovate-oblong to elliptic-oblong, 12–52 × 6–22 cm, glabrous adaxially, triplinerved, base cuneate or rotund, entire, acute to acuminate, tip obtuse. Racemes umbels type, 5 flowered. Perianth segments 6, ovate. In male flowers fertile stamens 9; rudimentary ovary pilose. In female flowers, ovary subglobose. Fruit oblong or ellipsoid.

Flowers & Fruits: April to May.

Specimen Cited: Gorumara, *Goutam & AP Das 1036*, dated 21.07.2010.

Local Distribution: Gorumara, Murti, Dhupjhora, Bichhbhanga.

General Distribution: India, Nepal, Bhutan.

Actinodaphne sikkimensis Meisn., Prodr. 15(1): 213 1864*;* Grierson *et* Long, Fl. Bhut. 1(2): 281. 1984. *Jozoste sikkimensis* Kuntze, Revis. Gen. Pl. 2: 570 1891.

Trees, up to 20 m. 4–7 leaves crowded at apex of each branchlet; leaf blade oblanceolate to obovate-lanceolate, 8–14 × 2–3.5 cm, gray-brown pubescent abaxially, glabrous adaxially, pinninerved, base acute, entire, acuminate. Umbels in leaf axils, 6–8-flowered, sessile. Perianth segments 6, elliptic. In male flowers, fertile stamens 9; rudimentary pistil glabrous; style slender. Immature fruit oblong.

Flowers & Fruits: March to July.

Specimen Cited: Gorumara, *Goutam & AP Das 1031*, dated 21.07.2010.

Local Distribution: Gorumara, Murti, Dhupjhora, Bichhbhanga.

General Distribution: India, Nepal, Bhutan.

CINNAMOMUM Schaef., Bot. Exped. 74. 1760, *nom. cons*.

Key to the Species:

1a. Leaves alternate, fruiting cup broad …….. *C. glaucescens*

1b. Leaves opposite; fruiting cup smaller …….…….. 2

2a. Terminal branchlet of panicle bearing a 3–5-flowered cymes ..... *C. tamala*

2b. Terminal branchlet of panicle bearing a 1–3-flowered cymes ……..... 2

3a. Lamina elliptic-oblong, 12–30 × 4–9 cm, thickly leathery, base subrounded or attenuate ……..…. *C. bejolghota*

3b. Lamina ovate to oblong-ovate or ovate-lanceolate, smaller, leathery or subleathery to papery, base acute ……..…… *C. verum*

Cinnamomum bejolghota (Buch.–Ham.) Sweet, Hort. Brit. 344. 1826. Long in Grierson *et* Long, Fl. Bhut. 1(2): 258. 1984. *Laurus bejolghota* Buch.-Ham., Trans. Linn. Soc. London 13(2): 559-560. 1822. *Laurus obtusifolia* Roxb., Fl. Ind., 2: 302-303. 1832.

Evergreen tree, up to 20m. Leaves coriaceous, opposite, elliptic, 25 – 40 x 6 – 12 cm, obtuse, base cuneate, glossy above, strongly 3 – veined from base; petioles 2 – 3cm. Flowers usually bisexual in axillary panicles. Panicles 12 – 20 cm, panicle bearing a 1–3-flower; perianth segments ovate, 2 – 3 mm, pubescent. Fruits ellipsoid.

Flowers & Fruits: March to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0469*, dated 23. 07. 2009.

Local Distribution: All over the forest areas.

General Distribution: India: Tropical and subtropical forests in West Bengal, Assam, Sikkim, Bihar, Orissa, Uttar Pradesh; Nepal, Bhutan, Bangladesh, Laos, Myanmar, Thailand, Vietnam

Cinnamomum glaucescens (Nees) Hand.-Mazz. Oesterr. Bot. Z. 85: 214 1936; Grierson *et* Long, Fl. Bhut. 1(2): 259. 1984. *Cinnamomum cecidodaphne* Meisn. *Prodr. 15(1): 25 1864.*

Local name: Malagiri.

Small tree, up to 12 m. Young branches glabrous. Leaves alternate, ovate elliptic, base broadlu cuneate to rounded. Panicle brownish tomentose; 4 – 9 densely clustered on young shoots. Perianth segments ovate, caduceus. Fruiting cup much broader, fruits globose.

Flowers & Fruits: January to February.

Specimen Cited: Gorumara, *Goutam & AP Das 1032*, dated 21.07.2010.

Local Distribution: Gorumara, Murti, Dhupjhora, Bichhbhanga.

General Distribution: India, Nepal, Bhutan.

Cinnamomum tamala (Buch.-Ham.) T. Nees *et* Ebermaier, Handb. Med.-Pharm. Bot. 2: 426 1831; Yasuiti Momiyama in Hara, Fl. E. Himal. 1: 99. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 355. 1984; Prain, Beng. Pl. 2: 899. 1903. *Laurus tamala* Buch.–Ham., Trans. Linn. Soc. London 13(2): 555 – 558. 1822. *Cinnamomum reinwardtii* Nees, Syst. Laur. 70. 1836.

Local name: Tejpataa

Evergreen trees, up to 20 m. Leaves coriaceous, opposite, lanceolate, 10 – 12 x 3 – 5 cm, shortly acuminate, base cuneate, glossy above, strongly 3 – veined from base; petioles 2 – 3cm. Flowers usually bisexual in axillary panicles. Panicles shorter, 5 – 10 cm, bearing 3–5-flowered units; perianth segments ovate, pubescent. Fruits ellipsoid, 1 – 1.4 cm, borne on enlarged perianth cup with lower part of segments persisting as short lobes 1 – 2 mm.

Flowers & Fruits: April to May.

Specimen Cited: Murti village, *Goutam & AP Das 0540*, dated 23.07.2009.

Local Distribution: Cultivated in village areas.

General Distribution: India: West Bengal, Assam, Sikkim, Bihar, Orissa; Bhutan, Nepal, Bangladesh.

Note: Leaves used as flavouring agent in food and have great market demand.

Cinnamomum verum Presl, Prir. Rostlin 2: 36. 1823. *Cinnamomum zeylanicum* Breyne, Eph. Nat. Cur. Dec. 4: 139. 1677; Prain, Beng. Pl. 2: 899. 1903. *Cinnamomum bengalense* Lukman., Nomencl. Icon. Cannel. 5. 1889.

Local name: Darchini.

Evergreen, up to 10 m. Young branchlets gray. Buds sericeou spuberulent. Leaves usually opposite; petiole 1.5 – 2 cm, glabrous; leaf blade greenish white abaxially, green and shiny adaxially, ovate to ovate-lanceolate, 10 – 15 × 4 – 5 cm, leathery, glabrous on both surfaces, triplinerved, midrib and lateral veins elevated on both surfaces, base acute, margin entire, acuminate. Terminal branchlet of panicle bearing a 3–5 flowered cyme. Flowers yellow. Perianth tube obconical; perianth lobes 6, oblong. Fertile stamens 9. Ovary ovoid, glabrous; style short; stigma discoid. Fruit ovoid, black when mature

Flowers & Fruits: April to May.

Specimen Cited: Murti village, *Goutam & AP Das 1537*, dated 23. 05. 2009.

Local Distribution: Cultivated in village areas.

General Distribution: India: all over country; Bhutan, Nepal, Bangladesh, native to Sri Lanka; also cultivated in many Asian countries.

LITSEA Lam., Encycl. 3: 574. 1792, *nom. cons*.

Key to the Species:

1a. Branchlets densely brown tomentose ……..…….. 2

1b. Branchlets pubescent or glabrous ……..…..... 4

2a. Umbels clustered on shortest branchlets ……..…….. 3

2b. Umbels solitary ……. *L. elongata*

3a. Fruits ellipsoid ……. *L. hookeri*

3b. Fruits subglobose ……..…….... *L. monopetala*

4a. Branchlets glabrous; lamina long elliptic …….. *L. salicifolia*

4b. Branchlets pubescent and becoming glabrous; lamina oblong to lanceolate …. 5

5a. Fruits broadly obovoid to subglobose on enlarged fleshy cup-shaped perianth … *L. laeta*

5b. Fruit compressed globose, seated on thin cup-shaped perianth tube …….. *L. panamanja*

6a. Leaf blade papery or membranous and deciduous ..... *L. cubeba*

6b. Leaf blade leathery or thinly leathery and evergreen ……..... *L. glutinosa*

Litsea cubeba (Lour.) Pers., Syn. Pl. 2(1): 44. 1807; Y. Momiyama in Hara, Fl. E. Him. 1: 101. 1966; Hara *et al*. Enum. Fl. Pl. Nep. 3: 185. 1982; Long in Grierson *et* Long, Fl. Bhut. 1(2): 274. 1984. *Laurus cubeba* Lour., Fl. Cochinch. 1: 252. 1790; Hook. *f*. in Hook. *f*., Fl. Brit. Ind. 5: 155. 1885.

Shrubs up to 5 m high. Stem usually glabrous, blackened when dry. Leaf blade papery or membranous and deciduous; lower leaves opposite, upper alternate; petioles to 0.13 cm, slender; lamina lanceolate, entire-half lanceolate, entire-half contortate 5.5 – 13 x 1.8 – 2.5 cm, acuminate, cuneate, upper surface green above, lower surface glaucous, glabrous both sides, nerves distinct, lateral veins obliquely ascending, 10 - 17 pairs. Inflorescence usually umbels in clusters of 3 - 4, 4 - 10 flowered, in short peduncled; pedicels white, pubescent. Flowers hairy; perianth toothed, tube slightly reduced at base. Fruits subglobose.

Flowers & Fruits: December to June.

Specimen Cited: Budhuram, *Goutam & AP Das 0118*, dated 07. 02. 2009.

Local Distribution: All over the forest areas.

General Distribution: India, E. Himalaya, Nepal, Bhutan, Myanmar, Java, W. & C. China.

Litsea elongata (Nees) Hook.*f*., Fl. Brit. Ind. 5: 165. 1886; Momiyama in Hara, Fl. E. Him. 1: 101. 1966; Matthew, Pl. Kurs. 90. 1981; Cowan *et* Cowan, Trs. N. Beng. 110. 1929; Long in Gierson *et* Long, Fl. Bhut. 1(2): 275. 1984; Kanjilal *et al*, Fl. Ass. 4: 86. 1940. *Daphnidium elongatum* Nees, Pl. Asiat. Rar. 2: 63. 1831.

Local name: Thulo pahenlay

Evergreen trees, up to 12m. Branchlets densely brown tomentose. Leaves alternate; leaf blade oblong-lanceolate to narrowly lanceolate, 5–22 × 1.2–6 cm, pubescent abaxially and glabrous adaxially, base cuneate or rounded, entire, obtuse to shortly acuminate. Umbels solitary, 4 – 5 flowered. Male flowers: perianth segments 6, ovate; fertile stamens 9–12; rudimentary pistil glabrous. Fruit oblong.

Flowers: August to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0794*, dated 19. 02. 20009.

Local distribution: Dhupjhora, Murti, Gorumara.

General distribution: India, Nepal, Bhutan, Myanmar, Tibet, China.

Note: The species is a good fodder for cattle and wood is used for construction works, making furniture, etc.

Litsea glutinosa (Lour.) Rob., Philipp. J. Sci. 6(5): 321. 1911; Long in Grierson *et* Long, Fl. Bhut. 1(2): 277. 1984. *Sebifera glutinosa* Lour., Fl. Cochinch. 638. 1790. *Litsea sebifera* Pers., Syn. Pl. 2: 4. 1807; Prain, Beng. Pl. 2: 902. 1903.

Tree, up to 15 m, young shoots whitish pubescent. Leaves coriaceous, ovate – lanceolate, 10 –16 x 4 – 8cm, acute, base cuneate, glabrous or pale pubescent beneath; lateral veins 7 – 10 pairs; petioles slender, 2.5 – 3.5 cm. Umbels large, 7 – 10mm in bud, whitish pubescent, pedicels 3 – 5mm, white – pubescent. Fruits globose.

Flowers & Fruits: May to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0618*, dated 11. 02. 2008.

Local Distribution: All over the forest areas.

General Distribution: Tropical and subtropical parts of India, Bhutan, Nepal, Myanmar, Philippines, Thailand, Vietnam.

Litsea hookeri (Meisn.) Long, Notes Roy. Bot. Gard. Edinburgh. 41: 510. 1984; Long in Gierson *et* Long, Fl. Bhut. 1(2): 276. 1984. *Cylicodaphne hookeri* Meisn., Prodr. 15(1): 209. 1864.

Local name: Dude Lampate

Evergreen trees, up to 12 m; branchlets brownish tomentose. Leaves alternate; lamina elliptic-obovate, 12 – 26 × 6 – 10 cm, base cuneate, entire, shortly acuminate; lateral veins 9 – 15 pairs; petioles 8 – 15 mm. Umbels densely pubescent, clustered on shortest branchlets; peduncle 4 – 8 mm. Fruits ellipsoid, 11–17mm long.

Flowers: May to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1081*, dated 11. 02. 20010.

Local distribution: Dhupjhora, Murti, Gorumara.

General distribution: India, Bhutan, Thailand.

Note: Timber is used for constructing houses and for making furniture.

Litsea laeta (Nees) Hook. *f*., Fl. Brit. Ind. 5: 169. 1886; Matthew, Pl. Kurs. 90. 1981; Cowan *et* Cowan, Trs. N. Beng. 111. 1929; Long in Gierson *et* Long, Fl. Bhut. 1 (2): 275. 1984. *Tetranthera laeta* Nees, Pl. Asiat. Rar. 2: 67. 1831.

Small trees up to 9 m. Leaves coriaceous, oblong-elliptic, 11–22x3–6 cm, base cuneate, entire, acute, glabrous, pale white beneath when dry. Umbels with 3–6flowerd cluster. Fruits broadly obovoid to subglobose on enlarged fleshy cup-shaped perianth.

Flowers:; Fruits: February – April Local distribution: Found in Mahananda Wildlife Sanctuary and University of North Bengal campus. General distribution:

Flowers & Fruits: November to April.

Specimen Cited: Murti, *Goutam & AP Das 1037*, dated 23. 02. 2009.

Local Distribution: Gorumara, Dhupjhora, Murti, Budhuram.

General Distribution:. India, Bhutan, Bangladesh.

Litsea monopetala (Roxb.) Pers., Syn. Pl. 2: 4. 1807; Y. Momiyama in Hara, Fl. E. Him. 1: 102. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 185. 1982; Long in Grierson *et* Long, Fl. Bhut. 1(2): 276. 1984.

Tetranthera monopetala Roxb., Pl. Corom. 2: 26.t. 1798. *Litsea polyantha* Juss., Ann. Mus. Natl. Hist. Nat. 6: 211. 1805; Prain, Beng. Pl. 2: 903. 1903.

Trees to 10 m, branchlets brownish tomentose. Leaves broadly elliptic, 8 – 20 x 4.5 – 10 cm, obtuse or apiculate, base rounded, greenish beneath when dry, softly tomentose and prominently reticulate beneath, lateral veins 7 – 11 pairs; petioles 1 – 2.2 cm. Umbels densely pubescent, bud 4 mm, on tomentose peduncles 2.5 – 9 mm, forming dense clusters, peduncles sessile or borne on a short stout stalk 2 – 3.5 mm. Fruit subglobose, 7 x 5 mm, apiculate, borne on perianth cup 4 – 4.5 mm across, on slender pedicels 8 – 10 mm.

Flowers & Fruits: November to July.

Specimen Cited: Khunia, *Goutam & AP Das 0685*, dated 14. 02. 2008.

Local Distribution: Forest areas.

General Distribution: Tropical and subtropical parts of India, Himalayas, Bhutan, Cambodia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam.

Litsea panamanja (Buch.–Ham. *ex* Nees) Hook. *f*., Fl. Brit. Ind. 5: 175. 1886; Prain, Beng. Pl. 2: 903. 1903; Long in Gierson *et* Long, Fl. Bhut. 1(2): 277. 1984. *Tetranthera panamanja* Buch.–Ham. *ex* Nees, Pl. Asiat. Rar. 2: 67. 1831.

Tetranthera panamanja Buchanan-Hamilton *ex* Nees in Wallich, Pl. Asiat. Rar. 2: 67. 1831.

Local name: Painle champ.

Evergreen trees, up to 20 m. Branchlets pubescent and becoming glabrous. Leaves alternate; glabrous; leaf blade oblong to lanceolate, 10–17 × 3–7.5 cm, glabrous on both surfaces, pinninerved, base cuneate, entire, acuminate. Umbels in 5-flowered racemes. Male flowers pubescent; perianth segments 6, oblong; fertile stamens 9; filaments glabrous; rudimentary pistil glabrous. Fruit compressed globose, seated on cup-shaped perianth tube.

Flowers: August to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1084*, dated 11. 02. 20010.

Local distribution: Dhupjhora, Murti, Gorumara.

General distribution: India, Bhutan, Nepal, Vietnam.

Litsea salicifolia (Roxb. *ex* Nees) Hook. *f*., Fl. Brit. Ind. 5: 167. 1886; Prain, Beng. Pl. 2: 903. 1903; Cowan *et* Cowan, Trs. N. Beng. 110. 1929; Momiyama in Hara, Fl. E. Him. 2: 39. 1971; Long in Gierson *et* Long, Fl. Bhut. 1 (2): 275. 1984; Banerjee, Pl. Res. Jal. Rhi. Sanc. 52. 1993. *Tetranthera salicifolia* Roxb.*ex* Nees, Pl. Asiat. Rar. 2: 66. 1831.

Local name: Sanu pahenle

Evergreen trees, up to 10 m. Branchlets glabrous. Leaves alternate; lamina long elliptic, 9–18 × 2.5–5cm, glaucous and yellow-brown puberulent when young abaxially, glabrous adaxially, pinninerved, base acute, entire, acuminate. Umbels axillary cluster of 2–6 flowers; male umbel 4–6 flowered. Male flowers pubescent; perianth segments 6, ovate or lanceolate; fertile stamens 9; rudimentary pistil lacking.

Flowers: April to September.

Specimen Cited: Gorumara, *Goutam & AP Das 0831*, dated 17. 02. 20008.

Local distribution: Murti, Dhupjhora, Gorumara.

General distribution: Bangladesh, Bhutan, India, Myanmar, Nepal, Vietnam.

PHOEBE Nees, Syst. Laur. 98. 1836.

Phoebe attenuata (Nees) Nees, Syst. Laur. 104 1836; Grierson *et* Long, Fl. Bhut. 1(2): 261. 1984.

Ocotea attenuata Nees, Pl. Asiat. Rar. 2: 71 1831.

Trees up to 20m; bud scale scars loosely arranged. Leaves clustered at the branch tip, oblanceolate to obovate, 10–18x3–6cm, rounded, base attenuate; pubescent and brown beneath when dry. Perianth densely pubescent. Fruits ellipsoid, enclosed by hardened pubescent perianth segments.

Flowers & Fruits: March to April.

Specimen Cited: Khunia, *Goutam & AP Das 0689*, dated 14. 02. 2008.

Local Distribution: Khunia, Murti, Gorumara.

General Distribution: Tropical and subtropical parts of India, Himalayas, Bhutan, Cambodia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam.

Order 7: Magnoliales Bromhead (1838)

Annonaceae Juss., Gen. Pl. 283. 1789; *nom. cons*.

Key to the Genera:

1a. Fruits with completely united carpels and seeds embedded in pulp ……..... ***Annona***

1b. Fruits with carpels forming free, often stipitate …… ..…… 2

2a. Sepals or inner petals and sometimes also outer petals clearly imbricate ..... ***Uvaria***

2b. Sepals and petal whorls all valvate or rarely very narrowly imbricate at tip ... 3

3a. Climbing shrubs. Peduncles and fruiting pedicels hooklike ..... ……..... ***Artabotrys***

3b. Trees or erect shrubs. Peduncles and fruiting pedicels not hooked …..…….. 4

4a. Sepals and outer petals equal ……..…… ***Milliusa***

4b. Sepals much shorter than petals ……..…… ***Polyalthia***

ANNONA L., Sp. Pl. 1: 536. 1753.

Key to the Species:

1a. Outer petals outside surface and carpels hairy; areoles flattened and separated by ridges; fruit pulp yellowish .... *A. reticulata*

1b. Outer petals and carpels glabrous; areoles convex and separated by deep grooves; fruit pulp whitish ..... *A. squamosa*

Annona reticulata L., Sp. Pl. 1: 573. 1753; Hook. *f. et* Thom. in Hook. *f.,* Fl. Brit. Ind. 1: 78. 1872; Sharma *et al*., Fl. Ind. 1: 207. 1993; Panda *et al.*, Fl. Samb. 35. 2004; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 355. 1984; Prain, Beng. Pl. 1: 206. 1903. *Annona excelsa* Kunth, Nov. Gen. Sp. 5: 59. 1821. *Annona lutescens* Saff., Contr. U. S. Natl. Herb. 18: 41. 1914.

Local name: Nona.

Trees, 4 – 10 m; glabrous. Leaves oblong – lanceolate, 9 –20 x 3 – 5cm, entire, acuminate, base rounded; petiole 1 –1.5 cm long, glabrous. Flowers in axillary or terminal cymes, 2 – 3; pedicels 1 – 2 cm long. Sepals 3, broadly ovate, shortly acuminate, 2 –3 x 2 – 3mm, pubescent outside. Petals 6, 3 in inner whorl; outer ones narrowly oblong, triquetrous, acute apex, pubescent outside. Stamens

numerous, 1mm long. Carpels many, ovoid to linear, 1mm, 1 ovuled; style oblong; stigma entire. Fruits ovoid, reticulate, many loculed. Seeds black, arillate.

Flowers & Fruits: May to November.

Specimen Cited: Dhupjhora village, *Goutam & AP Das 0253*, dated 10. 02. 2009.

Local Distribution: Khunia, Murti, Dhupjhora, Budhuram.

General Distribution: India: West Bengal, Delhi, Uttar Pradesh, Bihar; West Himalayas, Myanmar, Indo –China.

Note: Cutivated in the forests villages.

Annona squamosa L., Sp. Pl. 1: 537. 1753; Panda *et al.*, Fl. Samb. 35. 2004; Sharma *et al*., Fl. Ind. 1: 207. 1993; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 244. 1984 ; Prain, Beng. Pl. 1: 206. 1903. *Annona asiatica* L., Sp. Pl. 537. 1753. *Annona forskahlii* DC., Syst. Nat. 1: 472. 1817. *Guanabanus squamosus* Gómez, Fl. Haban. 114. 1897.

Local name: Ata

Small tree, up to 6 m. Leaves elliptic, 6 –10 x 2 –5cm, acute, base cuneate, pubescent at first, soon glabrous; petioles 6 – 10mm; flowers solitary or few, leaf – opposed; outer petals yellow, oblong; fruits ovoid – globose, 8 – 9 cm diameter, surface covered with the rounded tips of incompletely fused carpels, glaucous.

Flowers & Fruits: May to October.

Specimen Cited: Dhupjhora village, *Goutam & AP Das 0229*, dated 09. 02. 2009.

Local Distribution: Dhupjhora, Murti.

General Distribution: India: Widely cultivated; Nepal, Bhutan, Myanmar, Indo –China, S. China.

Note: Cutivated in the forests villages.

ARTABOTRYS R. Br. *ex* Ker Gawl., Bot. Reg. 5: t. 423. 1820.

Artabotrys hexapetalus (L. *f.*) Bhandari, Baileya 12: 147. 1964; Sharma *et al*., Fl. Ind. 1: 251. 1993; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 243. 1984. *Annona hexapetala* L. *f*., Sp. Pl. suppl. 270. 1781; *Artabotrys odoratissimus* R. Br., Bot. Reg. 5, t. 423. 1819; Prain, Beng. Pl. 1: 202. 1903. *Anona uncinata* Lam., Encycl. 2(1): 127. 1786. *Artabotrys uncata* (Lour.) Baill., Hist. Pl. 1: 232. 1867. *Uvaria uncata* Lour., Fl. Cochinch. 1: 349. 1790. *Uvaria odoratissima* Roxb., Fl. Ind. 2: 666. 1832.

Local name: Kathchampa.

Climbing shrubs, up to 10 m. Branchlets glabrous. Petiole 4 – 8 mm; leaf blade oblong to broadly lanceolate, 6 – 20 x 3 – 6 cm, papery, adaxially glabrous, base cuneate to acute, apex acuminate to acute, lateral veins 8 – 16 pairs and elevated on both surfaces. Inflorescences 1 – 2 flowered. Flowers fragrant. Sepals green, ovate, sparsely puberulous. Petals greenish to yellowish, oblong lanceolate, outside basally densely pubescent. Stamens oblong; connective apex 3 angular. Carpels oblong, glabrous. Fruiting carpels ovoid, glabrous, apex conspicuously apiculate. Seeds pale Br., smooth.

Flowers & Fruits: May to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0704*. dated 11. 09. 2007.

Local Distribution: Gorumara, Dhupjhora.

General Distribution: India: West Bengal, Assam, Bihar, Uttar Pradesh; Himalayas, Myanmar, Indo – China, S. China.

Note: Cutivated in the forests villages.

MILIUSA Lesch. *ex* A.DC., Mém. Soc. Phys. Genève 5: 213. 1832.

Miliusa roxburghiana Hook.f. & Thomson, Fl. Ind. 1: 150 1855. Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 243. 1984; Prain, Beng. Pl. 1: 201. 1903.

Local name: Kali lahara.

Dioecious shrubs, up to 4 m. Leaves oblong elliptic, 4-12x2-4 cm, acuminate, base rounded, pubescent on midrib beneath and other parts glabrous. Pedicels with elliptic bract. Sepals and outer petals narrowly ovate, spreading. Inner petals ovate. Fruiting carpels obovoid to subglobose.

Flowers & Fruits: March to May.

Specimen Cited: Dhupjhora village, *Goutam & AP Das 0229*, dated 09. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara.

General Distribution: India, Nepal, Bhutan, Myanmar.

POLYALTHIA Blume, Fl. Javae, Anonnaceae 68. 1829.

Key to the species:

1a. Leaves pendulous, narrowly lanceolate, gradually acuminate, margin undulate … *P. longifolia*

1b. Leaves not pendulous, Ovate-oblong, Shortly acuminate, margin not undulate …. *P. simiarum*

Polyalthia simiarum (Buch.-Ham. *ex* Hook.*f. et* Thom.) Benth. *ex* Hook. *f. et* Thom. in Hook. *f*., Fl. Brit. India 1: 63. 1872. Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 243. 1984; Prain, Beng. Pl. 1: 204. 1903.

Guatteria simiarum Buchanan-Hamilton ex J. D. Hooker & Thomson, Fl. Ind. 1: 142. 1855.

Local name: Lapche

Trees, up to 25m. Branches puberulent when young, glabrous and sparsely lenticellate with age. Petiole robust; lamina ovate-oblong to oblanceolate, 10–30 × 3.5–12 cm, membranous to papery, base rounded to broadly cuneate, entire, acuminate to shortly acuminate. Inflorescences axillary, 1- to several flowered; bracts ovate, tomentulose. Pedicel tomentulose. Sepals ovate-triangular. Petals yellowish green; outer petals longer than inner petals. Stamens oblong. Carpels oblong; ovule 1 per carpel, basal; stigmas capitate. Fruit ovoid to ovoid-ellipsoid.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0447*, dated 22. 07. 2009.

Local Distribution: At Beat Office of Dhupjhora.

General Distribution: Bhutan, India, Laos, Myanmar, C and N Thailand, Cambodia, Vietnam.

Polyalthia longifolia (Sonn.) Thwait., Enum. Pl. Zeyl. 398. 1864; Hook. *f. et* Thom. in Hook. *f.*, Fl. Brit. Ind. 1: 62. 1872; Sharma *et al*., Fl. Ind. 1: 274. 1993; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 244. 1984; Prain, Beng. Pl. 1: 204. 1903. *Uvaria longifolia* Sonn., Voyage aux Indes 2: 233. t.131. 1782. *Unona longifolia* (Sonn.) Dunal, Monogr. Fam. Anonac. 109.1817.

Local name: Debdaru

Trees, up to 30 m. Leaves pendulous, narrowly lanceolate, 10 – 18 x 2 – 3cm, gradually acuminate, base rounded, margin undulate; petioles 5 – 8mm. Flowers 5 – 10 in subumbellate clusters, pedicels 1.5 – 2.5 cm. Sepals and petal whorls all valvate or rarely very narrowly imbricate at tip. Fruit apocarpous, with carpels forming free, ellipsoid, often stipitate.

Flowers & Fruits: March to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0440*, dated 22. 07. 2009.

Local Distribution: At Beat Office of Dhupjhora.

General Distribution: India: grown as ornamental in all warmer parts of the country; Native of Sri Lanka; Bhutan, Bangladesh, Myanmar, China.

Note: Cultivated widely.

UVARIA L., Sp. Pl. 1: 536. 1753.

Uvaria hamiltonii Hook. *f. et* Thom., Fl. Brit. Ind. 1: 96. 1855; H. Ohashi in Hara, Fl. E. Himal. 1: 97. 1966; Hajra *et al*., Fl. W. Beng. 1: 153. 1997; Prain, Beng. Pl. 1: 199.1903; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 238. 1984. *Uvaria hamiltonii* var. *kurzii* King, Mat. Fl. Malay. Penins. 1(4): 263. 1892.

Scrambling shrubs, stems densely brownish pubescent. Leaves elliptic – obovate, 12 – 18 x 5 –9 cm, shortly acuminate, baserounded, brownish pubescent specially beneath; petioles 5 mm. Flowers 6 cm across, pedicels 2 – 3.5cm. Sepals broadly ovate, Br. tomentose. Petals red, obovate – spathulate, finely tomentose. Fruiting carpels obovoid – ellipsoid, reddish – Br., tomentose.

Flowers & Fruits: May to June.

Specimen Cited: Gorumara, *Goutam & AP Das 0707*. dated 11. 09. 2007: Murti, *Goutam & AP Das 0398.* dated 17. 12. 2006.

Local Distribution: Roadside forests.

General Distribution: India: West Bengal, Assam, Bihar, Uttar Pradesh; Bhutan, Bangladesh, Myanmar, China.

Magnoliaceae Juss., Gen. Pl. 280. 1789; *nom. cons*.

MAGNOLIA L., Sp. Pl. 1: 535. 1753.

Key to the Species:

1a. Staminal connective exserted …… 2

1b. Staminal connective not exserted …….... *M. hodgsonii*

Fruits cylindric or terete, flowers terminal on axillary branches ..... *M. champaca*

1b. Fruits globose to ovoid, flowers terminal in position ..... *M. grandiflora*

Magnolia champaca (L.) Baill. *ex* Pierre, Fl. Forest. Cochinch. t. 3. 1880. *Michelia champaca* L., Sp. Pl. 1: 536. 1753; Hook. *f. et* Thom. in Hook. *f.*, Fl. Brit. Ind. 1: 42. 1872; Hara in Fl. East. Himal. 2: 36. 1971; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 236. 1984; Sharma *et al*., Fl. Ind. 1: 175. 1993 ; Prain, Beng. Pl. 1: 197. 1903. *Michelia rufinervis* Bl., Bijdr. Fl. Ned. Ind. 1: 8. 1825.

Local name: Swarna Champa

Trees up to 50 m. Twigs ascending and forming a narrow umbelliform crown. Petiole 2 – 4 cm; lamina elliptic or elliptic–ovate, 12 – 25 × 4 – 8 cm, abaxially slightly puberulous, base broadly cuneate to rounded, entire, long acuminate to subcaudate. Flowers fragrant, terminal on axillary brachyblasts. Tepals 15 – 20, yellow, oblanceolate. Staminal connective exserted and forming a long tip. Gynophore 2.5 – 3 mm; gynoecium with trichomes. Fruit 6 – 12 cm; mature carpels cylindric or terete, tuberculate. Seeds 2 – 4 per carpel, rugose.

Flowers & Fruits: July to October.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0187*, dated 09. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India: Tropical and subtropical forest, West Bengal, Assam, Sikkim, Nagaland, Arunachal Pradesh, Bihar, Orrisa, Delhi, Uttar Pradesh, West Himalayas; native to India, Indonesia, Malaysia, Myanmar, Nepal, Thailand, Vietnam.

Note: Cultivated widely.

Magnolia grandiflora L., Syst. Nat., ed. 10, 2: 1802. 1759. *Magnolia longifolia* Sweet, Hort. Brit. 11. 1826. *Magnolia angustifolia* Mill., Magnolias 55, 83. 1927.

Local name: Magnolia

Trees, up to 30 m. Bark pale Brown to gray. Petiole 2 – 4 cm, deeply furrowed; lamina elliptic to obovate–oblong, 11–21 × 4–8 cm, thickly leathery, adaxially deep green and glossy, secondary veins 8–10 on each side of midvein, base cuneate, entire, shortly mucronate. Flowers 12–18 cm in diam., fragrant, terminal in position. Tepals 9–12, white, obovate, thickly fleshy. Stamens 1.8 – 2 cm; filaments purple, flat; connective exserted and forming a mucro; anthers introrse. Gynoecium ellipsoid, densely long tomentose; carpels ovoid; styles reclinate. Fruit ovoid, densely Br. to pale grayish yellow tomentose; mature carpels abaxially rounded, dehiscing along dorsal sutures, apex long beaked. Seeds ovoid; testa red.

Flowers & Fruits: June to October.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0123*, dated 07. 02. 2009.

Local Distribution: Planted at Ofest offices and Tourist Lodges areas.

General Distribution: India: widely cultivated; Himalayas, Myanmar, China, native to North America.

Note: Cultivated widely.

Magnolia hodgsonii (Hook.*f.* & Thom.) Keng, Gard. Bull. Singapore 31: 129 1978.

Talauma hodgsonii J. D. Hooker *et* Thomson, Fl. Ind. 1: 74. 1855. Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 236. 1984.

Trees, up to 15 m. Twigs glabrous. Stipular scar up to apex of petiole. Petiole 5–6 cm; lamina obovate-oblong, 20–46 × 10–12 cm, leathery, base cuneate, entire, obtuse to acuminate. Peduncle thick and strong, with 1 to 2 bract scars; spathaceous bracts purple. Tepals 9, thickly fleshy; outer 3 tepals ovate; inner tepals smallest. Fruit ovoid.

Flowers & Fruits: April to July.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0824*, dated 01. 02. 2008.

Local Distribution: Planted at the offices and Tourist Lodges areas.

General Distribution: Bhutan, NE India, N Myanmar, Nepal, Thailand.

Note: Cultivated widely.

Order 8: Piperales Dumort. (1829)

Aristolochiaceae Juss., Gen. Pl. 72. 1789; *nom. cons*.

ARISTOLOCHIA L., Sp. Pl. 2: 960. 1753.

Key to the species:

1a. Leaves leathery; racemes 5 – 8 flowered; capsules dehiscing basipetally …… *A. indica*

1b. Leaves papery; racemes 2 – 3 flowered; capsules dehiscing acropetally ……. *A. tagala*

Aristolochia indica L., Sp. Pl. (1): 960. 1753; Prain, Beng. Pl. 2: 891. 1903. *Aristolochia lanceolata* Wight, Icon. Pl. Ind. Orient. 5: t. 1858 1852. *Aristolochia indica* var. *lanceolata* (Wight) Duch. in DC., Prodr. 15(1): 479. 1864.

Local name: Iswarmul

Shrubby climber. Stem terete, with elongate internodes. Petiole 3 cm; lamina ovate, 5 – 10 × 4 – 8 cm, acute, base deeply cordate, leathery, glabrescent, veins palmate, 3 – 5 pairs from base. 5 – 8-flowered short racemes axillary. Pedicels pendulous, 3 – 6 cm; bracts ovate. Perianth tube geniculately curved, abaxially villous to glabrous; limb subcylindric, 3-lobed; lobes slightly unequal, subrounded. Anthers oblong. Gynostemium 3-lobed. Capsules oval, dehiscing basipetally.

Flowers & Fruits: April to July.

Specimen Cited: Murti, *Goutam & AP Das 0086*, dated 06. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: India; Nepal, Bhutan.

*Note:*Medicinaly very important plants and decreasing its presence throughout.

Aristolochia tagala Cham. in Linnaea 7: 207. 1832; Hara in Fl. E. Himal. 3: 29. 1971; Grierson *et* Long, Fl. Bhut. 1(2): 354. 1984; Prain, Beng. Pl. 2: 891. 1903. *Aristolochia roxburghiana* Klotz., Monatsber. Königl. Preuss. Akad. Wiss. Berlin 596. 1859. *Aristolochia acuminata* Lam., Encycl. 1: 254. 1783.

Shrubby twinners. Stems terete, slightly furrowed, glabrous. Petiole glabrous; lamina ovate-cordate to oblong-ovate, 8 – 12 × 4 – 10 cm, acute to acuminate, base deeply cordate, lateral lobes subrounded,papery, both surfaces glabrous, veins palmate. Racemes in axils of leafy shoots, 2 to 3 flowered. Pedicels sparsely hairy, glabrescent; bractlets ovate-lanceolate. Perianth pale yellowish to greenish; tube slightly curved; utricle globose; limb ligulate, oblong, apex obtuse. Anthers ovoid. Capsules obovoid-globose to ovoid-cylindric, dehiscing acropetally. Seeds triangular.

Flowers & Fruits: May to August.

Specimen Cited: Murti, *Goutam & AP Das 0298*, dated 10. 02. 2009.

Local Distribution: Forest areas.

General Distribution: India: West Bengal, Sikkim, Assam, Arunachal Pradesh; Nepal, Bhutan, Bangladesh, Cambodia, Indonesia, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Piperaceae C. Agardh, Aphor. Bot. 201. 1824; *nom. cons*.

Key to the Genera:

1a. Prophylls present, leaving conspicuous scars around stem nodes ..... ***Piper***

1b. Prophylls absent, without or scars at nodes ..... ***Peperomia***

PIPER L., Sp. Pl. 1: 28. 1753.

Key to the Species:

1a. Bracts oblong or obovate-oblong, adnate to rachis with only sides and apex free … *P. nigrum*

1b. Bracts orbicular, peltate with free margin all round .....…… 2

2a. Fruits apically tomentose, completely fused to each other to form a nearly smooth, fleshy ..... *P. betle*

2b. Fruit glabrous, distinct, sometimes very soft when fully ripe and then difficult to separate when pressed and dried ……..…….. 3

3a. Leaves with veins all basal or nearly basal and all arising less than 3 mm from base of blade. Leaves very finely powdery pubescent abaxially .....…….....… *P. longum*

3b. Leaves with 2 or more lateral veins arising more than 1 cm from base of blade. Leaf blade and petiole glabrous or very finely powdery pubescent along veins ..……. 4

4a. Ovaries and fruit partly fused to rachis . ……..…… … *P. hamiltonii*

4b. Ovaries and fruit free from rachis ……..... *P. sylvaticum*

Piper betle L., Sp. Pl. 1: 28. 1753; Hook. *f.,* Fl. Brit. Ind. 5: 85. 1886; Long in Grierson *et* Long, Fl. Bhut. 1(2): 349. 1984, *sensu Piper betleoides* C.DC.; Prain, Beng. Pl. 2: 893. 1903. *Chavica betle* (L.) Miq., Syst. Piperac. 228. 1843. *Chavica densa* Miq., Syst. Piperac. 252. 1843.

Local name: Jangli paan

Dioecious climbers. Stems rooted at nodes, slightly woody. Petiole very finely powdery pubescent; leaf-blade ovate to ovate-oblong, acuminate, cordate to rounded, symmetric, veins 7, usually opposite, others basal; reticulate veins conspicuous. Bracts orbicular, peltate with free margin all round. Spikes leaf-opposed. Fruits apically tomentose, completely fused to each other to form a nearly smooth. Drupes fused to form terete, fleshy, reddish infructescence.

Flowers & Fruits: May to July.

Specimen Cited: Murti, *Goutam & AP Das 0175*, dated 08. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India: Tropical and subtropical forests; S.E. to S.W. China, Indonesia, Malaysia, Philippines, Sri Lanka, Vietnam, Africa.

Note: Leaves are eaten as like as betle piper.

Piper hamiltonii C. DC., Prodr. 16(1): 360. 1869; Hook. *f.* in Hook. *f.,* Fl. Brit. Ind. 5: 88. 1885; Long in Grierson *et* Long, Fl. Bhut. 1(2): 351. 1984; Prain, Beng. Pl. 2: 893. 1903.

Climber. Stem deeply striate, when dry. petiole to 2.4 cm; Lamina elliptic or elliptic obovate, 6 – 13 x 3.5 – 7 cm, obtuse, base rounded, 5 – veined, in lower most, 4.5 mm, without lateral veins, glabrous or very finely powdery pubescent along veins, coriacious, pale in dry. Bracts orbicular, peltate with

free margin all round. Fruiting spike interrupted, 10 – 16 cm, on peduncle 1- 2.5 cm. Ovaries and fruit partly fused to rachis. Drupes ovoid-subglobose, to 2.8 mm.

Flowers & Fruits: February to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0120*, dated 07. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India: Tropical and subtropical forests; Nepal, Bhutan.

Piper longum L., Sp. Pl. 1: 29. 1753; Hook. *f.* in Hook. *f.,* Fl. Brit. Ind. 5: 83. 1886; Hara, Fl. E. Himal. 1: 43. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 183. 1982; Long in Grierson *et* Long, Fl. Bhut. 1(2): 348. 1984; Prain, Beng. Pl. 2: 893. 1903.

Local name: Pipul

Climbing shrub. Lamina symmetric, subacute or bluntly acuminate, base deeply cordate-auriculate, membranous, veins all basal or nearly basal and all arising less than 3 mm from base, very finely powdery pubescent abaxially. Bracts orbicular, peltate with free margin all round. Male spikes slender and female spikes cylindric. Fruits glabrous, distinct, sometimes very soft when fully ripe and then difficult to separate when pressed and dried.

Flowers & Fruits: September to January.

Specimen Cited: Murti, *Goutam & AP Das 0206*, dated 09. 02. 2009.

Local Distribution: In all sectors, abundant.

General Distribution: India: tropical and subtropical forest, West Bengal, Assam, Sikkim, Arunachal Pradesh, Nagaland; Bangladesh, Bhutan, Nepal, Malaysia, Sri Lanka.

Note: Fruits are medicinaly important.

Piper nigrum L., Sp. Pl. 28. 1753; Hook. *f.* in Hook. *f.*, Fl. Brit. Ind. 5: 90. 1887; Prain, Beng. Pl. 2: 893. 1903.

Local name: Golmorich

Slender climbers, rooting at nodes. Lamina broadly ovate oblong, oblique, base rounded, coriaceous. Bracts oblong or obovate-oblong, adnate to rachis with only sides and apex free. Spikes robust, Flowers dioecious. Fruits globose, sessile, black when ripe.

Flowers & Fruits: January to April.

Specimen Cited: Dhupjhora; *Goutam & AP Das 0262*, dated 10. 02. 2009.

Local Distribution: Commonly planted in Forest villages.

General Distribution: India: widely cultivated in warmer regions; Nepal, Bhutan, Bangladesh, China.

Note: Cultivated widely.

Piper sylvaticum Roxb., Fl. Ind. 1: 156. 1832; Hook. *f*., Fl. Brit. Ind. 5: 84. 1886; Long in Grierson *et* Long, Fl. Bhut. 1(2): 348. 1984; Prain, Beng. Pl. 2: 893. 1903.

Stoloniferous shrubby climbers. Lamina usually ovate, acuminate, base cordate, 2 or more lateral veins arising more than 1 cm above from base, glabrous or very finely powdery pubescent along veins. Spikes leaf-opposed. Bracts orbicular, peltate with free margin all round. Male spikes slender. Female spikes erect, very finely powdery pubescent. Ovary globose, distinct. Ovaries and fruits free

from rachis. Fruits glabrous, distinct, sometimes very soft when fully ripe and then difficult to separate when pressed and dried. Drupes globose.

Flowers & Fruits: August to September.

Specimen Cited: Murti, *Goutam & AP Das 0314*, dated 10. 02. 2009.

Local Distribution: All over the Forests.

General Distribution: Tropical and sub-tropical parts of the world.

PEPEROMIA Ruiz *et* Pav., Fl. Peruv. Prodr. 8: 8. 1794.

Peperomia pellucida (L.) Kunth, Nov. Gen. [H.B.K.] 1: 64. 1816 ; Hara, Fl. E. Himal. 1: 42. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 345. 1984; Prain, Beng. Pl. 2: 894. 1903. *Piper pellucidum* L., Sp. Pl. 1. 30. 1753; *Micropiper pellucidum* (L.) Miq., Comm. Phytogr. 54. 1840. *Peperomia ephemera* Ekman, Ark. Bot. 22 A(9): 20. 1929. *Peper exigua* (Bl.) Miq., Syst. Pip. 77. 1843; Hook. *f*., FI. Brit. Ind. 5: 97. 1886.

Local name: Luchipata

Annual herbs, fleshy, up to 30 cm, glabrous. Stems ascending, much branched. Petiole 1–2 cm; lamina broadly ovate to ovate-triangular, acute, base cordate, length equal to width, membranous, both surfaces glabrous, translucent. Spikes terminal or leaf-opposed, slender, glabrous, flowers lax, slightly embedded in rachis; bracts shield-shaped, suborbicular, stalk short. Anthers subglobose. Ovary ellipsoid. Nuts globose.

Flowers & Fruits: April to July.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0168*, dated 08. 02. 2009.

Local Distribution: Riverine forests and Beat office areas.

General Distribution: Native of tropical America, Tropical and sub-tropical parts of the world.

Monocots - Monocotyledon (Einkeimblättrige)

Non Commelinids - Nicht-Commelinide

Order 9: Acorales Reveal (1996)

Acoraceae Agardh, Aphor. Bot. 133. 1822 ('Acoroideae').

ACORUS L., Sp. Pl. 1: 324. 1753

Acorus calamus L., Sp. Pl. 324. 1753; Hook. *f*., Fl. Brit. Ind. 6: 555. 1893; Noltie, Fl. Bhut. 3(1): 158. 1994; Cook, Aqua. Wetl. Pl. Ind. 51, 1996.

Acorus angustatus Rafinesque, Autik. Bot. 196. 1840.

Local Name:Boch/ Bojo

Erect with creeping rhizomes, perennial, marshland herbs. Leaves unifacial, ensiform, erect with a prominent midrib, with acute apex. Spadix appears laterally on foliage leaf. Flowers bisexual, trimerous; perianth segments 6. Stamens 6 with linear filament. Ovary hexagonal-cylindrical with 2 – 3 locules.

Flowers & Fruits: May to August.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0868*, dated 08. 02. 2010.

Local Distribution: Dhupjhora.

General Distribution: India, Asia, Europe, North America.

Note: Sometimes grown as a medicinal plant.

Order: Alismatales Dumort. (1829)

Alismataceae Vent., Tabl. Regn. Vég. 2: 157. 1799; *nom. cons*.

Key to the Genera

1a. Plants with specialized tuber ……..…….... ***Butomopsis***

1b. Plants with simple tuber ……..…….. ***Sagittaria***

BUTOMOPSIS Kunth, Enum. Pl. 3: 164. 1841.

Butomopsis latifolia (Don) Kunth, Enum. Pl. 3: 165. 1841; Noltie, Fl. Bhutan 3(1): 163. 1994; Cook, Aqua. Wetl. Pl. Ind. 247. 1996. *Butomus latifolius* Don, Prodr. Fl. Nepal. 22. 1825. *Butomus lanceolatus* Roxb., Fl. Ind. 2: 315. 1832. *Butomopsis lanceolata* (Roxb.) Kunth, Enum. Pl. 3: 165. 1841; Prain, Beng. Pl. 2: 1120. 1903.

Annual herbs with specialized tuber. Leaves radical, erect; petiole up to 18 cm; lamina 5 – 16 cm, 3 – 7 veined, acute, base attenuate. Scapes up to 30 cm; umbels 3 – 14 flowered. Sepals broadly elliptic, margin membranous, apex rounded to retuse.

Flowers & Fruits: May to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0007*, dated 05. 02. 2009.

Local Distribution: Found only in Gorati Beel.

General Distribution: India, Nepal, throughout S.E. Asia, N. Africa, N. Australia.

SAGITTARIA L., Sp. Pl. 2: 993. 1753.

Key to the species:

1a. Plants with floating leaf; lamina cordate, obtuse ……..…..…… *S. guayanensis*

1b. Plants erect; stoloniferous; lamina hastate, acute ……...…… *S. sagittifolia*

Sagittaria guayanensis H. B.K. Gen. Sp.1: 250. 1815; Hook. *f*., Fl. Brit. Ind. 6: 561.1893; Prain, Beng. Pl. 2: 1120. 1903; Cook, Aqua. Wetl. Pl. Ind. 39, 1996; Rao *et*Verma in Bull. Bot. Surv. Ind. 18 (1-4): 39. 1976. *Sagittaria guanyanensias* ssp. *lappula* (Don) Bogin, Mem. N. Y. Bot. Gard. 9: 192. t. 5. 1955. *Sagittaria guyanensis* Kunth, Syn. Pl. 1: 261. 1822. *Lophiocarpus guayanensis* (Kunth) Micheli, Monogr. Phan. 3: 62. 1881. *Echinodorus guayanensis* (Kunth) Griseb., Fl. Brit. W. I. 505. 1862.

Fleshy, aquatic or marshy immerged herbs. Leaves radical; lamina floating, broadly ovate, obtuse or rounded, cordate at base; petiole long. Flowers white, in close whirls on stout pedicels; upper and lower few bisexual; petals ovate. Achenes several, surrounded by a toothed wing.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0009*, dated 05. 02. 2009.

Local Distribution: Margins of water bodies through out the Beel.

General Distribution: Throughout India; China, Malaysia, Australia.

Sagittaria sagittifolia L., Sp. Pl. 2: 993. 1753; Hook. *f*., Fl. Brit. Ind. 6: 561. 1893; Cook, Aqua. Wetl. Pl. Ind. 39, 1996; Rao *et* Verma in Bull. Bot. Surv. Ind. 18(1-4): 39. 1976; Noltie, Fl. Bhut. 3(1): 164. 1994; Prain, Beng. Pl. 2: 1120. 1903; Bora *et* Kumar, Fl. Div. Ass. 314. 2003. *Sagittaria sagittaria* Thunb., Fl. Jap. 242. 1784. *Alisma sagittaria* Stokes, Bot. Mat. Med. 2: 335. 1812. *Sagittaria aquatica* Lam., Fl. Franç. 2:197. 1779. *Sagittaria heterophylla* Schreber, Fl. Erlang. 2:119. 1811.

Local name: Chhoto kut.

Erect, fleshy aquatic or marshland stoloniferous herbs. Leaves radical; lamina hastate or sagittate, acute; petioles trigonous, spongy. 1-3 flowered whorls of panicles; flowers whitish purple. Achenes in a globose head, compressed, winged.

Flowers & Fruits: February to August.

Specimen Cited: Medlajhora, *Goutam & AP Das 0033*, dated 05. 02. 2009.

Local Distribution: All over the lowlands.

General Distribution: Plains of India; N. Asia, N. America and Europe.

Aponogetonaceae Planch., Bot. Mag. 82: ad. t. 4894. 1856; *nom. cons*.

APONOGETON L. *f*., Suppl. Pl. 32, 214. 1782, *nom. cons*.

Key to the species:

1a. Leaves floating ……. …… ……..…….. 2

1b. Leaves submerged …….…… ……..…….. *A. crispum*

2a. Flowers pink or purple …… *A. natans*

2b. Flowers white …… *A. la**khonensis***

Aponogeton crispum Thunb., Nov. Gen. 4: 73. 1784; Hook. *f*., Fl. Brit. Ind. 6: 564. 1893; Prain, Beng. Pl. 2: 1122. 1903; Cook, Aqua. Wetl. Pl. Ind. 48, 1996; Datta *et* Majumdar, Bull. Bot. Soc. Beng. 20 (2): 22. 1966. *Aponogeton echinatus* Roxb., Fl. Ind. 2: 210. 1832. *Spathium crispum* (Thunb.) Voigt, Hort. Suburb. Calcutt. 694. 1845. *Spathium echinatum* (Roxb.) Voigt, Hort. Suburb. Calcutt. 694. 1845.

Perennial, submerged, stoloniferous aquatic herbs. Leaves submerged, translucent. Flowers white, bisexual on long scapes; parianth segments longer than mature carpel. Follicles 1-2 seeded.

Flowers & Fruits: September to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0012*, dated 05. 02. 2009.

Local Distribution: In most of the Beels.

General Distribution: India: Andhra Pradesh, Kerala, Karnataka, Maharastra, Punjab, West Bengal; Sri Lanka.

Aponogeton natans (L.) Engl. *et* Krause, Engler Pfreich. 24: 11. 1906; Majumdar, Bull. Bot. Soc. Beng. 19 (1): 15. 1955; Cook, Aqua. Wetl. Pl. Ind. 48, 1996. *Saururus natans* L., Mantissa 2: 227. 1767. *Aponogeton monostachyus* L. *f*., Suppl. 214. 1781 (ut *monostachon*); Hook. *f*., Fl. Brit. Ind. 6: 564. 1893; Prain, Beng. Pl. 2: 1122. 1903. *Spathium monostachyum* (L. *f*.) Edgew, J. Asiat. Soc. Bengal 11: 148. 1842. *Aponogeton lucens* Hook. *f*., Fl. Brit. India 6: 564. 1893.

Aquatic, perennial, stoloniferous herbs; scapigerous. Leaves floating with scapes sticking out. Flowers differently coloured, pink or purple, bisexual; parianth segments longer than mature carpels. Follicles smooth, 4 – 8 seeded.

Flowers & Fruits: October to March.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0015*, dated 05. 02. 2009.

Local Distribution: Throughout Beel.

General Distribution: India: Andhra Pradesh, Jharkhand, Hariyana, Kerala, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajsthan, Tripura, West Bengal; Sri Lanka, Tropical Asia and Africa.

Aponogeton lakhonensis Camus, Notul. Syst. 1: 273. 1910; Cook, Aqu. Wet. Pl. Ind. 48. 1996. *Aponogeton luteus* Camus, Notul. Syst. (Paris) 2: 204. 1912. *Aponogeton pygmaeus* Krause, Bot. Jahrb. Syst. 44(101): 8. 1910. *Aponogeton taiwanensis* Masam., Kudoa 2(1): 1. 1941.

Rhizome elongated, up to 2 cm. Petiole 8 – 13 cm in submerged leaves and 30 – 55 cm in floating leaves; lamina narrowly ovate to linear, entire, rounded, base rounded, herbaceous, with primary veins 7–9 at base. Inflorescence 4–5.5 cm, pedunculate. Flowers white, bisexual. Perianth segments 2, slightly obovate. Stamens 6. Carpels slightly united near base. Fruits ovoid.

Flowers & Fruits: September to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0006*, dated 05. 02. 2009.

Local Distribution: Throughout Beel.

General Distribution: India: West Bengal, Assam; Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam.

Araceae Juss., Gen. Pl. 23. 1789. *nom. cons*.

Key to the Genera:

1a. Spadix with many flowers ……...…....…… 2

1b. Spadix with 1 – 2 male and 1 – 2 female flowers ……..……..... 11

2a. Plants aquatic or semi-aquatic …… …… …..……...…...…… 3

2b. Plants terrestrial ……..…… ……...…...…… 6

3a. Plants free-floating …… …..……..... ***Pistia***

3b. Plants rooted at the bottom …..…… ……...…...…….. 4

4a. Plants much spiny; flowers bisexual …….....…….. ***Lasia***

4b. Plants without spines; flowers unisexual or sterile …….....…….. 5

5a. Lamina peltate ……..….....….. ***Colocasia***

5b. Lamina not peltate, ovate to linear-lanceolate ……..….....…….. ***Cryptocoryne***

6a. Plants erect ……..…… 7

6b. Plants climbing ……..…….....…… 10

7a. Rhizome underground, short ……..……... 8

7b. Rhizome arial, large ……..…… ***Alocasia***

8a. Plants stemless ……..…… ***Xanthosoma***

8b. Plants with globose tuber ……...……..... 9

9a. Leaves usually deeply 3-lobed ……...……..... ***Typhonium***

9b. Leaves much divided, twice or more ……..…..... ***Amorphophallus***

10a. Lamina oblong-elliptic or ovate-elliptic ……..…….. ***Scindapsus***

10b. Lamina lanceolate to linear-lanceolate with an articulation near base … ***Pothos***

11a. Fronds rootless; inflorescences not enclosed in a membranous sheath … ***Wolffia***

11b. Fronds bearing roots; inflorescences enclosed in a membranous sheath … 12

12a. Roots solitary on each frond segment …… …… …..…..... ***Lemna***

12b. Roots several from each frond segment …… ……..…..... ***Spirodella***

LEMNA Linnaeus, Sp. Pl. 2: 970. 1753

Key to the species:

1a. Frond 1.5 – 2 mm long, ovate-oblong, seeds ribbed ……..…… *L. perpusilla*

1b. Frond 1 – 8 mm long, flattened, seeds not ribbed ……..... *L. minor*

Lemna perpusilla Torrey, Fl. N.Y. 2: 245. 1843; Cook, Aqua. Wetl. Pl. Ind. 65, 1996. *Lemna paucicostata* Hegelm., Lemnac 139. t. 8. 141. 1868; Hook. *f*., Fl. Brit. Ind. 6: 556. 1893.

Small, free floating herbs. Frond, 1.5 –2 mm. long, ovate or ovate-oblong, asymmetric, nearly flat. Roots solitary with winged root-sheath and acute root cap is called root pocket. Female flowers with solitary orthotropous ovule. Seed ovoid, prominently ribbed.

Flowers & Fruits: June to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0728*, dated 05. 02. 2010.

Local Distribution: Gorati Beel.

General Distribution: Throughout the India; Cosmopolitan in tropics and subtropics.

Lemna minor L., Sp. Pl. 2: 970. 1753; Noltie, Fl. Bhut. 3(1): 160. 1994; Cook, Aqua. Wetl. Pl. Ind. 228, 1996. *Lemna paucicostata* Hegelm., Lemnac.139. t. 8. 141. 1868; Hook. *f*., Fl. Brit. Ind. 6: 556. 1893; Prain, Beng. Pl. 2: 1117. 1903.

Fronds free floating, flattened, 1 – 8 mm long, without green stalk at base, margin entire, base rounded; veins 3(-5), nearly reaching apex, sheath not winged, apex mostly rounded. Ovary with 1 ovule; utricular scale with narrow opening at apex. Fruit winged laterally toward apex. Seeds not ribbed.

Flowers & Fruits: May to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0028*, dated 05. 02. 2009.

Local Distribution: Gorati Beel.

General Distribution: India, Nepal, China, Afghanistan, Kazakhstan, N Pakistan, W Russia, Turkmenistan; Africa, SW Asia, Europe, North America; introduced in Australia, Japan, Pacific islands.

SPIRODELA Schleid. in Linnaea 13: 391. 1839

Spirodela polyrrhiza (L.) Schl. in Linnaea 13: 392. 1829; Cook, Aqua. Wetl. Pl. Ind. 229, 1996. *Lemna polyrhiza* L., Sp. Pl. 2: 970. 1753; Hook. *f*., Fl. Brit. Ind. 6: 557. 1893; Prain, Beng. Pl. 2: 1117. 1903. *Lemna orbiculata* Roxb., Fl. Ind. 3: 565. 1832. *Lemna maxima* Blatt. *et* Hallb., J. India Bot. 2: 49. 1921. *Spirodela maxima* (Blatt. *et* Hallb.) McCann, J. Bombay Nat. Hist. Soc. 43: 158. 1942. *Lemna major* Griff., Not. Pl. Asiat. 3: 216. 1851.

Free floating tufted herbs with ovate fronds; each fronds with 5 – 10 minute roots. Upper leaf orbicular to obovate, 7 – 13 nerved, dark green above, purplish beneath. Spathe open only at the top. Seeds smooth or faintly reticulate.

Flowers & Fruits: January to April.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0037*, dated 05. 02. 2009.

Local Distribution: In all the Beels.

General Distribution: India; tropical and temperate parts of the world.

WOLFFIA Horkel *ex* Schleid., Beitr. Bot. 233. 1844.

Wolffia arrhiza (L.) Horkel *ex* Wimm., Fl. Schiiles. 3: 140. 1857; Hook. *f*., Fl. Brit. Ind. 6: 557. 1893. Prain, Beng. Pl. 2: 1117. 1903; Cook, Aqua. Wetl. Pl. Ind. 230, 1996. *Lemna arrhiza* L.**,** Mantiss. 2: 294. 1771. *Wolffia michelii* Schleid. in Beitr. Bot. 233. 1844 (*nom. Illeg.*). *Wolffia delilii* Miq., Ned. Kruidk. Arch. 3: 429. 1855.

Minute, 1 – 5 mm, free floating annual herbs. Fronds sub-globose, minute, ellipsoid, upper surface convex, rootless. Inflorescence 2-flowered, with one male and one female spathe; anther 1-celled; ovary 1 ovuled.

Flowers & Fruits: July to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0027*, dated 05. 02. 2009.

Local Distribution: In most of the Beels.

General Distribution: India, Bhutan, Bangladesh, Nepal, Cambodia, Indonesia, Japan, Laos, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; introduced to America.

RHAPHIDOPHORA Hassk., Flora 25 (Beibl. 2): 11. 1842.

Key to the species:

1a. Leaves scattered, with 1 foliage leaf of a branch ……. *R. glauca*

1b. Leaves clustered at shoot tips ……..……. *R. grandis*

Rhaphidophora grandis Schott in Oester. Bot. Wochenbl. 349.1858; Noltie, Fl. Bhutan 3(1): 128. 1994; Hajra *et* Verma. Fl. Sikkim 1:194. 1996.

Lianas, up to 15 m. Stem cylindric, internodes short. Leaves clustered at shoot tips; petiole channeled, margins sharp; lamina obliquely oblong, thinly leathery, base rounded, apex with an acumen. Inflorescences solitary at tips of free lateral shoots; peduncle pendent; cataphylls caducous, ovate or ovate-lanceolate. Spathe oblong-ovate. Spadix sessile, yellow, obovoid. Filaments 1 - 2 mm; anthers oblong; staminodes 4. Ovary hexagonal-cylindric; stigma subsessile.

Flowers & Fruits: July to October.

Specimen Cited: Murti, *Goutam & AP Das 1017*, dated 15. 03. 2010.

Local Distribution: Murti, Gorumara.

General Distribution: Bangladesh, Bhutan, India, Laos, Myanmar, Thailand.

Raphidophora glauca (Wall.) Schott in Blonplandia 5: 45.1875; Hook. *f*., Fl. Brit. India 6: 547. 1894; Noltie, Fl. Bhutan 3(1): 126. 1994. *Pothos glaucus* Wall., Pl. Asiat. Rar. 2: 45t.156. 1832.

Lianas, up to 10 m. Stems terete in cross section; climbing stems and rooting at the nodes. Leaves scattered, with 1 foliage leaf of a branch; petiole shallowly channeled; petiolar sheath reaching base of lamina; lamina base truncate, oblique to shallowly cordate, apex acuminate. Inflorescences erect, solitary, arising from tips of free lateral branches. Spadix sessile, dull cream-colored, cylindric. Stamens 4 per flower; filaments flat; pollen simply expelled from between pistils. Pistils truncate, smooth; stigma flat.

Flowers & Fruits: August to October.

Specimen Cited: Gorumara, *Goutam & AP Das 1127*, dated 25. 06. 2012.

Local Distribution: Gorumara, Murti.

General Distribution: Bangladesh**,** Bhutan, India, Myanmar, Nepal, Thailand.

COLOCASIA Schott in Schott *et* Endl., Melet. Bot. 18. 1832*, nom. cons*., not Link (1795).

Key to the Species:

1a. Leaf sheaths yellowish green …… *C. esculenta*

1b. Leaf sheaths reddish Br. ……..… *C. fallax*

Colocasia esculenta (L.) Schott in Schott *et* Endl.., Melet. Bot. 18. 1832; Hara *et al,* En. Flower. Pl. Nepal 1: 91. 1978; Noltie, Fl. Bhut. 3(1): 136. 1994**;** Cook, Aqua. Wetl. Pl. Ind. 51, 1996. Hajra *et al*., Fl. Sikkim 1: 191. 1996. *Arum esculentum* L., Sp. Pl. 2: 965. 1753. *Colocasia antiquorum* Schott in Schott *et* Endl., Melet. Bot. 18. 1832; Hook. *f*., Fl. Brit. Ind. 6: 523. 1893. *Arum chinense* L., Amoen. Acad. 4: 234. 1754. *Arum colocasia* L., Sp. Pl. 985. 1753. *Caladium nymphaeifolium* Vent., Descr. Pl. Nov. t. 30. 1801. *Colocasia esculenta* var. *antiquorum* (Schott) Hubb. *et* Rehder, Bot. Mus. Leafl. 1(1): 5. 1932. *Colocasia nymphaefolia* Kunth, Enum. 3: 37. 1850; Hook. *f*., Fl. Brit. Ind. 6: 523. 1893; Prain, Beng Pl. 2: 1112. 1903. *Arum nymphaeifolia* Roxb., Fl. Ind. 3: 495. 1832.

Local name: Kachu, Sar Kachu, Shola Kachu

Erect, marshland herbs; rhizomes variable, leaves from the rhizome, dark-green above and glabrous, yellowish, convulate. Spadix long. Female flowers at the base, fertile ovaries intermixed with sterile ones; neuter above the female; male portion above the neuter synandrium lobed.

Flowers & Fruits: May to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0036*, dated 05. 02. 2009; Forest, *Goutam & AP Das 0091*, dated 07. 02. 2009.

Local Distribution: In most of the low marshland areas.

General Distribution: India: West Bengal, Sikkim, Mizoram, Manipur, Maharastra, Rajsthan, Delhi, Kerala, Karnatak, Goa; Himalaya, Tropical Asia, Bangladesh, Sri Lanka and South America.

Note: There are many cultivars which are cultivated in forest villages.

Colocasia fallax Schott in Bonplandia 7: 28. 1859 ; Noltie, Fl. Bhutan 3(1): 137. 1994; Hajra *et al*., Fl. Sikkim 1: 192. 1996; *Colocasia kerrii* Gagnep., Notul. Syst. (Paris) 9: 130. 1941.

Local name: Ban Kachu

Rhizome erect, globose, 2 cm in diametre; stolons creeping. Petioles 15 – 25 cm, sheathing for almost half of length; sheaths reddish Br.; lamina narrowly oblong-ovate, 8 – 17 x 4 – 9 cm, apiculate, base shallowly cordate, slightly glaucous abaxially, intramarginal veins several. Peduncle slender. Spathe tube green; limb orange-yellow, narrowly lanceolate, finely acuminate. Female part of spadix 1 – 2 cm, with 4 – 5 rows of whitish sterile ovaries at base; male part scaly-rough, with several rows of sterile male flowers at base, apex acute. Ovaries green, speckled with white, subglobose; stigmas discoid at base.

Flowers & Fruits: August to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0025*, dated 05. 02. 2009.

Local Distribution: Forest village of Dhupjhora.

General Distribution: India: West Bengal, Sikkim, Manipur, Maharastra; Himalayas, Tropical Asia, Bangladesh, Sri Lanka.

Note: Rhizome edible.

CRYPTOCORYNE Fisch. *ex* Wydler, Linnaea 5: 428. 1830.

Key to the species:

1a. Limb of spathe ciliate along the margin …… *C. ciliata*

1b. Limb of spathe smooth ……..…… *C. retrospiralis*

Cryptocoryne ciliata (Roxb.) Fisch. *ex* Wydler in Linnaea 5: 428. 1830; Hook. *f*., Fl. Brit. Ind. 6: 492. 1893; Blatt. in J. Bomb. Nat. Hist. Soc. 17: 27. 1911; Prain, Beng. Pl. 2: 1106. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 54, 1996. *Ambrosinia ciliata* Roxb., Corm. Pl. 7. 90, t. 294. 1819. *Ambrosina ciliaris* Spreng., Syst. Veg. 3: 771. 1826. *Cryptocoryne elata* Griff., Not. Pl. Asiat. 3: 134. 1851.

Erect, unarmed aquatic herbs with stolons. Leaves linear-oblong or linear-lanceolate; limb of spathe ciliate along the margin. Spathe axillary, cuspidate with purple fimbriate margins. Carpels 5 – 7, fruit syncarpous, 5 – 7 loculed with 6 – 8 seeds in each, peduncle stout.

Flowers & Fruits: May to September.

Specimen Cited: Medlajhora, *Goutam & AP Das 0043*, dated 05. 02. 2009; *Goutam & AP Das 0059*, dated 07. 02. 2009.

Local Distribution: Lowlands along the forest margin

General Distribution: India and Malaysian Islands.

Cryptocoryne retrospiralis Fisch. *ex* Wydler in Linnaea 5: 428. 1830; Kunth, Enum. 3: 12. 1841; Engler in DC, Monog, Phan. 2: 625.1879; Hook. *f*., Fl. Brit. Ind. 6: 493. 1893; Noltie, Fl. Bhutan 3(1): 155. 1994; Prain, Beng. Pl. 2: 1106. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 57, 1996.

Aquatic, submerged herbs with fibrous root. Leaves numerous, radical, narrowly liniear, lanceolate, acute. Spathes as long as the leaves, dull green, entire. Carpels 5 – 6, ovules 3 or more; stigma orbicular.

Flowers & Fruits: May to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0045*, dated 05. 02. 2009.

Local Distribution: Found only in Gorati Beel.

General Distribution: India, S.E. Asia.

LASIA Lour., Fl. Cochinch. 1: 64, 81. 1790.

Lasia spinosa (L.) Thwait., Enum. 336. 1864; Hajra *et al*., Fl. Sikkim 1: 192. 1996; Noltie, Fl. Bhut. 3(1): 129. 1994; Cook, Aqua. Wetl. Pl. Ind. 64, 1996. *Dracontium spinosum* L., Sp. Pl. 967. 1753. *Lasia heterophylla* (Roxb.) Schott, Melet. Bot. 1: 21. 1832; Hook. *f*., Fl. Brit. Ind. 6: 550. 1893; Prain, Beng. Pl. 2: 1116. 1903. *Pothos heterophyllus* Roxb., Fl. Ind. 1: 457. 1820. *Pothos lasia* Roxb.*,* Fl. Ind. 1: 458. 1820.

*Local name:*Knata Kachu.

Perennial, stout, prickly, aquatic herbs; rhizomes branched. Leaves coriaceous, glabrous, hastate or sagittate, pinnatifid; lobes narrow or broadly acuminate. Spathe greenish purple, axis spongy. Perianth pink, lobes hooked over the stamens. Stigma oranged.

Flowers & Fruits: November to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0038*, dated 05. 02. 2009.

Local Distribution: Lowland areas along the forests margin

General Distribution: India (Tropical Himalaya), Bangladesh, China, Malaysia, Myanmar and and Sri Lanka.

TYPHONIUM Schott in Wiener Zeitschr. Kunst 1829: 732. 1829.

Key to the species:

1a. Lamina variously shaped, triangular-hastate to triangular-sagittate ….. *T. roxburghii*

1b. Lamina cordate-ovate ……..……. *T. trilobatum*

Typhonium roxburghii Schott, Aroideae, 1: 12. 1855; Hook. *f*., Fl. Brit. Ind. 6: 510. 1893; Beng. Pl. 2: 1108. 1903. *Arum diversifolium* Bl., Catalogus 102. 1823; Fl. E. Himal. 2. 156. 1966. *Arum roxburghii* Thwait. Enum. Pl. Zeyl. 432. 1864. *Typhonium schottii* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67: 303. 1898; Beng. Pl. 2: 1108. 1903.

A small herb. Rhizome sub-globose. Leaves 3 – 7; lamina variously shaped, simple entirehastate, triangular-hastate, triangular-sagittate, shallowly or deeply 3-lobed or completely trifoliolate. Inflorescence appearing after leaves. Spathe oblong ovoid; blade triangular to ovate-lanceolate, apex acute. Spadix subequaling spathe; staminodes sub-cylindric, slightly flat, yellow; anthers opening with an apical pore; appendix long conic-cylindric. Berries ovoid.

Flowers & Fruits: April to June.

Specimen Cited: Gorumara, *Goutam & AP Das 1154*, dated 17. 09. 2011.

Local Distribution: Gorumara.

General Distribution: India, Bangladesh, China, Sri Lanka, Japan, Thailand, Indonesia, Malaysia, Philippines, New Guinea; E Africa, W Australia, S America.

Note: Rarely found.

Typhonium trilobatum (L.) Schott in Wiener, Zeitschr. Kunst. 3: 72. 1829; Hook. *f*., Fl. Brit. Ind. 6: 509. 1893; Hajra *et al*., Fl. Sikkim 1: 195. 1996; Noltie, Fl. Bhut. 3(1): 139. 1994. *Arum trilobatum* L., Sp. Pl. 965. 1753. *Typhonium triste* Griff., Not. Pl. Asiat. 3: 145. 1851. *Arum orixense* Roxb., Fl. Ind., 3: 503-505. 1832.

*Local name:*Kharkon

Rhizome short, tuberous, subglobose. Petiole green to purple; lamina cordate-ovate, usually deeply 3-lobed, 10 – 15 x 5 – 10 cm, acuminate to mucronate; lateral lobes 8 – 11 cm. Inflorescence appearing after the leaves. Spathe with dark purplish-red line, limb ovate-lanceolate, acuminate. Spadix shorter than spathe; female zone slightly conical; sterile zone densely covered with staminodes, upper half naked; male zone ± 2 cm. Stamens pink. Ovaries yellowish green; stigma sessile.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0054*, dated 07. 02. 2009.

Local Distribution: Murti Beat Office side forest area.

General Distribution: India: West Bengal, Sikkim, Bihar, Odisha; China, Myanmar, Sri Lanka, Nepal, Thailand, Malaysia.

Note: Abundantly distributed.

PISTIA L., Sp. Pl. 2: 963. 1753.

Pistia stratiotes L., Sp. Pl. 2: 963. 1763; Hook. *f*., Fl. Brit. Ind. 6: 497. 1893; Noltie, Fl. Bhut. 3(1): 156. 1994; Prain, Beng. Pl. 2: 1105. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 65, 1996. *Zala asiatica* Lour., Fl. Cochinch. 405. 1790. *Pistia minor* Bl., Rumphia 1: 78. 1836. *Pistia africana* Presl, Epimel. Bot. 240. 1851.

*Local name:*Topa pana

Small, free floating fleshy stoloniferous herbs. Leaves several in a rosette, densely pubescent. Lamina sessile, obovate-cuneate. Spathe much shorter than leaves, shortly peduncled, open above. Spadix adnate to the back of the tube of spathe, very small, free above. Fruits membranous, few seeded. Seeds oblong or obovoid albuminous.

Flowers & Fruits: May to October.

Specimen Cited: Indong jhora, *Goutam & AP Das 0024*, dated 05. 02. 2009.

Local Distribution: In most of the wetlands of GNP

General Distribution: Throughout India, Sri Lanka, tropical and subtropical regions worldwide.

ALOCASIA (Schott) G. Don in Sweet, Hort. Brit., ed. 3, 631. 1839, *nom. cons*.

Alocasia macrorrhizos (L.) G. Don, Sweet, Hort. Brit. 3: 631. 1839; Hajra *et al*., Fl. Sikkim 1: 186. 1996; Noltie, Fl. Bhut. 3(1): 139. 1994. *Arum macrorrhizon* L., Sp. Pl. 965. 1753. *Alocasia indica* (Lour.) Spach, Hist. Nat. Vég. 12: 47. 1846; Prain, Beng. Pl. 2: 1111. 1903. *Arum indicum* Lour., Fl. Cochinch. 536. 1790. *Colocasia indica* (Lour.) Kunth, Enum. Pl. 3: 39. 1841.

*Local name:*Mann, Maan Kachu

Rootstock stout, almost erect. Leaves large; lamina ovate, undulate, obtuse-rounded, bright green. Spathes yellowish green. Fertile male inflorescence white; females yellow.

Flowers & Fruits: April to September.

Specimen Cited: Lataguri, *Goutam & AP Das 0044*, dated 05. 02. 2009.

Local Distribution: Dhupjhora forest village and road-side areas.

General Distribution: India, Bangladesh, Nepal, Sri Lanka, S.E. Asia to Pacific.

Note: Rhizome edible.

AMORPHOPHALLUS Blume *ex* Decne, Nouv. Ann. Mus. Hist. Nat. 3: 366. 1834, *nom. cons.*

Key to the species:

1a. Bulbils developed on the lamina – petole junction …… *A. bulbifer*

1b. Bulbils never formed on leaves …….. *A. napalensis*

Amorphophallus napalensis (Wall.) Bogner *et* Mayo, Avoideva 8(1): 19. 1985; Fl. Bhutan 3(1): 133. 1994; Fl. Sikkim 1: 186. 1996. *Thomsonia napalensis* Wallich Pl. Asiat. Rar. 1: 83. 1830.

Local Name: Buno ol.

Monoecious, perennial, herb. Tuber sub-globose, dorsiventrally slightly compressed. Leaf single, cataphylls brownish; petiole smooth, whitish, dark green mottled; lamina 3 segmented; base of leaflets winged petiole-like; leaflets lanceolate, acuminate. Bulbils never formed on leaves. Flowering before leaf. Peduncle shout and mottled like petiole, 25 – 50 cm. Spathe 15 – 25 cm, widely open, erect, not constricted so not divided into tube and blade, hence tube not formed at base, overlapping to right or left, pale green, apex obtuse, slightly hooded; Spadix: ¾ to sub-equaling spathe, to 10 – 20 cm; female portion at bottom to 3 cm, green; male portion central 4 – 6 cm, anthers creamy yellow, tinged with dark-purple; appendix yellow-cream, equal to shorter than male portion. Fruits ovate.

Flowers & Fruits: May to June.

Specimen Cited: Murti, *Goutam & AP Das 1105*, dated 17. 06. 2012.

Local Distribution: Murti and Gorumara.

General Distribution: Endemic to Himalayas.

Amorphophallus bulbifer (Roxb.) Bl. in Rumphia 1: 148. 1837; Hook. *f*., Fl. Brit. Ind. 6: 515. 1893; Hara, Fl. East. Himal. 1: 394. 1966; Hajra *et al*., Fl. Sikkim 1: 186. 1996; Noltie, Fl. Bhut. 3(1): 133. 1994; Prain, Beng. Pl. 2: 1110. 1903. *Arum bulbiferum* Roxb., Fl. Ind. 3: 516. 1832. *Amorphophallus aculatum* Hook. *f*., Fl. Brit. India 6: 515. 1893.

*Local name:*Buno Ol

Tuber subglobose. Cataphylls Br., membranous. Leaf divided into numerous leaflets; bulbils developed at primary or secondary divisions; leaflets acuminate. Spathe ovate, subacute, margins overlapping basally. Spadix subacute, pink, sometimes whitish.

Flowers & Fruits: April to July.

Specimen Cited: Budhuram, *Goutam & AP Das 0105*, dated 07. 02. 2009.

Local Distribution: Throughout the Forest.

General Distribution: South East Asia, Australia.

POTHOS L., Sp. Pl. 2: 968. 1753.

Pothos scandens L., Sp. Pl. 2: 968. 1753; Noltie, Fl. Bhut. 3(1): 125. 1994; Prain, Beng. Pl. 2: 1115. 1903. *Pothos longifolius* Presl, Epimel. Bot. 242. 1851. *Pothos scandens* f. *angustior* Engl. in, Bot. Tidsskr. 24: 272. 1902. *Pothos fallax* Schott, Prodr. Syst. Aroid. 560. 1860. *Pothos angustifolius* (Raf.) Presl, Epimel. Bot. 243. 1851.

Shrubby root-climber. Profusely branched; branches terete. Petiole cuneate, truncate at apex, many veined, upper part winged; lamina lanceolate to linear-lanceolate, 4 – 8 x 1 – 3 cm, acuminate, base obtuse. Inflorescence solitary, axillary, small; peduncle short; cataphylls imbricate, green, ovate, small. Spathe greenish to maroon, ovate, concave. Spadix stipitate; stipe erect, greenish; fertile zone yellow-green to off-white, globose or ovoid to subclavate. Fruit mid-green, ripening to deep scarlet, obclavate.

Flowers & Fruits: October to November.

Specimen Cited: Murti, *Goutam & AP Das 0133*, dated 07. 02. 2009.

Local Distribution: All over the forest in semi-open areas; abundant.

General Distribution: Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Madagascar.

SCINDAPSUS Schott in Schott & Endl.., Melet. Bot. 21. 1832.

Scindapsus officinalis (Roxb.) Schott, Melet. Bot. 21. 1832; Noltie, Fl. Bhut. 3(1): 129. 1994; Prain, Beng. Pl. 2: 1114. 1903. *Pothos officinalis* Roxb., Fl. Ind. 1: 452. 1820. *Monstera officinalis* (Roxb.) Schott, Wiener Z. Kunst 4: 1028. 1830. *Scindapsus annamicus* Gagnep., Notul. Syst. (Paris) 9: 139. 1941.

Local name: Gajpipul.

Robust liana, root-climber. Petiole 26 – 32 cm, base imbricate, sheath reaching pulvinus; lamina pale green abaxially, green adaxially, oblong-elliptic or ovate-elliptic, 23 – 36 x 12 – 24 cm, entire, acute to shortly acuminate, base subcordate, leathery; lateral veins numerous, diverging from midrib. Spathe yellow, involute-tubular, acuminate. Spadix sessile, cylindric.

Flowers & Fruits: November to December

Specimen Cited: Murti, *Goutam & AP Das 0124*, dated 07. 02. 2009.

Local Distribution: Gorumara, Murti, Bichhabhanga, Budhuram, Khunia.

General Distribution: India, Bangladesh, Bhutan, China, Thailand, Vietnam.

XANTHOSOMA Schott, Melet. Bot. 19. 1832.

Xanthosoma brasiliense (Desf.) Engler, Engler Pflanzenr. Arac. Colocas. 58. 1920; Noltie, Fl. Bhut. 3(1): 139. 1994; *Caladium brasiliense* Desf., Tabl. Ecole Bot., ed. 3: 386. 1829. *Xanthosoma hastatum* Eggers, Fl. St. Croix 99. 1879. *Xanthosoma hastifolium sensu* Duss, Fl. Phan. Antill. Franç. 481. 1897. *Philodendron fontanesii* Kunth, Enum. Pl. 3: 48. 1841. *Acontias hastifolius* Schott, Melet. Bot. 19. 1832.

*Local name:*Dudh Kachu

Stem small. Petiole 15 – 25 cm, sheathing for almost half of length; lamina large, ovate-hastate, undulate, obtuse-rounded, bright green, veins conspicuous; petiole to 40 cm.

Flowers & Fruits: September to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0697*, dated 14. 02. 2008.

Local Distribution: All over the forest areas.

General Distribution: Native of tropical America; widely cultivated; often naturalized.

Hydrocharitaceae Juss., Gen. Pl. 67. 1789; *nom. cons*.

Key to the genera:

1a. Flowers enclosed in a bifid spathe or within 2 opposite spathal bracts 2

1b. Flower solitary or few in leaf axil ..... ***Najas***

2a. Perianth 3 in single whorls ……..……..……..……. ***Vallisneria***

2b. Perianth 3+3 in two whorls …… ……..…… 3

3a. Leaves whorled sometime opposite ……..……..... 4

3b. Leaves scattered ……..…… 5

4a. Leaves whorls arranged in regular and repeating patterns along elongated stems …..... ***Hydrilla***

4b. Leaves whorls in two rows even if sometimes spirally wound, arranged somewhat irregularly along the stem **.....** …….....…. ***Nechamandra***

5a. Leaves sessile, linear …… …….. ……..……. ***Blyxa***

5b. Leaves petiolate, ovate-oblong …… ……. ……. ……..... ***Ottelia***

BLYXA Noronha *ex* Thouars, Gen. Nov. Madagasc. 4. 1806.

Blyxa octandra (Roxb.) Planch. *ex* Thwaites, Enum. 332. 1864; Cook, Aqua. Wetl. Pl. Ind. 218, 1996. *Vallisneria octandra* Roxb., Pl. Corom. 2: 34. t. 165. 1802. *Blyxa roxburghii* Rich., Mem. Inst. Paris 12(2): 23.1812 (*nom. illeg.*); Hook.*f*., Fl. Brit. Ind. 5: 660. 1888; Prain, Beng. Pl. 2: 996. 1903.

Local name: Pata Seola.

Tufted, annual, submerged, delicate, aquatic herbs. Leaves radical, linear, entire, acuminate, base broad, membranous. Spathe linear, cylindrical with white flowers; peduncle slender, terete. Fruits linear; seeds many, small oblong- elliptic.

Flowers & Fruits: November to February.

Specimen Cited: Murti Jaldhaka junction, *Goutam & AP Das 0052*, dated 05. 02. 2009.

Local Distribution: In most of the Beels

General Distribution: India: West Bengal, Andrapradesh, Maharastra, Madhyapradesh, Orrisa, Kerala; Bangladesh, Myanmar, New Guinea, Sri Lanka, Vietnam, Australia.

HYDRILLA Rich., Mém. Cl. Sci. Math. Inst. Natl. France 1811(2): 9, 61, 76. 1814.

Hydrilla verticillata (L. *f*.) Royle, Ill. Bot. Himal. t. 376. 1839; Hook. *f*., Fl. Brit. Ind. 5: 659. 1888; Noltie, Fl. Bhut. 3(1): 165. 1994; Prain, Beng. Pl. 2: 995. 1903; Cook, Aqua. Wetl. Pl. Ind. 218, 1996. *Serpicula verticillata* L. *f*., Suppl. 416. 1781; Roxb., Cor. Pl. 2: 33. t. 164. 1798; Fl. Ind. 3: 578. 1832. *Hydrilla polysperma* Blatt. in J. Proc. Asiat. Soc. Beng. (N.s.) 26: 356.1931. *Elodea verticillata* (L. *f*.) F. Muell., *Key Vict. Pl. 1: 423. 1888*. *Hydrilla angustifolia* Hassk., Pl. Jav. Rar. 117. 1848. *Hydrilla najadifolia* Zoll. *et* Moritzi, Syst. Verz. 91. 1846.

Local name: Kureli.

Submerged, leafy, dioecious herbs. Stem slender, branched. Leaves whorled, rarely opposite, oblong to linear, rarely lanceolate, serrate or sub-entire, acute. Flowers unisexual, perianth 3+3, male spathe solitary, axillary, globose; female spathe bifid, axillary, cylindric, 1-2 flowered. Fruits subulate, smooth to muricate; seeds oblong.

Flowers & Fruits: November to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0029*, dated 05. 02. 2009.

Local Distribution: Abundant in Beels.

General Distribution: India: throughout country; Japan, Malaysia, Philippines; S. & E. Europe, Africa, S. & E. Asia, Australia.

NECHAMANDRA Planch., Ann. Sci. Nat., Bot., sér. 3, 11: 78. 1849.

Nechamandra alternifolia (Roxb. *ex* Wight) Thwait., Enum. Pl. Zeyl. 332. 1864; Subramanyam *et* Balakrishnan, Bull. Bot. Surv. Ind. 3: 23. 1961; Cook, Aqua. Wetl. Pl. Ind. 219, 1996; Datta *et* Majumdar, Bull. Bot. Soc. Beng 20 (20): 23. 1966. *Vallisneria alternifolia* Roxb. *ex* Wight, Bot. Misc. 2: 344. 1831; Naskar, Aqu. Semiaqut. Pl. Low. Ganget. plain, 229. 1990.

Submerged, fresh water herb. Leaves 1 to 2, opposite below and crowded, scattered at the branches, linear or linear lanceolate, serrulate, acuminate to acute; sessile, amplexicaul, usually 3 – nerved. Male spathe sessile, axillary, ovoid, 2- fid. Female spathe sessile, narrow oblong. Flowers many, densely arranged.

Flowers & Fruits: December to June.

Specimen Cited: Medlajhora, *Goutam & AP Das 0010*, dated 05. 02. 2009.

Local Distribution: In all the beels, common.

General Distribution: India: Assam, West Bengal, Bihar, Karnataka, Maharastra; Nepal, Bangladesh, Myanmar, Sri Lanka, Vietnam.

OTTELIA Pers., Syn. Pl. 1: 400. 1805.

Ottelia alismoides (L.) Pers., Sys. Pl. 1: 400. 1805; Hook. *f*., Fl. Brit. Ind. 5: 662. 1888; Noltie, Fl. Bhut. 3(1): 166. 1994; Prain, Beng. Pl. 2: 997. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 220, 1996. *Strtiotes alismoides* L., Sp. Pl. 1: 535. 1753. *Ottelia lanceolata* (Gagnep.) Dandy, J. Bot. 72: 138. 1934. *Boottia lanceolata* Gagnep., Bull. Soc. Bot. France 54: 540. 1907.

Local Name: Pani Kolla

Submerged herbs. Leaves crowded, submerged; petioles long, variable in shape; lamina ovate-lanceolate, oblong or cordate, entire, acute. Spathe solitary, axillary, 1-flowered; flowers bisexual, sessile, yellowish white; ovary of 6 united carpels covered by spathe with 3 - 6 wavy-wings. Fruits oblong, ellipsoid, crowded with the sepals. Seeds numerous, oblong.

Flowers & Fruits: October to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0001*, dated 05. 02. 2009.

Local Distribution: Throughout Beel.

General Distribution: India, Nepal, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Cambodia, Philippines, Thailand, Sri Lanka, Vietnam, New Guinea, Africa, Australia; introduced in North America.

VALLISNERIA L., Sp. Pl. 2: 1015. 1753.

Vallisneria natans (Lour.) Hara, J. Jap. Bot. 49: 136. 1974; Cook, Aqua. Wetl. Pl. Ind. 221, 1996. *Physkium natants* Lour., Fl. Cochinch. 663. 1790. *Vallisneria asiatica* Miki, Bot. Mag. (Tokyo) 48: 329. 1934. *Vallisneria minor* Ito, Nippon Shokubutsumeii 1: 23. ver. 1874. *Vallisneria spiralis* L. var. *denseserrulata* Mikino, Bot. Mag. Tokyo 28: 27. 1914; Lowden, Aquat. Bot. 13: 288. 1982. *Vallisneria physcium* Juss. *ex* Spreng., Syst. 3: 900. 1826. *Vallisneria spiraloides* Roxb., Fl. Ind. 3: 75. 1832; Naskar, Aqu. Semiaqut. Pl. Low. Ganget. plain, 231. 1990.

Submerged, stoloniferous, tufted herbs. Leaves linear, serrulate or entire, acute or obtuse, translucent green; male spathe 5 to 10 mm lomg; female spathe on long coiled peduncle which at maturity uncoils and helps fertilization after getting floating pollens from water surface. Fruits linear. Seeds numerous, oblong.

Flowers & Fruits: January to May.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0005*, dated 05. 02. 2009.

Local Distribution: Throughout Beel.

General Distribution: India, Nepal, China, Japan, Malaysia, Sri Lanka, Korea, Vietnam and Australia.

NAJAS L., Sp. Pl. 2: 1015. 1753.

Key to the species:

1a. Male and female flowers alike without sheath; anthers 4 locular ……. *N. graminea*

1b. Male flowers only in a sheath; anthers 1 locular ……... *N. indica*

Najas graminea Delile, Descr. Egypt. Hist. Nat. 2: 282, t. 50, f. 3. 1813; Hook. *f*., Fl. Brit. Ind. 6: 569. 1893; Prain, Beng. Pl. 2: 1125. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 268, 1996. *Caulinia graminea* (Delile) Tzvelev, Novosti Sist. Vyssh. Rast. 13: 20. 1976.

Local name: Seola.

Stems up to 20 cm. Leaves narrowly linear to linear; sheath 1 – 3 mm, deeply auriculate; auricles lanceolate, serrulate with several teeth on each side, apex acute; lamina minutely and densely serrulate, acuminate. Monoecious; male flowers usually more toward upper axils with elliptic perianth; spathe absent; female flowers 1 – 2 mm; stigmas 2 – 4 lobed. Fruits oblong.

Flower & Fruits: October to July.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0013*, dated 05. 02. 2009.

Local Distribution: Throughout Beel.

General Distribution: India, Bhutan, Bangladesh, Nepal, Indonesia, Japan including Ryukyus, Korea, Malaysia, Myanmar, Phillipines, Sri Lanka, Thailand; throughout Old World, Africa, Australia, introduced into North America.

Najas indica (Willd.) Cham. in Linnaea 4: 501. 1829; Prain, Beng. Pl. 2: 1125. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 269, 1996. *Cauline indica* Willd., Mem. Ac. R. Sc. Berl. 89, f. 3. 1801. *Najas falciculata* R. Br., J. Bot. 2: 278, f. 4.1864. *Najas minor sensu* Hook. *f*., Fl. Brit. Ind. 6: 569. 1893. *Najas lacerata* Rendle, Trans. Linn. Soc. 2, Bot. 5: 416, t. 41, f. 132-138. 1899. *Najas tenuis* Braun *ex* Magnus, Beitr. Kenntn. Najas 7. 1870 non *Zostera tenuis* Reuter, 1854.

Local name: Seola.

Submerged much branched, herbs. Leaves slightly recurved. Staminate flower solitary, enclosed in a spathe, perianth linear, anthers 4-celled; pistilate flower with no spathe or perianth. Seeds ellipsoid.

Flower & Fruits: November to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0003*, dated 05. 02. 2009.

Local Distribution: Throughout, in water bodies.

General Distribution: India, China, Japan and Taiwan.

Potamogetonaceae Dumort., Anal. Fam. P1. 59. 1829 ('Potamogetoneae'); *nom. cons*.

POTAMOGETON L., Sp. Pl. 1: 126. 1753.

Key to the species:

1a. Lamina of submerged leaves clasping the stem at base, sessile; floating leaves absent ..... *P. crispus*

1b. Lamina of submerged leaves never clasping the stern, petiolate; floating leaves present …..... 2

2a. Lamina of submerged leaves lanceolate; petiole longer than lamina in floating leaves …… ……...…….. *P. nodosus*

2b. Lamina of submerged leaves linear; petiole shorter than lamina in floating leaves …… ……...….. *P. octandrus*

Potamogeton octandrus Poir. in Lam., Encycl. M. Bot., Suppl. 4: 534. 1816; Noltie, Fl. Bhut. 3(1): 170. 1994; Hajra *et al*., Fl. Sikkim 1: 196, 1996; Cook, Aqu. Wet. Pl. Ind. 333. 1996. *Potamogeton octandrus* var. *minduhikimo* (Makino) Hara, J. Jap. Bot. 20(6-7): 331. 1944. *Hydrogeton heterophyllus* Lour., Fl. Cochinch. 244. 1790. *Potamogeton huillensis* Welw. *ex* Schinz, Ber. Schweiz. Bot. Ges. 1: 61. 1891.

Plants annual. Stems few to densely branched, filiform, terete; nodal glands absent; dormant buds axillary, narrowly fusiform. Leaves dimorphic; stipules axillary, convolute, membranous, free from leaf base, decaying early, green to greenish Br. when dry. Submerged leaves sessile, alternate, linear to filiform, acuminate, 3 veined. Floating leaves petiolate, usually alternate; lamina opaque, elliptic to oblong ovate, entire, acute to obtuse, base rounded, leathery. Spikes densely flowered. Fruits obovoid.

Flowers & Fruits: August to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0008*, dated 05. 02. 2009.

Local Distribution: In most of the Beels; common.

General Distribution: India: West Bengal, Sikkim, Madhya Pradesh, Jammu and Kasmir, Meghalay; Indonesia, Japan including Ryukyus, Korea, Malaysia, Nepal, Russia; Africa, Asia, Australia.

Potamogeton crispus L., Sp. Pl. 1: 126. 1753; Hook. *f*., Fl. Brit. Ind. 6: 566. 1893; Noltie, Fl. Bhut. 3(1): 171. 1994; Prain, Beng. Pl. 2: 1123. 1903; Cook, Aqua. Wetl. Pl. Ind. 268, 1996; Majumdar, Bull. Bot. Soc. Beng. 19 (1): 15. 1965; Rao *et* Verma, Bull. Bot. Surv. Ind. 18 (1-4): 42. 1976. *Potamogeton tuberosus* Roxb., Fl. Ind. 1: 472. 1820. *Buccaferrea crispata* Bubani, Fl. Pyren. 4: 13. 1901. *Potamogeton crispus* var. *serrulatus* (Opiz) Roxb., Icon. Fl. Germ. Helv. 7: 18. 1845. *Potamogeton crispus* var. *najadoides* Graebn., Pflanzenr. IV, 11: 100. 1907. *Potamogeton lactucaceum* Montandon, Syn. Fl. Jura ed. 2: 305. 1868. *Potamogeton serrulatus* Opiz, Flora 5: 267. 1822.

Plants perennial, submerged in freshwater. Rhizome terete. Stems sparsely branched, terete to slightly flattened and angular, creeping at base. Leaves sessile; lamina broadly linear to narrowly oblong, undulate to crispate and serrate, obtuse, 3 – 7 veined. Spikes cylindrical. Fruits ovoid.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0023*, dated 05. 02. 2009.

Local distribution: Gorati Beel.

General Distribution: India: West Bengal, Sikkim, Madhya Pradesh, Uttar Pradesh, Karnataka, Goa, Maharashtra; Bhutan, Nepal, Japan, Kazakhstan, Korea, Pakistan, Russia, Tajikistan, Thailand, Uzbekistan; Cosmopolitan: Africa, Asia, Europe, Australia, introduced into New Zealand, North & South America.

Potamogeton nodosus Poir., Encycl. Meth. Bot. Suppl. 4: 535. 1810; Majumdar, Bull. Bot. Soc. Beng. 20(2): 78. 1966; Noltie, Fl. Bhutan 3(1): 170. 1994; Cook, Aqua. Wetl. Pl. Ind. 333, 1996; Hajra *et al*., Fl. Sikkim 1: 196, 1996; *Potamogeton indicus* Roxb., Fl. Ind. 1: 471. 1820 (*nom. Illeg.*); Hook.*f*., Fl. Brit. Ind. 6: 565. 1893; Prain, Beng. Pl. 2: 845. 1903. *Potamogeton mexicanus* Benn., J. Bot. 25: 289. 1887. *Potamogeton roxburghianus* Schult. *et* Schult. *f*., Mant. 3: 367. 1827. *Potamogeton peruviana* Presl, J. Bot. 28: 298. 1890.

Aquatic herbs, stem terete, branched, length depends upon the depth of the water. Upper leaves floating, petiolate; lamina oblong or elliptic-lanceolate, entire, acuminate, base acuminate, coriaceous, glossy, many nerved. Spike 3 – 4 cm long, dense flowered, green. Flowers bisexual. Druplets long beaked, oblique.

Flowers & Fruits: September to March.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0035*, dated 05. 02. 2009.

Local Distribution: Gorati Beel.

General Distribution: India, Sri Lanka, Malaya, Temperate and Tropical region.

Order: Asparagales Bromhead (1838)

Amaryllidaceae Chen, Acta Phytotax. Sin. 19(3): 323. 1981.

CRINUM L., Sp. Pl. 1: 291. 1753

Key to the species:

1a. Leaves linear-lanceolate, margins undulate ……. *C. asiaticum*

1b. Leaves spreading, ensiform, margins narrow membranous ……..…… *C. amoenum*

Crinum asiaticum L., Sp. Pl. 292. 1753; Prain, Beng. Pl. 2: 1061. 1903. *Amaryllis carnosa* Hook.*f*., Fl. Brit. India 6: 280. 1892. *Crinum bancanum* Kurz, Tijdschr. Ned.-Indië 27: 231. 1864.

Local name: Bara Kanur

Perennial bulbous herb. Leaves dark green, linear-lanceolate, acute-acuminate, margins undulate. Umbels, white, scape with 3 – 10 white flowers; bracts linear with 2 involucres, perianth white, anthers versatile. Capsules subglobose.

Flowers & Fruits: June to August.

Specimen Cited: Gorumara, *Goutam & AP Das 1170*, dated 08. 02. 2011..

Local Distribution: Gorumara.

General Distribution: India, Sri Lanka, Java, Malaysia, Western Polynesia.

Crinum amoenum Roxb. *ex* Ker Gaw., J. Sci. Arts (London) 3: 106. 1817; Hajra *et al*., Fl. Sikkim 1: 137. 1996. *Crinum himalense* Royle*,* Ill. Bot. Himal. Mts. 374. 1839*. Crinum verecundum* Carey *ex* Roem.*,* Fam. Nat. Syn. Monogr. 4: 75. 1847*. Crinum amoenum* Roxb., Fl. Ind. 2: 127. 1832; Hook.*f*., Fl. Brit. Ind. 6: 282. 1892; Noltie, Fl. Bhutan 3(1): 83. 1994.

Bulbs subglobose. Leaves spreading, ensiform, margins narrow membranous, acute. Umbels on long solid, purplish scape with 3 – 10 white; flowers fragrant; perianth white; anthers versatile. Capsules subglobose.

Flowers & Fruits: June to August.

Specimen Cited: Murti, *Goutam & AP Das 0170*, dated 08. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India: West Bengal, Sikkim, Assam; Sri Lanka, Bhutan, Bangladesh, China, Mayanmar.

Hypoxidaceae R.Br. in Flinders, Voy. Terra Austr. 2: 576. 1814 ('Hypoxideae'); *nom. cons*.

Key to the genera:

1a. Inflorescences from base of stem, 4 to 6 flowered raceme ……..... *Curculigo*

1b. Inflorescences from node of stem, flowers more than 5 in raceme ……. *Molineria*

CURCULIGO Gaertn., Fruct. i. 63. t. 16. 1788.

Curculigo orchioides Gaertn., Fruct. *Sem. Pl.* 1: 63, t. 13. 1788; Hook.*f*., Fl. Brit. India 6: 279. 1894; Prain, Beng. Pl. 2: 1059. 1903; Noltie, Fl. Bhut**.** 3(1): 69. 1994; Hajra *et al*., Fl. Sikkim 1: 139. 1996. *Curculogo brevifolia* Dryand. in Aitton, Hort. Kew. 2(2): 253. 1811. *Curculigo malabarica* Wight, Ic. t. 2043. A, f. 1. 1853. *Curculigo orchioides* var. *minor* Benth.*,* Fl. Hongk. 366. 1861.

Rhizomes erect, subcylindric. Leaves in rosette, sessile to shortly petiolate; lamina lanceolate to linear, usually 10 – 55 × 1 – 2.5 cm, narrowly acuminate. Racemes umbellate, 4 to 6 flowered. Pedicel 2 mm. Perianth yellow; segments oblong-lanceolate, 8 – 10 × 2 – 3 mm. Stamens half as long as perianth segments. Ovary narrowly oblong. Stigma lobes longer than style. Berry subfusiform.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0140*, dated 07. 02. 2009.

Local Distribution: Throughout the forest in open and semiopen habitat

General Distribution: Pakistan, India, Myanmar, Thailand,Cambodia, Indonesia, Japan, Laos, Papua New Guinea, Philippines, Vietnam.

MOLINERIA Colla, Hort. Ripul. App. ii. 333. t. 18. 1826.

Molineria capitulata (Lour.) Herb., Amaryllidaceae 84. 1837; Fl. Jow. 2: 533. 1987; Noltie, Fl. Bhut. 3(1): 67. 1994. *Leucojum capitulatum* Lour., Fl. Cochinch. 199. 1790. *Curculigo capitulata* (Lour.) Kuntze, Rev. Gen. Pl. 2: 703. 1891; Hajra *et al*., Fl. Sikkim 1: 1139. 1996; *Leucojum capitulatum* Lour., Fl. Cochin. 199. 1790. *Curculigo recurvata* Dryand. in Aiton, Hort. Kew 2(2): 253. 1811; Hook. *f.*, Fl. Brit. India 6: 278. 1894; Prain, Beng. Pl. 2: 1059. 1903. *Molineria recurvata* (Dryand.) Herb., Amaryllidaceae 84. 1837.

Herbs up to 1 m. Rhizomes tuberous. Leaves 4 to 7 in rosette; petiole 30 – 70 cm; lamina oblong-lanceolate, 40 – 70 × 5 – 15 cm, acuminate. Flowering stems Br. villous. Racemes nodding, capitate to subovoid, densely many flowered. Perianth yellow; segments ovate-oblong. Stamens 5 mm. Ovary subglobose to oblong. Style longer than stamens. Berry white. Seeds black.

Flower & Fruit: April to May

Specimen Cited: Murti, *Goutam & AP Das 0196*, dated 09. 02. 2009.

Local Distribution: Murti and Dhupjhora forests.

General Distribution: Subtropical and temperate Himalayas, India, Sri Lanka, Bhutan, Myanmar, Malaysia,Indochina, China, Australia.

Order: Dioscoreales Hook. *f*. (1873)

Burmanniaceae Bl., Enum. Pi. Jav. 1: 27. 1830. *nom. cons*.

BURMANNIA L., Sp. Pl. 1: 287. 1753.

Burmannia coelestis Don, Prodr. Fl. Nepal. 44. 1825; Prain, Beng. Pl. 2: 998. 1903; Noltie, Fl. Bhut. 3(1): 91. 1994; Hajra *et al*., Fl. Sikkim 1: 23. 1996. *Burmannia triflora* Roxb., Fl. Ind. 2: 117. 1832. *Burmannia javanica* Bl., Enum. Pl. Javae 1: 28. 1827. *Burmannia bifurca* Ham. *ex* Hook. *f*., Fl. Brit. India 5: 665. 1888.

Small erect herbs. Stems green. Leaves few in basal rosette; cauline leaves linear, 1 – 3 x 0.2 – 0.5 cm. Racemes terminal, 2– 4 flowered. Flowers pedicellate to subsessile, bluish purple with yellow tepals. Perianth tube 4–12 mm; outer tepals ovate triangular, margin double. Stamens sessile. Capsule obovoid.

Flowers & Fruits: July to October.

Specimen Cited: Medlajhora, *Goutam & AP Das 0428*, dated 22. 07. 2009.

Local Distribution: Marshy low land areas; rare.

General Distribution: India, Bangladesh, Nepal, Myanmar, Thailand, Malaysia, Cambodia, Indonesia, Laos, New Guinea, Vietnam, Australia.

Dioscoreaceae R. Br., Prodr. 1: 294. 1810 ('Dioscoreae'). *nom. cons*.

DIOSCOREA L., Sp. Pl. 2: 1032. 1753.

Key to the Species:

1a. Female spikes born solitary ……..……. *D. prazeri*

1b. Female spikes more than one in a axis …….…. 2

2a. Leaves palmately 3 – 7 foliolate ……..... .. *D. pentaphylla*

2b. Leaves simple …….....…… 3

3a. Stem twining to right …….....…….....…… *D. pubera*

3b. Stem twining to left …….....…….....…… 4

4a. Plant densely hairy ……..…….....…...…… *D. bulbifera*

4b. Plants glabrous ……..…….....…… *D. esculenta*

Dioscorea bulbifera L., Sp. Pl. 1: 1033. 1753; Prain, Beng. Pl. 2: 1066. 1903; Hara, Fl. East. Himal. 1: 419. 1966; Noltie, Fl. Bhut. 3(1): 9. 1994. *Dioscorea sativa* Thunb., Fl. Jap. 151. 1784; *non* L., 1753; Hook. *f.*, Fl. Brit. Ind. 6: 295. 1892. *Dioscorea latifolia* Benth., Niger Fl. 535. 1849. *Dioscorea pulchella* Roxb., Fl. Ind. 3: 801. 1832.

*Local name:*Mete alu.

Tuber solitary, ovoid; roots fibrous. Stem twining to left. Bulblets purplish Br. with orbicular spots. Leaves alternate, lamina broadly cordate, 9 – 17 × 4 – 14 cm, entire, caudate-acuminate. Male spikes usually clustered in leaf axils. In female flowers- staminodes 6. Capsule reflexed or drooping, oblong-globose. Seeds inserted near apex.

Flowers & Fruits: June to February.

Specimen Cited: Budhuram, *Goutam & AP Das 0330*, dated 21. 07. 2009.

Local Distribution: Cultivated in forest villages and all over the forests.

General Distribution: A native of Old World; India, Nepal, Sri Lanka.

Dioscorea esculenta (Lour.) Burkill, Gard. Bull. Straits Settlem. 1: 396. 1917; Noltie, Fl. Bhut. 3(1): 8. 1994; Hajra *et al*., Fl. Sikkim 1: 141. 1996. *Onchus esculentus* Lour., Fl. Coch. 194. 1790. *Dioscorea spinosa* Roxb. *ex* Wall., Numer. List n. 5103. 1830. *Dioscorea fasciculata* Roxb., Fl. Ind. 3: 801. 1832; Prain, Beng. Pl. 2: 1066. 1903.

*Local name:*Metey Aalu.

Twining to left with large unequal tubers; densely hairy; stems prickly. Lamina simple, reniform or orbicular, acuminate or cuspidate, base cordate, 5 – 7 veined. Male spikes erect, sessile or shortly pedicellate; bracteoles very broad. Female racemes short. Capsules obcordate; seeds broadly winged.

Flowers & Fruits: September to January.

Specimen Cited: Budhuram, *Goutam & AP Das 0341*, dated 21. 07. 2009.

Local Distribution: Cultivated in forest villages.

General Distribution: Cultivated in tropical Asia.

Dioscorea pentaphylla L., Sp. Pl. 1: 1032. 1753; Hook. *f.,* Fl. Brit. India 6: 289. 1892; Prain, Beng. Pl. 2: 1066. 1903; Hara, Fl. East. Himal. 1: 420. 1966; Noltie, Fl. Bhut. 3(1): 10. 1994. *Dioscorea jacquemontii* Hook. *f.,* Fl. Brit. India 6: 290. 1892. *Dioscorea digitata* Mill., Gard. Dict. 8: 6. 1768. *Dioscorea pentaphylla* var. *jacquemontii* (Hook. *f.*) Prain *et* Burkill, J. Proc. Asiat. Soc. Bengal 10(1): 23. 1914.

*Local name:*Pnachpata.

Tubers irregular, long-ovoid; blaze white when fresh, becoming Br.. Stem twining to left, prickly. Leaves alternate, palmately 3 – 7 foliolate; petiole 7 – 10 cm; leaflets ovate to lanceolate, 7 – 20 × 2 – 7 cm, pinnately veined, base attenuate, entire, acute. Male spikes in axillary panicles with long, lateral branches. Female spikes simple or branched, puberulent. In female flowers bracts, perianth, and ovary hairy. Capsule long ellipsoid.

Flowers & Fruits: September to February.

Specimen Cited: Murti, *Goutam & AP Das 0337*, dated 21. 07. 2009.

Local Distribution: All over the forests.

General Distribution: India, Bangladesh, Sri Lanka, Myanmar, tropical Africa.

Dioscorea prazeri Prain *et* Burkill in Jour. Asiat. Soc. Beng. 73 (2): 2. 1896 & in Annott, Roy. Bot. Gard. (Calcutta) 14: 29. 202. t.5. 1936; F Enum. Fl. Pl. Nepal 1: 68. 1978; Fl. Sikkim 1: 142. 1996; Trans. Bose Res. Inst. 51(4): 112. 1987; Fl. Bhutan 3 (1): 7. 1994. *Dioscorea sikkimensis* Prain *et* Burkill in Rec. Bot. Surv. Ind. 4: 77, 84, 134. 1910. *Dioscorea deltoidea* var. *sikkimensis* Prain, Beng. Pl. 2: 1066. 1903.

Local Name: Chupri alu

Tuber irregular, branched, brownish black out-side, pale white inside. Stem twining clockwise, terete, glabrous, bulbils absent. Leaves alternate, triangular-ovate, 10 – 18 × 5 – 12 cm, thick textured coriaceous and glossy above, cordate, acuminate. Male inflorescence unbranched axillary panicle pairs, flowers lax. Male flower minute, shortly pedicellate; perianth lobes 6, all similar, ovate, obliquely open, pale green; stamens 6. Female spike axillary, borne solitary; ovary oblong-ovate. Capsule oblong-obovate.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0330*, dated 21. 07. 2009.

Local Distribution: Dhupjhora and Gorumara.

General Distribution: Endemic to tropical & subtropical E Himalaya.

Note : Wild but highly exploited for its high diosgenin content.

Dioscorea pubera Bl., Enum. Pl. Javae 1: 21. 1827; Noltie, Fl. Bhut. 3(1): 14. 1994. *Dioscorea anguinea* Roxb., Fl. Ind. 3: 803. 1832; Hook. *f.*, Fl. Brit. Ind. 6: 293. 1892; Prain, Beng. Pl. 2: 1066. 1903. *Dioscorea cornifolia* Kunth, Enum. Pl. 5: 385. 1850.

Tubers 1 or 2, narrowly cylindric, rootlets few, flesh lemon yellow. Stem twining to right, lacking prickles, shortly pubescent; bulbils sometimes produced. Leaves alternate-subopposite; lamina ovate, cuspidate to shortly caudate, base shallowly cordate, margins cartilaginous, persintently pubescent beneath.

Flowers & Fruits: August to January.

Specimen Cited: Murti, *Goutam & AP Das 0324*, dated 21. 07. 2009.

Local Distribution: Throughout the forest areas.

General Distribution: Himalayas, India, Myanmar, Sumatra, Java.

Order: Liliales Perleb (1826)

Smilacaceae Vent., Tabl. Regne V6g. 2: 146. 1799 (‘Smilaceae’); *nom. cons*.

SMILAX L., Sp. Pl. 2: 1028. 1753.

Key to the Species:

1a. Lamina ovate, peduncles slightly zigzagged, berries globose …….. *S. perfoliata*

1b. Lamina ovate - elliptic, peduncles stout, berries oblong ……;…… *S. zeylanica*

Smilax perfoliata Lour., Fl. Cochinch. 2: 622. 1790; Noltie, Fl. Bhutan 3(1): 28. 1994; Hajra *et al*., Fl. Sikkim 1: 165. 1996. *Smilax prolifera* Roxb., Fl. Ind. 3: 795. 1832; Prain, Beng. Pl. 2: 1071. 1903.

Climbing shrubs. Stem branched, woody. Petiole 2 – 4 cm, broadly winged; wings 7 – 10 mm wide. Lamina usually ovate, 6 – 15 × 3 – 10 cm. umbels in panicles with slightly zigzagged rachis, 15 – 30 flowered. Male flowers: stamens 3 – 5 mm. Female flowers: tepals slightly smaller than male ones; staminodes 3. Berries globose.

Flowers & Fruits: Not recorded.

Specimen Cited: Murti, *Goutam & AP Das 0242*, dated 09. 02. 2009.

Local Distribution: Throughout the forests.

General Distribution: India, Myanmar, Thailand, Laos, Vietnam.

Smilax zeylanica L., Sp. Pl. 1: 1029. 1753; Hook. *f.* in Fl. Brit. India 6: 309. 1892; Hara *et al,* Enum. Fl. Pl. Nepal 1: 79. 1978; Hajra *et al*., Fl. Sikkim 1: 166. 1996. *Smilax collina* Kunth, Enum. Pl. 5: 261. 1850.

*Local name:*Kukur-dainy.

Shrubby climbers. Branchlets striate, glabrous, prickly. Tendrils simple, glabrous. Lamina ovate–elliptic, entire, acute, base cuneate. In female umbels peduncles stout; receptacle globose. Receptacles in male umbels globose with Br. bracteoles, flower buds oblong. Berries red when ripen.

Flowers & Fruits: March to December.

Specimen Cited: Murti, *Goutam & AP Das 0335*, dated 21. 07. 2009; Dhupjhora, *Goutam & AP Das 0285*, dated 10. 02. 2009.

Local Distribution: throughout the forests.

General Distribution: Tropical Himalayas, India: West Bengal, Assam, Bihar; Bhutan, Nepal, China, Bangladesh, Myanmar.

Commelinids; unassigned at ordinal level - Keine Ordnungseinteilung

Order 16: Arecales Bromhead (1840)

Arecaceae Schultz, Nat. Syst. Pflan- zenr. 317. 1832 (*nom. alt*. vs. Palmae); *nom. cons*.

Key to the genera:

1a. Leaves twice pinnate; leaflets wedge shaped …… ***Caryota***

1b. Leaves simply pinnate ……..…..… 2

2a. Leaf rachis spiny; slender climber ……..... *Calamus*

2b. Leaf rachis not spiny; not climbing but with slender to stout trunk …..... 3

3a. Inflorescence interfolier ……..……..…. 4

3b. Inflorescence intrafolier ……..……..…… ***Cocos***

4a. Stem narrow, 10 – 18 cm diameter throughout; infloriscence branched to

only 3 order ….. .... ***Areca***

4b. Stem swollen at base with 30 – 60 cm diametre, often irregularly swollen at the middle portion, upward gradually narrowed**; i**nfloriscence branched generally to 2 order …….....…. ***Roystonea***

ARECA L., Sp. Pl. 2: 1189. 1753.

Areca catechu L., Sp. Pl. 1189. 1753; Hajra *et al*., Fl. Sikkim 1: 180. 1996; Noltie, Fl. Bhut. 3(1): 430. 1994; Prain, Beng. Pl. 2: 1097. 1903. *Areca cathechu* Burm. *f*., Fl. Indica 241. 1768. *Areca hortensis* Lour., Fl. Cochinch. 568. 1790.

Local name: Supari

Trunk green when young, distant annualr scars, 10 – 18 cm in diametre throughout. Leaves pinnate; leaflets narrow. Calyx minute in male flowers; corolla lobes lanceolate, ribbed. Calyx lobed to base in females, oblong – ovate, imbricate; corolla lobes small. Fruits orange when ripe, large, mesocarp fibrous; nuts ellipsoid.

Flowers & Fruits: March to July.

Specimen Cited: Murti, *Goutam & AP Das 0089*, dated 06. 02. 2009.

Local Distribution: Planted in all forest villages.

General Distribution: Widely cultivated throughout tropical Asia; origin probably C. Malaysia.

CALAMUS L., Sp. Pl. 325. 1753.

Calamus tenuis Roxb., Fl. Ind. 3:780. 1832; Blatt., J. Bomb. Nat. Hist. Soc. 25(3): 392. 1918; Noltie, Fl. Bhut. 3(1): 421. 1994; Prain, Beng. Pl. 2: 1099. 1903. *Palmijuncus tenuis* (Roxb.) Kuntze, Revis. Gen. Pl. 2: 734. 1891. *Calamus amarus* Lour., Fl. Cochinch. 210. 1790. *Calamus royleanus* Griff., Calcutta J. Nat. Hist. 5: 40. 1845.

Local name: Bandari Bet.

Climbing shrubs, growing in clumps, stem large, slender. Leaves glabrous, pinnate, 40 – 70 cm long, leaflets 18 – 30 on each side, equidistant, alternate, linear lanceeolate, acuminate, gradually becoming smaller upward, setose above. Petiole short; petiole and the nerves of the leaflets armed with straight spines. Leaf sheath armed with flat spines. Inflorescence very long, flexuose. Flowers minute. Fruit subglobose, mucronate.

Flowers & Fruits: April to October.

Specimen Cited: Murti, *Goutam & AP Das 0055*, dated 07. 02. 2009.

Local Distribution: Rarely found in Murti and Dhupjhora.

General Distribution: India: West Bengal, Assam; Tropical Himalaya, Bangladesh, Bhutan, Mayanmar.

CARYOTA L., Sp. Pl. 1189. 1753.

Caryota urens L., Sp. Pl. 1181. 1753; Noltie, Fl. Bhut. 3(1): 428. 1994; Hajra *et al*., Fl. Sikkim 1: 182. 1996; Prain, Beng. Pl. 2: 1093. 1903.

Local name: Sago Paam.

Tree, up to 25 m tall, stem blackish Br., 40 65 cm diameter throughout, surface not covered, leaf scars ringed. Leaves 3 – 5 m long; leaflets broadly cuneiform to narrowly oblique cuneiform, regularly

toothed margins, tips irregularly cut with sharp angles. Cymba 1 – 2 m covering much branched numerous spikes. Fruits globose to oblate, red when ripe.

Flowers & Fruits: January to July.

Specimen Cited: Murti, *Goutam & AP Das 0088*, dated 06. 02. 2009.

Local Distribution: Murti and Gorumara.

General Distribution: India, peninsula of Indo-china, Myanmar, Sri Lanka.

COCOS L., Sp. Pl. 1188. 1753.

Cocos nucifera L., Sp. Pl. 1188. 1753; Noltie, Fl. Bhut. 3(1): 430. 1994; Prain, Beng. Pl. 2: 1095. 1903. *Cocos indica* Royle, Ill. Bot. Himal. Mts. 395. 1840. *Cocos nana* Griff., Not. Pl. Asiat. 3: 166. 1851. *Calappa nucifera* (L.) Kuntze, Revis. Gen. Pl. 2: 982. 1891.

*Local name:*Narkel.

Trees to 30 m tall, leaf scars ringed, enlarged towards the base. Leaves 3 – 4 m long; leaflets numerous, reduplicate, entire, linear lanceolate, 60 – 100 x 3 – 4 cm, acuminate. Inflorescence axially, branched multiple; cymba spindle shaped, thickly woody. Fruits ovoid to subglobose, slightly trigonous apical.

Flowers & Fruits: Round the year.

Specimen Cited: Murti, *Goutam & AP Das 0090*, dated 07. 02. 2009.

Local Distribution: In the villages.

General Distribution: Cultivated throughout Asia.

ROYSTONEA Cook in Sci. Ser. 2. 12: 479. 1900.

Roystonea regia (HBK) O.F. Cook in Sci. Ser. 2. 12: 479. 1900. *Oreodoxa regia* HBK, Nov. Gen. & Sp. Pl. 1: 244. 1815. *Oenocarpus regius* (HBK) Spreng., Syst. Veg. 2: 140. 1825. *Roystonea elata* (W. Bartram) F. Harper, Proc. Biol. Soc. Wash. 59: 29. 1946. *Roystonea regia* var. h*ondurensis* P.H. Allen, Ceiba 3: 17. 1952.

Trees to 20 m tall, swollen at base, often irregularly swollen at the middle portion, upward gradually narrowed. Leaves 4 – 5 m long; leaflets 150 to 250 on both side of rachis; leaflets 4-farious, linear lanceolate, acuminate; terminal leaflets shorter. Inflorescence interfolier, branched, 2 and 3 order. Female flowers only at base of rachillae.

Flowers & Fruits: December to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0092*, dated 07. 02. 2009.

Local Distribution: Often planted in Dhupjhora Beat Offices and villages.

General Distribution: Usually planted in tropical areas as avenue tree.

Order: Commelinales Dumort. (1829)

Commelinaceae R. Br., Prodr. 1: 268. 1810 ('Commelineae'); *nom. cons*.

Kye to the genera

1a. Inflorescence within leaf sheath, sessile ..... *Amischotolype*

1b. Inflorescence outside of leaf sheath, stalked 2

2a. Fruits indehiscent baccate ..... *Pollia*

2b. Fruits dehiscent capsular 3

3a. Inflorescence broomlike, with extremely numerous small flowers;

capsule 2-valved .... *Floscopa*

3b. Inflorescence not broomlike, with few flowers; capsule 3-valved 4

4a. Involucral bracts spathelike 5

4b. Involucral bracts absent or spreading or sheathlike ..... ***Murdannia***

5a. Petals connate with 2 ends free; bracts imbricately arranged in

2 rows ..... ***Cyanotis***

5b. Petals wholly free; bracts not imbricately arranged in 2 rows ..... ***Commelina***

AMISCHOTOLYPE Hassk., Flora 46: 391. 1863.

Amischotolype hookeri (Hassk.) Hara, Fl. East. Himal. 1: 399. 1966; Noltie, Fl. Bhut. 3(1): 223. 1994; Hajra *et al*., Fl. Sikkim 1: 167. 1996; *Forrestia hookeri* Hassk., Flora 47: 629. 1864; Prain, Beng. Pl. 2: 1086. 1903.

Perennial herbs. Stems erect, distally branched. Leaf sheaths overlapping in distal part of stem; lamina elliptic, 25 – 30 × 5 – 10 cm, adaxially sparsely hispid or glabrous, abaxially yellow hirsute along veins, entire, caudate-acuminate, base cuneate. Heads with up to 10 flowers, within leaf sheath, sessile. Sepals ovate-oblong, 5 × 4 mm, sub-glabrous. Petals pale purple to reddish. Capsule ovoid, trigonous, rugose.

Flowers & Fruits: June to July.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0148*, dated 08. 02. 2009.

Local Distribution: Marginal lowland areas; common

General Distribution: Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Vietnam.

COMMELINA L., Sp. Pl. 1: 40. 1753.

Key to the species:

1a. Lamina elliptic-ovate; capsule 5 seeded ……..……..… *C. benghalensis*

1b. Lamina ovate-lanceolate or linear-lanceolate; capsules 2 – 3 seeded ….. 2

2a. Leaves scabridly pubescent; ovary 2 celled …… ……..….*C. suffruticosa*

2b. Leaves glabrous with only a few hairs at mouth or hirsute throughout;

ovary 3 celled …..... 3

3a. Leaves acute; spathes 2 – 3 cm ……..… ……..…….…… 4

3a. Leaves acuminate; spathes 2 – 4 cm …… ……..….… *C. longifolia*

4a. Spathes conduplicate or free margins ……...…*C. diffusa*

4b. Spathes funnel shaped or fused margins ……..... *C. paludosa*

Commelina benghalensis L., Sp. Pl. 1: 41. 1753; Hook. *f*., Fl. Brit. Ind. 6: 370. 1892; Noltie, Fl. Bhut. 3(1): 238. 1994; Hajra *et al*., Fl. Sikkim 1: 168. 1996; Prain, Beng. Pl. 2: 1082. 1903; Cook, Aqua. Wetl. Pl. Ind. 86, 1996; Guha Bakshi, Fl. Mur. Dist. 326. 1984.

Local name: Kanchera.

Perennial herbs. Stems mostly creeping. Leaf sheaths sparsely hirsute-ciliate; lamina ovate, 3 – 6 × 1.5 – 3 cm, subglabrous. Involucral bracts borne opposite to leaves, often several, aggregated at branche-tips, proximal margins connate, acute. Proximal branch of cincinni with elongate peduncle and 1 – 3 exserted, flowers sterile, distal branch longer with fertile flowers. Sepals 2 mm, membranous. Petals blue, free, 5 mm. Chasmogamous flowers underground. Capsule ellipsoid, dehiscent.

Flowers & Fruits: January- September

Specimen Cited: Murti, *Goutam & AP Das 0156*, dated 08. 02. 2009.

Local Distribution: In open area all over forests and road side; very common

General Distribution: India, Bangladesh, Myanmar, Java, Hong Kong.

Commelina diffusa Burm. *f.*, Fl. Indica 18. t. 7. f. 2. 1768; Datta *et* Majumdar, Bull. Bot. Soc. Bengal 20(2): 39. 1966; Noltie, Fl. Bhutan 3(1): 237. 1994; Cook, Aqua. Wetl. Pl. Ind. 86, 1996; Hajra *et al*., Fl. Sikkim 1: 168. 1996; *Commelina nudiflora auct. non* L.**,** Sp. Pl. 1: 41. 1753; Hook. *f*., Fl. Brit. Ind. 6: 369. 1892; Prain, Beng. Pl. 2: 1082. 1903.

Local name: Kanchera.

Annual herbs. Stems creeping, branched. Leaves subsessile; lamina lanceolate, 3 – 10 × 1 – 3 cm. Spathes conduplicate. Involucral bracts borne opposite to leaves, folded, ovate-lanceolate, acuminate. Cincinni dichotomously branched from base; 1 – 4 long exserted male flowers; other branches with much shorter peduncle and 3 – 5 bisexual flowers. Sepals 3 – 4 mm, membranous. Petals blue, free, 2 longer ones 5 mm. Capsule oblong, trigonous.

Flowers & Fruits: January to September

Specimen Cited: Murti, *Goutam & AP Das 0182*, dated 09. 02. 2009.

Local Distribution: In open area all over forests and road side; very common

General Distribution: Pantropical.

Commelina longifolia Lam., 111. Gen. 1: 129. 1791; Cook, Aqua. Wetl. Pl. Ind. 85, 1996; Khan *et* Alam, Fl. Banglad. 4: 22. 1977. *Commelina salicifolia* Roxb., Fl. Ind. 1: 172. 1832; Hook. *f*., Fl. Brit. Ind. 6: 370. 1892; Prain, Beng. Pl. 2: 1082. 1903. *Commelina pedunculosa* Spreng. *et.* Link, Jahrb. Gewächsk. 1(3): 74. 1820.

Local name: Pani Kanchera.

Stem slender, diffuse or spreading with long internodes; rooting from the basal nodes. Lamina glabrous, linear or linear-lanceolate, acute; sheath ciliate. Spathe axillary, ovate to ovate-lanceolate usually acuminate. Flowers blue. Petals free. Capsule upto 6 mm long, broadly oblong, 3-celled; seeds 2 – 4 mm long, ovoid, smooth, appendiculate.

Flowers & Fruits: July to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0216*, dated 09. 02. 2009.

Local Distribution: Beel marginal forest.

General Distribution: India, Java and Hong Kong.

Commelina sufruticosa Bl., Enum. Pl. Jav. 1: 3. 1827-28; Hook. *f*, Fl. Brit. Ind. 6: 374. 1892; Noltie, Fl. Bhut. 3(1): 236. 1994; Hajra *et al*., Fl. Sikkim 1: 169. 1996; Prain, Beng. Plants 2: 1083. 1903.

Commelina rugulosa Clarke, J. Linn. Soc., Bot. 11: 446. 1871. *Commelina simsonii* Clarke, J. Linn. Soc., Bot. 11: 446. 1871. *Spathodithyros suffruticosus* (Bl.) Hassk., Commelin. Ind. 11. 1870.

Local name: Kanchera.

Perennial herbs. Stems erect or ascending, branched only distally, glabrous. Leaf sheaths sparsely hirsute ciliate; lamina lanceolate to ovate lanceolate, 8 – 10 × 3 – 5 cm, glabrous on both surfaces. Involucral bracts borne opposite to leaves, broadly cordate, obtuse. Cincinni 4 flowered; pedicels 3 mm, twisted in fruit. Petals white, free. Capsule sub globose, 2 valved. Seeds 1 per valve.

Flowers & Fruits: January to March.

Specimen Cited: Murti, *Goutam & AP Das 0201*, dated 09. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India, Bangladesh, Nepal and Malaysia.

Commelina paludosa Bl., Enum. Pl. Jav. 1: 2. 1827; Hook. *f*., Fl. Brit. India 6: 372. 1894; Hara *et al.,* En. Fl. Pl. Nepal 1: 82. 1978; Noltie, Fl. Bhut. 3(1): 235. 1994; Cook, Aqua. Wetl. Pl. Ind. 85, 1996; Hajra *et al.,* Fl. Sikkim 1: 169. 1996. *Commelina obliqua* Buch.–Ham. *ex* Don, Prodr. Fl. Nepal. 45. 1825 (*nom. Illeg.*); Hook. *f*., Fl. Brit. India 6: 372. 1894; Prain, Beng. Pl. 2: 1083. 1903. *Commelina donii* Dietrich, Sp. Pl. 2: 895. 1832. *Commelina paludosa* f. *pedunculata* Qaiser *et* Jafrin, Fl. W. Pakistan 84: 13. 1975.

Local name: Jota Kanchera.

Perennial herbs. Stems often semi-erect. Leaves sessile; sheath densely Br. hispid at mouth; lamina lanceolate to ovate-lanceolate, 9 – 18 × 3 – 6 cm. Spathes funnel shaped. Involucral bracts often 5 – 8, forming terminal heads, sessile, glabrous, proximal margins connate, acute. Cincinnus 1; peduncle 1 cm; flowers 1 to several; pedicels twisted. Sepals 3 – 6 mm, membranous. Petals blue, 5 – 8 mm. Capsules ovoid – globose, trigonous.

Flowers & Fruits: August to April.

Specimen Cited: Murti, *Goutam & AP Das 0282*, dated 10. 02. 2009.

Local Distribution: Throughout forests; abundant.

General Distribution: India, Nepal, Bhutan, Myanmar, China, Thailand, Malaysia, Laos, Vietnam, Cambodia, Indonesia.

CYANOTIS D. Don, Prodr. Fl. Nepal. 45. 1825, *nom. cons*.

Key to the species:

1a. Cincinni reduced, 3 - 6 in axillary fascicles ……..……. *C. axillaris*

1b. Cincinni solitary, rarely terminal and also with flowers in axillary heads … 2

2a. Capsule obovoid, roots not fibrous ……..… *C. vaga*

2b. Capsule columnar, roots fibrous ……..…….. *C. cristata*

Cyanotis axillaris (L.) Don *ex* Sweet, Hort. Brit. 430. 1826; Noltie, Fl. Bhut. 3(1): 222. 1994; Hajra *et al*., Fl. Sikkim 1: 167. 1996; Prain, Beng. Pl. 2: 1085. 1903**;** Cook, Aqua. Wetl. Pl. Ind. 87, 1996. *Commelina axillaris* L., Sp. Pl. 1: 42. 1753; *Cyanotis axillaris* (L.) Schult. *f.,* Syst. Veg. 7(2): 1154. 1830. *Tonningia axillaris* (L.) Kuntze, Revis. Gen. Pl. 2: 722. 1891. *Cyanotis disrumpens* Hassk., Commelin. Ind. 105. 1870.

Annual herbs; roots fibrous. Stems creeping, branched, 25 – 40 cm. Leaves all cauline; lamina linear, 20 – 60 × 5 – 7 mm, abaxially glabrous. Cincinni reduced, in axillary fascicles of 3 – 6 flowers. Sepals free, linear spatulate, abaxially hirsute. Petals blue, connate with 2 ends free; bracts imbricately arranged in 2 rows. Filaments blue, lanate. Capsules oblong, trigonous.

Flowers & Fruits: June to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0721*, dated 14. 02. 2008.

Local Distribution: Roadside forests; less common.

General Distribution: India, Sri Lanka, Myanmar, Malaysia, Indonesia, Cambodia, Laos, Philippines, Thailand, Vietnam, Oceania.

Cyanotis cristata (L.) Don, Prodr. Fl. Nepal. 46. 1825; Noltie, Fl. Bhut. 3(1): 222. 1994; Hajra *et al*., Fl. of Sikkim 1: 169. 1996; Prain, Beng. Pl. 2: 1085. 1903; Cook, Aqua. Wetl. Pl. Ind. 87, 1996. *Commelina cristata* L., Sp. Pl. 1: 42. 1753; *Tonningia cristata* (L.) Kuntze, Revis. Gen. Pl. 2: 722. 1891. *Tradescantia cristata* (L.) L., Syst. Nat. 12(2): 233. 1767. *Cyanotis imbricata* (Roxb.) Kunth, Enum. Pl. 4: 103. 1843. *Tradescantia imbricata* Roxb., Fl. Ind. 2: 120. 1824.

Annual herbs; roots fibrous. Stems creeping, often branched, 10 – 30 cm. Leaves all cauline; lamina oblong, lanceolate to narrowly elliptic, 2 – 8 × 1 – 2 cm. Cincinni often solitary, terminal or also axillary. Sepals connate at base, linear-lanceolate to oblanceolate, abaxially hirsute along mid-vein and margin. Petals blue or purple, connate with 2 ends free, 4 – 5 mm; bracts imbricately arranged in 2 rows. Filaments blue, lanate. Capsules columnar, trigonous, 2.5 mm. Seeds gray-Br., pitted.

Flowers & Fruits: July to October.

Specimen Cited: Khunia, *Goutam & AP Das 0654*, dated 13. 02. 2008.

Local Distribution: Throughout the forests.

General Distribution: India, Bhutan, Sri Lanka, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Cyanotis vaga (Lour.) Schult. *et* Schult.*f*., Syst. Veg. 7: 1153. 1830; Hara *et al,* Enum. Fl. Pl. Nepal 1: 82. 1978; Noltie, Fl. Bhut. 3(1): 220. 1994; Hajra *et al.*, Fl. Sikkim 1: 169. 1996. *Transescantic vaga* Lour., Fl. Cochinch. 193. 1790. *Cyanotis barbara* Don, Prodr. Fl. Nepal 46. 1825; Hook. *f*., Fl. Brit. India 6: 385. 1894. *Commelina hirsuta* Hochst. *ex* Rich., Tent. Fl. Abyss. 2: 344. 1850. *Tonningia vaga* (Lour.) Kuntze, Revis. Gen. Pl. 2: 722. 1891. *Tradescantia vaga* Lour., Fl. Cochinch. 193. 1790.

Perennial herbs, bulbiferous. Bulbs globose. Stem branched, branching usually from base. Leaves all cauline; lamina linear to lanceolate, 4–12 cm × 0.3–1.5 cm. Cincinni solitary, rarely terminal and also with flowers in axillary heads. Sepals connate at base, oblong-lanceolate, abaxially white hirsute. Petals blue-purple, connate; bracts imbricately arranged in 2 rows. Filaments blue lanate. Capsule obovoid, trigonous. Seeds gray-Br., striate and finely reticulate.

Flowers & Fruits: July to October.

Specimen Cited: Khunia, *Goutam & AP Das 0729*, dated 14. 02. 2008.

Local Distribution: Throughout the forests; common in herland areas.

General Distribution: India, Nepal, Bhutan, Myanmar, Laos, Thailand, Vietnam.

FLOSCOPA Lour., Fl. Cochinch. 1: 189, 192. 1790.

Floscopa scandens Lour., Fl. Cochinch. 1: 193. 1790; Noltie, Fl. Bhut. 3(1): 225. 1994; Hajra *et al*., Fl. Sikkim 1: 170. 1996; Prain, Beng. Pl. 2: 1086. 1903; Cook, Aqua. Wetl. Pl. Ind. 88, 1996.

Perennial herbs. Stems 50 – 70 cm, simple, prostrate proximally. Leaves usually sessile or with short, winged petiole; lamina elliptic to lanceolate, 5 – 10 × 1–3 cm. Inflorescence broomlike, with extremely numerous small flowers; peduncle nearly absent; pedicels very short. Sepals shallowly boat shaped. Petals blue - purple. Fertile stamens 6; filaments glabrous. Capsules ovoid, 2-valved, compressed. Seeds semi-ellipsoid.

Flowers & Fruits: July to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0671*, dated 13. 02. 2008.

Local Distribution: Margin of the Gorati Beel.

General Distribution: India, Bhutan, Laos, Myanmar, Thailand, Vietnam; Oceania.

MURDANNIA Royle, Ill. Bot. Himal. Mts. 1: 403. 1840, *nom. cons*.

Key to the species:

1a. Lamina linear; inflorescence scorpioid cymose …… ….…….... *M. nudiflora*

1b. Lamina ovate-lanceolate; inflorescence terminal panicle ……...……. *M. spiralis*

Murdannia nudiflora (L.) Brenan, Kew. Bull. 7: 189. 1952; Noltie, Fl. Bhut. 3(1): 229. 1994; Hajra *et al*., Fl. Sikkim 1: 171. 1996; Cook, Aqua. Wetl. Pl. Ind. 90, 1996. *Commelina nudiflora* L., Sp. Pl. 1: 41. 1753. *Aneilema nudiflorum* (L.) R. Br., Prodr. 271. 1810; Hook. *f*., Fl. Brit. Ind. 6: 378. 1892; Prain, Beng. Pl. 2: 1084. 1903. *Commelina minuta* Bl., Catalogus 34. 1823. *Aneilema minutum* (Blume) Kunth, Enum. Pl. 4: 661. 1843.

Annual herbs. Roots fibrous. Rhizomes absent. Stems diffuse, creeping proximally. Leaves nearly all cauline; lamina linear to lanceolate, 3 – 10 × 0.5 – 1 cm, obtuse or acuminate. Involucral bracts absent or spreading or sheathlike. Cincinni several, in terminal panicles, several densely arranged flowers; peduncle slender; pedicels slender, straight. Sepals ovate-elliptic. Petals purple, obovate-orbicular. Fertile stamens 2. Capsules ovoid globose, trigonous.

Flowers & Fruits: October to April.

Specimen Cited: Medlajhora, *Goutam & AP Das 0613*, dated 11. 02. 2008.

Local Distribution: Marshy low lands of forest.

General Distribution: Pantropical.

Murdannia spirata (L.) Brüeckn., Pfamilien. 2, 15a: 173. 1930 (ut "s*piratum*"); Noltie, Fl. Bhut. 3(1): 229. 1994**;** Cook, Aqua. Wetl. Pl. Ind. 91, 1996. *Commelina spirata* L., Mant. Alt. 176. 1771. *Aneilema spiratum* (L.) R.Br., Prodr. 271. 1810; Hook. *f*., Fl. Brit. Ind. 6: 377. 1892; Prain, Beng. Pl. 2: 1084. 1903.

Perennial herbs. Roots fibrous. Rhizomes horizontal. Stems slender. Lamina narrowly ovate to lanceolate, 2 – 3.5 × 1 cm, , margin undulate, obtuse to acute, base truncate, glabrous on both surfaces. Cincinni 1 – 4, forming terminal panicles; bracts very small; pedicels elongate. Sepals elliptic, persistent. Petals pale blue or nearly white, obovate-orbicular. Fertile stamens 3; staminodes 3. Capsules oblong, trigonous.

Flowers & Fruits: July to February.

Specimen Cited: Medlajhora, *Goutam & AP Das 0591*, dated 25. 07. 2009.

Local Distribution: Marshy low land of conserved areas.

General Distribution: India and Indo-Malaysia.

POLLIA Thunb., Nov. Gen. Pl. 1: 11. 1781 [24 Nov 1781].

Pollia hasskarlii R.S. Rao in Notes Roy. Bot. Gard. Edinburgh 25: 188. 1964; Noltie, Fl. Bhut. 3(1): 232. 1994; Hajra *et al*., Fl. Sikkim 1: 171. 1996.

Perennial herbs. Stems ascending. Leaves sessile; lamina elliptic to obovate-oblanceolate, 20 – 30 × 4 – 8 cm, glabrous on both surfaces. Inflorescence usually shorter than distal leaves; cincinni numerous; bracts membranous. Sepals subovate, shallowly boat shaped, abaxially puberulent glandular, caducous. Petals white or pale purple, obovate. Stamens 6, all fertile. Fruits indehiscent baccate, globose.

Flowers & Fruits: March to June.

Specimen Cited: Medlajhora, *Goutam & AP Das 0568*, dated 24. 07. 2009.

Local Distribution: Marshy low land.

General Distribution: India, Bhutan, Bangladesh, Mayanmar, China.

Pontederiaceae Kunth in HBK, Nov. Gen. et Sp. 1: 265. 1816; *nom. cons*.

Key to the genera

1a. Flowers sessile; perianth zygomorphic, segments basally united ..……..... *Eichhornia*

1b. Flowers pedicellate; perianth actinomorphic, segments free nearly to base ….. *Monochoria*

EICHHORNIA Kunth, Enum. Pl. iv. 129. 1843.

Eichhornia crassipes (Mart.) Solms in de Candolle, Monogr. Phan.4: 527. 1883; Subramanym, Aquat. Angiosp. 70. 1962; Noltie, Fl. Bhut. 3(1): 175. 1994; Cook, Aqua. Wetl. Pl. Ind. 329, 1996; Hajra *et al*., Fl. Sikkim 1: 166. 1996; Bora *et* Kumar, Fl. Div. Ass. 358. 2003. *Pontederia crassipes* Mart., Nov. Gen. Pl. 9. t. 4. 1823. *Heteranthera formosa* Miq., Linnaea 17: 60. 1843. *Piaropus crassipes* (Mart.) Raf., Fl. Tellur. 2: 81. 1837.

Local name: Kachuri pana

Floating herbs. Roots many, long fibrous. Stems very short; stolons simple, apically producing new plants. Leaves radical; petiole green, 5 – 30 cm, spongy, usually very much swollen; lamina orbicular to broadly ovate, 5 – 18 × 5 – 16 cm, leathery, shallowly cordate to rounded. Spike spirally 7 – 15 flowered. Perianth 6 parted. Stamens 6; filaments curved. Pistil heterostylic; stigma glandular hairy.

Flowers: September to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0179*, dated 09. 02. 2009.

Local Distribution: Throughout the water bodies of National Park.

General Distribution: India: all states of the country; Sri Lanka, Nepal, Bhuan, Bangladesh, Pakistan. Native to Brazil, now Pantropic.

MONOCHORIA Presl, Rel. Haenk. i. 127. 1827.

Key to the species:

1a. Lamina triangular with sagittate or hastate base ……..……. *M. hastata*

1b. Lamina broadly ovate to oblong, base obtuse ……. ……..... *M. vaginalis*

Monochoria hastata (L.) Solms in Candolle, Mon. Phan.4: 523. 1883; Prain, Beng. Pl. 2: 1079. 1903; Noltie, Fl. Bhut**.** 3(1): 175. 1994; Bora *et* Kumar, Fl. Div. Ass. 358. 2003. *Pontederia hastata* L., Sp. Pl. 1: 288. 1753. *Monochoria hastaefolia* Presl, Rel. Haenk.1: 128. 1827; Hook. *f.*, Fl. Brit. Ind. 6: 362. 1882. *Carigola hastata* (L.) Raf*., Fl. Tellur. 2: 10. 1837.*

Perennial herbs, aquatic. Radical leaves with sheath broadened at base; petiole 10 – 60 cm; lamina triangular to triangular-ovate, 5 – 20 × 3 – 15 cm, sagittate to hastate, acuminate. Racemes short, erect, subumbellate; peduncle shorter than associated leaf petiole. Perianth segments bluish with green median vein and reddish blotch, ovate. Stamens filaments filiform. Style hairy at apex. Capsule oblong. Seeds oblong.

Flowers & Fruits: August to March.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0212*, dated 09. 02. 2009.

Local Distribution: Marginal areas of Gorati Beel.

General Distribution: Throughout India; Sri Lanka, China, Malaysia and S.E. Asia.

Monochoria vaginalis (Burm. *f.*) C. Presl*,* Reliq. Haenk. 1: 128. 1827; Prain, Beng. Pl. 2: 1079. 1903; Noltie, Fl. Bhut. 3(1): 174. 1994; Hajra *et al*., Fl. Sikkim 1: 166. 1996. *Monochoria vaginalis* (Burm. *f.*) C. Presl *ex* Kunth, Enum. 4: 134. 1834; Hook. *f.*, Fl.Brit. Ind. 6: 363. 1892. *Pontederia vaginalis* Burm. *f.*, Fl. Ind. 80. 1768. *Monochoria vaginalis* var. *plantaginea* (Roxb.) Solms, in Candolle, Monog. Phan. 4: 524. 1883; Hook. *f.*, Fl. Brit. Ind. 6: 363. 1892. *Gomphima vaginalis* (Burm. *f.*) Raf., Fl. Tellur. 2: 10. 1837.

Aquatic herbs. Stems erect. Radical leaves with broad sheath; petiole 3 – 40 cm; lamina narrowly cordate, ovate to lanceolate, 2 – 20 × 1 – 8 cm, acute to acuminate. Flowering stems 12 – 35 cm. Inflorescences reflexed after anthesis; bract lanceolate. Flowers pedicellate. Perianth segments purplish. Filaments of smaller stamens filiform. Capsules ovoid. Seeds ellipsoid.

Flowers & Fruits: September to May.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0257*, dated 10. 02. 2009.

Local Distribution: Marginal areas of Gorati Beel.

General Distribution: India, Bangladesh, Sri Lanka, Malayan Islands, China, Japan, Tropical Africa.

Order: Poales Small (1903)

Sub-order: Graminoid

Poaceae Nash in Small, Fl. Southeast U.S. 48. 1903 (*nom. alt*. vs. Gramineae *nom. cons*.)

Key to the genera:

1a. Spikelets unisexual, male and female in same or different inflorescence …..... ***Coix***

1b. Spikelets hermaphrodite, sterile and fertile in mixed inflorescence ……...… 2

2a. Spikelets 2 flowered …… ……. ……..…… 3

2b. Spikelets 3 to many flowered ……...…. 16

3a. Spikelets paired …… ……. ……. ……..…..... 4

3b. Spikelets solitary …… …… ……...……7

4a. Spikelets in false compact spike…… ……..... ***Hemarthria***

4b. Spikelet not in above manner …… ……....……. 5

5a. Spikelets awned; glumes coriaceous ……..... ***Sclerostachya***

5b. Spikelets awnless; glumes herbaceous …… ……..…… 6

6a. Panicle cylindric; all spikelets pedicellate ……...……..….....… ***Imperata***

6b. Panicle wide; only one spikelet pedicellate …… …….....… ***Saccharum***

7a. Some spikelets replaced by solitary bristle ……..... ***Setaria***

7b. Spikelets not replaced by any bristle ……...…….. 8

8a. Spikelets in panicles …… …… …….…..… 10

8b. Spikelets in spike or raceme like inflorescence ……..…….....…….. 9

9a. Lateral inflorescence erect… ……..... ***Sacciolepis***

9b. Lateral inflorescence densely congested and spike like ……..…..... ***Panicum***

10a. Upper lemma cartilaginous …….....…. ***Digitaria***

10b. Upper lemma crustaceous or coriaceous ….……..... 11

11a. Spikelets abaxial …….....… ***Bracharia***

11b. Spikelets adaxial ……..…….....…… 12

12a. Spikelets surrounded by one or more bristles …….....……. ***Pennisetum***

12b. Spikelets not surrounded by bristles ……..... 13

13a. Glumes awned …….....…….....… 14

13b. Glumes awnless …….....….....… 15

14a. Lamina ovate- lancelate; spikelet solitary …….....…….....… ***Oplismenus***

14b. Lamina linear; spikelets crowded …….....….....….. ***Echinochloa***

15a. Lower glume absent or very small ..... ……...…….....…. ***Paspalum***

15b. Lower glume usually half length of spikelets ....…..….....…. ***Paspalidium***

16a. Spikelets with only one fertile floret and others sterile …….....…. 17

16b. Spikelets with 2 or more fertile florets …….....….. 23

17a. Raceme deciduous or spikelets falling entire …… ……...…… ***Perotis***

17b. Raceme persistent; spikelets breaking up at maturity ……...…….. 18

18a. Spikes arranged digitately ..…….....……... 19

18b. Spikes usually in panicle ……..…….....……. 20

19a. Spikelets without reduced florets, awnless ……..…… ***Cynodon***

19b. Spikelets with one or more reduced florets; awned ……..……. ***Chloris***

20a. Glumes well developed; stamens 1-3 ……...……..…… ***Sporobolus***

20b. Glumes minute or absent; stamens 6 ……..…...… 21

21a. Culms floating, lamina ovate-lanceolate …….....… ***Hygroryza***

21b. Culms not floating, lamina linear ……..…….... 22

22a. Spikelets consist of a single fertile florets …….....…… ***Leersia***

22b. Spikelets with 2 glume like sterile lemmas bellow fertile florets ……..... ***Oryza***

23a. Lower glumes absent; upper one long ……..…….... ***Axonopus***

23b. Both glumes present ……..…..…… 24

24a. Spikelets arranged in open, contractile or spike like panicle ……..…... ***Eragrostis***

24b. Spikelets arranged in solitary digitate spike ……..…..… 25

25a. Inflorescence solitary terminal spike ..... ***Desmostachya***

25b. Inflorescence not in solitary terminal spike …….. …… 26

26a. Spikes racemosely arranged …… …….……....… ***Leptochloa***

26b. spikes digitatly arranged …… …… ……...……... 27

27a. Rachis ending in a sharp point …...…….....…. ***Dactyloctenium***

27b. Rachis ending in a spikelet …… …….....……... ***Eleusine***

AXONOPUS P. Beauv., Ess. Agrostogr. 12. 1812.

Axonopus compressus (Sw.) P. Beauv., Ess. Agrost. 12: 154, 167. 1812; Noltie, Fl. Bhut. 3(2): 717. 2000. *Milium compressus* Sw., Prodr. Veg. Ind. Occ. 24. 1788.

Perennial ascending tufted grass, culms slender, compressed. Lamina oblong to linear–lanceolate; sheath keeled; ligules thin, fimbriate. Inflorescence racemose. Upper glumes elliptic – lanceolate, laterally hairy**.** Lemma ovate, acute.

Flowers & Fruits: August to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0605*, dated 26. 07. 2009.

Local Distribution: Open forests and road side areas.

General Distribution: India: Arunachal Pradesh, Assam, North India, West Bengal, Andaman & Nocobar Islands; America, Brazil, Mexico, Myanmar.

BRACHIARIA (Trin.) Griseb., Ledebour, Fl. Ross. 4: 469. 1853.

Key to the species:

1a. Lamina linear-lancelate, hispid at margin ……...…. *B. distachya*

1b. Lamina ovate-lanceolate, amplexicaul, hairy …….……..... *B. reptans*

Brachiaria distachya (L.) Stapf in Prain, Fl. Trop. Afr. 9: 565. 919. *Panicum distachyum* L., Mant. 1: 138. 1767; Hook. *f.*, Fl. Brit. Ind. 7: 37. 1896; Prain, Beng. Pl. 2: 1178. 1903.

Annual decumbent creeping grass. Lamina linear-lanceolate, hispid at margin; ligule with ring of hairs. Spikelets in panicle, elliptic–obovate. Caryopsis oblong.

Flowers & Fruits: September to December.

Specimen Cited: Khunia, *Goutam & AP Das 0659*, dated 13. 02. 2008.

Local Distribution: Low grasslands.

General Distribution: Plains of India, Myanmar, Malaysia, China and Australia.

Brachiaria reptans (L.) Gardner *et* Hubb. in Hook., Pl. sub. t. 3: 363. 1938; Hajra *et al*., Fl. Sikkim 1: 246. 1996. Guha Bakshi, Fl. Mur. Dist. 378. 1984. *Panicum reptans* L., Syst. Nat. 10: 870. 1759.

Panicum prostratum Lam. in Tab. Morais, Encycl. Meth. Bot. 1: 171. 1791; Hook. *f*., Fl. Brit. Ind. 7: 33. 1896; Prain, Beng. Pl. 2: 1177. 1903. *Urochloa reptans* Stapf; *sensu* Haines, Bot. Bihar & Orissa V: 1003. 1924.

Clums long, creeping below, nodes glabrous; much branched, innovation shoots intravaginal. Lamina amplexicauled, hairy, ovate–lanceolate, sheaths ciliate not up to the next node. Racemes spreading, usually crowded, rachis hairy, trigonous pedicels with cilia longer than spikelets. Spikelets crowded, sub-sessile, ellipsoid glabrous.

Flowers & Fruits: March to December.

Specimen Cited: Murti, *Goutam & AP Das 0362*, dated 21. 07. 2009.

Local Distribution: Roadside areas.

General Distribution: Pantropical.

BAMBUSA Schreber, Gen. Pl. 236. 1789, *nom. cons*.

Key to the Species:

1a. Culms sheaths without auricles ..... ……..……...…. *B. balcooa*

1b. Culms sheaths with auricles …….……. 2

2a. Nodes with rings of gray-white silky hairs below and above sheath scar …… *B. tulda*

2b. Nodes without hairs and sheath scar but a deep yellow ring is present …..... *B. vulgaris*

Bambusa balcooa Roxb., Hort. Beng. 25. 1814; Fl. Ind. 2: 196. 1832; Hook. *f.,* Fl. Brit. Ind. 7: 39. 1896; Noltie, Fl. Bhut. 3(2): 488. 2000; Prain, Beng. Pl. 2: 1233. 1903.

*Local name:*Boro Bansh

Culms up to 25 m long, to 16 cm in diameter, green when young, pale grayish-green on maturity; wall thick at base, sheaths without auricles; nodes swollen with whitish ring above, hairy below; lower internodes 10 – 12 cm and upper internodes upto 45 cm long. Lamina oblong – lanceolate, rounded or sub-cordate at the base, glabrous above; leaf-sheaths with dense, Br. hairs. Mature spikelets flattened.

Flowers & Fruits: June to December.

Specimen Cited: Village sector, *Goutam & AP Das 0702*, dated 14. 02. 2008.

Local Distribution: Planted in Murti and Dhupjhora forests and forest villages.

General Distribution: Bangladesh, India, Indonesia.

Bambusa tulda Roxb., Fl. Ind., 2: 193. 1832; Noltie, Fl. Bhut. 3(2): 491. 2000; Prain, Beng. Pl. 2: 1232. 1903; Hajra *et al*., Fl. Sikkim 1: 237. 1996.

*Local name:*Talda Bansh

Culms up to 14 m, internodes 30 – 35 cm, wall very thick, sheaths with auricles; nodes with rings of gray-white silky hairs below and above sheath scar, apex subtruncate; auricles unequal, shortly fimbriate; blade erect, slightly asymmetrical, broadly triangular, apex acutely acuminate. Lamina broadly linear or linear – lanceolate, densely villous, glabrous.

Flowers & Fruits: June to December.

Specimen Cited: Murti, *Goutam & AP Das 0715*, dated 14. 02. 2008.

Local Distribution: Planted in Villages.

General Distribution: Bangladesh, Nepal, Bhutan, India, Thailand, Vietnam.

Bambusa vulgaris Schrad. *ex* Wendl., Coll. Pl. 2: 26. 1810; Prain, Beng. Pl. 2: 1233. 1903.

Local name: Holud Bansh.

Culms up to 15 m, straight, sheaths with auricles; internodes deep yellow; nodes prominent; usually branching from lower nodes. Branches many, clustered. Culm sheaths deciduous. Lamina lanceolate, 10 – 25 x 1 – 3 cm. Pseudospikelets several, clustered at nodes, narrowly lanceolate to linear lanceolate, slightly flattened, apparently bifid.

Flowers & Fruits: Not recorded.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0678*, dated 14. 02. 2008.

Local Distribution: Planted in Tourist Lodge garden.

General Distribution: Pantropical.

Note: Cultivated in Forest boundary areas.

CHLORIS Sw., Prodr. 25. 1788.

Chloris inflata Link, Enum. Pl. 1: 105. 1821. *Andropogon barbatum sensu* L., Mantissa 2: 302. 1771. *Chloris barbata sensu* Sw., Prodr. 1: 200. 1797; Hook. *f.*, Fl. Brit. Ind. 7: 292. 1897; Prain, Beng. Pl. 2: 1228. 1903; Guha Bakshi, Fl. Mur. Dist. 379. 1984.

Perennial tufted grass; culms erect, stout with creeping branched base; nodes with large tuft of leaves. Lamina flat, sometimes folded, sheath mouth ciliate, ligules a narrow membranous ring. Inflorescence a whorl of 4 – 22 spikes, sub-erect, rachis scabrid.

Flowers & Fruits: June to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0628*, dated 12. 02. 2008.

Local Distribution: Marginal to highland.

General Distribution: Pantropical.

COIX L., Sp. Pl. 2: 972. 1753.

Coix lachryma-jobi L., Sp. Pl. 2: 972. 1753; Hook. *f.*, Fl. Brit. Ind.7: 100. 1897; Noltie, Fl. Bhut. 3(2): 839. 2000; Prain, Beng. Pl. 2: 1210. 1903; Hajra *et al*., Fl. Sikkim 1: 248. 1996; *Coix lachrymal* L., Syst. Nat. (ed. 10) 1261. 1759. *Coix arundinacea* Lam., Encycl. Meth. Bot. 3: 422. 1791.

Tall densely tufted or perennial, grass; culms much branched, rooting at lower nodes, robust, spongy, glabrous, polish leafy. Lamina flat, firm, acuminate, cordate at base; inflorescence sub erect, false spikes, peduncles long.

Flowers & Fruits: October to March.

Specimen Cited: Murti Jaldhaka junction, *Goutam & AP Das 0657*, dated 13. 02. 2008.

Local Distribution: Marginal to lowland areas.

General Distribution: India; Tropical Asia, Africa, America.

CYNODON Rich. in Pers., Syn. Pl. 1: 85. 1805, *nom. cons*.

Cynodon dectylon (L.) Pers., Syn. Pl. 1: 85. 1805; Hook. *f*., Fl. Brit. Ind. 7: 288. 1896; Noltie, Fl. Bhut. 3(2): 678. 2000; Prain, Beng. Pl. 2: 1227. 1903; Hajra *et al*., Fl. Sikkim 1: 285. 1996; Bor, Grass. Bur. Cey. Ind. & Pak. 269, t. 52. 1960; Guha Bakshi, Fl. Mur. Dist. 381. 1984. *Panicum dactylon* L.**,** Sp. Pl. 58. 1753.

*Local name:*Durbaghas

Perennial prostate or creeping; runners rooting at nodes. Lamina linear-lanceolate or ovate-lanceolate, sparsely hairy; sheath margin ciliate; ligule membranous. Panicle of radiating branches, peduncle erect; spikelets pedicelled, 2-flowered; lower florets sterile; upper bisexual, glumes 3 – 5 nerved.

Flowers & Fruits: Most part of the year.

Specimen Cited: Khunia, *Goutam & AP Das 0689*, dated 14. 02. 2008.

Local Distribution: Forests and road side open areas.

General Distribution: India and S.E. Asia.

DESMOSTACHYA (Stapf) Stapf in Dyer, Fl. Cap. 7: 316. 1898.

Desmostachya bipinnata (L.) Stapf, Fl. Cap. 7: 632. 1900; Majumdar, Bull. Bot. Soc. Beng. 10 (1 & 2): 30. 1956; Guha Bakshi *et.* Sen, Bull. Bot. Soc. Beng. 23: 34. 1964. *Briza bipinnata* L., Syst. Nat. (ed. 10) 2: 875. 1759. *Uniola bipinnata* L., Sp. Pl. (ed. 2) 104. 1762. *Cynosurus durus* Forssk., Fl. Aegypt. Arab. 21. 1775. *Eragrostis cynosuroides* Beauv., Agrost. 71: 162. 1812; Hook. *f.*, Fl. Brit. Ind. 7: 324. 1896; Prain, Beng. Pl. 2: 1223. 1903.

Perennial, giant grass, branches from base. Root stock very stout; stolons with shiny sheath. Stem tufted, sub-erect. Leaves many, basal, rigid; lamina with filiform apex, margin hispid; sheath with long hairs, ligule ciliate, ridged. Panicles strict and erect; rachis puberulous. Spikelets sessile, jointed. Caryopsis obliquely obovoid to ovate-oblong.

Flowers & Fruits: April to January.

Specimen Cited: Khunia, *Goutam & AP Das 0707*, dated 14. 02. 2008.

Local Distribution: Forests and road side areas.

General Distribution: India, Persia, Arabia, North Africa to Tropical Africa.

DACTYLOCTENIUM Willd., Enum. Pl. 2: 1029. 1809.

Dactyloctenium aegyptium (L.) Willd., Enum. Pl. Horti. Berol. 1029. 1809, as "*aegypticum*"; Bor, Grass. Bur. Cey. Ind. & Pak. 489, t. 52.1960; Hajra *et al*., Fl. Sikkim 1: 285. 1996. *Cynosurus aegyptius* L., Sp. Pl. 1: 72. 1753. *Eleusine aegyptiaca* (L.) Desf., Fl. Atlant. 1: 85. 1798; Prain, Beng. Pl. 2: 1230. 1903. *Panicum dactylon* L., Sp. Pl. 1: 58. 1753; Hook. *f.*, Fl. Brit. Ind. 7: 295. 1896.

Annual herbs; rooting at nodes. Leaves distichous; lamina linear-lanceolate, flat, ciliate on margin; ligule membranous. Panicle of 2 – 6 digitate horizontal spikes; spikelets long, compressed, sessile, densely crowded; glumes unequal. Stamens 3. Caryopsis laterally flattened.

Flowers & Fruits: July to December.

Specimen Cited: Khunia, *Goutam & AP Das 0718*, dated 14. 02. 2008.

Local Distribution: Forests and road side areas.

General Distribution: India, Tropical parts of the world.

DIGITARIA Haller, Hist. Stirp. Helv. 2: 244. 1768, *nom. cons*., non Heister *ex* Fabricius (1759), *nom. rej*.

Key to the species:

1a. Racemes 2 – 9; decumbent …… ……..…….….. *D. bicornis*

1b. Racemes 2; erect …… ……....……. *D. ciliaris*

Digitaria bicornis (Lam.) Roem. *et* Schult., Syst. 2: 470. 1817; Guha Bakshi, Fl. Mur. Dist. 384. 1984. *Paspalum bicorne* Lam., Encycl. 1: 176. 1791. *Digitaria biformis* Willd., Enum. Pl. Hort. Berol. 1: 92. 1809. *Paspalum sanguinale* Lam. var. *commutatum* Hook. *f.*, Fl. Brit. Ind. 7: 15. 1896. *Digitaria sanguinalis* Scopoli var. *commutata* Hook.*f. sensu* Haines, Bot. Bihar & Orissa V: 1007. 1924; Prain, Beng. Pl. 2: 1181. 1903.

Erect, annual herbs. Lamina linear, scabrid, sparsely soft-hairy; sheath glabrous to pilose. Spikelets binate, glabrous to slightly hairy, sessile spikelet slightly pubescent; stamens 3. Caryopsis elliptic, 0.25 cm long.

Flowers & Fruits: July to November.

Specimen Cited: Murti, *Goutam & AP Das 0725*, dated 14. 02. 2008.

Local Distribution: All over the forests and road side areas.

General Distribution: India, Tropical and Sub-tropical Asia and Africa.

Digitaria ciliaris (Retz.) Koeler, Descr. Gram. 27. 1802; Noltie, Fl. Bhut. 3(2): 728. 2000; Hajra *et al*., Fl. Sikkim 1: 251. 1996; Guha Bakshi, Fl. Mur. Dist. 385. 1984. *Panicum ciliare* Retz., Obs. Bot 4: 16. 1786. *Paspalum sanguinale* Lam. Var *ciliaris* (Retz.) Hook. *f.*, Fl. Brit. Ind. 15. 1896. *Digitaria sanguinalis* Scopoli, fa. *commutata sensu* Haines, Bot. Bihar & Orissa V: 1007.1924; Prain, Beng. Pl. 2: 1181. 1903. *Digitaria adscendens* (H B K) Henrard, Blumea 1: 92. 1934.

Erect or decumbent, annual grass. Lamina linear-lanceolate, glabrous, ligule truncate. Racemes 2 – 9, sub-digitate; spikelets in pairs, oblong, acute, awnless. Stamens 3. Caryopsis 0.2 cm long.

Flowers & Fruits: May to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0674*, dated 13. 02. 2008.

Local Distribution: All over the marshy lands.

General Distribution: Pantropical.

ECHINOCHLOA Beauv., Ess. Agrostogr. 53. 1812, *nom. cons.*

Key to the species:

1a. Stem slender, decumbent; lowest racemes usually under 2 cm …… *E. colona*

1b. Stem stout, erect; lowest racemes usually over 3 cm …….. *E. crus-galli*

Echinochloa crus-galli (L.) Beauv., Ess. Agrost. 53: 161. 1812; Noltie, Fl. Bhut. 3(2): 703. 2000; Hajra *et al*., Fl. Sikkim 1: 254. 1996; Guha Bakshi, Fl. Mur. Dist. 387. 1984. *Panicum crusgalli* L.**,** Sp. Pl. 1: 56. 1753; Hook. *f.*, Fl. Brit. Ind. 7: 30. 1896; Prain, Beng. Pl. 2: 1177. 1903.

Annual, aquatic, floating or ascending, glabrous grass. Lamina linear, tapering to the acute point, subflaccid, margin finely cartilaginous. Inflorescence erect, much branched, pedicles binate or flascicled, very short; spikelets crowded, ovate elliptic, cuspidate or awned. Caryopsis broadly elliptic.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0730*, dated 14. 02. 2008.

Local Distribution: All over the marshy lands.

General Distribution: India, Myanmar, S. E. Asia, Sri Lanka, Africa.

Echinochloa colona (L.) Link, Enum. Hort. Berol. 2: 209. 1833; Noltie, Fl. Bhut. 3(2): 702. 2000; Hajra *et al*., Fl. Sikkim 1: 253. 1996; Bor, Grass. Bur. Cey. Ind. & Pak. 308. 1960; Guha Bakshi, Fl. Mur. Dist. 387. 1984. *Panicum colonum* L., Syst. 870. 1759; Hook. *f.*, Fl. Brit. Ind. 7: 295. 1896; Prain, Beng. Pl. 2: 1177. 1903.

Annual, marshland, prostrate, slender grass; branched at lower parts, glabrous and smooth. Lamina narrow, linear, glabrous; sheath loose, smooth, compressed. Panicles branches 6 to many; spikelets ovate or elliptic, nearly sessile, glabrous, crowded, 4-ranked. Caryopsis elliptic.

Flowers & Fruits: July to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0708*, dated 14. 02. 2008.

Local Distribution: All over the marshy lands.

General Distribution: India, Tropical Asia, Australia.

ELEUSINE Gaertn., Fruct. Sem. Pl. 1: 7. 1788.

Eleusine indica (L.) Gaertn., Fruct. 1: 8. 1788; Hook. *f.*, Fl. Brit. Ind. 7: 293. 1896; Noltie, Fl. Bhut. 3(2): 667. 2000; Hajra *et al*., Fl. Sikkim 1: 288. 1996; Bor, Grass. Bur. Cey. Ind. & Pak. 493.1960; Prain, Beng. Pl. 2: 1229. 1903. *Cynosurus indicus* L., Sp. Pl. 1: 72. 1753.

Annual herbs. Culms tufted, rooted at nodes. Lamina flat or folded, 8 – 14 x 0.2 – 0.5 cm, glabrous to adaxial surface tuberculate-pilose. Inflorescence of digitate, 2 – 5 linear ascending racemes; spikelets elliptic, florets 3 – 9; glumes lanceolate, scabrid along keel; lower glume 1 veined; upper glume with thickened keel; lemmas ovate, acute; palea keels winged. Grain blackish, oblong to ovate.

Flowers & Fruits: June to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0574*, dated 25. 07. 2009.

Local Distribution: All over the forests.

General Distribution: India, tropical and subtropical parts of world.

ERAGROSTIS Wolf, Gen. Pl. 23. 1776.

Key to the species:

1a. Rachilla jointed …… ……... *E. tenella*

1b. Rachilla tough and smooth ……..…… …… 2

2a. Spikelets flate, elliptic-oblong…… ……..…….....…. *E. unioloides*

2b. Spikelets not flat, linear-oblong …….....… *E. pilosa*

Eragrostis pilosa (L.) Beauv., Ess. Agrost. 71. 162. 175. 1812; Hook. *f.*, Fl. Brit. Ind. 7: 323. 1896; Noltie, Fl. Bhut. 3(2): 665. 2000; Prain, Beng. Pl. 2: 1223. 1903; Hajra *et al*., Fl. Sikkim 1: 291. 1996; *Poa pilosa* L., Sp. Pl. 1: 68. 1753.

Annual grass. Culms tufted. Lamina finely acuminate; sheath glabrous, ligule a ridge of hairs. Panicles long, pyramidal, spikelets linear, purplish; rachilla persistent; glumes unequal, ovate; stamens 3. Caryopsis ellipsoid.

Flowers & Fruits: June – August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0558*, dated 24. 07. 2009.

Local Distribution: All over the marshy lands.

General Distribution: Tropical and warmer regions of world.

Eragrostis tenella (L.) Beauv. *ex* Roem. *et* Schult., Syst. Veg. 2: 576. 1817; Noltie, Fl. Bhut. 3(2): 657. 2000; Prain, Beng. Pl. 2: 1221. 1903; Hajra *et al*., Fl. Sikkim 1: 291. 1996; Guha Bakshi, Fl. Mur. Dist. 392. 1984. *Poa tenalla* L., Sp. Pl. 1: 69. 1753. *Eragrostis tenella* var. *plumosa* (Retz.) Stapf, 315. 1896; Prain, Beng. Pl. 2: 1220. 1903.

Annual, erect, tufted grass. Lamina narrowly linear; sheath ciliate at the mouth; ligule ciliate. Panicles loose, plumose; spikelets oblong. Glumes ovate-oblong. Caryopsis ovoid.

Flowers & Fruits: August to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0514*, dated 23. 07. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, tropical parts of world.

Eragrostis unioloides (Retz.) Nees *ex* Steud., Syn. Pl. Glum. 1: 264. 1854; Hajra *et al*., Fl. Sikkim 1: 292. 1996. *Poa unioloides* Retz., Obs. Bot. 5: 19. 1789. *Eragrostis amabelis auct. non* Wight *et.* Arn. in Hook. *f.*, Fl. Brit. Ind. 317.1896; Prain, Beng. Pl. 2: 1220.1903.

Annual, erect, tufted grass. Lamina flat; sheath striate; ligules membranous. Spikelets ovate – oblong, obtuse, pinkish-white. Caryopsis pointed.

Flowers & Fruits: August to March.

Specimen Cited: Medlajhora, *Goutam & AP Das 0572*, dated 24. 07. 2009.

Local Distribution: Moist areas.

General Distribution: India, Myanmar, Sri Lanka, S.E. Asia.

HEMARTHRIA R.Br., Prodr. 207. 1810.

Key to the species:

1a. Decumbent, pubescent grass ……..……...….... *H. compressa*

1b. Erect, glabrous grass …… ……..…….……. *H. longifolia*

Hemarthria compressa (L.*f.*) R.Br., Prodr. 207. 1810; Majumdar, Bull. Bot. Soc. Beng. 10(1&2): 102. 1956. Hajra *et al*., Fl. Sikkim 1: 256. 1996. *Rottb.ia compressa* L.*f*., Suppl. 114. 1781; Hook. *f.*, Fl. Brit. Ind. 7: 153. 1896; Prain, Beng. Pl. 2: 898.1903. *Rottbia glabra* Roxb., Fl. Ind. 1: 253. 1820.

Annual, erect, tufted grass; usually branched; culms leafy throughout; lamina linear, acute; sheath loose and short; ligule small and round. Racemes, compressed, erect; spikelets linear, lanceolate.

Flowers & Fruits: March to January

Specimen Cited: Gorumara, *Goutam & AP Das 0584*, dated 25. 07. 2009.

Local Distribution: Forests and road side areas.

General Distribution: India and hotter part of world.

Hemarthria longiflora (Hook.*f.*) Camus in Lecomte, Fl. Gen. Indo-Chine, 7: 380. 1922. Chowdhury *et* Das in Indian J. Appl. Res. 3(5): 48 – 49. 2013. *Rottbia longiflora* Hook. *f*., Fl. Brit. Ind. 7: 154. 1896; Naskar, Aqu. Semiaqut. Pl. Low. Ganget. plain, 252. 1990.

Perennial. Stoloniferous, culms prostrate. Lamina conduplicate, acuminate; sheaths purple. Racemes subtended by an inflated leaf-sheath; spikelets in pairs with cuneate callus; base truncate; attached obliquely. Fertile lemma oblong; lemma apex obtuse. Palea absent or minute.

Flowers & Fruits: February to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0564*, dated 24. 07. 2009.

Local Distribution: All over the forests and road side areas.

General Distribution: Eastern India: West Bengal; Bangladesh, Myanmar, Thailand, Vietnam, China, Malaysia.

HYGRORYZA Nees, Edinb. New Philos. J. 15: 380. 1833.

Hygroryza aristata (Retz.) Nees *ex* Wight *et* Arn., Edinb. New Phil. Journal 15: 380. 1838; Hook. *f.,* Fl. Brit. Ind. 7: 95. 1896; Prain, Beng. Pl. 2: 1185. 1903.

Culms floating. Leaf sheaths open, strongly inflated, forming floats. Lamina 4 – 6 × 0.5 – 2 cm, obtuse, base rounded to cordate, adaxial surface papillate; ligule truncate. Inflorescence triangular; branches short, lowermost sub-verticillate; spikelets greenish; stipe 2 – 5 mm; lemma body 5 – 8 mm, spinulose on veins; palea keeled and spinulose along midvein, outer veins smooth, apex acute.

Flowers & Fruits: October to December.

Specimen Cited: Murti Jaldhaka junction, *Goutam & AP Das 0623*, dated 11. 02. 2008.

Local Distribution: Throughout the lowlands and beel areas.

General Distribution: India, Myanmar, S.E. Asia.

IMPERATA Cirillo, Pl. Rar. Neapol. 2: 26. 1792.

Imperata cylindrica (L.) Raeusch., Nom. Bot. ed. 3: 10. 1797; Bor, Grass. Bur. Cey. Ind. & Pak. 169. 1960; Hajra *et al*., Fl. Sikkim 1: 257. 1996. *Lagurus cylindricus* L., Syst. Nat. ed. 10, 2: 878. 1759. *Imperata arundinacea* Cirillo, Pl. Rar. Neap. 2: 26. 1792; Hook. *f.*, Fl. Brit. Ind. 7: 106. 1896; Prain, Beng. Pl. 2: 1188. 1903. *Imperata cylindrica* var. *major* (Nees) Hubb.*et* Vaughan, Grasses Maur. 96. 1940. *Cynosurus indicus* L., Sp. Pl. 1: 72. 1753.

Perennial, tufted, erect, long grass. Rootstock rigid, creeping with deep-seated succurs. Lamina linear-lanceolate, margin scabrid; ligule membranous. Inflorescens compact panicle; spikelets lanceolate, densely white-silky. Stamens 2. Stigmas 2. Caryopsis oblong.

Flowers & Fruits: February to May.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0656*, dated 13. 02. 2008.

Local Distribution: All over the marshy lands.

General Distribution: India, Asia, Australia, S. E. Africa.

ISACHNE R.Br., Prodr. 196. 1810.

Isachne globosa (Thunb.) Kuntze, Revis. Gen. Pl. 2: 778. 1891. *Milium globosum* Thunb., Fl. Jap. 49 1784. *Isachne miliacea* Roth, Syst. Veg. 2: 476. 1817; Prain, Beng. Pl. 2: 1172. 1903.

Perennial herbs. Culms slender, erect to decumbent. Leaf sheaths shorter than internodes; lamina narrowly lanceolate, 3 – 11 × 0.4 – 0.8 cm, acute, base rounded, glabrous. Panicle open; branches and pedicels filiform, flexuose; spikelets elliptic-globose; lower floret male, upper female; glumes subequal, broadly elliptic; lower lemma oblong, shallowly convex.

Flowers & Fruits: October to March.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0350*, dated 21. 07. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, Bangladesh, Sri Lanka, Bhutan, Nepal, Thailand, Malaysia, Indonesia, Japan, Korea, New Guinea, Philippines, Vietnam; Australia, Pacific Islands.

LEERSIA Solander *ex* Sw., Prodr. 21. 1788, *nom. cons*.

Leersia hexandra Sw., Prodr. 1: 21. 1788; Hook. *f.*, Fl. Brit. Ind. 7: 94. 1896; Prain, Beng. Plants 2: 1184. 1903; Bora *et.* Kumar, Flor. Div. Ass. 412. 2003. *Leersia australis* R.Br., Prodr. 210. 1810.

Annual, aquatic, erect grass. Branches slender, creeping, rooting at base. Lamina linear, acuminate, rigid, flat; sheath somewhat loose; ligules glaucous and truncate. Panicles, oblong, contracted, branches few; spikelets, oblong, closely imbricate, pale Br., sparsely hispidous, keels bristly ciliate. Caryopsis narrowly oblong.

Flowers & Fruits: October to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0327*, dated 21. 07. 2009.

Local Distribution: Margins of Gorati Beel.

General Distribution: India (Lower Himalaya); Tropical Africa, Australia, Myanmar.

LEPTOCHLOA P. Beauv., Ess. Agro. 71. 1812.

Leptochloa panicea (Retz.) Ohwi, Bot. Mag. Tokyo 55: 311. 1941; Bor, Grass. Burma, Ceyl., Ind. & Pak. 517.1960. *Poa panicea* Retz., Obs. 3: 11. 1783. *Leptochloa filiformis* Roem. *et* Schult., Syst. 2: 580.1870; Hook. *f.*, Fl. Brit. Ind. 7: 298. 1896; Prain, Beng. Pl. 2: 924. 1903. *Aira filiformis* Koen. *ex* Roxb., Fl. Ind. 1: 328. 1820.

Annual, slender, aquatic grass. Lamina flat, finely tapering; sheath papillose-pilose, lacerate. Panicle diffuse, much branched; spikelets 2 – 4-fid, almost sessile, unilateral, alternate.

Flowers & Fruits: May to October

Specimen Cited: Gorati Beel, *Goutam & AP Das 0368*, dated 21. 07. 2009.

Local Distribution: Margins of Gorati Beel.

General Distribution: India, Sri Lanka; Asia, Tropical Africa and America.

OPLISMENUS Beauv., Fl. Oware 2: 14. 1810 ["1807"], *nom. cons*.

Key to the Species:

1a. Inflorescence with 2 – 7 racemes, awns of glumes very slender … *O. burmannii*

1b. Inflorescence with 5 – 10 racemes, awns of glumes stout …… *O. compositus*

Oplismenus burmannii (Retz.) Beauv., Ess. Agrost. 54: 168 – 169. 1812; Hook. *f*., Fl. Brit.Ind.7: 68. 1896; Prain, Beng. Pl. 2: 1173. 1903; Hajra *et al*., Fl. Sikkim 1: 261. 1996; Gierson *et* Long, Fl. Bhut. 3(2): 684. 2000. *Panicum burmannii* Retzius, Obs. Bot. 3: 10. 1783.

Annual herbs, prostrate; rooting at nodes. Lamina ovate-elliptic to lanceolate, pubescent; sheath compressed, ciliate. Panicle of 4 – 7 racemes; spikelets elliptic-lanceolate. Caryopsis convex.

Flowers & Fruits: August to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0396*, dated 22. 07. 2009.

Local Distribution: Abundant in forests and road side areas.

General Distribution: India, Bangladesh, Sri Lanka, China, Japan.

Oplismenus compositus (L.) Beauv., Ess. Agrost. 54: 168. 1812; Noltie, Fl. Bhut. 3(2): 684. 2000; Prain, Beng. Pl. 2: 1173. 1903; Hajra *et al*., Fl. Sikkim 1: 261. 1996. *Panicum compositum* L., Sp. Pl. 1: 57. 1753.

Annual prostrate herb; rooting at nodes. Lamina lanceolate, acuminate, pubescent; sheath compressed, ciliate. Panicle 12 – 23 cm long with 5 – 10 racemes; spikelets 3 – 4 mm, elliptic – lanceolate. Caryopsis convex.

Flowers & Fruits: August to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0443*, dated 22. 07. 2009.

Local Distribution: Abundant on forest margins and road side open vegetation.

General Distribution: Pantropical.

ORYZA L., Sp. Pl. 1: 333. 1753.

ORYZALinnaeus, Sp. Pl. 1: 333. 1753

1a. Spikelets long awned, awn over 2 cm. ..... *O. rufipogon*

1b. Spikelets unawned, or awns under 1 cm 2

2a. Lamina 1.5-3.5 cm, ligules 3-5 mm …….....…… *O. latifolia*

2b. Lamina 0.5-2cm, ligules 10-40 mm…….....… *O. sativa*

Oryza rufipogon Griff., Notul. 3: 5. 1851; Hook. *f*.,Fl. Brit. Ind.7: 92. 1896; Cook, Aqua. Wetl. Pl. Ind. 304 – 305.m1996; Shukla, Grass. North East Ind. 301. 1996. *Oryza sativa* Linnaeus var. *fatua* Prain, Beng. Pl. 1184. 1903. *Oryza nivara* Sharma *et* Shastry, Ind. I. Genet. Pl. Breed. 25: 161. 1965; Cook, Aqua. Wetl. Pl. Ind. 304. 1996.

Annual grass; culms long, spongy bellow. Lamina linear, acuminate, margins scabrid; sheath loose; ligules splitting at tip. Spikelets long, long awaned. Caryopsis elliptic or oblong.

Flowers & Fruits: October to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0401*, dated 22. 07. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India: Assam, Meghalaya, Sikkim, West Bengal, Central India; Tropical Australia and Peru.

Oryza sativa L., Sp. Pl. 1: 333. 1753; Hook. *f*., Fl. Brit. Ind. 7: 92. 1896; Prain, Beng. Pl. 2: 1184. 1903; Cook, Aqua. Wetl. Pl. Ind. 304. 1996. Gierson *et* Long, Fl. Bhut. 3(2): 517. 2000. *Oryza communissima* Lour., Fl. Cochinch. 215. 1790. *Oryza glutinosa* Lour., Fl. Cochinch. 215. 1790. *Oryza perennis* Moench, Methodus 197. 1794.

Local name:Dhaan

Annual, aquatic, tufted. Culms erect, often rooting at lower submerged nodes. Leaf sheaths slightly inflated below, upper sheaths tight, glabrous, auricles falcate, ciliate; glabrous, smooth or scabrid on both sides, acuminate. Spikelets oblong to oblong-lanceolate, persistent; sterile lemmas lanceolate, acuminate; fertile lemma papillose, spinulose, acuminate; awn very variable, slender or stout. Caryopsis ovate or elliptic.

Flowers & Fruits: June – December Exiccatus: Mahananda Barrage, Anurag & AP Das 0302, dated 26.11.2011; Doumahoni Beel, Anurag & AP Das 0508, dated 12.06.2013. Status: Abundant. Local Distribution: Throughout the study area General Distribution: Note: Main cultivated crop of the area; often escapes.

Flowers & Fruits: October to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0971*, dated 08. 09. 2010.

Local Distribution: Medlajhora.

General Distribution: India, China, Tropical and Temperate America.

Oryza latifolia Desv., J. Bot. Agric. 1: 77. 1813; Prain, Beng. Plants 2: 1184. 1903. *Oryza sativa* var. *latifolia* Doell in Mart. Fl. Bras. 23:7. 1871.

Annual grass. Culms 1-2 m. high, succulent, sheaths elongate, longer than the internodes, ligule 3 – 5 mm. long, hispid;lamina mostly 32 – 40 cm. long, 1.5 – 3.5 cm. wide, scabrous and sparsely pubescent on both surfaces;spikelets 5 mm. long, short-pedicellate, oblong, sparsely hispid, the awns 1 – 2.5 cm. long.

Flowers & Fruits: June to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0901*, dated 22. 07. 2010.

Local Distribution: Gorati Beel.

General Distribution: India, West Indies to Brazil.

PANICUM L., Sp. Pl. 1: 55. 1753.

Panicum repens L., Sp. Pl. 2: 87. 1762; Hook. *f.,* Fl. Brit. Ind. 7: 49. 1896; Prain, Beng. Pl. 2: 1179. 1903. Hajra *et al*., Fl. Sikkim 1: 263. 1996.

Perennial, tufted, erect, marshland grass. Rooting at nodes. Lamina long, linear-lanceolate; sheaths ciliate at throat. Spikelets long, elliptic-lanceolate. Caryopsis oblong.

Flowers & Fruits: September to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0445*, dated 22. 07. 2009.

Local Distribution: Marginal marshy areas.

General Distribution: India, S. Europe, Asia, Africa, America.

PASPALUM L., Syst. Nat., ed. 10, 2: 855. 1759.

Paspalum conjugatum Berg., Acta Helv. Phys. – Math. 7: 129. 1772; Hook. *f.*, Fl. Brit. Ind. 7: 11. 1897; Prain, Beng. Pl. 2: 1182. 1903; Hajra *et al*., Fl. Sikkim 1: 264. 1996; Shukla, Grass. North East. Ind. 345. 1996.

Perennial with long stolons producing small tufts of culms, compressed. Leaf sheaths keeled, glabrous or pilose along upper margins and mouth, a line of hairs at junction with blade; lamina lanceolate-linear, acute, thin, glabrous or papillose along margins. Peduncled panicle of 2 racemes; spikelets single, in 2 rows, ovate to suborbicular; upper glume hyaline, long silky hairs along margins; lower lemma similar but not ciliate; upper lemma pallid at maturity, ovate, crustaceous.

Flowers & Fruits: May to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0403*, dated 22. 07. 2009.

Local Distribution: Lowland and moist areas.

General Distribution: India; throughout tropics and subtropics of the world.

PASPALIDIUM Stapf in Prain, Fl. Trop. Africa 9: 582. 1920.

Paspalidium punctatum (Burm.*f*.) Camus in Lecomte, Fl. Gen. Del. Indo–China 7: 419. 1922; Hajra *et al*., Fl. Sikkim 1: 264. 1996; Sukla, Grass. North East. Ind. 344. 1996; Bora *et* Kumar, Flor. Div. Ass. 421. 2003. *Panicum punctatum* Burm.*f*., Obs. Bot. 4: 15. 1786; Prain, Beng. Pl. 2: 1177. 1903.

Perennial grass. Culms long, floating, rooting at base, spongy. Lamina long, linear, acute, scabrid margined; sheaths glabrous; ligule hairy. Spikes longer than internodes; spikelets long, ovate-oblong, imbricate, sessile; glumes membranous. Caryopsis compressed.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0279*, dated 10. 02. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, tropical Asia, North Africa.

PENNISETUM Rich. *ex* Pers., Pers. Syn. 1: 72. 1805.

Key to the species:

1a. Ligules ciliated ……..……. 2

1b. Ligules not ciliated ……..……*P. polystachion*

2a. Upper lemma coarsely rugose, boat-shaped ……..… *P. glaucum*

2b. Upper lemma not coarsely rugose, lanceolate ……..……. *P. pauperum*

Pennisetum glaucum (L.) R. Br., Prodr. Fl. Nov. Holl. 195. 1810. *Panicum glaucum* L., Sp. Pl. 56. 1753. *Setaria glauca* (L.) Beauv., Ess. Agrost. 51: 178. 1812; Hook. *f*., Fl. Brit. Ind. 7: 78. 1896; Haines, Bot. Bihar & Orissa Pt. V: 988. 1924; Bor, Grass. Bur. Cey. Ind. & Pak. 360. 1960; Panda *et* Das, Fl. Sambalp. 439. 2004.

Annual grass. Culms erect, prostrate below. Leaves linear, rough on margins; sheaths keeled; ligules ciliate. Spike dense, cylindric; spikelets long, elliptic; upper lemma coarsely rugose, boat-shaped. Caryopsis rounded-elliptic.

Flowers & Fruits: February to August.

Specimen Cited: Medlajhora, *Goutam & AP Das 914* dated 05. 02. 2010.

Local Distribution: Medlajhora.

General Distribution: Tropical Africa to India.

Pennisetum pauperum Steud., Syn. Pl. Glumac. 1: 102. 1854. *Pennisetum purpureum* Schum., Beskr. Guin. Pl. 44. 1827; Hsu, Fl. Taiwan 5: 592. 1978; Gierson *et* Long, Fl. Bhut. 3(2): 741 – 742. 2000.

Local Name:Hati-ghaash

Perennials erect herbs. Ligules ciliated. Panicle cylindrical; spikelets 2-flowered, solitary, subsessile; glumes deltoid as long as spikelet; lower lemma lanceolate, minutely hispidous, 5-veined, palea absent; upper lemma lanceolate.

Flowers & Fruits: October to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0562*, dated 24. 07. 2009.

Local Distribution: Gorati Beel.

General Distribution: Tropical Africa to India.

Pennisetum polystachion (L.) Schult., Syst. Veg. Mant. 2: 146. 1824; Noltie, Fl. Bhut. 3(2): 741. 2000. *Panicum polystachion* L., Syst. Nat. 10, 2: 870. 1759.

Annual grass, culms ±1 m tall. Leaves linear, acuminate, glabrous or hairy. Sheath glabrous. Ligule line fringed with soft hairs. Panicle purplish Br.; rachis glabrous. Spikelet solitary, sessile; upper glumes oblong; lemma oblong, truncate, smooth; palea oblong, toothed or ciliate at tip.

Flowers & Fruits: October to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0548*, dated 24. 07. 2009.

Local Distribution: Margin of the Gorati Beel.

General Distribution: Tropical Africa to India.

PEROTIS Aiton, Hort. Kew. 1: 85. 1789.

Perotis indica (L.) Kuntze, Rev. Gen. Pl. 2: 787. 1891; Majumdar, Bull. Bot. 10(1 & 2): 44. 1956. *Anthoxanthum indicum* L., Sp. Pl. 1: 28. 1753. *Saccharum spicatum* L., Sp. Pl. 1: 54: 1753. *Perotis latifolia* Aiton, Hort. Kew 1: 85. 1789; Hook. *f.*, Fl. Brit. Ind. 7: 98. 1896; Prain, Beng. Pl. 2: 1186. 1903.

Aquatic, soft, wiry, spongy grass. Leaf-sheaths short, loose, striate; ligule short. Inflorescence terminal, rachis simple and scabrid; spikelets 1-flowered; pedicel small. Stamens 3. Caryopsis free in glume, terete.

Flowers & Fruits: July – August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0308*, dated 10. 02. 2009.

Local Distribution: Marginal areas of the Gorati Beel.

General Distribution: India, Sri Lanka, Mayanmer, tropical Africa.

SACCHARUM L., Sp. Pl. 1: 54. 1753

Key to the Speices:

1a. Lower glumes glabrous on the back; lemmas not cuspidate ……..…. *S. sponteneum*

1b. Lower glumes with long hairs; lemmas cuspidate …….....……. *S. arundinaceum*

Saccharum arundinaceum Retz., Obs. Bot. 4: 14. 1786; Hook. *f.*, Fl. Brit. Ind 7: 119. 1897; Prain, Beng. Pl. 2: 1189. 1903; Sedge. & gras. Dakh. Kan & Udu. Dist. 315. 2001. *Erianthus arundinaceus* (Retz.) Jews. In Arch. Suikerind. Ned.-Ind. 399. 1925.

A tufted large perennial grass. Culms upto 6 m high, erect from the root stock. Leaf sheath beaded about the mouth; ligule hairy. Panicle effuse, long, white villous. Spikelets lanceolate; hairs at callus silky. Lower lemma empty, oblanceolate; upper lemma bisexual; palea ovate.

Flowers & Fruits: January to March.

Specimen Cited: Khunia, *Goutam & AP Das 0322*, dated 21. 07. 2009.

Local Distribution: Khunia.

General Distribution: India (coastal area), E. Australia, S. Europe, Sri Lanka.

Saccharum spontaneum L., Mant. Alt. 183. 1771; Hook. *f.*, Fl. Brit. Ind 7: 118. 1896; Prain, Beng. Pl. 2: 1188. 1903; Hajra *et al*., Fl. Sikkim 1: 271. 1996; Bor, Grass. Bur. Cey. Ind. & Pak. 214. 1960. *Imperata spontanea* (L.) Beauv., Ess. Agro. 8. 1812.

Tall perennial herbs; rhizomes long. Culms hollow, softly pilose below inflorescence. Leaf- sheaths pilose at mouth and margin; lamina 60 – 150 × 0.2 – 1 cm, glaucous, long attenuate; ligule Br.. Panicle up to 40 cm; spikelets 3–4 mm; lower glume papery, acuminate; lower lemma ovate-lanceolate; upper lemma linear to linear-oblong. Lodicules ciliate.

Flowers & Fruits: September to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0322*, dated 21. 07. 2009.

Local Distribution: Marginal lowland areas of Gorati Beel.

General Distribution: Afghanistan, Pakistan, India, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Malaysia, Indonesia, Cambodia, New Guinea, Philippines, Turkmenistan, Vietnam; SW Asia, Australia, Pacific Islands, Africa.

SACCIOLEPIS Nash, Man. Fl. N. States 89. 1901.

Key to the species:

1a. Plants annual; panicles under 4 cm long; caryopsis elliptic ……..…. *S. indica*

1b. Plants perennial; panicles more than 6 cm long; caryopsis obovoid ……. *S. interrupta*

Sacciolepis indica (L.) Chase, Proc. Biol. Soc. Wash. 21: 8. 1908; Hajra *et al*., Fl. Sikkim 1: 271. 1996; Bor, Grass. Bur. Cey. Ind. & Pak. 357. 1960. *Panicum indicum* L., Mant. 2: 184. 1771 (*non P. indicum* Mill.); Hook. *f.*, Fl. Brit. Ind. 7: 156. 1896; Prain, Beng. Pl. 2: 1178. 1903.

Erect, annual grass. Culms long, spreading. Lamina linear, acuminate, glabrous; sheath slightly keeled; ligule membranous. Panicle spike like, terete, upto 4 cm long; spikelets shortly pedicelled, ovoid. Stamens 3. Caryopsis elliptic.

Flowers & Fruits: August to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0352*, dated 21. 07. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, tropical and sub-tropical regios of Asia and Australia.

Sacciolepis interrupta (Willd.) Stapf in Prain, Fl. Trop. Afr. 9: 757. 1920; Blatt. *et* Mac Cann, Bombay grass 167. 1935; Majumdar, Bull. Bot. soc. Beng. 10(1&2): 58. 1956; Hajra *et al*., Fl. Sikkim 1: 272. 1996. *Panicum interrupta* Willd., Sp. Pl. 1: 341. 1798; Hook. *f.*, Fl. Brit. Ind. 7: 40. 1896; Prain, Beng. Pl. 2: 1178. 1903.

Erect, branched, perennial, quite glabrous. Culms creeping, spongy, lower nodes rooting. Lamina soft, glabrous, base sub-cordate; ligule short. Panicles spike-like, terete; spikelets lanceolate, densely arranged, imperfect, ovoid, turgid spreading. Caryopsis obovoid.

Flowers & Fruits: August to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0437*, dated 22. 07. 2009.

Local Distribution: Marginal marshy areas of Gorati Beel.

General Distribution: India, Sri Lanka, Mayanmar and China.

SETARIA P. Beauv., Ess. Agrostogr. 51. 1812, *nom. cons*., non Acharius *ex* Michaux (1803).

Key to the Species:

1a. Leaves linear, margins rough; panicles spike-like; bristles in clusters

of 6 or more …… …… ……..…….. *S. glauca*

1b. Leaves linear-lanceolate, margins ciliate; panicles partially distant;

bristles borne singly … …… ....*S. palmifolia*

Setaria palmifolia (Koen.) Stapf, J. Lin. Soc. Bot. 42: 186. 1914; Hara *et al*., Fl. East. Himal. 1: 376. 1966; Noltie, Fl. Bhut. 3(2): 723. 2000; Hajra *et al*., Fl. Sikkim 1: 273. 1996. *Panicum palmaefolium* Koenig, Naturf. 22: 208. 1788.

Perennial, rhizomatous stem woody, knotted. Culms decumbent. Lamina linear-lanceolate, ciliate margins, acuminate, glabrous or sparsely hairy; sheath margin ciliate. Panicles partially distant, loose. Spikelets solitary, bristle single.

Flowers & Fruits: May to February.

Exscicatus: Gorati Beel, *Goutam & AP Das 0450*, dated 22. 07. 2009.

Local Distribution: Marginal lowland moist areas of Gorati Beel.

General Distribution: Tropics of the Old World.

Setaria glauca (L.) Beauv., Ess. Agro. 51: 178. 1812; Hook. *f*., Fl. Brit. Ind. 7: 78. 1896; Bor, Grass. Bur. Cey. Ind. & Pak. 360. 1960. *Panicum glaucum* L., Sp. Pl. 56. 1753; Prain, Beng. Pl. 2: 1170. 1903.

Small erect annual. Culms light. Lamina linear, rough on margins; sheaths keeled; ligules ciliate. Panicle spike like, dense, terete; spikelets long, elliptic; bristles in clusters of 6 or more; ciliate margins upper lemma coarsely rugose, boat-shaped. Caryopsis rounded-elliptic.

Flowers & Fruits: February to August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0489*, dated 23. 07. 2009.

Local Distribution: Marginal lowland areas of Gorati Beel.

General Distribution: India, throughout the warm and temperate countries.

SPOROBOLUS R.Br., Prodr. 169. 1810.

Sporobolus diander (Retz.) Beauv., Ess. Agro. 26: 147 – 178. 1812; Hook. *f.*, Fl. Brit. Ind. 7: 247. 1896; Hajra *et al*., Fl. Sikkim 1: 303. 1996; Prain, Beng. Pl. 2: 1213. 1903; Bora *et* Kumar, Flor. Div. Ass. 427. 2003. *Agrostis diandra* Retz., Obs. Bot. 5: 19. 1789.

Perennial grass. Culms tufted, slender, branched. Lamina narrowly lanceolate, 1 – 7 × 0.1 – 0.4 cm. Panicle linear, spikelike, 1.5 – 7 × 0.3 – 0.6 cm; branches short, erect, mostly unbranched; spikelets narrowly lanceolate-oblong; lower glume lanceolate, upper glume oblong; lemma oblong, acute; palea broader, obtuse. Anthers 3. Grains red-Br., elliptic, apex rounded.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0619*, dated 11. 02. 2008.

Local Distribution: Marginal lowland areas of Gorati Beel.

General Distribution: India: Assam, Manipur, Nagaland, Bihar, Orissa, West Bengal; Sri Lanka, Australia.

Sub order: cyperoid

Cyperaceae Juss., Gen. P1. 26. 1789 ('Cyperoideae'); *nom. cons*.

Key to the genera :

1a. Flowering glumes all distichous …… …… ……. 2

1b. Flowering glumes spirally arranged ……..…….... 4

2a. Rachilla deciduous..... ……. …… 3

2b. Rachilla persistent …… ……. ……. ***Kyllinga***

3a. Style base dilated, separate from achene by a constriction …….. …….. .. ***Fimbristylis***

3b. Style base neither dilated nor constricted ……. ..……..… ***Cyperus***

4a. Style base dilated and constricted …… …….……..... 5

4b. Style base neither dilated nor constricted …….. …….…… 6

5a. Hypogynous bristles present … **……** …….....…. ***Eleocharis***

5b. Hypogynous bristles absent …….. …… ……..... ***Bulbostylis***

6a. Glumes awned …… …..…… 7

6b. Glumes not awned …… ……..... ***Fuirena***

7a. Leaves reduced to sheath …….. …… ……..... ***Schoenoplectus***

7b. Leaves well developed ……. ……. ...……....…… 8

8a. Spikelets solitary in terminal …… ..... ……..…… ***Bolboschoenus***

8b. Spikelets in terminal cluster …… ……..….. ***Scirpus***

BOLBOSCHOENUS (Asch.) Palla in Hallier & Brand, Syn. Deut. Schweiz. Fl., ed. 3, 3: 2531. 1905.

Bolboschoenus maritimus Palla var. ***affinis*** (Roth) Parmar, Shetty *et* Singh, Fl. Rajsthan 3: 888. 1993. *Scirpus affinis* Roth, Roem. *et* Schult., Veg. 2: 140. 1817. *Bolboschoenus affinis* (Roth) Drobow, Trav. Mus. Bot. Acad. Sc. Imp. Petersburg 16: 139. 1916. *Scirpus maritimus* L. ssp. *affinis* (Roth) Norlindh Nils, Bot. Not. 125: 404. 1972; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 659. 1893; Pain, Beng. Pl. 2: 1161. 1903.

Aquatic, erect, annual sedge. Stem triangular, glabrous. Leaves linear-lanceolate; sheath Br.. Spikes terminal, compact, oval; glumes Br., oval, membranous. Achenes black-Br., cordate, hard, compressed.

Flowers & Fruits: October to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0192*, dated 09. 02. 2009.

Local Distribution: Marshy lowlands.

General distribution: India to Europe.

BULBOSTYLIS Kunth, Enum. Pl. 2: 205. 1837. *nom. cons*.

Bulbostylis densa (Wall.) Hand.-Mazz. *ex* Karsten *et* Schenck, Vegetations Beelder 20. 7: 16. 1930; Noltie, Fl. Bhut. 3(1): 298. 1994; Hajra *et al*., Fl. Sikkim 1: 198. 1996; *Scirpus densus* Wall., Roxb., Fl. Ind. 1: 231. 1820. *Bulbostylis capillaris* var. *trifida* (Nees) C.B. Clarke in Hook. *f*., Fl. Brit. Ind. 6: 652. 1893; Prain, Beng. Pl. 2: 1156. 1903.

Annual herbs, without rhizome. Clumps tufted, slender. Leaves basal, erect, half or more of stem length, entire, slightly evolute on margins, acuminate. Bracts 2 – 3. Inflorescence simple or subcompound anthela, bearing 4 – 7 spikelets. Spikelets solitary or clustered, 5 – 18 flowered. Glumes ovate to broadly ovate, ciliate. Stamens 2; style filiform, stigmas 3. Achenes obovate, trigonous.

Flowers & Fruits: April to December.

Specimen Cited: Forest, *Goutam & AP Das 0160*, dated 08. 02. 2009.

Local Distribution: Marshy lowlands.

General Distribution: India, Bangladesh, Nepal, China, Japan, Africa.

CYPERUS L., Sp. Pl. 1: 44. 1753.

Key to the species:

1a. Spikelets digitate or clustered …… ……..…… *C. haspan*

1b. Spikelets spicate or racemose ...…… ……. 2

2a. Rachilla of spikelet prominently winged ...…….. 3

2b. Rachilla of spikelet not winged or slightly winged ……..……..... 5

3a. Spikelets 3 – 9 in short spike …… ……....…...…. *C. rotundus*

3b. Spikelets more than 8 in long spike ……..……..…... 4

4a. Wing of rachilla deciduous …..…… ……....…… *C. stoloniferus*

4b. Wing of rachilla persistent …… ……..……..... *C. pangorie*

5a. Slender annual, tufted …… ……..……..... 6

5b. Stout perennial …… ……..……..…… 7

6a. Bracts ovate, margin not curved …… ……...……...…… *C. iria*

6b. Bracts oblong, margin curved; spikelets winged ……..……...… *C. compressus*

7a. Rachilla of spikes hairy … …… ……..... *C. pilosus*

7b. Rachilla of spikes glabrous ……..…… 8

8a. Glumes obtuse; spikelets ovate ……..……..……..….. *C. distans*

8b. Glumes mucronate; spikelets linear ……..…….....… *C. cyperoides*

Cyperus compressus L., Sp. Pl. 46. 1753; C.B. Clarke in Hook.*f*., Fl. Brit. Ind. 6: 605. 1893; Noltie, Fl. Bhut. 3(1): 310. 1994; Hajra *et al*., Fl. Sikkim 1: 214. 1996; Prain, Beng. Pl. 2: 1143. 1903. *Cyperus pectiniformis* Roem. *et* Schult., Mantissa 2: 128. 1824; Guha Bakshi, Fl. Mur. Dist. 352. 1984.

Glabrous annual; roots fibrous; stems tufted, erect or rarely prostrate, 3- gonous. Leaves shorter, sometimes longer than stem, acuminate. Bracts 3 – 7, leafy. Spikelets digitately clustered, much compressed; glumes ovate-lanceolate, closely imbricate; keel produced, laterally compressed. Nuts obovate, dark- Br. or Br. or brownish-black.

Flowers & Fruits: July to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0211*, dated 09. 02. 2009.

Local Distribution: Margin of the Gorati Beel.

General Distribution: Throughout India; Sri Lanka, Tropical Africa, Asia and America.

Cyperus cyperoides (L.) Kuntze, Revis. Gen. Pl. 3 (2): 333. 1898; Noltie, Fl. Bhut. 3(1): 307. 1994. *Scirpus cyperoides* L., Mantissa Pl. 181. 1771; Hajra *et al*., Fl. Sikkim 1: 230. 1996; *Mariscus sieberianus* Nees *ex* Steud., Synops. Pl. Glum. 2: 61. 1855; Prain, Beng. Pl. 2: 1147. 1903.

Perennials herbs. Rhizome short. Culms laxly tufted, acutely triquetrous. Lamina 5 mm wide, conduplicate at basal part, gradually flatted upward, margin not scabrous. Bracts leaf-shaped, longer than inflorescence. Spikes cylindric to oblong, with densely arranged many spikelets. Spikelets linear-lanceolate; rachilla wings white. Stamens 3; anthers shortly linear. Style short; stigmas 3, slender. Achenes dark Br..

Flowers & Fruits: April to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0237*, dated 09. 02. 2009.

Local Distribution: All over the marshy lands.

General Distribution: Pakistan, India, Sri Lanka, Nepal, Bhutan, Myanmar, Malaysia, Indonesia, Japan, Korea, Laos, Philippines, Thailand, Vietnam; tropical Africa, America, and Oceanic Islands

Cyperus haspan L., Sp. Pl. 45. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 600. 1892; Noltie, Fl. Bhut. 3(1): 313. 1994; Hajra *et al*., Fl. Sikkim 1: 215. 1996; Prain, Beng. Pl. 2: 1142. 1903.

Perennial, erect sedge. Stems solitary, compressed-trigonous. Lamina broad, spreading. Spikelets linear-lanceolate. Glumes ovate-oblong. Stamen-1; style bifid. Nuts shortly apiculate.

Flowers & Fruits: May to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0131*, dated 07. 02. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, Tropical, sub-tropical and temperate regions of the old world.

Cyperus iria L., Sp. Pl. 45. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 606. 1893; Noltie, Fl. Bhut. 3(1): 312. 1994; Hajra *et al*., Fl. Sikkim 1: 215. 1996; Prain, Beng. Pl. 2: 1143. 1903; Guha Bakshi, Fl. Mur. Dist. 356. 1984.

Annuals. Roots fibrous. Culms tufted, slender to slightly stout, compressed triquetrous. Leaves much shorter than culm; sheath reddish Br. to brownish purple; lamina slightly folded. Bracts 3 to 5, leaf-like, basal 2 longer than inflorescence. Spikes ovoid; spikelets laxly arranged, lanceolate to oblong, compressed; rachilla almost wingless. Stamens 3; anthers ellipsoid. Style very short; stigmas short. Achenes dark Br..

Flowers & Fruits: August to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0343*, dated 21. 07. 2009.

Local Distribution: Margin of the Gorati Beel.

General Distribution: India; Southern Hemisphere.

Cyperus distans L.*f*., Suppl. P1.103.1781; Clarke in Hook. *f*., Fl. Brit. Ind 6: 607. 1893; Noltie, Fl. Bhut. 3(1): 314. 1994. Hajra *et al*., Fl. Sikkim 1: 214. 1996; Prain, Beng. Pl. 2: 1143. 1903.

Perennial sedge, usually rhizomatous. Stem solitary, trigonous. Leaves shorter or as long as stem. Umbels compound, large. Spikelets spicate, narrowly linear, erect or spreading 10 – 20 flowered; rachilla slender, scarcely winged. Glumes long, elliptic-oblong, redish-Br., margins membranous, obtuse, slightly imbricate. Stamens 3. Achenes obolong, trigonous, Br..

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0359*, dated 21. 07. 2009.

Local Distribution: Marginal lowland areas.

General distribution: Tropical and sub-tropical regions of the old world.

Cyperus rotundus L., Sp. Pl. 45. 1753; C.B. Clarke in Hook. *f*., Fl. Brit. Ind. 6: 598. 1893; Noltie, Fl. Bhut. 3(1): 316. 1994; Prain, Beng. Pl. 2: 1145. 1903; Hajra *et al*., Fl. Sikkim 1: 217. 1996; Guha Bakshi, Fl. Mur. Dist. 358. 1984; Bora *et* Kumar, Fl. Div. Ass. 382. 2003.

*Local name:*Mutha ghas

Perennial sedges; rhizome elongated tuberous, ovoid, black, fragrant. Stems trigonous. Leaves acuminate. Umbel simple to compound; bracts usually 3, shorter or longer than inflorescence. Spikelets linear-lanceolate, many-flowered redish-Br.; ranchilla winged; glumes ovate to elliptic, imbricare. Achenes broadly obovoid, trigonous, dark-brown.

Flowers & Fruits: July to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0370*, dated 21. 07. 2009.

Local Distribution: Marginal lowland of Gorati Beel.

General distribution: Throughout India; warm countries.

Cyperus stoloniferus Retz., Observ. Bot. 4: 10. 1786. *Cyperus arenarius* Hance *ex* Clarke, J. Linn. Soc., Bot. 21: 173 1884; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 616. 1893; Prain, Beng. Pl. 2: 1142. 1903.

Rhizome long, thick. Culms solitary, trigonous. Leaves usually shorter than culm; lamina folded, rarely flat. Bracts leafy. Spikelets oblong-lanceolate to lanceolate, 8 – 14 x 2 – 3 mm; rachilla narrowly winged; scales densely imbricate, broadly ovate, acute to subobtuse. Stamens 3; anthers linear. Style medium in length; stigmas 3. Achenes dark Br. when mature, trigonous.

Flowers & Fruits: July.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0042*, dated 05. 02. 2009.

Local Distribution: Marginal low lands.

General Distribution: Pakistan, India, Sri Lanka, Myanmar, Malaysia, Indonesia, Cambodia,Laos, New Guinea, Philippines, Thailand, Vietnam; N Australia, Indian Ocean Islands, Madagascar

Cyperus pangorei Rottb., Descr. Pl. Rar. 18. 1772; Noltie, Fl. Bhut. 3(1): 314. 1994; Hajra *et al*., Fl. Sikkim 1: 216. 1996; Prain, Beng. Pl. 2: 1144. 1903.

Rhizome short. Culms trigonous. Leaves apically bladeless or with a short blade. Bracts longer than inflorescence. Anthela compound, unequal. Spikes broadly ovate, with 4 - 12 laxly arranged spikelets, slightly compressed, 6 – 30 flowered; scales reddish Br. on both surfaces, obtuse. Stamens 3. Styles medium in length; stigmas 3. Achenes dark Br..

Flowers & Fruits: November to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0084*, dated 06. 02. 2009.

Local Distribution: Marshy lowland areas.

General Distribution: Pakistan, India, Sri Lanka, Nepal, Bhutan, Myanmar, Vietnam.

Cyperus pilosus Vahl, Enum. Pl. 2: 354. 1805; Noltie, Fl. Bhut. 3(1): 315. 1994; Hajra *et al*., Fl. Sikkim 1: 216. 1996; Prain, Beng. Pl. 2: 1143. 1903.

Perennial herbs. Rhizome with slender stolons. Culms scattered, triquetrous. Leaves shorter than culm; sheath brownish; lamina flat. Bracts 5, basal 3 longer than inflorescence. Spikes ovate to oblong; rachis densely yellow hispid. Spikelets distichous, laxly arranged; rachilla wings white; scales pale, mucronate. Stamens 3. Style short; stigmas 3. Achenes blackish, trigonous.

Flowers & Fruits: August to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0099*, dated 07. 02. 2009.

Local Distribution: Marshy lowlands.

General Distribution: India, Nepal, Bhutan, Malaysia, Indonesia, Philippines.

ELEOCHARIS R.Br. in DC., Prodr. 224. 1810.

Key to the species:

1a. Erect, over 1m high; spikes over 30 mm long ……. .... …. *E. tetraquetra*

1b. Erect, less than 1m high; spikes less than 20 mm long …… ……. 2

2a. Styles 2-fid, nuts compressed …… ……. 3

2b. Styles 3-fid, nuts trigonous or obovoid …… ……..…….. 5

3a. Rhizome present, creeping ……..…… ….....…..... *E. palustris*

3b. Rhizome absent … ……..……...…….....…….. 4

4a. Bristlets glistening, white ….…… ……..…….. *E. atropurpurea*

4b. Bristlets Br. or rusty …… ……..…….....…. *E. geniculata*

5a. Nuts smooth, spikelets dense …… ……...……. *E. conjesta*

5b. Nuts coarse, spikelets lax …… ……....……. *E. retroflexa*

Eleocharis retroflexa (Poir.) Urb. ssp. ***chaetaria*** (Roem. *et* Schult.) Koyama, Bull. Nat. Sci. Mus.Tokyo 17: 68. 1974; Noltie, Fl. Bhut. 3(1): 287. 1994. *Eleocharis chaeraria* Roem. *et* Schult., Syst. 2: 154. 1871; Prain, Beng. Pl. 2: 1149. 1903.

Tufted annual, marshland sedge. Stems filiform, recurved. Leaves reduced to sheaths. Purple spikelets elliptical or ovoid, few flowered. Glumes 6 – 8, boat-shaped, obtuse or subacute, margin hyaline, membranous, purple-tinged, pale-Br., style base pyramidal, 3- lobed; style 3-fid. Achenes obovate, trigonous, trabeculate.

Flowers & Fruits: July to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0220*, dated 09. 02. 2009.

Local Distribution: Marshy lowland areas.

General distribution: Tropical to temperate regions of the world.

Eleocharis tetraquetra Nees in Wight, Contr. Bot. Ind. 112. 1834; Noltie, Fl. Bhut. 3(1): 186. 1994; Naskar, Aqu. Semiaqut. Pl. Low. Ganget. plain, 245. 1990.

Annual, erect, strait, stoloniferous. Stems rather firm, tetraqutrous. Leaf-sheaths 2, reddish Br.. Spikelets erect, ovoid-lanceolate, acute, 1 nerved. Perianth bristles 5, subequal, rather coarse; stamens 2; style long; stigmas 3. Nuts narrowly of broadly obovoid, biconvex, smooth, pale Br..

Flowers & Fruits: October to November.

Specimen Cited: Medlajhora, *Goutam & AP Das 0234*, dated 09. 02. 2009.

Local Distribution: Marshy lowland areas.

General distribution: India to Malaysia.

Eleocharis congesta Don, Prodr, Fl. Nepal 41.1825; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 630. 1893; Noltie, Fl. Bhut. 3(1): 286. 1994; Prain, Beng. Pl. 2: 1149. 1903. *Eleocharis afflata* Steud., Syn. Pl. glum. 2: 76. 1855.

Annual or perennial marshland sedge; stems triangular, ridged. Sheath apex truncate, apiculate. Spikelets oblong, terete, sub-acute, purplish; glumes loosely imbricate, oblong; stigmas 3. Nuts 0.15 cm long, yellow-green. Bristles 7, white or Brown..

Flowers & Fruits: July to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0219*, dated 09. 02. 2009.

Local Distribution: Marshy lowland areas.

General distribution: India, Sri Lanka, Malaysia.

Eleocharis palustris R.Br., Prodr. 224. 1810; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 628. 1893; Noltie, Fl. Bhut. 3(1): 285. 1994; Prain, Beng. Pl. 2: 1149. 1903. *Helocharis palustris* Lindl., syst. 2: 154. 1817 & Syn. Brit. Fl. 280.1829.

Erect tufted sedge with creeping rhizome. Stem terete. Lamina absent, sheath truncate. Spikelets ellipsoid or cylindric. Glumes imbricate, ovate-lanceolate. Nuts broadly obovoid, biconvex.

Flowers & Fruits: November to March.

Specimen Cited: Medlajhora, *Goutam & AP Das 0266*, dated 10. 02. 2009.

Local Distribution: Marshy lowland areas.

General Distribution: Cosmopolitan except Australia.

Eleocharis atropurpurea (Retz.) Kunth, Enum. 2: 151. 1837; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 627. 1893; Noltie, Fl. Bhut. 3(1): 287. 1994; Prain, Beng. Pl. 2: 1149. 1903. *Scirpus atropurpurea* Retz., Obs. 5: 14. 1788. *Eleocharis atropurpurea* Nees in Wight, Contrib. Bot. Ind. 113. 1834.

Marshy unbranched sedge. Stem terete, short. Spikelets in terminal head. Glumes imbricate. Nut black, obtuse, biconvex, tipped with the pale disciform style base, style 2-fid.

Flowers & Fruits: October to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0293*, dated 10. 02. 2009.

Local Distribution: Marshy lowland areas.

General Distribution: Pantropical.

Eleocharis geniculata (L.) Roem. *et* Schult., Syst. Veg. 2: 150. 1817; Svenson, Rhodora 41: 50. 1939. *Scirpus geniculata* L., Sp. Pl. 1: 48.1753. *Eleocharis capitata* R. Br., Prodr. 225. 1810; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 627. 1893; Prain, Beng. Pl. 2: 1149. 1903.

Small, marshland sedge. Roots fibrous, stem terete. Leaf-sheath short, base oblique with acute tip. Spikelets terminal, Br., globose – oblong. Glumes imbricate. Nuts brownish, slighlty compressed.

Flowers & Fruits: July to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0248*, dated 10. 02. 2009.

Local Distribution: Marginal lowland areas.

General Distribution: India and in other warmer countries.

FIMBRISTYLIS Vahl, Enum. Pl. 2: 285. 1805, *nom. cons*.

Key to the species:

1a. Stem with only one spikelet ……..…… *F. tetragona*

1b. Stem with more than one spikelet …… 2

2a. Stems tufted, compressed, grooved; nuts whitish …….. *F. dichotoma*

2b. Stems filiform, slender, not grooved; nuts yellow ….……..….. *F. aestivalis*

Fimbristylis tetragona R.Br., Prodr. 226. 1810; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 631. 1893; Prain, Beng. Pl. 2:1152. 1903.

Tufted, erect perennial sedge. Stems slender, quadrangular. Leaves reduced to sheaths. Inflorescence of one terminal ovoid or concial spikelet. Glumes obovate-oblong or obtuse, rounded on the back. Stamens usually 2, rarely 3; style flattened, villous, 2-fid. Achenes linear – oblong, pale, tapering towards base, with a slender stalk.

Flowers & Fruits: October to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0290*, dated 10. 02. 2009.

Local Distribution: Commoon in marshy lowland areas.

General distribution: India, Bangladesh, Nepal, Sri Lanka, E. Asia to tropical Australia.

Fimbristylis aestivalis (Retz.) Vahl, Enum. Pl. 2: 288. 1806; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 637. 1893; Noltie, Fl. Bhut. 3(1): 296. 1994; Hajra *et al*., Fl. Sikkim 1: 219. 1996; Prain, Beng. Pl. 2: 1154. 1903. *Scirpus aestivalis* Retz., Obs. Bot. 4: 12. 1786.

Culms densely tufted without rhizome, flatly trigonous, few leaves at base. Leaves shorter than culms, flat; sheaths short. Bracts filiform; anthelae compound, loose; spikelets solitary, ovate to oblong-lanceolate, many-flowered; glumes spiral, membranous, ovate to oblong, mucronate, reddish Br.; stamen 1, anther lanceolate; style long and compressed. Achenes obovate, yellow.

Flowers & Fruits: May to August.

Specimen Cited: Medlajhora, *Goutam & AP Das 0616*, dated 11. 02. 2008.

Local Distribution: Abundant in marshy areas.

General distribution: India, China, Japan, Malaysia and N. Australia.

Fimbristylis dichotoma (L.) Vahl, Enum. Pl. 2: 287. 1806; Noltie, Fl. Bhut. 3(1): 294. 1994; Hajra *et al*., Fl. Sikkim 1: 220. 1996; Bora *et* Kumar, Fl. Div. Assam, 385. 2003. *Scirpus dichotomus* L., Sp. Pl. 50. 1753. *Fimbristylis diphylla* (Retz.) Vahl, Enum. Pl. 2: 289. 1806; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 636. 1893; Prain, Beng. Pl. 2: 1153. 1903.

Annual or perennial, erect, marshland sedge, shortly rhizomatous. Leaves flat, broad. Anthela simple or sub-compound. Spikelets ovate, acute, terete; glumes broadly ovate; stamens 3. Nuts obovate – elliptic, whitish.

Flowers & Fruits: May to November.

Specimen Cited: Medlajhora, *Goutam & AP Das 0555*, dated 24. 07. 2009.

Local Distribution: Abundant in marshy areas.

General Distribution: Tropical to temperate zones across the world.

FUIRENA Rottb., Descr. Icon. Rar. Pl. 70. 1773.

Fuirena ciliaris (L.) Roxb., Fl. Ind.1: 184. 1820; Noltie, Fl. Bhut. 3 (1): 282. 1994. *Scirpus ciliaris* L., Mant. Ail. 182. 1771. *Fuirena glomerata* Lam., Encyl. 1: 150. 1791; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 666. 1893; Prain, Beng. Pl. 2: 1158. 1903.

Erect, annual, marshland sedge. Rhizome absent. Stems tufted. Leaves linear – lanceolate, acuminate; sheaths striate. Spikelets in clusters of 3 – 10, gray-green or brownish, ovoid or oblong. Glumes obovate or oblong; keel green. Achenes triquetrous, obovoid, surface smooth, pale.

Flowers & Fruits: October to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0509,* dated 23. 07. 2009.

Local Distribution: Common along the margin of Gorati Beel.

General distribution: Cosmopolitan to tropical and sub-tropical regions.

KYLLINGA Rottb., Descr. Icon. Rar. Pl. 12. 1773, *nom. cons*., not *Killinga* Adanson (1763).

Key to the species:

1a. Keel of achene glume winged; heads greenish …… ……..... *K. brevifolia*

1b. Keel of achene glume not winged; heads whitish …… ……... *K. nemoralis*

Kyllinga brevifolia Rottb., Descr. 13. t. 4. f. 3. 1773; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 588. 1893; Noltie, Fl. Bhut. 3(1): 324. 1994; Prain, Beng. Pl. 2: 1135. 1903; Hajra *et al*., Fl. Sikkim 1: 227. 1996. *Cyperus brevifolius* (Rottb.) Hassk., Cat. Hort. Bogor. 24. 1844.

Rhizome slender. Culms tufted, compressed, trigonous, 4 to 5 sheathed. Leaf-sheaths Br., acuminate; lamina 5 – 17 cm x 2 - 4 mm, flaccid. Bracts 3, leaf-like. Spike 1, ovoid-globose, with numerous densely arranged spikelets. Spikelets oblong-lanceolate, compressed, 1 to 2 flowered; scales ovate, keel spinulate. Stamens 1 – 3; anthers short, linear. Style long; stigmas 2. Achenes obovoid-oblong.

Flowers & Fruits: May to October.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0485*, dated 23.07.2009.

Local Distribution: In open areas, over the forests; common.

General distribution: Tropical and warm regions of South-East Asia.

Kyllinga nemoralis (Forst. & Forst.) Dandy *ex* Hutchinson & Dalziel, Fl. W. Trop. Afr. 2: 487. 1936; Noltie, Fl. Bhut. 3(1): 325. 1994; Hajra *et al*., Fl. Sikkim 1: 227. 1996. *Kyllinga monocephala* Rottb., Descr. 13, t. 4, F. 4. 1773, *nom. Superfl*; Prain, Beng. Pl. 2: 1141. 1903. *Thryocephalon nemorale* Forst. & Forst., Char. Gen. Pl. 65. 1775. *Cyerus kyllinga* Endl., Cat. Hort. Ac.Vindob.1: 94.1842.

Local name: Gothube.

Perennials herbs. Culms tufted, compressed triquetrous. Leaves usually shorter than culm; sheath brown; lamina flat. Bracts 3 to 4, much longer than inflorescence. Spikes ovoid to globose, with numerous spikelets. Spikelets sub-obovoid, compressed, 1-flowered; scales boat-shaped, apex slightly recurved mucronate. Stamens 3. Style long; stigmas 2. Achenes Br., oblong to obovoid-oblong.

Flowers & Fruits: May to August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0550*, dated 24. 07. 2009.

Local Distribution: In open areas, over the forests; common.

General Distribution: Pantropical.

RHYNCHOSPORA Vahl, Enum. Pl. 2: 229. 1805 ["Rynchospora"], *nom. cons*.

Rhynchospora corymbosa (L.) Britton in Trans. New York Acad. Sci. 11: 84. 1892; Noltie, Fl. Bhut. 3(1): 329. 1994; Cook, Aqua. Wetl. Pl. Ind. 173, 1996; Hajra *et al*., Fl. Sikkim 1: 233. 1996. *Scirpus corymbosus* L., Cent. Pl. 2: 7.1956.

Rhizome short. Culms erect, trigonous. Leaves basal and cauline, blades broadly linear, long acuminate; sheaths membranous. Bracts shorter than large compound paniculate inflorescence; anthela 2 – 5, distant corymbiform. Spikelets many, lowest flower bisexual, upper 1 - 2 male. Glumes ovate to ovate lanceolate. Stamens 3. Achenes oblong-obovate to obovate, Br..

Flowers & Fruits: June to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0423*, dated 22.07.2009.

Local Distribution: Common in marshy areas.

General Distribution: Pantropical; India: West Bengal, Assam, Arunachalpradesh, Meghalaya, Tripura, Nagaland, Kerala, Karnataka; Sri Lanka, Bangladesh, Bhutan, Nepal.

SCHOENOPLECTUS (Rchb.*f*.) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38 (Sitzungsber.): 49. 1888, *nom. cons*.

Key to the species:

1a. Nuts smooth, triangular …… ……..……..…….... *S. grossus*

1b. Nuts transversely wavy …… …… ……..….. 2

2a. Glumes distinctly keeled, spikelets angular ..…… ……..…… *S. laterifolius*

2b. Glumes faintly keeled, spikelets terete ……..… ….. 3

3a. Spiklets 2 – 4; nuts plano-convex …… ……..... *S. juncoides*

3b. Spiklets more than 10; nut triquetrous …… ……. ……..… *S. articulatus*

Schoenoplectus articulatus (L.) Palla, Bot. Jahrb. 10: 229. 1888; Palla, Fl. Hassan dist. 697. 1976; Noltie, Fl. Bhut. 3(1): 284. 1994. *Scirpus articulatus* L., Sp. Pl. 47. 1753; Hook. *f*., Fl. Brit. Ind. 6: 656. 1893; Prain, Beng. Pl. 2: 1160. 1903. *Isolepis articulate* Nees in Wight, Contrib. Bot. Ind. 108.1834.

Glabrous, annual, tufted marshland robust sedge. Stems terete, spongy, transversely septate. Leaves reduced to sheaths. Inflorescence of many sessile spikelets, head like cluster. Spikelets ovoid to cylindric-oblong. Glumes ovate, concave, acute; hypogynous bristles absent. Style linear. Achenes obovate, triquetrous, black, smooth.

Flowers & Fruits: October to January.

Specimen Cited: Murti, *Goutam & AP Das 0439*, dated 22. 07. 2009; Gorati Beel, *Goutam & AP Das 0617*, dated 11. 02. 2008.

Local Distribution: All over the marshy and riverine lowlands.

General distribution: Tropical Asia, Africa and Australia.

Schoenoplectus grossus (L.*f*.) Palla, Allg. Bot. Z. 17. Biebl. 3. 1911; Srivastava in Hajra *et al.,* Fl. Sikkim 1: 234. 1996. *Scirpus grossus* L.*f*., Suppl. 104. 1781; Clarke in Hook. *f*., Fl. Brit. Ind. 6: 659. 1896; Noltie, Fl. Bhut. 3(1): 280. 1994; Prain, Beng. Pl. 2: 1160. 1903.

Perrenial, aquatic, glabrous sedges. Rootstock stout, stolons produces tubers; roots fibrous, triquerous spongy. Leaves few, radical, concave, strongly keeled, spongy; sheaths long open. Inflorescence decompound, terminal, open, ovoid, dark Br.. Glumes broadly elliptic concave. Nuts elliptic–obovoid.

Flowers & Fruits: September to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0617*, dated 11. 02. 2008.

Local Distribution: Margins of lowland areas.

General distribution: India, Bhutan, Bangladesh, Sri Lanka, China, Malaysia, Philippines.

Schoenoplectus juncoides (Roxb.) Palla, Bot. Jahrb. 10: 299.1888; Noltie, Fl. Bhut. 3(1): 283. 1994; Srivastava in Hajra *et al.,* Fl. Sikkim 1: 235. 1996. *Scirpus juncoides* Roxb., Fl. Ind. 1: 218. 1820; *Scirpus erectus sensu* Clarke in Hook. *f.,* Fl. Brit. Ind. 6: 656. 1893; Prain, Beng. Pl. 2: 1160. 1903.

Tufted annual, marshland sedge. Stems flaccid or rigid. Leaves reduced to sheaths. Spikelets sessile, 2–5 in a lateral cluster; glumes suborbicular, concave, acute, pale–Br.; hypogynous bristles 5–6, unequal, retrorsely scarbid, shorter or longer than achenes. Style linear, branches 2. Achenes globosely obovoid, Br. to black.

Flowers & Fruits: July to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0631*, dated 12. 02. 2008.

Local Distribution: Marginal areas of Gorati Beel.

General distribution: India, China, Japan, Malaysia, Australia.

Schoenoplectus lateriflorus (Gmelin) Lye, Bot. Nat. 290. 1971; Bhat *et al.*, Sedg. & Gras. 82. 2001. *Scirpus lateriflorus* Gmelin, Syst. Nat. 2, 1: 127. 1791. *Scirpus supinus* var. *uninoides* Clarke in Hook. *f.*, Fl. Brit. Ind. 6: 656. 1893; Prain, Beng. Pl. 2: 1160. 1903. *Scirpus supinus* var. *lateriflorus* (Gmelin) Koyama, J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 7: 302. 1958; Noltie, Fl. Bhut. 3(1): 284. 1994. *Scirpus supinus auct non* L., Sp. Pl. 1: 49.1753; Hara *et al.*, Enn. Flower. Pl. Nepal 1: 119. 1978.

Aquatic or marshland annual, erect, tufted. Stems glabrous, trigonous. Leaves short, sheath short. Spikelets in a axillary cluster, ovate, oblong, sessile, rachilla slender. Glumes ovate, membranous. Nuts transversely lineolate.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0635*, dated 12. 02. 2008.

Local Distribution: Marginal areas of Gorati Beel.

General distribution: India, Tropical Asia, N. America and Australia.

SCIRPUS L., Sp. Pl. 1: 47. 1753, *nom. cons*.

Scirpus michelianus L., Sp. Pl. 1: 52.1753; Clarke in Hook. *f.*, Fl. Brit. Ind. 6: 662. 1893; Noltie, Fl. Bhut. 3(1): 280. 1994; Prain, Beng. Pl. 2: 873. 1903; Datta & Majumdar, Bull. Bot. Soc. Beng. 20(2): 35. 1966. *Cyperus diffuses* Roxb., Fl. Ind. 1: 189. 1832.

Small, annual, tufted sedge; root fibrous. Stem triquetrous, leafy towards and base. Leaves as long as stem, linear, acute. Spikelets numerous, in dense compound terminal heads. Glumes elliptic. Nuts fusiform.

Flowers & Fruits: July to January.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0349*, dated 21. 07. 2009.

Local Distribution: Marginal areas of Gorati Beel.

General distribution: Warmer parts of India, South Asia, South Europe to Japan.

Juncaceae Juss., Gen. P1. 43. 1789 ('Junci'); *nom. cons*.

JUNCUS L., Sp. Pl. 1: 325. 1753.

Juncus prismatocarpus R.Br., Prodr. Fl. Nov. Holl. 1: 259. 1810; Noltie, Fl. Bhut. 3(1): 254. 1994; Hajra *et al*., Fl. Sikkim 1: 176. 1996; Prain, Beng. Pl. 2: 1088. 1903.

Perennial tufted herbs. Stems erect. Basal leaves few; lamina linear, 8 – 22 cm × 2 – 4 mm, obtuse to acute. Inflorescence terminal, much branched; involucral bracts leafy, shorter than inflorescence; heads globose to hemispheric; bracts broadly ovate to ovate lanceolate. Perianth segments narrowly lanceolate to linear-lanceolate, acute. Stamens 3. Stigmas very long. Capsules narrow.

Flowers & Fruits: May to November.

Specimen Cited: Medlajhora, *Goutam & AP Das 0169*, dated 08. 02. 2009.

Local Distribution: Common in marshy areas.

General Distribution: Pakistan, India, Sri Lanka, Bhutan, Nepal, Indonesia, Japan, Korea, Laos, Cambodia, Malaysia, Papua New Guinea, Thailand, Vietnam, Australia, Pacific Islands.

Typhaceae Juss. Gen. Pl. 25. 1789 ('Typhae').

TYPHA L., Sp. Pl. 2: 971. 1753.

Typha elephantina Roxb., Fl. Ind., 3: 566. 1832; Noltie, Fl. Bhut. 3(1): 177. 1994; Prain, Beng. Pl. 2: 1102. 1903. *Typha schimperi* Rohrbach, Verh. Bot. Vereins Prov. Brandenburg 11: 95. 1869. *Typha maresii* Batt., Bull. Soc. Bot. France 34: 389. 1887. *Typha elephantina* var. *schimperi* (Rohrbach) Graebn., Pflanzenr. IV, 8: 11. 1900. *Typha latifolia* subsp. *maresii* (Batt.) Batt., Fl. Algérie 1(2): 18. 1895.

Plants up to 2.5 m, stout. Leaves 1 – 1.5 m long, abaxially carinate, transverse section triangular. Staminate part of spikes with 1 bract, axis with dense Br. hairs; pistillate part of spikes separated from staminate part. Female flowers with whitish bracteoles; bracteoles linear; ovary lanceolate, stalked; stigmas lanceolate.

Flowers & Fruits: unknown.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0566*, dated 24. 07. 2009.

Local Distribution: Lowlands, mostly in central area of GNP.

General Distribution: Pakistan, India, Bangladesh, Bhutan, Nepal, Myanmar; Africa.

Eriocaulaceae P. Beauv. *ex* Desv., Ann. Sc. Nat. 13: 45. 1828 ('Eriocauloneae').

ERIOCAULON L., Sp. Pl. 1: 87. 1753.

Key to the Species :

1a. Leaves upto 5 cm long; anthers white or pale yellow …….. *E. cinereum*

1b. Leaves 5 – 12 cm long; anthers black ……. *E. alpestre*

Eriocaulon cinereum R.Br., Prodr. 254. 1810; Noltie, Fl. Bhut. 3(1): 244. 1994**;** Cook, Aqua. Wetl. Pl. Ind. 191. 1996. *Eriocaulon Sieb.ianum* Sieb. *et* Zucc. *ex* Steud., Syn. Pl. Glum. 2: 272. 1855; Hook. *f*., Fl. Brit. Ind. 6: 577. 1893; Prain, Beng. Pl. 2: 1127. 1903.

Small, stemless, tufted annual sedge. Leaves 2 – 5 cm long, narrowly linear glabrous, gradually attenuate to filiferous apex. Peduncle 10 – 15 cm, numerous, aggregated, glabrous, 5-ribbed. Heads small, whitish globose or ovoid; bracts glabrous.

Flowers & Fruits: October to March.

Specimen Cited: Medlajhora, *Goutam & AP Das 0734*, dated 14. 02. 2008.

Local Distribution: In all marshlands.

General Distribution: India and Tropical parts of world.

Eriocaulon alpestre Hook. *f.* & Thoms. *ex* Körnicke, Miq. Ann. Mus. Bot. Lugduno-Batavi 3: 163. 1867; Noltie, Fl. Bhut. 3(1): 245. 1994; Hajra *et al*., Fl. Sikkim 1: 197. 1996; Cook, Aqua. Wetl. Pl. Ind. 187. 1996. *Eriocaulon alpestre* var. *ampullaceum* Royen, Blumea 10: 126. 1960.

Leaves linear, 5 – 12 x 0.3 – 0.5 cm. Scapes 5 – 8 cm**;** sheath 3 – 8 cm; heads straw colored at base, black at apex; involucral bracts yellowish green, ovate, usually silky, glabrescent; floral bracts obovate to oblanceolate, glabrescent. Male flowers: petals 3, subequal, anthers black. Female flowers: petals 3, spatulate; ovary 3 loculed. Seeds narrowly ovoid.

Flowers & Fruits: June to August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0136*, dated 07. 02. 2009.

Local Distribution: In all marshy areas.

General Distribution: India, Bhutan, Nepal, Japan, Korea, Philippines, Thailand.

Xyridaceae Agardh, Aphor. Bot. 158. 1823 ('Xyrideae').

XYRIS L., Sp. Pl. 1: 42. 1753.

Xyris pauciflora Willdenow, Phytogr. 1: 2, t. f. 1 & Sp. Pl. 1: 255. 1794; Hooker *f*., Fl. Brit. Ind. 6: 363. 1892; Noltie, Fl. Bhut. 3(1): 242. 1994; Hajra *et al*., Fl. Sikkim 1: 167. 1996; Prain, Beng. Pl. 2: 1080. 1903; Cook, Aqua. Wetl. Pl. Ind. 369, 1996. *Xyris denticulata* R.Br., Prodr. Fl. Nov. Holl. 256. 1810. *Xyris maritima* Koyama, Philipp. J. Sci. 84: 367. 1956. *Xyris dajacensis* Royen, Blumea 7: 208. 1953.

Tufted, aquatic, erect annual herbs. Lamina linear acuminate. Heads globose or ovoid. Flowers 4 – 6 in a head, bracts orbicular. Capsule broadly ovoid. Seeds minute, linear oblong, many.

Flower & Fruits: November to February.

Specimen Cited: Medlajhora, *Goutam & AP Das 0143*, dated 08. 02. 2009.

Local Distribution: In all marshy areas.

General Distribution: India; native to Tropical Australia.

Order: Zingiberales Griseb. (1854)

Cannaceae Juss. Gen. P1. 62. 1789 ('Cannae'); *nom. cons*.

CANNA L., Sp. Pl. 1: 1. 1753.

Canna indica L., Sp. Pl. 1: 1. 1753; Prain, Beng. Pl. 2: 1047. 1903. *Canna orientalis* var. *flava* Roscoe, Monandr. Pl. Scitam. 40. 1826; Noltie, Fl. Bhut. 3(1): 212. 1994; *Canna montana* Blume, Enum. Pl. Javae 35. 1827. *Canna indica* var. *rubra* Aiton, Hort. Kew. 1: 1. 1789.

Rhizome much branched. Stems up to 2 m. Leaf sheath green; petiole short; lamina adaxially green, 25 – 55 × 8 – 16 cm. Racemes compact, branched; bracts ovate. Flowers 1 – 2 per cincinnus. Sepals pale. Corolla tube apricot yellow. Staminodes 2 or 3; labellum red, lanceolate. Ovary green, globose. Capsule broadly ovoid.

Flowers & Fruits: Through out the year.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0167*, dated 08. 02. 2009.

Local Distribution: Grown in Dhupjhora Beat Offices and gardens; often planted.

General Distribution: Native to tropical America; cultivated throughout the tropics. Seminaturalized in many areas.

Costaceae (Meisn.) Nakai, Journ. Jap. Bot. 17: 203. 1941.

CHEILOCOSTUS C.D. Specht, Taxon 55(1): 159. 2006.

Cheilocostus speciosus (König) Specht, *Taxon 55: 159. 2006. Banksia speciosa* König, Retz. Obs. 3: 75. 1783. *Hellenia grandiflora* Retz., *Observ. Bot. 6: 18. 1791. Costus speciosus* (König) Sm., Trans. L. Soc. 1: 249. 1791; G. Watt, Dict. Econ. Prod. 2: 579. 1889; Baker in Hook. *f.*, Fl. Brit. Ind. 6: 249. 1892; Prain, Beng. Pl. 2: 786. 1903; Noltie, Fl. Bhut. 3(1): 210. 1994; Hajra *et al*., Fl. Sikkim 1: 124. 1996.

Stems up to 3 m. Petiole 5 – 7 mm; lamina oblong to lanceolate, 12 – 22 × 5 – 11 cm. Condensed spike terminal, ellipsoid to ovoid; bracts bright red, apex sharply pointed; bracteoles pale red. Calyx red, apex 3 lobed. Corolla tube 1 cm; lobes oblong-elliptic, apex white. Labellum white. Stamen petaloid, white with orange-yellow base. Capsule red, globose. Seeds black.

Flowers & Fruits: July to November.

Specimen Cited: Murti, *Goutam & AP Das 0195*, dated 09. 02. 2009.

Local Distribution: All over the forests, prefer open areas; common.

General Distribution: India, Bangladesh, Sri Lanka, Java.

Marantaceae Lindl., Nat. Syst. 267. 1830; *nom. cons*.

PHRYNIUM Willd., Sp. Pl., ed. 4, 1(1): 1, 17. 1797; *nom. cons*.

Phrynium pubinerve Bl., Enum. Pl. Javae 1: 38. 1827; Noltie, Fl. Bhut. 3(1): 214. 1994. *Phrynium densiflorum* Moritzi *ex* Körnig, Bull. Soc. Imp. Naturalistes Moscou 35(1): 101. 1862. *Phrynium malaccense* Ridl., *Jour. Asiat. Soc. Straits 32: 180. 1899.*

Plants up to 1 m. Rhizomes tuberous. Basal leaves several; cauline leaf 1; petiole to 60 cm, pulvinus 5 – 6 cm, glabrous; lamina ovate-oblong to oblong, 30 – 45 × 8 – 12 cm, glabrous, shortly acuminate, base acute. Inflorescence sessile, capitate; bracts purple-red, oblong-lanceolate, apex initially acute. Flower sessile. Sepals linear, sericeous. Corolla tube violet, shorter than calyx; lobes dark red, oblong-obovate. Outer staminodes light red, obovate, slightly corrugated. Ovary sericeous. Fruit dark red, shiny, pyriform; exocarp hard. Seeds shallowly grooved.

Flowers & Fruits: June to September.

Specimen Cited: Medlajhora, *Goutam & AP Das 0232*, dated 09. 02. 2009.

Local Distribution: Dhupjhora and Gorumara lowland areas.

General Distribution: Eastern Himalaya, including Terai and Duars; South East Asia.

Musaceae Juss. Gen. P1. 61. 1789 (‘Musae’); *nom. cons*.

MUSA L., Sp. Pl. 2: 1043. 1753.

Key to the Species:

1a. Bracts adaxially purple red, abaxially yellowish green …… *M. balbisiana*

1b. Bracts adaxially deep red, abaxially purple ……. *M. paradisiaca*

Musa balbisiana Colla, Mem. Reale Accad. Sci. Torino 25: 384. 1820; Kew Bull. 1948: 14. 1948; Hara, Fl. East. Himal. 3: 136. 1975; Hara *et al,* En. Flower. Pl. Nepal 1: 63. 1978; Noltie, Fl. Bhutan 3(1): 180. 1994; Hajra *et al*., Fl. Sikkim 1: 135. 1996.

*Local name:*Bichikola

Pseudostems upto 5 m high, green with dark markings. Lamina oblong, entire, petiole spongy, base asymmetric. Compound spadix pendulous, 1 - 1.5 m; peduncle and rachis glabrous. Bracts of bisexual and male flowers adaxially purple red, abaxially yellowish green; bracts of female flowers deciduous. Flowers numerous. Berries yellow when ripe, obovoid, distinctly angled at maturity. Seeds numerous, Br., oblate, minutely warty.

Flowers & Fruits: Round the year.

Specimen Cited: Murti, *Goutam & AP Das 0567*, dated 24. 07. 2009.

Local Distribution: Commonly grown in forests villages.

General Distribution: India, Sri Lanka, Nepal, Myanmar, Thailand, Malaysia, Indonesia (Java), New Guinea, Philippines.

***Note*:** Cultivated widely.

Musa* × *paradisiaca L., Sp. Pl. 2: 1043. 1753. Hajra *et al*., Fl. Sikkim 1: 135. 1996. *Musa sapientum* L., Syst. 10, 2: 1303. 1759; Hook. *f.*, Fl. Brit. Ind. 6: 262. 1892; Prain, Beng. Pl. 2: 1050. 1903.

Pseudostems clumped. Leaves erect; lamina adaxially deep green, abaxially light green, oblong, 1.5 – 2.5 m × 30 – 55 cm, base subsymmetric, acute. Compound spadix pendulous; rachis glabrous. Bracts adaxially deep red, abaxially purple, deciduous. Flowers in 2 rows in each bract. Tepal suborbicular to oblong, acuminate. Infructescence with 6 – 8 clusters of erect to slightly curved berries. Seeds absent.

Flowers & Fruits: All round the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0630*, dated 12. 02. 2008.

Local Distribution: Commonly cultivated in forest villages.

General Distribution: Native to tropical Asia; widely cultivated in the tropics.

***Note*:** Cultivated widely.

Zingiberaceae Lindl., Nat. Syst. ed. 2. 322. 1836; *nom. cons*.

Key to the genera:

1a. Inflorescence terminal or lateral on pseudostems 2

1b. Inflorescence on separate shoots arising from rhizomes …….....……... 3

2a. Lateral staminodes reduced to small subulate point or swellings ..... *Alpinia*

2b. Lateral staminodes attached to corolla tube and petal-like 4

3a. Style exserted well beyond anther-thecae and enfolded in a long anther-crest ... *Zingiber*

3b. Style not exserted much beyond anther-thecae and not enfolding style……...… *Curcuma*

4a. Ovary tri-locular; lip free from filament …….....……. *Hedychium*

4b. Ovary unilocular; lip adnate to the base of filament to form a slender tube …..... *Globba*

ALPINIA Roxb., Asiat. Res. 11: 350. 1810*, nom. cons*.

Key to the species:

1a. Bracteoles funnel-shaped, persistent ..... *A. nigra*

1b. Bracteoles shell-shaped, deciduous after anthesis ..... *A. calcarata*

Alpinia calcarata (Haw.) Roscoe in Trans. Linn. Soc. London 8: 347. 1807; Prain, Beng. Pl. 2: 1047. 1903; Noltie, Fl. Bhut. 3(1): 206. 1994. *Renealmia calcarata* Haw. in Bot. Repos. 6: t. 421. 1805. *Alpinia calcarata* var. *compacta* Gagnep. in Bull. Soc. Bot. France 48: 85. 1902.

*Local name:*Purundi.

Pseudostems up to 1 m. Leaves sessile, lamina linear-lanceolate, 20 – 40 × 2 – 4 cm, glabrous, acuminate and caudate-mucronate, base attenuate. Panicles terminal, less than 10 cm; rachis slightly velvety. Calyx split on 1 side. Corolla tube white; lobes oblong. Lateral staminodes red. Labellum white with rose red and purple streaks. Filament 1.5 cm. Capsule red, globose.

Flowers & Fruits: May.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0716*, dated 14. 02. 2008; *Goutam & AP Das 0660*, dated 13. 02. 2008.

Local Distribution: Common along the margins of Gorati Beel.

General Distribution: India, Sri Lanka, Myanmar.

Alpinia nigra (Gaertn.) Burtt, Notes Roy. Bot. Gard. Edinburgh 35(2): 213. 1977; Noltie, Fl. Bhut. 3(1): 205. 1994; Hajra *et al*., Fl. Sikkim 1: 121. 1996. *Zingiber nigrum* Gaertn., Fruct. Sem. Pl. 1: 35. 1788. *Alpinia allughas* (Retz.) Roscoe, Trans. Linn. Soc. London 8: 346. 1807; Prain, Beng. Pl. 2: 1047. 1903. *Amomum nigrum* (Gaertn.) Räusch, Nomencl. Bot. 3: 1. 1797. *Heritiera allughas* Retz., Observ. Bot. 6: 17. 1791.

*Local name:*Purundi.

Pseudostems up to 2 m. Leaves sessile to subsessile; lamina elliptic-lanceolate, 25 – 50 × 6 – 8 cm, apex and base acute. Panicles terminal, erect; branches expanded; bracts ovate; bracteoles funnel shaped. Pedicel 5 mm. Calyx tubular. Corolla, cucullate. Lateral staminodes subulate. Labellum obovate. Stamen ca. 2 cm; anther curved. Ovary pubescent. Capsule black when dry.

Flowers & Fruits: July to October.

Specimen Cited: Murti Jaldhaka junction, *Goutam & AP Das 0155*, dated 08. 02. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India, Bhutan, Sri Lanka, Thailand.

CURCUMA L., Sp. Pl. 1: 2. 1753, *nom. cons*.

Key to species:

1a. Petiole equal to lamina; rhizomes yellow inside .... *C. aromatic*

1b. Petiole shorter than lamina; deep pink or blackish inside of rhizome …..... *C. caesia*

Curcuma aromatica Salisb., Parad. Lond. 2: t, 96. 1807; Hook. *f.*, Fl. Brit. Ind. 6: 210. 1890; Prain, Beng. Pl. 2: 1042; Noltie, Fl. Bhut. 3(1): 192. 1994. 1903; Hajra *et al*., Fl. Sikkim 1: 125. 1996. *Curcuma wenyujin* Chen *et.* Ling, Acta Pharm. Sin. 16: 387. 1981.

*Local name:*Soti.

Plants up to 1 m. Rhizomes pale yellow inside, aromatic. Petiole equaling leaf blade; lamina oblong, 25 – 50 × 10 – 20 cm, narrowly caudate, base attenuate. Inflorescences on separate shoots arising from rhizomes; spike cylindric; fertile bracts pale green, ovate. Calyx sparsely hairy. Corolla tube funnel-shaped, villous at throat; lobes pinkish white. Lateral staminodes yellowish. Labellum yellow. Ovary villous.

Flowers & Fruits: May to September.

Specimen Cited: Murti, *Goutam & AP Das 0189*, dated 09. 02. 2009.

Local Distribution: Forest and road side areas.

General Distribution: India, Nepal, Bangladesh, Sri Lanka, Myanmar, Java.

Curcuma caesia Roxb., Asiat. Res. 11: 334. 1810. Fl. Sikkim 1: 125. 1996. Curcuma kuchoor Royle, Ill. Bot. Himal. Mts. 357 1839.

Local name: Kalo Halud

Rhizomatous perennial herb up to 10 cm. Rhizomes fleshy, aromatic, bluish inside. Leaves 4 – 8, basal rosette-like; petiole 5 – 15 cm, much shorter than lamina; lamina oblong-lanceolate, glabrous above and beneath, dark purple around mid-vein, acuminate. Inflorescence a spike arising terminal

from a leafy pseudostem; peduncle hidden within petioles; spike cylindric; fertile bracts green, thick textured, gradually flushed with pink towards apex, ovate; coma bracts red or very deep pink, oblong, obtuse, not widely spreading. Flowers yellow, not much studied.

Flowers & Fruits: May to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0189*, dated 09. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Budhuram.

General Distribution: India, Nepal, Bangladesh, Sri Lanka, Myanmar, Java.

Note : Rhizomes medicinally important, used in sprains and bruises.

GLOBBA L., Mant. Pl. 2: 143, 170. 1771.

Key to species:

1a. Cincini stalk and bracts ..... *G. clarkei*

1b. Cincini stalk and bracts green …….. .... *G. racemosa*

Globba racemosa Sm., Exot. Bot. 2: 115. 1806; Noltie, Fl. Bhut. 3(1): 191. 1994; Hajra *et al*., Fl. Sikkim 1: 127. 1996. *Globba orixensis* var. *racemosa* (Sm.) Gagnep., Bull. Soc. Bot. France 48: 201. 1901; Prain, Beng. Pl. 2: 1037. 1903.

Pseudostems up to 100 cm. Leaves subsessile; lamina oblong to ovate-lanceolate, 12 – 20 × 4 – 5 cm, caudate, base acute, glabrous. Flowers in terminal thyrses, yellow, with orange, glandular spots. Calyx turbinate. Corolla lobes reflexed. Lateral staminodes lanceolate. Labellum reflexed, obcuneate. Filament 1 cm; anther without appendages. Capsule ellipsoid, smooth.

Flowers & Fruits: June to September.

Specimen Cited: Murti, *Goutam & AP Das 0204*, dated 09. 02. 2009.

Local Distribution: Murti, Gorumara.

General Distribution: India, Nepal, Bhutan, Myanmar, Thailand.

Globba clarkei Baker in Fl. Brit. Ind. 6: 210. 1890; Noltie,, Fl. Bhutan 3 (1): 190. 1994; Fl. Sikkim 1: 126. 1996. *Globba hookeri* Clarke *ex* Baker in Fl. Brit. Ind. 6: 202. 1890; Trans. Bose Res. Inst. 51(4): 115. 1987.*Globba racemosa* var. *hookeri* (Clarke *ex* Baker) S. Kumar in Fl. Sikkim 1: 127. 1996.

Rhizomatous, perennial herb. Pseudostems leafy. Leaves sessile, alternate; ligule membranous, 2-lobed; lamina lanceolate, 12 – 30 × 4 – 8 cm. Bulbils formed along main axis at after maturity. Bracts purplish, with 3 – 4 flowers. Flowers yellow; calyx tubular, shortly 3-lobed, lobes greenish; corolla-tube ovate, reflexed; lateral staminodes ovate, equaling petals, narrower; lip reflexed. Capsule globose.

Flowers & Fruits: June to September.

Specimen Cited: Budhuram, *Goutam & AP Das 1124*, dated 19. 02. 2012.

Local Distribution: Murti, Dhupjhora, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Endemic to E Himalaya and NE India.

HEDYCHIUM König in Retzius, Observ. Bot. 3: 61 [“73”]. 1783.

Key to the Species:

1a. Bracts convolute, 1 – 2 flowered ..... *H. Thyrsiforme*

1b. Bracts lanceolate, usually 3 flowered ……..... *H. coccineum*

Hedychium coccineum Buch.-Ham.*ex* Smith in Rees, Cycl. 17: 5.1811; Hook. *f*., Fl. Brit. Ind. 6: 231. 1892; Hara, Fl. E. Himal. 422. 1966; Noltie,, Fl. Bhutan 3 (1): 204. 1994. *Hedychium squarrosum* Buch.-Ham. *ex* Wall. in Hook. *f*., Kew. Jour. Bot. 5: 372. 1853. *Hedychium angustifolium* Roxb., Fl. Ind. ed.13.1832. *Hedychium coccineum* var. *angustifolium* (Roxb.) Baker in Fl. Brit. Ind. 6: 231. 1890; Beng. Pl. 2: 1040. 1903.

Local Name: Dolon Champa

Terrestrial rhizomatous perennial herb. Pseudostems 1 – 2 m, annual. Leaves alternate, sessile; ligule entire, 1.5 – 2.5 cm, obtuse, brown; lamina narrowly linear-lanceolate, 22 – 40 × 3 – 5 cm, glabrous above, minutely pubescent beneath, attenuate, acuminate to shortly caudate. Inflorescence spike, cylindric, moderately dense; bracts oblong, glabrous, usually 3flowered, obtuse. Flowers all parts homogeneously brick-red to deep orange. Calyx apically 3 toothed; corolla tube equaling to slightly longer than calyx; petals linear. Capsule globose.

Flowers & Fruits: June to September.

Specimen Cited: Gorumara, *Goutam & AP Das 0749*, dated 19. 03. 2008.

Local Distribution: Murti, Dhupjhora, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Myanmar, Sri Lanka, China, Thailand.

Hedychium thyrsiforme Smith in Rees, Cycl. 17: 5.1811; Hooker f., Fl. Brit. Ind. 6: 230. 1892; Beng. Pl. 2: 1033. 1903; Noltie,, Fl. Bhutan 3 (1): 201. 1994. *Gandasulium thyrsiforme* (Wall.) Kuntze, Revis. Gen. Pl. 2: 690. 1891.

Local Name: Dolon Champa

Terrestrial rhizomatous perennial herb. Pseudostems up to 2 m. Leaves alternate, shortly petiolate to 1 cm; ligule entire, emerginate; lamina elliptic to broadly lanceolate, 15 – 30 × 6 – 11 cm, acuminate. Spike very densely flowered. Bracts lanceolate, 1 – 2 flowered. Flowers white. Calyx slightly shorter than bracts, membranous; corolla tube white; petals linear, inrolled; lateral staminodes linear-lanceolate; lip clawed, oblong.

Flowers & Fruits: August to November.

Specimen Cited: Gorumara, *Goutam & AP Das 0824*, dated 19. 03. 2008.

Local Distribution: Murti, Dhupjhora, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India to Myanmar.

ZINGIBER Mill., Gard. Dict. Abr., ed. 4, [1545]. 1754, *nom. cons*.

Key to the Species:

1a. Inflorescences deep orange-red at maturity …..... *Z. zerumbet*

1b. Inflorescences dark brownish green …….....…….. *Z. montanum*

Zingiber montanum (König) Link *ex* Dietrich, *Sp. Pl. 1: 52. 1831. Amomum montanum* König, Observ. Bot. 3: 51. 1783. *Zingiber purpureum* Roscoe, Trans. Linn. Soc. London 8: 348. 1807;

Noltie, Fl. Bhut. 3(1): 188. 1994. *Zingiber cassumunar* Roxb., Asiat. Res. 11: 347. t. 5. 1810; Roxb., Fl. Ind. 1: 48. 1820; Hook. *f.*, Fl. Brit. Ind. 6: 248. 1892; Prain, Beng. Pl. 2: 1045. 1903.

*Local name:*Bon aada.

Rhizome perennial, fleshy, aromatic, yellow inside. Leaves subsessile; ligule short, bilobed, pubescent; lamina linear-lanceolate, acute, base slightly rounded. Inflorescence basal, ovate; spike ovate, deep red. Calyx white, membranous. Style exserted well beyond anther-thecae and enfolded in a long anther-crest. Capsules ovoid; seeds purple.

Flowers & Fruits: June to August.

Specimen Cited: Murti, *Goutam & AP Das 0246*, dated 09. 02. 2009.

Local Distribution: All over the forests.

General Distribution: Native of India; Sri Lanka and Malay Penninsula.

Zingiber zerumbet (L.) Roscoe *ex* Smith in Exot. Bot.2:105.t.112.1804; Hook. *f.*, Fl. Brit. Ind. 6: 247. 1892; Prain, Beng. Pl. 2: 1045. 1903; Noltie, Fl. Bhutan 3(1): 188. 1994. *Amomum zerumbet* L., Sp. Pl. 1. 1753; Hook. *f.*, Fl. Brit. Ind. 6: 247. 1892.

Common name : Soti

Loosely tufted, rhizomatous perennial. Rhizomes fleshy, tuberous, aromatic, yellowish inside. Pseudostems to 1.5m, leafy through out. Leaves alternate, sessile; ligule membranous, 1.5 – 2cm, entire; lamina narrowlanceolate, 20 – 30 × 5 – 7 cm, glabrous above, minutely pubescent beneath, acuminate. Flowering shoots separately arising from rhizomes, by the leafy shoot; peduncle erect, 15 – 25 cm, bracteate. Inflorescences terminal, conical or oblong-elliptic, 7 – 10 × 2 – 3 cm, brownish yellow turning deep orange-red at maturity; bracts tightly packed and over-lapping ovate, glabrous, singly flowered, minutely mucronate. Flower and fruits not observed.

Flowers & Fruits: June to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0845*, dated 05. 06. 2009.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: India, Sri Lanka, Myanmar, Thailand, Laos, Vietnam, Malaysia, Cambodia.

Note : Grown for its showy inflorescence; rhizomes used medicinally used variously in bacterial diseases, as antihypertensive, stimulant, carminative etc.

Ceratophyllaceae Gray**,** Nat. Arr. Brit. Pl. 2: 395, 554. 1822; *nom. cons*.

CERATOPHYLLUM L., Sp. Pl. 2: 992. 1753.

Ceratophyllum demersum L., Sp. Pl. 2: 992. 1753; Hook. *f.* in Hook. *f.*, Fl. Brit. Ind. 5:639.1888; Prain, Beng. Pl. 2: 743. 1903. *Dichotophyllum demersum* (L.) Moench, Methodus 345. 1794. *Ceratophyllum cornutum* Rich. *ex* Gray, Nat. Arr. Brit. Pl. 2: 555. 1821.

Stems up to 3 m long, suspended in water. Leaves bright green, coarse textured; whorls 1.5 – 6 cm in diameter; segments linear to filiform, not inflated. Flowers 1–3 mm in diameter. Achenes dark green to reddish Br., smooth or slightly tuberculate, margins wingless and spineless, facial spines absent; basal spines or tubercles 2, straight or curved; terminal spine 1.5 – 14 mm.

Flowers & Fruits: August to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0076*, dated 06. 02. 2009.

Local Distribution: All over the marshy lands.

General Distribution: India: West Bengal, Assam, Sikkim, Bihar, Uttar Pradesh; Bhutan, Bangladesh.

Orchidaceae Jussieu, Gen. P1. 64. 1789.

Key to genera:

1a. Plants terrestrial …….. 2

1b.Plants epiphytic or lithophytic ……..…… 5

2a. Plants reed like, stem rigid, woody, 1 – 2.5 m tall .....…..… ***Arundina***

2b. Plants not as above, stem soft, if taller than 1 m then saprophytic 3

3a. Pollinia 8, in 2 groups ..... ***Phaius***

3b. Pollinia 4 ..... ……. 4

4a. Lip equalling or shorter than petals, epichile unlobed .....…… ***Goodyera***

4b. Lip well developed and exerted, epichile largely 2-lobed ..... ***Zeuxine***

5a. Growth of plants monopodial …… 7

5b. Growth of plants sympodial …….. ……. 6

6a. Cylindric pseudobulb present; plants arising from that pseudobulb ..... ***Cymbidium***

6b. Pseudobulb absent, plants arising directly from tough rhizomes ..... ***Dendrobium***

7a. Pollinia 4 or 8 ……..…….. 8

7b. Pollinia 2 ……..… 11

8a. Pollinia 4 …….. 9

8b. Pollinia 8 ……..…….. ***Eria***

9a. Inflorescences arising from base of pseudobulb ..... ***Bulbophyllum***

9b. Inflorescence terminal or lateral from the tip of pseudobulb 10

10a. Lip concave or saccate at base ..... …….. ***Pholidota***

10b. Lip not concave or saccate at base ..... ***Coelogyne***

11a. Pollinia 2 12

11b. Pollinia 4 ..... ***Acampe***

12a. Column with a distinct short or long foot 13

12b. Column without foot 14

13a. Leaves terete ..... ***Papilionanthe***

13b. Leaves flat ..... ***Aerides***

14a. Lip distinctly 3-lobed; pollinia attached by a short and broad stipe ..... ***Vanda***

14b. Lip simple unlobed; stipes long, slender, linear .... ***Rhynchostylis***

ACAMPE Lindley, Fol. Orchid. 4(Acampe): 1. 1853, nom. cons.

Acampe praemorsa (Roxb.) Blatt. *et* McCann in J. Bombay Nat. Hist. Soc. 35: 495. 1932. *Epidendrum praemorsum* Roxb., Pl. Corom. 1: 34 1795. *Acampe papillosa* (Lindl.) Lindl. in Fol. Orchid. Acampe 4: 2, no.5.1853; Tuyama in Hara, Fl. E. Himal. 2: 176. 1971; Hara *et al*., Enum. Fl. Pl. Nepal 1: 30. 1978; Hajra *et al*., Fl. Sikkim 1: 24. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 491. 2002. *Saccolabium*

papillosum Lindl. in Bot. Reg. 18: t. 1552. 1833; Hook.*f*., Fl. Brit. Ind. 6: 63. 1890; Prain, Beng. Pl. 2: 1022. 1903. *Gastrochilus papillosuum* (Lindl.) Kuntze, Revis. General Pl. 2: 661. 1891.

Monopodial evergreen epiphyte. Stem erect to sub-erect to decumbent, 5 – 20 cm tall; stem 4 – 6 mm thick, covered by old leaf sheaths, rooting from nodes piercing the sheaths, distantly branched below, leafy above. Leaves alternate opposite, jointed; lamina 10 – 15 × 1 – 2 cm, coriaceous, linear oblong. Inflorescence leaf opposed, racemose, 3 – 5 per stem. Peduncle sheathed with dry overlapping sheathes at base. Flowers odorant, 1.2 – 1.6 cm across, sepals and petals sub-equal 0.2 – 0.3 × 0.5 – 1 cm, petals slightly narrower, pale yellow to greenish cream with brick-Br. transverse stripes; lip fleshy, warty, white and fading to yellowish with age, blotched with fade pink, obscurely lobbed along margins and decurved apically, obovate; column short, thick.

Flowers & Fruits: October to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1851*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Myanmar, China, Thailand, Indochin and Vietnam.

AERIDES Loureiro, Fl. Cochinch. 2: 525. 1790.

Aerides multiflora Roxb., Pl. Corom. 3: 68, t. 217. 1820; Hook.*f*., Fl. Brit. Ind. 6:44. 1890; King *et* Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 212, t. 283. 1898; Prain, Beng. Pl. 2: 1020. 1903; Hara, Fl. E. Himal. 1. 425. 1966; Hara *et al*., Enum. Fl. Pl. Nepal 1: 31. 1978; Hajra *et al*., Fl. Sikkim 1: 26. 1996; Pears & Cribb, Fl. Bhutan 3(3): 493. 2002. *Aerides affine* Lindl., Gen. Sp. Orchid. Pl. 239. 1833. *Epidendrum geniculatum sensu* Buch.-Ham. ex Hook.*f*., Fl. Brit. Ind. 6: 45. 1890.

Pendent monopodial epiphyte. Stem 8 – 20 × 1 – 1.5 cm, basal portion densely covered with old, Br. distichous leaf sheaths. Aerial roots arising axillary or leaf opposed, fleshy. Leaves distichous, fleshy, oblong-linear, apex bilobed, 12 – 25 × 1.3 – 2 cm, channeled. Inflorescence raceme, 1 – 3, axillary from leafy portion of stem, pendent, 10 – 25 cm, densely many flowered, unbranched; peduncle sheathed, 5 – 10 cm, glabrous; floral bracts triangular-lanceolate, 5 – 8 mm. Flowers pink, showy, fragrant, ± 3 cm wide; pedicel and ovary ± 5 mm, pale pink; sepals oblong-elliptic, spotted with dark pink, 1.5 × 0.9 cm; petals ± similar, slightly larger, obtuse; lip similar in colour and texture, clawed, slightly 3-lobed, 1.5 × 1 cm, lateral lobes semi-circular; mid-lobe hastate-ovate, obtusely acute; spur short, 4 mm, compressed, porrect; column like a head of a bird, beaked, 2 – 3 mm, white. Capsule ovoid, 1.2 – 1.5 × 0.8 cm.

Flowers & Fruits: April to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1852*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam.

ARUNDINA Blume, Bijdr. 401. 1825.

Arundina graminifolia (Don) Hochr. in Bull. New York Bot. Gard. 6: 270. 1910; Hara, Fl. E. Himal. 1. 425. 1966; Hara *et al*., Enum. Fl. Pl. Nepal 1: 32. 1978; Das *et* Chanda in Trans. Bose Res. Inst. 51(4): 106. 1987; Hara *et al*.,Fl. Sikkim 1: 30. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 319. 2002. *Bletia graminifolia* Don, Prodr. Fl. Nepal 29. 1825. *Cymbidium bambusifolium* Roxb., Hort. Beng. 63. 1814; Fl. Ind. ed. 460. 1832. *Limnodorum graminifolium* Buch.-Ham. *ex* Don, Prodr. Fl. Nepal 30. 1825. *Arundina bambusifolia* (Roxb.) Lindl., Gen. Sp. Orchid. Pl. 125. 1831. *Arundina densa* Lindl. in Bot. Reg. 28: misc. 25, no.26. 1842.

Terrestrial, reed-like plants, 1 – 2.5 m tall. Stem rigid, woody, enclosed by leaf sheaths. Leaves distichous, alternate, linear lanceolate, acuminate, 9 – 18 × 1 – 2 cm; sheaths 2.5 – 4 cm. Inflorescence terminal raceme, 1 – 2 branched at base and paniculate, 5 – 20 cm, laxly 4 – 10 flowered, flowers opening in succession; floral bracts broadly ovate-triangular, 3 – 5 mm, sheathing at base. Flowers uniformly pink, large and showy, 4 – 5 cm across; pedicel and ovary 1.5 – 3 cm. Sepals similar, narrowly elliptic-lanceolate, 2.5 – 4 × 0.7 – 1 cm, acuminate; petals broadly ovate elliptic, spreading, 3 – 4 × 1.2 – 1.5 cm, acute to acuminate; lip simple, 4 – 6 × 2.5 – 3.5 cm, apical margin undulate, apex 2-lobed; disk with 2 (– 3) parallel lamellae; column slightly angular, 2 – 2.6 cm. Fruits ellipsoid.

Flowers & Fruits: February to November.

Specimen Cited: Gorumara, *Goutam & AP Das 1881*, dated 14. 06. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga; less common.

General Distribution: India, Myanmar, China, Sri Lanka, Thailand, Laos, Vietnam, Cambodia, Indonesia, Malaysia.

BULBOPHYLLUM Thouars, Hist. Orchid., Tabl. Esp. 3. 1822, nom. cons.

Key to species:

1a. Racemes lax or dense, cylindric …….....……. *B. crassipes*

1b. Racemes umbel or dense umbel like ……..... *B. spathulatum*

Bulbophyllum crassipes Hook.*f*., Fl. Brit. Ind. 5: 760. 1890; Pears *et* Cribb, Fl. Bhutan 3(3): 451. 2002. *Phyllorchis crassipes* (Lindl.) Kuntze, Revis. General Pl. 2: 677. 1891. *Bulbophyllum careyanum* var. *crassipes* (Hook. *f*.) Pradhan, Indian Orch.: Guide & Ident. & Cult. 2: 713. 1979.

Epiphyte with stout, creeping, rhizome, rooting from base of pseudobulbs. Pseudobulbs borne 2 – 2.5 cm apart, conical, 3 – 5 cm, 1 – 3 cm across. Leaf single, terminal; petiole 1 – 2 cm; lamina oblong, obtuse, slightly mucronate, 10 – 15 × 2 – 3.5 cm, fleshy or thickly leathery. Inflorescence cylindric raceme, arising laterally from base of pseudobulb, arching, 5 – 16 cm; raceme 2 – 8 cm, densely many flowered; peduncle stout, base with 3 to 4, swollen, 1.5 – 2 × 0.3 – 0.6 cm sheaths; floral bracts pale Br., ovate-lanceolate, acute, 4 – 6 mm. Pedicel and ovary 3 – 4 mm. Flowers 4 – 6 mm long, yellowish Br.; dorsal sepal oblong, obtuse rounded, concave, 5 – 5.5 × 2.6 – 3 mm; lateral sepals ovate-lanceolate, acute, much longer than dorsal sepal, 5 – 7.5 × 3 – 4 mm; petals obliquely triangular, 2 – 3 × 0.5 – 1 mm, margins irregularly denticulate; lip ligulate, longer than petals, fleshy, margin finely papillate, with 2 auricles on both basal sides; column 2.5 – 3 mm.

Flowers & Fruits: September to January.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1848*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, S China, Myanmar, Thailand, Malaysia.

Bulbophyllum spathulatum (Rolfe *ex* Cooper) Seiden *f.* in Bot. Tidsskr. 65: 347. 1970; Pears *et* Cribb, Fl. Bhutan 3(3): 476. 2002. *Cirrhopetalum spathulatum* Rolfe *ex* Cooper, Orchid Rev. 37: 106. 1929. *Cirrhopetalum bootanense sensu* Hook. *f.*, Fl. Brit. Ind. 5: 775. 1890.

Epiphyte with creeping, stout, 3 – 4 mm wide rhizome, rooting from base of pseudobulbs. Pseudobulbs borne 5 – 10 cm apart, narrowly cylindric-ovoid, 2 – 4 × 0.5 – 1cm. Leaf 1, terminal; petiole 0.8 – 1 cm, conduplicate; lamina oblong, obtuse, 5 – 10 × 1.5 – 2.5 cm, fleshy. Scape arising from base of

pseudobulb, 3 – 4.5 cm; inflorescence umbel, more than 20 flowered; peduncle with 4 to 5 sheaths; floral bracts oblong ovate, sub-acute, 0.7 – 1 cm. Pedicel and ovary 1 – 2 cm. Flowers purplish red, ± 1.5 cm long; dorsal sepal sub-obovate, 7 – 8 × 2 – 3 mm, apex sub-truncate, slightly mucronate; lateral sepals 1.3 – 1.6 cm, twisted near base, connate upto near apex forming a slipper-shaped synsepal; synsepal 9 – 11 mm wide, outer surface finely papillate, apex rounded; petals narrowly oblong lanceolate, falcate, obtuse, 4 – 5 × 0.5 – 1 mm, entire; lip recurved at a right angle, lanceolate, obtuse, glabrous, conduplicate in basal half; column 1 – 2 mm; stelidia 2, triangular.

Flowers & Fruits: March to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1841*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, S China, Myanmar, Thailand, Laos, Vietnam.

COELOGYNE Lindl., Coll. Bot. ad t. 33. 1821 ["Caelogyne"].

Coelogyne cristata Lindl., Coll. Bot.: sub. t. 33. 1821; Hooker *f.*, Fl. Brit. Ind. 5: 829. 1890; King *et* Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 133.t.184. 1898; Tuyama in Hara, Fl. E. Himal. 429. 1966; Hara *et al*.,Enum. Fl. Pl. Nepal 1: 36. 1978; Das *et* Chanda in Trans. Bose Res. Inst. 51(4): 110. 1987; Hara *et al*., Fl. Sikkim 1: 47. 1996; Pears *et.* Cribb, Fl. Bhutan 3(3): 332. 2002; *Cymbidium speciosissimum* Don, Prodr. Fl. Nepal 35. 1825. *Pleione speciosissima* (Don) Kuntze, Revis. Gen. Pl. 2: 681. 1891.

Rhizome rigid, branched, with leathery, scaly sheaths. Pseudobulbs oblong. Lamina linear lanceolate, 7 – 20 × 0.7 – 2 cm, papery, base attenuate to inconspicuous petiole, apex long acuminate. Inflorescence heteranthous, 9 – 13 cm, basal half embraced in sheaths; raceme 4 – 7 cm; floral bracts ovate lanceolate. Flowers white, rather large. Sepals lanceolate to oblong lanceolate, apex acute. Petals 9 – 12 mm wide; lip ovate, concave, 3 lobed; lateral lobes subovate, nearly entire; mid lobe broadly obovate, apex obtuse; column 22 – 30 mm, both sides winged; wings widened from base to apex, apex emarginate to sub-truncate.

Flowers & Fruits: March to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1846*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: General Distribution : Temperate Eastern Himalaya (Nepal to Bhutan) to NE India; S China.

CYMBIDIUM Swartz, Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 70. 1799.

Key to species:

1a. Column shorter than lateral lobes of lip ..... *C. aloifolium*

1b. Column longer than lateral lobes of lip ..... *C. bicolor*

Cymbidium aloifolium (L.) Sw. in Nova Acta Regiae Soc. Sci. Upsal. 6: 73. 1799; Hook.*f*., Fl. Brit. Ind. 6: 10. 1890; King *et* Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 189, t. 252. 1898; Hara *et al*., Enum. Fl. Pl. Nepal 1: 37. 1978; Hara *et al*., Fl. Sikkim 1: 51. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 259. 2002. *Epidendrum aloifolium* L., Sp. Pl. 2: 953. 1753.

Plants epiphytic, forming dense tuft. Pseudobulbs ovoid, bilaterally slightly compressed, enclosed in leaf bases, 5 – 10 × 3 – 5 cm. Leaves 4 – 6, jointed, oblong to linear lanceolate, 35 – 85 × 1.5 – 4 cm,

thickly leathery, apex obtuse, unequally 2 lobed. Inflorescence laxly 20 – 40-flowered, arising from within sheaths at base of pseudobulb. Flowers 4 – 5 cm across, slightly fragrant; pedicel and ovary 1 – 2.5 cm; sepals and petals pale to cream yellow, with a broad, central maroon Br. stripe; lip white to cream, with dense, maroon venation on lateral lobes and longitudinal maroon stripes on mid lobe. Sepals and petals sub-similar, spreading, narrowly oblong to elliptic, obtuse, 2 – 2.5× 0.5 – 0.8 cm; lip subovate, saccate at base, 3 lobed; lateral lobes acute, loosely clasping column; mid-lobe recurved; disk minutely papillate or puberulent, with 2 sigmoid ridges; column winged at apex, ± 1 cm. Capsule oblong-ellipsoid.

Flowers & Fruits: April to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1843*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Nepal, India, Bangladesh, Sri Lanka, Bhutan, Myanmar, China, Thailand, Laos, Vietnam, Indonesia, Malaysia, Cambodia.

Cymbidium bicolor Lindl., Gen. Sp. Orchid. Pl. 164. 1833; Hajra *et al*., Fl. Sikkim 1: 52. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 260. 2002. *Cymbidium crassifolium* Lindl., Gen. Sp. Orchid. Pl. 165. 1833. *Cymbidium mannii* Rchb.*f*., Flora 55: 274. 1872. *Cymbidium pendulum sensu* King *et.* Pantl. in Ann. Roy. Bot. Gard. (Calcutta) 8: 188, t. 251. 1898.

Plants epiphytic. Pseudobulbs narrowly ovoid, bilaterally slightly compressed, 3 – 5 × 2 – 3 cm, enclosed in leaf bases. Leaves 5 – 7, thickly leathery, narrowly oblong, acute, 30 – 60 × 1.5 – 3 cm, unequally 2 lobed, emarginate at apex. Inflorescence arising from within sheaths at base of pseudobulb, pendulous; rachis 10 – 20 flowered; floral bracts triangular, 1.5 – 4.5 mm. Pedicel and ovary 1 – 4 cm. Flowers lightly fragrant, 3 – 4 cm across; sepals and petals pale yellowish to whitish, with a central maroon stripe; lip cream yellow, spotted, striped with maroon. Sepals similar, spreading, narrowly oblong, obtuse to acute, 1.5 – 2 × ± 0.5 cm; petals narrowly oblong-elliptic, obtuse, 1.5 – 2 × ± 0.5 cm; lip sub-ovate, base slightly saccate, 3 lobed; mid lobe recurved; disk minutely papillate, pubescent; lateral lobes erect, clasping the column, column ± 1 cm, slightly curved. Capsule cylindric-ellipsoid.

Flowers & Fruits: March to January.

Specimen Cited: Gorumara, *Goutam & AP Das 1888*, dated 14. 06. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Nepal to Bhutan, NE India, Bangladesh, Myanmar, China, Thailand, Laos, Vietnam, Cambodia, Malaysia.

DENDROBIUM Sw., Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 82. 1799, nom. cons.

Dendrobium amoenum Wall. *ex* Lindl., Gen. Sp. Orchid. Pl. 78. 1830; Hook.*f.*, Fl. Brit. Ind. 5: 738. 1890; King *et.* Pantl. in Ann. Roy. Bot. Gard. (Calcutta) 8: 49. t 69. 1898; Hara *et al*., Enum. Fl. Pl. Nepal 1: 38. 1978; Das *et* Chanda in Trans. Bose Res. Inst. 51(4): 111. 1987; Hajra *et al*., Fl. Sikkim 1: 56. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 405. 2002. *Callista amoena* (Wall. *ex* Lindl.) Kuntze, Revis. General Pl. 2: 654. 1891.

Plant epiphytic or lithophytic, 20 – 45 cm tall. Stem tufted erect or pendent, slender, grooved, blackish green; internodes 2 – 5 cm, with dry, papery, tubular old leaf sheath. Leaves 5 – 10, arising alternate from nodes, sessile; lamina elliptic-ovate, lanceolate, acute to acuminate, 5 – 10 × 0.5 – 2 cm. Inflorescence lateral, on old leafless stem, arising from nodes, 2 – 4-flowered on a short panicle; rachis short, 3 – 5 mm, membranous sheathed; peduncle to 1.2 cm; floral bracts small, 5 – 8 mm,

ovate, acuminate, membranous. Flowers showy, scented, 3 – 4 cm across, sepals and petals white, often flushed with pink; pedicel and ovary 1 – 1.5 cm; sepals similar, oblong-lanceolate, obtuse to sub-acute, 2 – 2.5 × ± 0.6 cm, lateral sepals jointed at base to form a conical mentum to 6 mm; petals ovate, wider than petals; lip 3-lobed, 2 – 2.5 × 1 –1.5 cm, white with central olive-green densely hairy patch, margins undulate.

Flowers & Fruits: April to November.

Specimen Cited: Gorumara, *Goutam & AP Das 1889*, dated 14. 06. 2009.

Local Distribution: All over the Forest; abundant.

General Distribution: India, Bangladesh, Myanmar.

ERIA Lindley, Bot. Reg. 11: ad t. 904. 1825, nom. cons.

Eria lasiopetala (Willd.) Ormerod in Opera Botanica 124: 22. 1995; Pears *et* Cribb, Fl. Bhutan 3(3): 376. 2002. *Aerides lasiopetala* Willd., Sp. Pl. ed. 4(1): 130. 1805. *Dendro-bium albidotomentosum* Blume, Bijdr.: 345. 1825. *Octomeria flava* Wall. *ex* Lindl., Gen. Sp. Orchid. Pl. 65. 1830. *Eria flava* Lindl., Gen. Sp. Orchid. Pl. 65. 1830; Hook.*f.*, Fl. Brit. Ind. 5: 8011. 1890; Prain, Beng. Pl. 2: 1013. 1903. *Pinalia albidotomentosum* (Bl.) Kuntze, Revis. Gen. Pl. 2: 678. 1891.

Plants lithophytic or epiphytic, turning black when dried. Pseudobulbs tufted, contiguous, cylindric, 5 – 15 × 0.2 – 0.5 cm. Leaves 2, sub-terminal, sub-sessile; lamina narrowly elliptic to ovate-lanceolate, acute, 5 – 15 × 2.5 – 4.5 cm, thick, coriaceous. Inflorescence arising from apex of pseudobulb, between leaves, laxly 2 – 6-flowered; floral bracts linear lanceolate, 3 – 5 mm. Flowers 2.5 – 3 cm across, white, lip with lateral lobes dark purple and mid lobe yellow; pedicel and ovary 5 – 10 mm; sepals sub-similar, 1.5 – 2 × 0.5 – 0.7 cm; dorsal sepal elliptic-lanceolate, sub-acute; lateral sepals falcate-lanceolate, acute, adnate to the column foot; petals oblong lanceolate, acute, 1.5 – 2 × 0.5 – 1 cm; lip 3 lobed; lateral lobes divaricate, erect, rounded; mid-lobe oblong or subsquare, acute, deflexed with two large and few intermidiatery undulate yellow lamellae; column ± 5 mm. Capsule obovoid cylindric.

Flowers & Fruits: February to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1836*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, China, Myanmar, Thailand, Laos, Vietnam, Cambodia.

GOODYERA R. Br. in Aiton, Hortus Kew., ed. 2, 5: 197. 1813.

Goodyera procera (Ker Gawl.) Hook. *f*., Exot. Fl. 1(3): t. 39. 1823 & Fl. Brit. Ind. 6: 111. 1890; Prain, Beng. Pl. 2: 1027. 1903; King *et* Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 282, t. 278. 1898; Hara, Fl. E. Himal. 436. 1966; Hara *et al*., Enum. Fl. Pl. Nepal 1: 44. 1978; Das *et* Chanda in Trans. Bose Res. Inst. 51(4): 115. 1987; Hara *et al*., Fl. Sikkim 1: 76. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 92. 2002. *Neottia procera* Ker Gawl. in Bot. Reg. 8: t. 639. 1822. *Orchiodes procerum* (Ker Gawl.) Kuntze, Revis. General Pl. 2: 675. 1891.

Plant to 90 cm; stem leaved for ¼ below and sheathed for ¾ above; leaves 5 – 8, 10 – 15 × 4 – 5 cm, acute, 5 veined, mid vein distinct, petiolate; petioles lower shorter upper longer, to 4 cm, tubular at base; lower sheath longer, larger and tubular, upper smaller and not tubular but triangular attached to one side of peduncle. Inflorescence dense, to 20 cm, flowering down to upwards, successively, lowest ovary becomes fruit when upper ones flower; peduncle and rachis pubescent ; floral bracts hairy and ciliate, exceeding ovary, acute, 9 – 10 mm; flowers ± 5 mm across, ovary glabrous only warty, 6 – 7 mm; sepals pubescent externally, white, greenish at base; lateral sepals spreading little, reflexed

little, 3.5 × 1.5 mm; dorsal sepal boat-shaped, forming wing like appearance with petals; petals thin, lathery, white, 3 × 1 mm; lip white, thick, simple hypochile hairy inside, light Br., adnate to column base, 3.5 × 3 mm, deflexed; column 2.5 mm; anther brick red at maturity; fruit not twisted, 1 cm, globose green.

Flowers & Fruits: April to August.

Specimen Cited: Gorumara, *Goutam & AP Das 1893*, dated 14. 06. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bangladesh, China, Myanmar, Sri Lanka, Japan, Thailand, Laos, Vietnam, Cambodia, Indonesia, Philippines.

PAPILIONANTHE Schlechter, Orchis 9: 78. 1915.

Papilionanthe teres (Roxb.) Schltr. in Orchis 9:78, t.12.1915; Hara *et al*., Fl. Sikkim 1: 98. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 536. 2002. *Dendrobium teres* Roxb., Fl. Ind. ed. 1832, 3: 485. 1832. *Vanda teres sensu* Lindl., Gen. Sp. Orchid. Pl. 217. 1833, non Roxb. 1932; Hook.*f.*, Fl. Brit. Ind. 6: 49. 1890; Prain, Beng. Pl. 2: 1021. 1903.

Plant scrambling, monopodial epiphyte. Stems branched, erect and stout, 0.5 – 3 m, terete, 3.5 – 4.5 mm wide, covered with ridged, tubular leaf-sheathes. Leaves obliquely borne, 4 – 10 cm apart, slightly curved, fleshy, jointed, terete and linear, obtuse, 5 – 15 cm × 3 – 4 mm. Inflorescence laxly 3 – 5-flowered, borne leaf-opposed; peduncle 5 – 10 cm, stout and woody, sub-erect; floral bracts broadly ovate, obtuse, 4 – 5 × 1 – 1.5 mm. Flowers large and showy, 5 – 8 cm across, pedicel and ovary 2 – 3 cm; sepals white; dorsal sepal broadly ovate, obtuse, 3.3 – 3.7 × 2.8 – 3 cm; lateral sepals obliquely ovate-oblong, obtuse, slightly smaller than dorsal; petals white tinged with pink, broadly oblong to sub-orbicular, rounded, margins undulate, 3 – 4.5 ×2.7 – 3.5 cm; lip deep purplish-pink above, base and spur yellowish Br. with dark dotted lines; 3-lobed; lateral lobes erect and embracing column, sub-obovate, rounded; mid-lobe 2 – 2.5 cm, spreading, deeply bilobed at apex; spur conical, compressed, ± 2 cm long; column erect, 7 – 8 mm. Fruits ridged, cylindric.

Flowers & Fruits: May to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0251*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Nepal, India, Bhutan, Bangladesh, China, Myanmar, Thailand, Vietnam.

PHAIUS Loureiro, Fl. Cochinch. 2: 517, 529. 1790.

Phaius tankervilleae (Banks) Bl., Mus. Bot. 2: 177. 1856; Hara *et al*., Fl. Sikkim 1: 101. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 305. 2002. *Limnodorum tankervilleae* Banks *ex* L'Heritier, Sert. Angl.: 28. 1789. *Phaius veratifolius* Wall. *ex* Lindl., Gen. Sp. Orchid. Pl. 127. 1831.

Plants 0.5 – 1.2 m. Pseudobulb ovoid-conic, 5 – 10 × 2 – 5 cm. Leaves 4 – 6, arising from pseudobulb clothing it, petiolate to 10 – 20 cm, elliptic-lanceolate, weakly plicate, acuminate, 25 – 70 × 5 – 15 cm. Inflorescences arising from top of pseudobulb above leaves, laxly 7 – 18-flowered; peduncle laxly shethed, stout, 30 – 50 cm; floral bracts persistent, ovate lanceolate, 4 – 5 × 0.7 – 1.2 cm. Flowers widely opening, large and showy, 9 – 12 cm across; pedicel and ovary glabrous, 3 – 4 cm; sepals and petals more or less alike, pale to dark brownish yellow inside, white outside, sub-similar, oblong-elliptic or lanceolate, acute to acuminate, 4 – 6 × 1 – 1.5 cm; lip rolled, spurred, yellowish purple to pinkish purple, basally whitish, apically darker, shallowly 3 lobed, margin faintly undulate, recurved, apex bilobed, truncate or apiculate; spur slightly curved, white, conic, 0.5 – 1.5 cm, apex obtuse or often bilobed; column 2 cm. Fruit ellipsoid.

Flowers & Fruits: February to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1830*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Nepal, India, Sri Lanka, China to SE Asia to Pacific Islands, Australia.

PHOLIDOTA Lindl. *ex* Hook. *f,* Exot. Fl. 2: ad t. 138. 1825.

Pholidota articulata Lindl., Gen. Sp. Orchid. Pl. 38. 1830; Hook.*f*., Fl. Brit. Ind. 5: 844. 1890; Hara *et al*., Fl. Sikkim 1: 102. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 349. 2002. *Pholidota khasyana* Rchb.*f*. in Bonplandia 4: 329. 1856. *Coelogyne articulata* (Lindl.) Rchb.*f*. in Walpers, Ann. Bot. Syst. 6: 238. 1861. *Pholidota griffithii* Hook. *f.*, Icon. Pl.: t. 1881. 1889 & Fl. Brit. Ind. 5: 842. 1890. *P. obovata* Hook. *f*., Fl. Brit. Ind. 5: 845. 1890.

Plant epiphytic. Pseudobulbs superposed, connected to each other at end to end or new pseudobulb borne on the top of previous one, some times branched, cylindric, sheathed basally, 3 – 8 × 0.6 – 1 cm. Leaves 2, at apex of new pseudobulb, petiolate portion hidden within sheathes; lamina obovate-elliptic to oblong, 5 – 12 × 1.5 – 3 cm, veins plicate, acute to acuminate. Inflorescence syananthus, borne at apex of new pseudobulb, between the leaves, 10 – 25 flowered; peduncle wiry, 1.5 – 3.5 cm; rachis slightly zigzag, 3 –7 cm; floral bracts deciduous during flowering, narrowly ovate oblong, papery, 0.5 – 1 × 0.3 – 0.6 cm. Flowers greenish to creamy white, widely opening, 0.9 – 12 cm across; sepals uniformly creamy white; dorsal sepal oblong to ovate-elliptic, concave, obtuse, 4 – 7 × 2 – 3 mm; lateral sepals ovate, oblique, slightly wider than dorsal sepal, acute; petals uniformly creamy white, oblong lanceolate, obtuse to acute, slightly smaller than sepals; lip creamy white with yellow hypochile and linings, broadly oblong in outline, constricted at the middle; hypochile boat shaped, 5-yellow-keeled, 3 – 5 × 2 – 4 mm; epichile transversely elliptic, 2-lobed, margin crisped/ papillose, whitish; column stout, winged. Fruit ellipsoid.

Flowers & Fruits: April to October.

Specimen Cited: Medlajhora, *Goutam & AP Das 0251*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Nepal, Bhutan, China, Myanmar, Thailand, Cambodia, Indonesia, Laos, Malaysia, Vietnam.

RHYNCHOSTYLIS Bl., Bijdr. 285 [“Rynchostylis”], 434. 1825.

Rhynchostylis retusa Bl., Bijdr.: 286, t. 49. 1825; Hook.*f*., Fl. Brit. Ind. 6: 32. 1890; Prain, Beng. Pl. 2: 1020. 1903; Hara *et al*., Fl. Sikkim 1: 109. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 552. 2002. *Epidendrum retisum* L., Sp. Pl. 2. 953. 1753. *Aerides undulatum* Sm. in Rees, Cycl. (Addenda) 39: Aerides no. 12. 1819. *Epidendrum hippium* Buch.-Ham. *ex* Don, Prodr. Fl. Nepal 32. 1825. *Sarcanthus guttatus* Lindl. in Bot. Reg. 17: t. 1443. 1831.

Epiphytic. Stems ascending, usually 4 – 15 cm, 1 – 1.5 cm across, enclosed in old leaf bases. Leaves broadly lorate, 20 – 35 × 2 – 4 cm, unequally bilobed at apex. Inflorescences 1 to 3, pendulous, 25 – 40 cm, densely many flowered; rachis 18 – 30 cm, thick; floral bracts reflexed, broadly ovate, 3 – 5 mm. Flowers scentless, 2 – 2.5 cm across, sepals and petals white with pink spotted, lip purplish pink, apex white, spur white; pedicel and ovary 8 – 11 mm; dorsal sepal elliptic, 8 – 12 × 4 – 5 mm, obtuse; lateral sepals obliquely oblong, obtuse, 7 – 14 × 4 – 5 mm, base adnate to column foot; petals narrowly oblong, 7 – 8 × 2 – 3 mm, obtuse; lip often conduplicate, oblong-spatulate, rounded, apiculate, 8 – 12 × 5 – 7 mm, spurred; spur laterally compressed, rounded; column 3 – 4 mm, foot 1 – 2 mm. Capsule obovoid.

Flowers & Fruits: May to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0251*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: General Distribution : Nepal, Bhutan, India, Myanmar, Sri Lanka, China, Cambodia, Laos, Malaysia, Thailand, Indonesia, Philippines, Vietnam.

VANDA Jones *ex* R. Br., Bot. Reg. 6: ad t. 506. 1820.

Vanda cristata Lindl., Gen. Sp. Orchid. Pl.216.1831; Hook.*f*., Fl. Brit. Ind. 6: 53. 1890; King *et* Pantling in Ann. Roy. Bot. Gard. Cal.8: 216 -287. 1898; Hajra *et al*., Fl. Sikkim 1: 118. 1996; Pears *et* Cribb, Fl. Bhutan 3(3): 574. 2002. *Aerides cristata* (Wall. ex Lindl.) Wall. *ex* Hook. *f*., Fl. Brit. India 6: 53. 1890. *Vanda striata* Rchb.*f*., Xenia Orchid. 2: 137 1868.

Epiphytic orchid. Stems 15 – 20 cm, covered by old leaf sheaths. Leaves distichous, overlapping; lamina thickly coreaceous, apex obliquely 2 or 3-dentate, 7 – 15 × 0.7 – 1.2 cm. Inflorescences 1 to 3, borne from axils of lower leaves, 2 – 4-flowered; rachis weakly zigzag; floral bracts ovate, obtuse to acute, 3 – 5 × 1.5 – 2 mm. Flowers thickly textured, widely opening, 4 – 5 cm across; pedicel and ovary 2 – 3 cm, yellowish green; sepals and petals uniformly pale yellowish green; dorsal sepal oblong ovate, 2 – 2.5 × 0.5 – 0.8 cm, obtuse; lateral sepals lanceolate, sub-acute, ± similar to dorsal; petals falcate oblong, sub-acute, narrower than sepals; lip golden cream white, fleshy, saccate basally, striped with dark violet purple to red Br., 3-lobed; lateral lobes erect, short, ovate triangular, obtuse; mid-lobe broadly oblong, apex keeled beneath, bifurcated into two horn-like processes; column white, 5 mm; anther cap yellow. Fruit cyllindric-obovoid.

Flowers & Fruits:March to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1845*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, S China, N Vietnam.

ZEUXINE Lindl., Orchid. Scelet. 9. 1826 [“Zeuxina”], nom. cons.

Zeuxine nervosa (Wall. *ex* Lindl.) Benth. *ex* Clarke in Jour. Linn. Soc. Bot, 25: 73. 1889; Pears *et* Cribb, Fl. Bhutan 3(3): 111. 2002. *Monochilus nervosus* Wall. *ex* Lindl., Gen. Sp. Orchid. Pl. 487. 1840. *Haplochilus nervosus* (Wall. ex Lindl.) Dietrich, Syn. Pl. 5: 172. 1852. *Zeuxine formosana* Rolfe, Ann. Bot. (Oxford) 9: 258. 1895.

Plants terrestrial, 10 to 30 cm. Rhizome stem-like, prostrate. Stem erect glabrous. Leaves 6 – 8, scattered, shortly petiolate; sheath tubular; lamina elliptic, ovate, acute, 2.5 – 7 × 1.5 – 2.3 cm, slightly fleshy, coriaceous, green, midrib whitish. Inflorescence terminal, laxly 10 – 20-flowewed, Peduncles densely pubescent; floral bracts green, ovate-lanceolate, acuminate, 8 – 10 × 3 – 4 mm, pubescent, equaling ovary. Rachis hairy. Flowers resupinate, only lateral sepals and lip open, green, lip white; pedicel and ovary 8 – 10 mm, pubescent. Sepals green, pubescent outside; dorsal sepal ovate, concave, acute, 4.5 – 5 × 4 – 4.5 mm; lateral sepals oblong-ovate, 5.5 – 6.5 × 3.5 – 4 mm; petals green below flushed white apically white, ovate, obtuse, oblique, 5 – 7 × 3 – 3.5 mm, glabrous; lip white, Y-shaped, 6 – 7 mm; hypochile saccate, with 3 parallel calli, green; epichile broad, 2-lobed; lobes diverging, sub-quadrate to sub-orbicular.

Flowers & Fruits: January to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1844*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bangladesh, Sri Lanka, Cambodia, Laos, Taiwan, China, Japan, Thailand, Vietnam, Philippines.

Eudicots - Eudicotyledon

Peripheral Eudicots - Periphere Eudicotyledonen

Unassigned to order - Ohne Ordnungseinteilung

Order 24: Ranunculales Dumort. (1829)

Menispermaceae Juss. Gen. Pl. 284. 1789; *nom. cons*.

Key to the genera:

1a. Main basal veins and their outer branches leading directly to margin …….. 2

1b. Main basal vein and their outer branches are not leading to margin …….. 3

2a. Sepals 6 in 2 whorls ……... *Tinospora*

2b. Sepals 8–12 in 3 or 4 whorls ..... *Pericampylus*

3a. Flowers and fruits in pedunculate umbel-like cymes, sometimes forming a terminal thyrse ….....…. *Stephania*

3b. Flowers and fruits in a simple cymes, sometimes racemelike .....…… *Cissampelos*

CISSAMPELOS L., Sp. Pl. 2: 1031. 1753.

Cissampelos pareira L., Sp. Pl. 1031. 1753; Kanai in Hara, Fl. E. Himal. 1: 94. 1966; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 336. 1984; Prain, Beng. Pl. 1: 208. 1903. *Cissampelos argentea* Kunth, Nov. Gen. Sp. 5: 67. 1821. *Cissampelos pareira* L. var. *hirsuta* (Buch.–Ham. *ex* DC.) Forman in Kew Bull. 22: 356. 1968.

Woody vines. Branches slender, striate, usually densely pubescent. Petioles shorter than lamina; leaf blade cordate-rotunded to rotunded, 2 – 7 cm long and wide, papery, abaxially densely pubescent, adaxially sparsely pubescent, base often cordate, sometimes subtruncate, rarely slightly rounded, apex often emarginate, with a mucronate acumen, palmately 5 – 7 veined. Male inflorescences axillary, solitary or few fascicled, corymbose cymes, pubescent. Female inflorescences thyrsoid, narrow, up to 18 cm, usually less than 10 cm; bracts foliaceous and suborbicular, overlapping along rachis, densely pubescent. Female flowers: sepals broadly obovate; petals minute. Drupes pubescent; endocarp broadly obovate.

Flowers & Fruits: August to January.

Specimen Cited: Murti, *Goutam & AP Das 0032*, dated 05. 02. 2009.

Local Distribution: All over the forests; common.

General Distribution: Pantropical in Asia.

STEPHANIA Lour., Fl. Cochinch. 2: 598, 608. 1790.

Key to the species:

1a. Perianth in female flowers asymmetrical …….....…… *S. glabra*

1b. Perianth in female flowers symmetrical …….....…… *S. japonica*

Stephania glabra (Roxb.) Miers, Ann. Mag. Nat. Hist., ser. 3 18: 14. 1866; Contrib. Bot. 3: 217. 1817; Hara, Fl. E. Himal. 2: 36. 1971;Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 336. 1984; Sharma *et al*., Fl. Ind. 1: 334. 1993. *Cissampelos glabra* Roxb., Fl. Ind. 3: 840. 1832. *Stephania rotunda* Lour., Fl. Cochinch. 608. 1790.

Local name: Bhuin Kumra.

Rootstock often tuberous. Lamina ovate or suborbicular, acute or subacute, base rounded, glabrous. Inflorescence usually axillary; pedunculate umbel-like cymes or discoid heads, these often in compound umbels, sometimes forming a terminal thyrse peduncles umbels slender in male, generally stouter in female; Perianth in female flowers asymmetric. Fruits suborbicular, reddish on ripening.

Flowers & Fruits: April to July.

Specimen Cited: Murti, *Goutam & AP Das 0098*, dated 07. 02. 2009.

Local Distribution: All over the forest areas; common.

General Distribution: India: Arunachal Pradesh, Assam, Manipur, Nagaland, Tropical Himalayas, Western Peninsula; Nepal, Bhutan, Bangladesh, China.

Note: Undergroun stem used as medicin.

Stephania japonica (Thunb. *ex* Murray) Miers, Ann. Mag. Nat. Hist. ser. 3, 18: 14. 1866; Kanai in Hara, Fl. E. Himal. 1: 95. 1966; Hook. *f. et* Thom. in Hook. *f*., Fl. Brit. Ind. 1: 103. 1872; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 337. 1984; Sharma *et al*., Fl. Ind. 1: 335. 1993; *Menispermum japonicum* Thunb. *ex* Murray, Syst. Veg., ed. 14: 892. 1784.

Local name: Chhoto Bhuin kumra.

Slender twiner. Lamina deltoid, acuminate, rounded, entire, sparsely pubescent beneath. Umbels axillary; male flowers sessile in dense capitate clusters; sepals oblanceolate, petals obovate; female inflorescence a pedunculate umbel-like cyme or discoid heads, these often in compound umbels, sometimes forming a terminal thyrse; female flowers similar to male; perianth in female flowers symmetric. Fruits suborbicular, red on ripening.

Flowers & Fruits: May to December.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0518*, dated 23. 07. 2009.

Local Distribution: All over the forest areas; common.

General Distribution: Tropical to temperate regions of Asia and Africa.

Note: Under ground stem and arial branch used as medicin.

TINOSPORA Miers, Ann. Mag. Nat. Hist., ser. 2, 7: 35, 38. 1851, *nom. cons*.

Tinospora cordifolia (Willd.) Miers in Ann. Mag. Nat. Hist., ser. 2 7: 35, 38. 1851. *Menispermum cordifolium* Willd., Sp. Pl. 4: 826. 1806. *Tinospora cordifolia* (Willd.) Hook. *f. et* Thom., Fl. Indica. 184. 1855; Hook. *f. et* Thom. in Hook. *f.*, Fl. Brit. Ind. 1: 97. 1872; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 335. 1984; Sharma *et al*., Fl. Ind. 1: 347. 1993.

Local name: Gulancha.

Large twiner with long slender (thread-like) arial roots. Lamina broadly ovate, abruptly acuminate, base cordate, glandular domatia in veins axils on lower surface, otherwise glabrous. Male flowers in few-flowered clusters, female flowers borne singly along axis. Outer sepals ovate in male, inner elliptic; petals obovate. Female flowers with sepals and petals similar to male; staminodes linear, carpels ellipsoid. Drupes red.

Flowers & Fruits: January to May.

Specimen Cited: Budhuram, *Goutam & AP Das 0551*, dated 24. 07. 2009.

Local Distribution: All over the forest areas; abundant.

General Distribution: India, Sri Lanka, Bangladesh and Myanmar.

Note: Often cultivated as medicinal plants.

PERICAMPYLUS Miers, Ann. Mag. Nat. Hist., ser. 2, 7: 36, 40. 1851, *nom. cons*.

Pericampylus glaucus (Lam.) Merr., Interpr. Rumph. Herb. Amboin. 219. 1917; Kanai in Hara, Fl. E. Himal. 1: 95. 1966; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 336. 1984; Sharma *et al*., Fl. Ind. 1: 330. 1993. *Menispermum glaucum* Lam., Encycl. Meth. 4: 100. 1797. *Pericampylus formosanus* Diels, Pflanzenr. IV.94: 221, f. 75, 221. 1910.

Base with a globose woody tuber. Lamina triangular-ovate to triangular-oblong, base subtruncate to cordate, rarely broadly cuneate, margin crenate or subentire, apex obtuse or rounded, rarely mucronate, apiculate. Inflorescences corymbose cymes. Drupes red or purple.

Flowers & Fruits: Apirl to October.

Specimen Cited: Murti, *Goutam & AP Das 0254*, dated 10. 02. 2009.

Local Distribution: All over the forest areas; common.

General Distribution: India: Eastern Himalaya, West Bengal, Assam; Bhutan, Myanmar, China, Thailand, Taiwan, Japan, Malaysia.

Papaveraceae Juss., Gen. Pl. 235. 1789; *nom. cons*.

Key to the Genera:

1a. Spinescent stem with yellow latex, lamina prickly on lower surface ……..... ***Argemone***

1b. Stem spineless with watery latex, lamina prickle less …… ***Fumaria***

ARGEMONE L., Sp. Pl. 1: 508. 1753.

Argemone mexicana L., Sp. P1. 1: 508. 1753; Hara, Fl. E. Himal. 1: 103. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 402. 1984; Hook. *f. et* Thoms. in Hook. *f*., Fl. Brit. Ind. 1: 117.1872; Prain, Beng. Pl. 1: 215.1903; Sharma *et al*., Fl. Ind. 2: 2. 1993; Hajra *et al*., Fl. West Beng. 1: 405, 1997. *Argemone mexicana* var. *lutea* Kuntze, Revis. Gen. Pl. 1: 12. 1891. *Argemone vulgaris* Spach in Hist. Nat. Veg. 7: 26. 1839. *Argemone spinosa* Gaterau, Descr. Pl. Montauban 99. 1789.

***Local name*:** Shiyal Kanta.

Annuals, 40 – 90 cm high, much spinescent with yellow latex. Leaves sessile, elliptic – obovate, cordate, pinnatifid, 2 –18 x 1.5 8 cm; segments dentate, spiny along margins, glaucous green, prickly on lower surface, smooth above. Flowers in terminal cluster, bright yellow, 3 – 6 cm in diameter, sessile. Sepals elliptic, 8 –15 x 6 – 9 mm, prickly out side. Petals 4 –6, imbricate, obovate. Stamens many, 9 –10 mm long, filaments yellow, anthers 2 mm, yellow. Ovary ovoid, 10 –12 x 3 –5 mm. Capsules oblong; seeds many, deeply reticulate, blackish Br..

Flowers & Fruits: February to July.

Specimen Cited: Medlajhora, *Goutam & AP Das 0294*, dated 10. 02. 2009.

Local Distribution: In open areas; less common.

General Distribution: Throughout India. Native of tropical America.

FUMARIA L., Sp. Pl. 2: 699. 1753; Gen. Pl. ed. 5, 314, 1754.

Fumaria indica (Hassk.) Pugsley, J. L. Soc. Bot. 44: 313. 1919; Long in Grierson *et* Long, Fl. Bhut. 1(2): 384. 1984; *Fumaria vaillantii* Loisel var. *indica* Hassk.., Fl. Ind. 56: 443. 1873; *Fumaria parviflora sensu* Wight *et* Arn., Prodr. 1: 18. 1834; Prain, Beng. Pl. 1: 143. 1963; Sharma *et al*., Fl. Ind. 2: 34. *Fumaria parviflora* var. *indica* (Haussk) Parsa, Fl. Iran 2: 490. 1986. *Fumaria vaillantii* Loisel. in Desv., Jour. de Bot. 2: 358. 1809; Hara, Fl. E. Himal. 1: 104. 1966.

Small, erect much branched herbs. Stem glabrous, much branched, grooved. Leaves decompounds, multifid, glaucus, 3 x 2 cm; ultimate lobes flat, narrowly linear to linear – lanceolate, entire, acute, mucronate. Flowers pink in a 18 – 22 flowered racemes; bracts lanceolate, acuminate, equal, membranous. Sepal lanceolate, caduceus. Filament connate. Ovary glabrous; style slender.

Flowers & Fruits: December to March.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0331*, dated 21. 07. 2009.

Local Distribution: In open and moist places in Murti and Dhupjhora Beat office garden; common.

General Distribution: India: West Bengal, Assam, Bihar, Orissa, Uttar Pradesh, Punjab, Haryana, Maharastra, Karnataka, Tamilnadu; Bhutan, Nepal, Bangladesh, Pakistan to West Asia.

Ranunculaceae Juss., Gen. Pl. 231. 1789; *nom. cons*.

Key to the Genera:

1a. Climbing shrubs. Leaflets reniform to broadly ovate …..... ***Naravelia***

1b. Annual herbs leaflets ovate …….....…… ***Ranunculus***

NARAVELIA Adanson, Fam. Pl. 2: 460, 581. 1763, *nom. et orth. cons*.

Naravelia zeylanica (L.) DC., Syst 1: 167, 1817; Hara, Fl. E. Himal. 1: 89. 1966; Hajra *et al*., 1: 127, 1997; Prain, Beng. Pl. 1: 124,1963; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 291. 1984. *Atragene zeylanica* L., *Sp. Pl. 1: 542. 1753. Naravelia pilulifera* var. *yunnanensis* Y. Fei, Acta Bot. Yunnan. 19(4): 406. 1997.

Local name: Chhagalbanti.

Climbing shrubs. Leaves alternate, leaflets ovate, 8 – 10 x 5 – 7cm, acuminate, base cordate, glabrous above but densely pubescent beneath. Flowers on branched panicles, numerous. Sepals elliptic, densely appressed pubescent. Petals spathulate, greenish yellow. Achenes hairy, stalked.

Flowers & Fruits: November to January.

Specimen Cited: Murti, *Goutam & AP Das 0014*, dated 05. 02. 2009.

Local Distribution: All over the forest areas; common.

General Distribution: India: Tropical and sub tropical parts; Nepal, Bhutan, Bangladesh, Myanmar, China.

RANUNCULUS L., Sp. Pl. 1: 548. 1753.

Ranunculus sceleratus L., Sp. Pl. 1: 551. 1753; H. Hara in Hara, Fl. E. Himal. 2: 32. 1971; Hooker *f. et* Thomson in Hooker *f*., Fl. Brit. Ind. 1:19.1872; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 303. 1984; Sharma *et al*., Fl. Ind. 1:128.1993; Bora *et* Kumar, Flor. Div. Ass. 38. 2003. *Ranunculus holophyllus* Hance, Ann. Sci. Nat., Bot., sér. 4 5: 220. 1861. *Ranunculus oryzetorum* Bunge, Enum. Pl. China Bor. 2. 1833.

Rosette annual herbs. Roots fibrous. Stems up to 60 cm, glabrous, much branched above. Basal leaves 5 – 13; petiole 2 – 10 cm; blade 3-partite, pentagonal, reniform to broadly ovate, base broadly cordate, central lobe cuneate to rhombic, 3-lobed; lateral lobes obliquely broadly obovate to obliquely cuneate. Compound monochasium terminal, corymbose; bracts leaflike. Reeptacle glabrous. Sepals 5, ovate-elliptic. Petals 5, obovate, yellow, apex rounded. Stamens 10 – 19; anthers ellipsoid. Aggregate fruit cylindric; carpels numerous.

Flowers & Fruits: May to November.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0026*, dated 05. 02. 2009.

Local Distribution: Marginal side of the beel.

General Distribution: India: tropical and subtropical part of the country; Bhutan, Nepal, Afghanistan, Japan, Kazakhstan, Korea, N Pakistan, Russia (Siberia), Thailand, SW Asia, Europe, North America.

Core-Eudicots, non-Rosid, non-Asterid

Unassigned to order - Keine Ordnungseinteilung

Dilleniaceae Salisb. in W. Hooker Parad. Lond. 2(1): t. 73. 1807.

Key to the genera

1a. Woody climbers ..... ***Tetracera***

1b. Large trees ..... ***Dillenia***

DILLENIA L., Sp. Pl. 1: 535. 1753.

Key to the species

1a. Flowers solitary; flower buds and fruits more than 5 cm in diametre; carpels 14–20 ..... *D. indica*

1b. Flowers 2–7 in fascicles or racemes; flower buds and fruits less than 5 cm in diametre; carpels 5 ..... *D. pentagyna*

Dillenia pentagyna Roxb., Pl. Corom. 1: 21. t. 20. 1795; Clarke in Hooker *f*., Fl. Brit. Ind. 1: 38. 1872; FI 1: 156. 1993; Grierson ***et*** Long, Fl. Bhut. 1(2): 355. 1984. *Colbertia augusta* Wall. *ex* G.Don, Gen. Hist. 1: 77. 1831. *Colbertia coromandelina* DC., Syst. Nat. 1: 435. 1817. *Dillenia augusta* Roxb., Fl. Ind. 2: 652. 1832. *Dillenia hainanensis* Merr., Lingnan Sci. J. 13: 64. 1934.

Local name: Tertary.

Deciduous tree, up to 20m. Leaves simple, alternate, exstipulate; lamina obovate, 27 – 45 x 10 – 20 cm, serrate, obtuse, base cuneate. Flowers actinomorphic, bisexual, 2–7 in fascicles or racemes on older branches; buds less than 5 cm in diametre. Sepals 5, imbricate, persistent, ovate, reddish, acute. Petals free, imbricate, deciduous, obovate, yellow, rounded at apex. Stamens in 2 series, the outer numerous. Carpels 5, oblong. Fruits less than 5 cm in diameter; pseudocarp orange, 1 – 2 seeded, seeds ovoid, black, glabrous.

Flowers & Fruits: March to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0695*, dated 14. 02. 2008.

Local Distribution: All over the forests; abundant.

General Distribution: India: tropical part throughout; Myanmar, China, Vietnam.

Note: Leaves are good fodder.

Dillenia indica L., Sp. Pl. 1: 535. 1753. Grierson & Long, Fl. Bhut. 1(2): 355. 1984; *Dillenia elongata* Miq., Fl. Ned. Ind. 1(2): 12. 1858. *Dillenia indica* f. *elongata* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 79. 1868.

Local name: Chalta.

Evergreen tree, up to 20m. Leaves simple, alternate, exstipulate; lamina elliptic to oblanceolate, 2 0 – 35 x 6 – 15 cm, serrate, acute, base attenuate. Flowers actinomorphic, bisexual, solitary, terminal; buds more than 5 cm in diametre. Sepals 5, imbricate, persistent, obovate. Petals free, imbricate, deciduous, obovate, white, rounded at apex. Stamens in 2 series, the outer numerous; anther opening by apical pores. Carpels 14 – 20, styles white, narrowly oblanceolate, flattened. Fruits more than 5 cm in diametre; pseudocarp yellowish green, each with 5 seeds embedded in pulp, seeds reniform, reddish.

Flowers & Fruits: February to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0666*, dated 13. 02. 2008.

Local Distribution: All over the forests; abundant.

General Distribution: India: tropical part throughout; Bhutan, Myanmar, China.

Note: Fruits are edible and also good fodder.

TETRACERA L., Sp. Pl. 1: 533. 1753.

Tetracera sarmentosa (L.) Vahl, Symb. Bot. 3: 70. 1794. *Seguieria asiatica* Lour., Fl. Cochinch. 1: 341. 1790. *Tetracera asiatica* (Lour.) Hoogl. in Fl. Males. Bull. 1(4): 143. 1951. *Tetracera levinei* Merr. in Philipp. J. Sci. 13(3): 147. 1918. *Delima sarmentosa* L., Gen. Pl., ed. 5, App. 1754.

Evergreen woody climbers up to 20m. Leaves simple, alternate, lamina orbicular, 4 – 9 × 2 – 4 cm, finely serrate distally, apex acute, base broadly cuneate or approximately rounded, leathery. Panicles terminal, many flowered; peduncle pubescent, zigzag. Sepals 5, free, broadly ovate, unequal, persistent in fruit, apex obtuse, glabrous, ciliate. Petals 3, white, ovate, as long as sepals. Stamens numerous. Carpels 1, glabrous; style longer than stamens. Follicles orange, pericarp thinly leathery, with persistent style. Seed 1, black.

Flowers & Fruits: April to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0696*, dated 14. 02. 2008.

Local Distribution: All over the forests; common.

General Distribution: India: West Bengal, Assam, Bihar, Orissa; Bhutan, China, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand.

Order 27: Caryophyllales Perleb (1826)

clade of 'core caryophyllids':

Amaranthaceae Juss., Gen. Pl. 87. 1789, *nom. cons*.

Key to the Genera:

1.a. Perianth scarious and dry; stamens often connate below …….. 2

1.b. Perianth not scarious; stamens free …… 8

2.a. Leaves alternate ……..….. 3

2.b. Leaves opposite ……..…… 5

3.a. Ovary with 2 to many ovules ..…….…….. 4

3.b. Ovary with 1 ovule …….....…… *Amaranthus*

4.a. Fruit a red berry, indehiscent ..... *Deeringia*

4.b. Fruit a utricle or capsule, dehiscent by a lid ..... *Celosia*

5.a. Inflorescences heads or complex thyrsoid; anthers 1 loculed …….....… *Alternanthera*

5.b. Inflorescences spikes; anthers 2 loculed ……....…… 6

6.a. Pseudostaminodes fringed or long fimbriate ……..…….....…. *Achyranthes*

6.b. Pseudostaminodes triangular ro rectangular ……..……. 7

7.a. Tepals of perfect flowers light green, glabrous; yellow, villous in imperfect ... *Pupalia*

7.b. Tepals densely puberulous abaxially, pink ……..…..….. *Aerva*

8.a. Plants covered with glandular hairs ..... *Dysphania*

8.b. Plants covered with vesicular hairs, occasionally glabrous …….....….. *Chenopodium*

ACHYRANTHES L., Sp. Pl. 1: 204. 1753.

Key to the Species:

1a. Flowers in long slender spike, bracts subulate, tepal ovate to lanceolate … *A. aspera*

1b. Flowers dense, bracts broadly ovate, tepal lanceolate ……..……..… *A. bidentata*

Achyranthus aspera L., Sp. Plant. 204. 1753; Hara, Fl. E. Himal. 1:76. 1996; Hook. *f*. in Hook. *f*., Fl. Brit. Ind. 4: 4. 1885: Long in Grierson *et* Long, Fl. Bhut. 1(2): 227. 1984; Prain, Beng. Pl. 2: 875.1903. *Achyranthes australis* R.Br., Prodr. Fl. Nov. Holl. 417. 1810. *Achyranthes canescens* R. Br., Prodr. Fl. Nov. Holl. 417. 1810.

Local name: Apang.

Perennial herbs, erect or spreading up to 80 cm. Leaves opposite, ovate – elliptic; petiole 10 to 13 mm; lamina 3 – 12 x 2 – 7 cm, acute, base cuneate, pubescent. Flowers in long slender spike, up to 30 cm; bracts subulate, occasionally spinous, concave. Perianth segments rigid, ovate to lanceolate; stamens 5; anthers 2 celled, filament connate at base; ovary oblong, style filiform; stigma capitate. Fruits 1 seeded.

Flowers & Fruits:

Specimen Cited: Murti, *Goutam & AP Das 0102*, dated 07. 02. 2009.

Local Distribution: In open areas and roadsides, common.

General Distribution: India, Bhutan, Nepal, Bangladesh, China.

Note: Plants has good medicinal values.

Achyranthes bidentata Bl., Bijdr. 545. 1826; Hook. *f.*, Fl. Brit. Ind. 4:730. 1885; Hara, Fl. E. Himal. 1:76. 1966; Hara *et al*., Enn. Fl. Pl. Nep.3:168. 1982; Long in Grierson *et* Long, Fl. Bhut. 1(2): 227.1984; Prain, Beng. Pl. 2: 875.1903. *Achyranthes chinensis* Osbeck, Dagb. Ostind. Resa 205. 1757. *Achyranthes fruticosa* Lam., Encycl. 1: 545. 1785.

Local name: Bon apang.

Annual or biannial erect herbs. Stem green, quadrangular, appressed pubescent to nearly glabrous; branches opposite. Petioles hairy; leaf blade elliptic to elliptic – lanceolate, rarely oblanceolate, both surfaces spreading pubescent, base cuneate, caudate. Spikes terminal or axillary, up to 25 cm; rachis white hairy. Flowers dense. Bracts broadly ovate, apex acuminate; bracteoles spiny, base 2-parted, apex curved. Tepals lanceolate, apex acute. Utricles yellowish Br., shiny. Seeds brownish, oblong.

Flowers & Fruits: August to November.

Specimen Cited: Murti, *Goutam & AP Das 0113*, dated 07. 02. 2009.

Local Distribution: Road side and other open areas; abundant.

General Distribution: India, Bhutan, Nepal, Bangladesh, Myanmar, China.

ALTERNANTHERA Forssk., Fl. Aegypt.-Arab. 28. 1775.

Key to the Species:

1a. Heads solitary, globose ……..……. *A. philoxeroides*

1b. Heads all sessile ……..…… 2

2.a. Tepals abaxially hairy ……..……. *A. paronychioides*

2.b. Tepals abaxially glabrous …….. 3

3a. Stamens 3; midvein of tepals not spiny at apex …….....… *A. sessilis*

3b. Stamens 5; midvein of tepals spiny at apex …….....… *A.. pungens*

Alternantheara philoxeroides (Mart.) Griseb. in Abh. Koen. Ges. Wiss. Goett. Phys. Cl. 24: 36.1983; Bora *et al*., Flor. Div. Ass., 275. 2004. *Bucholzia philoxeroides* Mart., Beitr. Amarantac. 107. 1825; Nova Acta Leop. 13: 315.1826. *Achyranthes paludosa* Bunbury, Proc. Linn. Soc. London 1: 109. 1841.

Local name: Jol Chhenchi.

Perennial herb. Stem ascending from a creeping base, branched; young stem and leaf axil white hairy; old ones glabrous. Petiole glabrous. Lamina oblong, oblong obovate to ovate – lanceolate, entire, acute with a mucro, base attenuate, glabrous. Heads solitary at leaf axil, globose. Bracts and bracteoles white, acuminate; bracts ovate; bracteoles lanceolate,. Tepals white, oblong, 5 mm, glabrous, acute. Filaments connate at base. Ovary obovoid, with short stalk.

Flowers & Fruits September to February.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0172*, dated 08. 02. 2009.

Local Distribution: Beel margins; abundant.

General Distribution: India; native of tropical Brazil.

Note: Used as vegetable.

Alternanthera paronychioides St. Hill, Voy. Bres. 2 (2): 39. 1833; Panda et Das, Fl. Sambalp. 308. 2004. *Achyranthes chacoensis* (Mor.) Standle in Jour. Wash. Acad. Sci. 5: 74. 1915. *Alternanthera ficoidea* (L.) R.Br., Prodr. Fl. Nov. Holl. 417. 1810. *Gomphrena ficoidea* L., Sp. Pl. 225. 1753. *Illecebrum ficoideum* L., Sp. Pl. (ed. 2) 1: 300. 1762.

Perennial herb. Stem hairy to glabrescent. Leaf blade oblanceolate to spatulate, abaxially hairy, apex obtuse to rounded. Heads sessile, ovoid to globose. Tepals white, ovate - oblong, scarious, hairy on

the veins, outer 3 segments: 3-veined in proximal half, inner 2 somewhat laterally compressed, apex acute to mucronate. Stamens 5; anthers yellow, ellipsoid; staminodes 3- or 4-toothed; stigma capitate. Utricle Br., obcordate.

Flowers & Fruits: January to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0068*, dated 06. 02. 2009; Gorati Beel, *Goutam & AP Das 0650*, dated 12. 02. 2008.

Local Distribution: On moist soil along the beel margins; less common.

General Distribution: India; a native of tropical America; naturalized in tropics.

Alternanthera pungens HBK, Nov. Gen. Sp. 2: 206. 1818; Long in Grierson *et* Long, Fl. Bhut. 1(2): 228. 1984 ; Datta *et* Majumdar in Bull. Bot. Soc. Beng. 20 (2): 50. 1966. *Telanthera pungens* (HBK) Moq. in Prodr. 13(2): 371. 1849. *Achytanthus repens* L., Sp. Pl. 1: 205. 1753. *Achyranthes nivea* Aiton in Hort. Kew. 1: 286. 1789. *Alternanthera echinata* Sm., Cycl. 39 (Suppl.): 10. 1818. *Alternanthera repens* (L.) Kuntze, Revis. Gen. Pl. 2: 536 – 540. 1891.

Annual herbs. Stem diffuse, creeping, much branched, up to 30 cm, densely rigidly hairy. Leaf blade ovate to elliptic – obovate, 2 – 4 x 0.5 – 1.5 cm, unequal in each pair, glabrous to slightly pilose, base acuminate, apex obtuse. Heads sessile, axillary, white, globose to oblong. Bracts lanceolate, spiny at apex; bracteoles lanceolate, acuminate, without spines. Tepals unequal, rigid after anthesis, midvein stretching into spines; central segment elliptic, compressed. Stamens 5. Style very short. Utricles Br., broadly ellipsoid.

Flowers & Fruits: May to September.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0436*, dated 22. 07. 2009.

Local Distribution: Beel margins.

General Distribution: Naturalized in India, native to South America; Bhutan, Myanmar, Thailand, China, Australia, and United States.

Alternanthera sessilis (L.) R.Br. *ex* DC., Cat. Pl. Hort. Mon sp. 4: 77. 1813; Hook. *f.*, Fl. Brit. Ind. 4: 731. 1885; Hara, Fl. East. Himal. 1: 77. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 228. 1984. *Gomphrene sessilis* L., Sp. Pl. 1: 225. 1753. *Achyranthes sessilis* (L.) Besser, Cat. Jard. Bot. Krzemieniec 12. 1810. *Alternanthera nodiflora* R. Br., Prodr. Fl. Nov. Holl. 417. 1810. *Alternanthera triandra* Lam., Encycl. 1: 95. 1785. *Achyranthes triandra* Roxb., Fl. Ind. 1: 678. 1820. *Achyranthes villosa* Blanco, Fl. Filip. 189. 1837. *Allaganthera forskalli* Mart., Pl. Hort. Erlang. 69. 1814. *Alternanthera angustifolia* R.Br., Prodr. Fl. Nov. Holl. 417. 1810. *Alternanthera denticulata* R.Br., Prodr. Fl. Nov. Holl. 417. 1810.

Local name: Chhenchi sag.

Prostrate herb, rooting at nodes, often perennial, stems with 2 lines of hairs. Lamina elliptic, 2 – 4.5 x 0.5 – 1.5 cm, acute, attenuate at base, sessile, glabrous. Flower clusters sessile, globose, white. Perianth segments all similar, 2 – 3mm, papery, unarmed. Stamens 5, 3 bearing anthers, basal cup very short, pseudostaminodes minute. Capsule rounded, 2 mm diameter, compressed, emerginate at apex; seed 1mm, surrounded by a thick wing.

Flowers & Fruits: March to August.

Specimen Cited: Khunia, *Goutam & AP Das 0222*. dated 04. 07. 2006: *Murti, Goutam & AP Das 0542*. dated 19. 12. 2006.

Local Distribution: All over the forests.

General Distribution: India, Sri Lanka, Myanmar, China, Pantropical.

Note: Used as vegetable.

AMARANTHUS L., Sp. Pl. 2: 989. 1753.

Key to the Species:

1a. Tepals 3; stamens 3; utricles indehiscent …… 2

1b. Tepals 5; stamens 5; utricles usually dehiscent by lid ……..…… *A. spinosus*

2a. Stem erect, somewhat branched; utricles very rugose ..... *A. viridis*

2b. Stem ascending, much branched; utricles smooth ..... *A. blitum*

Amaranthus blitum subsp. ***oleraceus*** (L.) Costea, Sida 19: 984 2001. *Amaranthus blitum* L., Sp. Pl. 1: 990. 1753; Hook. *f.*, Fl. Brit. Ind. 4: 721. 1885; Prain, Beng. Pl. 2: 871.1903. *Amaranthus lividus* L., Sp. Pl. 1: 990. 1753; Hara, Fl. East. Himal. 1:77. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 224. 1984. *Amaranthus circinnatus* Poirat, Encycl. Suppl. 1: 311. 1810. *Blitum lividum* (L.) Moench, Methodus 359. 1794. *Amaranthus oleraceus* L., Sp. Pl. 1403. 1753.

Prostrate or semi erect, annual herbs; branches in rosette. Leaves broadly ovate, 3 – 7 x 2 – 5cm, obtuse. Flowers in clusters densely aggregated in to slender spikes, up to 7 cm. Flowers unisexual, mostly female with a few males above; perianth segments 3, 1 mm long; tepal 3; stamens 3; stigma 3, minute; Capsules distinctly exceeding perianth, seeds strongly glossy, faintly striate without scurfy warts.

Flowers & Fruits: April to August.

Specimen Cited:Dhupjhora, *Goutam & AP Das 0424*, dated 22.07.2009.

Local Distribution: Dhupjhora Beat Office.

General Distribution: India, Bhutan, Bangladesh, Myanmar, China.

Amaranthus spinosus L., Sp. Pl. 2: 991. 1753; Hook. *f.*, Fl. Brit. Ind. 4: 718.1885; Hara, Fl. East. Himal. 1:77. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 225. 1984; Prain, Beng. Pl. 2: 879.1903. *Galliaria spitosa* (L.) Nieuwl., Amer. Midl. Naturalist 3(9): 278. 1914. *Amaranthus spinosus* var. *viridicaulis* Hassk., Flora 25: litt. 20 litt. 20. 1842.

Local name: Kanta notey.

Perennial herb. Stem erect, green, terete, branched, glabrous. Petiole 1.8 cm, glabrous; leaf blade ovate-lanceolate, 3× 1.5 cm, glabrous or slightly pubescent along veins when young, base cuneate, margin entire, apex obtuse. Terminal spike usually with all male flowers at or toward apex. Bracts becoming very sharply spiny in proximal part of spike. Tepals green, transparent at margin, apex acute; male flowers oblong; female flowers oblong-spatulate. Filaments slightly shorter than perianth. Stigmas 3. Utricles included in perianth, oblong. Seeds brownish black, subglobose.

Flowers & Fruits: May to September.

Specimen Cited: Murti, *Goutam & AP Das 0330*. dated 17. 12. 2006: *Khunia, Goutam & AP Das 0124*. dated 02. 07 2006.

Local Distribution: In most of the open areas; abundant.

General Distribution: India: West Bengal, Assam, Bihar, Madhyapradesh, Uttar Pradesh; Myanmar, China.

Note: Used as vegetable.

Amaranthus viridis L., Sp. Pl. ed. 2: 1405. 1753; Hook. *f.*, Fl. Brit. Ind. 4: 720. 1885; Prain, Beng. Pl. 2: 651. 1903; Long in Grierson *et* Long, Fl. Bhut. 1(2): 224. 1984; Bora *et al*., Flor. Div. Ass., 277. 2003. *Pyxidium viride* (L.) Moq. in DC., Prodr. 13(2): 274. 1849. *Amaranthus polystachyus* Willd., Sp. Pl. 4: 385. 1805. *Galliaria adscendens* Bubani, Fl. Pyren. 1: 186. 1897. *Amaranthus fasciatus* Roxb., Fl. Ind. ed. 1832 3: 609. 1832. *Amaranthus gracilis* Desf. *ex* Poirat, Encycl., Suppl. 1(1): 312. 1810. *Amaranthus gracilis* Desf., tabl. Ecole Bot. 43. 1804.

Local name: Notey.

Erect annual herbs, up to 50 cm high. Leaves broadly ovate, 3 – 7 x 2 – 5cm, obtuse. Flowers in clusters densely aggregated in to slender spikes, up to 7 cm. Flowers unisexual, mostly female with a few males above; perianth segments 3, 1 mm long; tepal 3; stamens 3; stigma 3, minute; Capsules 1 seeded, seeds somewhat glossy, minutely reticulate with scurfy warts.

Flowers & Fruits: April to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0664*. dated 24. 03. 2007; *Specimen Cited*: Khunia, *Goutam & AP Das 0131*. dated 02. 07. 2006.

Local Distribution: In most of the open areas; abundant.

General Distribution: India: West Bengal, Assam, Sikkim, Bihar, Orisa, Uttar Pradesh; Bhutan, Bangladesh, Myanmar, China.

Note: Used as vegetable.

CELOSIA L., Sp. Pl. 1: 205. 1753.

Celosia argentea L., Sp. Pl. 1: 205. 1753; Hook. *f.*, Fl. Brit. Ind. 4: 714. 1885; Hara, Fl. East. Himal. 1:77. 1966; Prain, Beng. Pl. 2: 867. 1903; Long in Grierson *et* Long, Fl. Bhut. 1(2): 221. 1984. *Amaranthus purpureus* Nieuwl., Amer. Midl. Nat. 3: 279. 1914. *Celosia pallida* Salisb., Prodr. Stirp. Chap. Allerton 145. 1796.

Local name: Morog data.

Erect annual herbs; branches grooved. Leaves alternate, variable, shortly petiolate, linear – lanceolate, acute, base tapering, glabrous. Flowers bisexual, white or tinged pink in dense, terminal, lanceolate spikes. Capsules ellipsoid; seeds 4-8, sub-reniform, black, shining.

Flowers & Fruits: March to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0019*, dated 05. 02. 2009.

Local Distribution: Found only in Dhupjhora Beat area; rare.

General Distribution: Tropical regions of Asia, Africa and America.

Note: Young plants edible as vegetable.

DEERINGIA R.Br., Prodr. Fl. Nov. Holl. 413. 1810.

Deeringia amaranthoides (Lam.) Merr., Interpr. Rumph. Herb. Amboin. 211. 1917; Hara, Fl. East. Himal. 1:78. 1966; Hara *et al*., Enn. Fl. Pl. Nep.3:169.1982; Long in Grierson *et* Long, Fl. Bhut. 1(2): 221. 1984. *Achyranthes amaranthoides* Lam., Encycl. Meth. B. 1: 548. 1785. *Celosia baccata* Retz., Observ. Bot. 5: 23. 1788. *Cladostachys amaranthoides* (Lam.) K.C.Kuan, Fl. Xizangica 1: 645. 1983. *Deeringia indica* Retz. *ex* Blume, Bijdr. 542. 1826.

Local name: Hare lorong sag.

Climbing shrub, up to 6 m. Stem with pendulous branches, hairy when young. Petiole 1.5 cm, glabrous; Leaves opposite; lamina ovate, 3 – 7 x 2 – 3.5 cm, acuminate, base rounded, puberulous beneath;

petioles 5 – 15 mm. Spikes 10 – 20 cm; flowers bisexual, pedicels 1 – 2mm. Perianth segments5, concave, 2.5 mm. Stamens 5, anthers 2 – celled. Ovary subglobose, stigmas 3, linear. Berry subglobose, red.

Flowers & Fruits: August to February.

Specimen Cited: *Murti*, *Goutam & AP Das 0241*. dated 16. 12. 2006; Khunia, *Goutam & AP Das 0231*. dated 26. 06. 2006: Dhupjhora, *Goutam & AP Das 0582*. dated 22. 03. 2007.

Local Distribution: All over the forest margins.

General Distribution: Tropical parts of India; Bhutan, Nepal, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; Australia.

Note: Young plants used as vegetable.

PUPALIA Juss., Ann. Mus. Natl. Hist. Nat. 2: 132. 1803.

Pupalia lappacea (L.) A. Juss., Ann. Mus. Hist. Nat. Paris 2:132.1803; Hook.*f.*, Fl. Brit. Ind. 4:724. 1885; Long in Grierson *et* Long, Fl. Bhut. 1(2): 207. 1984 ; Prain, Beng. Pl. 2: 872.1903. *Achyranthes lappacea* L., Sp. Pl. 204.1753. *Pupalia atropurpurea* (Lam.) Moq. in DC., Prodr. 13(2): 331.1849;

Annual to perennial herb. Stem ascending to semi-erect, tinged red, obtusely quadrangular, inflated at nodes. Lamina ovate to rhombic-oblong, entire, obtuse, base rounded, both surfaces densely hairy and ciliate. Racemes terminal, erect and straight, with 2 or 3 hermaphroditic and some unisexual flowers, unisexual flowers gradually decreasing upward; rachis densely pubescent; flower clusters shortly stalked. Bracts acuminate. Tepals of perfect flowers light green, ovate-oblong, glabrous, acuminate. Stamens 5; pseudostaminodes rectangular, truncate. Tepals of imperfect flowers and bracts yellow, villous, hooked. Utricles globose, glabrous. Seeds Br., very small, smooth.

Flowers & Fruits: June to November.

Specimen Cited: Khunia, *Goutam & AP Das 0181*. dated 03. 07. 2006; Murti, *Goutam & AP Das 0284*. dated 16. 12. 2006.

Local Distribution: Road side, open garden and Dhupjhora Beat Office.

General Distribution: Tropical parts of India; Myanmar, Bhutan, Nepal, Bangladesh, China.

AERVA Forssk., Fl. Aegypt.-Arab. 170. 1775, *nom. cons*.

Aerva sanguinolenta (L.) Bl., Bijdr. 547.1826; H. Hara in Hara, Fl. East. Himal. 1:77. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 226. 1984. *Achyranthes sanguinolenta* L., Sp. Pl. ed. 2: 294. 1762. *Achyranthes scandens* Roxb., Fl. Ind. 1: 676. 1820. *Aerva sanguinea* Miq. in DC., Prodr. 13(2): 3. 1849. *Aerva scandens* (Roxb.) Wall., Icon. Pl. Orient. 2: t. 724. 1840; Prain, Beng. Pl. 2: 874.1903.

Local name: Lopang.

Perennial herbs. Stem erect to slightly stoloniferous, less branched. Leaves ovate-elliptic to oblong–lanceolate, 2–8 x 1–5 cm. Inflorescences purple sericeous. Bracts, bracteoles, and tepals densely puberulous abaxially. Tepals pink. Pseudostaminodes triangular. Utricles ovate, glabrous. Seeds reniform.

Flowers & Fruits: January to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0093*, dated 07. 02. 2009.

Local Distribution: Dhupjhora Beat Office.

General Distribution: India: widely grown in gardens; Bhutan, Nepal, Bangladesh, Cambodia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Note: Often cultivated as medicinal plants.

CHENOPODIUM L., Sp. Pl. 1: 218. 1753.

Key to the Species:

1.a. Plants up to 2 – 3 m; lower leaves to 20 cm; inflorescence pendulous ..... *C. giganteum*

1.b. Plants usually smaller; lower leaves less than 8 cm; inflorescence panicles ..... *C. album*

Chenopodium album L., Sp. Pl. 1: 219. 1753; Hook. *f.*, Fl. Brit. Ind. 5: 3. 1886; Hara, Fl. E. Himal. 1: 76. 1966; Prain, Beng. Pl. 2: 6571903; Long in Grierson *et* Long, Fl. Bhut. 1(2): 217. 1984. *Chenopodium candicans* Lam., Fl. Franç. 3: 248. 1779. *Chenopodium browneanum* Schult., Syst. Veg. 6: 275. 1820.

Local name: Bethua.

Herbaceous, up to 80 cm. Leaves ovate – deltoid, 3 – 7 x 1 – 3.5 cm, acute, base cuneate, margin entire, sometimes weakly 3 – lobed, petioles 1 – 3 cm. Flower clusters dense, sessile, slender panicles. Flower bisexual, 0.7mm diameter. Perianth segments 5. Stamens 5. Seeds black.

Flowers & Fruits: November to May.

Specimen Cited: Murti, *Goutam & AP Das 0072*, dated 06. 02. 2009.

Local Distribution: In open sparse herbaceous vegetation, mostly along road-sides; less common.

General Distribution: Tropical America and common in tropics.

Note: Young plants edible.

Chenopodium giganteum Don, Prodr. Fl. Nepal. 75 1825; H. Hara in Hara, Fl. E. Himal. 2: 24. 1971, sensu *Chenopodium album* L.; Long in Grierson *et* Long, Fl. Bhut. 1(2): 218. 1984. *Chenopodium atriplicis* L. *f.*, Suppl. Pl. 171. 1782. *Chenopodium punctulatum* Scop., Delic. Fl. Faun. Insubr. 1: 26. 1786.

Local name: Boro Bethua.

Herbaceous, reddish up to 3 m. Leaves rhombic - ovate, 6 – 20 x 4 – 7 cm, acute, base cuneate, margin coarsely irregular - dentate, sometimes weakly 3 – lobed, petioles 5 – 9 cm. Flower clusters dense, sessile, slender panicles. Flower bisexual, 0.7mm diameter. Perianth segments 5. Stamens 5. Seeds black.

Flowers & Fruits: September to February.

Specimen Cited: Murti, *Goutam & AP Das 0066*, dated 06. 02. 2009.

Local Distribution: In forest villages; common.

General Distribution: Cultivated widely in tropical Asia, America.

Note: Young plants edible.

DYSPHANIA R.Br., Prodr. Fl. Nov. Holl. 411. 1810.

Dysphania ambrosioides (L.) Mosy. *et* Clemants in Ukrayins'k. Bot. Zhurn. 59: 382. 2002. *Chenopodium ambrosioides* L., Sp. Pl. 219. 1753; Hook. *f.*, Fl. Brit. Ind. 5: 4. 1886, Hara, Fl. E. Himal. 76. 1966; Long in Grierson *et* Long, Fl. Bhut. 1(2): 218. 1984; Prain, Beng. Pl. 2: 657. 1903; Hara *et al*., Enn. Fl. Pl. Nep. 3: 170. 1982; *Ambrina ambrosioides* Spach, Hist. Nat. Veg. 4: 297. 1836; *Chenopodium integrifolium* Vorosch., Bot. Zhurn. 27: 42. 1942; *Chenopodium suffruticosum* Willd., Enum. Pl. Hort. Berol.: 290. 1809.

Arometic herb, up to 100cm. Leaves lanceolate, 3 – 7 x 1 – 2cm, acuminate, base attenuate, serrate – dentate, yellowish gland –dotted beneath; petiole 0.5 – 1cm. Flower clusters subglabrous, elongate panicles. Flowers bisexual. Perianth segments 5. Stamens 5. Seeds smooth.

Flowers & Fruits: April to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0145*, dated 08. 02. 2009.

Local Distribution: Road side marshy land.

General Distribution: Tropical parts of India; native to Tropical America.

Caryophyllaceae Juss., Gen. Pl. 299. 1789; *nom. cons*.

Key to the Genera :

1a. Stipules present, rarely obscure …….…….. 2

1b. Stipules absent ……. ***Stellaria***

2a. Sepals green, leaflike; petals 2 – 6 parted …….. ***Drymaria***

2b. Sepals white, scarious; petals entire …….. ***Polycarpon***

DRYMARIA Willd. *ex* Schult. in Roem. *et* Schult., Syst. Veg. 5: 31. 1819.

Drymaria cordata (L.) Willd. *ex* Roem. *et* Schult., Syst. Veg. 5: 406.1819; Hook. *f. et* Thomson in Hook. *f.*, Fl. Brit. Ind. 1: 244. 1874; Grierson in Grierson *et* Long, Fl. Bhu. 1(2): 215.1984; Prain, Beng. Pl. 1: 238.1903. *Holosteum cordatum* L., Sp. Pl. 1: 88. 1753. *Drymaria diandra* Blume, Bijdr. 62. 1825; Mizushima in Hara, Fl. East. Himal. 1: 80. 1966; Sharma *et al*., Fl. Ind. 2:533. 1993. *Holosteum diandrum* Sw., Prodr. Veg. Ind. Occ. 27. 1788. *Stellaria adenophora* León, Fl. Cuba 2: 154. 1950. *Drymaria procumbens* Rose, Contr. U. S. Natl. Herb. 1: 304. 1895.

Local Name: Abhijalo.

Stems elongate, rooting at nodes. Leaves broadly ovate or suborbicular, Leaves broadly ovate, 0.5 – 1.5 x 0.5 – 1.5 cm, acute or obtuse, mucronate, base rounded, glabrous, 5 veined, petiole 2 – 3mm; stipules lacerate into 1 – 2 mm filaments. Flowers broadest above middle. Sepals elliptic – ovate, green, leaflike, 3 veined, inflexed, glandular-papillose on veins. Petals white, 2 – 6 parted. Seeds finely tuberculate.

Flowers & Fruits: May to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0030*, dated 05. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: India; Tropical and Subtropical Asia, Formosa, W. & S. China, Oceania, Hawaii.

Note: Plants has good medicinal values.

POLYCARPON L., Syst. Nat., ed. 10. 2: 881. 1759.

Polycarpon prostratum (Forssk.) Asch. *et* Schw. in. F. Ost. Bot. Zoitschr. 39: 128. 1889. Sharma *et al*., Fl. Ind. 2: 553. 1993; Grierson in Grierson *et* Long, Fl. Bhu. 1(2): 216. 1984. Guha Bakshi, Fl. Mur. Dist. 57. 1984. *Alsine protrata* Forssk., Fl. Aegypt. – Arab. 207. 1775. *Hapalosia loeflingiae* Wight *et* Arn., Prodr. Fl. Ind. Orient. 358. 1834. *Polycarpon loeflingiae* (Wight *et* Arn.) Benth. *et* Hook. *f*., Gen. Pl. 1: 153. 1862; Hook. *f. et* Thomson in Hook. *f.*, Fl. Brit. Ind. 1: 245. 1874; Prain, Beng. Pl. 1: 238.1903. *Polycarpon indicum* (Retz.) Merr., Philipp. Jour. Sci. 10(5): 302-303. 1915. *Loeflingia indica* Retz., Observ. Bot. 4: 8. 1786.

Plants annual. Stems prostrate to ascending, base rigid, 10 – 22 cm, glabrous. Lamina obovate to spatulate, 5 – 20 x 1.5 – 4 mm, glabrous, entire, acute, base attenuate. Cymes often axillary, sometimes rather lax, 2 – 4 cm; bracts stipule like. Pedicel short or absent, pilose. Sepals lanceolate, white, apex obtuse, hooded. Petals often fewer than 5, oblong, entire. Stamens 3, shorter than sepals. Capsules ovoid, shorter than sepals. Seeds light Br., cylindric, reticulate.

Flowers & Fruits: February to June.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0414*, dated 22. 07. 2009.

Local Distribution: Beel margins.

General Distribution: Tropical India; tropical region of Asia and Africa.

STELLARIA L., Sp. Pl. 1: 421. 1753.

Key to the Species:

1a. Sepals connate at base into obconic calyx; stamens perigynous ..... *S. uliginosa*

1b. Sepals distinct; stamens hypogynous …….....….. 2

2a. Sub erect herb, rooting at nodes …….....…….. *S. media*

2b. Decumbent or prostrate, nodes rootless …….....…….. *S. wallichiana*

Stellaria media (L.) Vill., Hist. Pl. Dauphiné 3: 615. 1789; Mizushima in Hara, Fl. East. Himal. 1: 82. 1966; Grierson in Grierson *et* Long, Fl. Bhu. 1(2): 207. 1984; Prain, Beng. Pl. 1: 237.1903. *Alsine media* L., Sp. Pl. 272. 1753. *Stellaria apetala* Ucria *ex* Roem., Pl. Linn. Op. Arch. I (1): 68. 1796. *Stellaria vulgaris* Raunk., Bot. Studier 13, 22. 1934.

Diffuse prostrate to sub-erect herb, 12 – 45 cm, rooting at nodes. Lamina ovate, 1 – 2 x 1 –1.5cm, acute, base cordate, glabrous, petioles minute, veins indistinct. Few flowers in terminal leafy cymes, pedicels 1 – 1.5 cm. Sepals ovate, 3 – 4m, petals shorter than sepals, deeply bifid. Stamens 4 – 8. Capsule ovoid.

Flowers & Fruits: March to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0053*, dated 05. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: India, Bhutan, Afghanistan, Japan, Korea, Pakistan, Russia, Europe.

Stellaria uliginosa Murray, Prodr. Strip. Gotting. 55. 1770; Hara *et al*., Enn. Fl. Pl. Nep.1:58. 1979; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 208. 1984. *Alsine uliginosa* (Murray) Britt. inn, Mem. Torrey Bot. Club 5(10): 150. 1894. *Alsine uliginosa* (Murray) Krause, Deutschl. Fl. ed. 2, 5: 54. 1901. *Stellaria dilleniana* Leers, Fl. Herborn. 107. 1775.

Diffuse, sub-erect or decumbent herb, stems 4–30 cm, 4-angular, with a line of pubescence along one side, rooting at nodes. Lamina elliptic, 0.5–1.5 x 0.15 – 0.45 (-0.55) cm, acute or acuminate, sessile, glabrous. Flowers few in terminal cymes; bracts ovate, acute c 1.5 mm, scarious; sepals 2.5 – 3.5 mm, glabrous; stamens 10 or sometimes 3 -5, hypogynous.

Flowers & Fruits: April to august.

Specimen Cited: Gorumara, *Goutam & AP Das 0712*, dated 14. 02. 2008.

Local Distribution: All over the forests.

General Distribution: India, Bhutan, Nepal, Japan, Korea, Pakistan, China, Vietnam.

Stellaria wallichiana Benth. *ex* Haines, Bull. Misc. Inf. Kew 1920: 66.1920; Sharma *et al*., Fl. Ind 2: 591. 1993; Bora *et al*., Flor. Div. Ass., 56. 2003. *Stellaria media* (L.) Vill., Hist. Pl. Dauph 3: 615. 1789, p.p.; Hooker *f. et* Thomson in Hook. *f.*, Fl. Brit. Ind. 1: 230. 1874.

Decumbent or prostrate, annual herbs. Lamina flat, entire, simple. Inflorescence cymose. Flower actinomorphic; corolla white, bisexual; sepals 5, petals 5, stamens hypogynous. Fruits capsule; seeds compressed, embryo annular.

Flowers & Fruits: January to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0363*, dated 21. 07. 2009.

Local Distribution: Beat office garden and road side forests.

General Distribution: India, Nepal, Bhutan, Bangladesh, Myanmar, China.

'Succulent' clade:

Cactaceae Juss., Gen. Pl. 310. 1789; *nom. cons*.

Key to the genera:

1a. Branch with 6 ribs, broadly triangular …….. ***Cereus***

1b. Branch spreading, basally flattened ……..… ***Opuntia***

CEREUS Mill., Gard. Dict., ed. 4. 308. 1754.

Cereus repandus (L.) Mill., Gard. Dict. ed. 85. 1768. *Cactus repandus* L., Sp. Pl. 467. 1753. *Cereus peruvianus* (L.) Mill., Gard. Dict. ed. 84. 1768; Long in Grierson *et* Long, Fl. Bhut. 1(2): 233. 1984. *Cactus peruvianus* L., Sp. Pl. 467. 1753.

Local name: Sij

Columnar shrub or tree up to 10m. Branch segments elongate, 10 – 12 cm diameter, slightly glaucous – green. Ribs 6, when young almost flat, becoming broadly triangular when old. Areoles whitish, bearing 9 – 12 yellowish – Brown. spines. Flowers white, 15 mm long; stamens numerous, not exserted. Fruit orange yellow, subglobose.

Flowers & Fruits: March to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0020*, dated 05. 02. 2009.

Local Distribution: Dhupjhora, Murti.

General Distribution: India: cultivated throughout; Bhutan, Bangladesh, Myanmar, China.

Note: Commonly planted in forest villages; rarely escaped.

OPUNTIA Miller, Gard. Dict. Abr., ed. 4. 1754.

Opuntia dillenii (Ker Gawler) Haworth, Suppl. Pl. Succ. 79. 1819; Long in Grierson *et* Long, Fl. Bhut. 1(2): 233. 1984. *Cactus dillenii* Ker Gawler, Bot. Reg. 3: t. 255. 1818.

Local name: Fani Manasha

Shrubs sprawling to erect, up to 3 m. Trunk short. Larger, terminal joints green to gray-green, obovate to elliptic-obovate, 10–40 × 7–20 cm. Spines 2 - 20 per areole on most areoles, spreading, basally flattened. Leaves subulate, deciduous. Flowers 5–10 cm in diam. Sepaloids greenish with yellow

margin, broadly deltoid-obovate to obovate, mucronate. Petaloids spreading, bright yellow, obovate to cuneate-obovate, entire, apex rounded to emarginate. Filaments yellow. Style yellow; stigmas 5, pale green. Fruit purple, turbinate to obovoid, fleshy at maturity.

Flowers & Fruits: January to October.

Specimen Cited: Budhuram, *Goutam & AP Das 1020*, dated 15. 02. 2011.

Local Distribution: Budhuram, Dhupjhora, Murti.

General Distribution: India, widely naturalized in Tropical zones.

Portulacaceae Juss., Gen. Pl. 312. 1789; *nom. cons*.

PORTULACA L., Sp. Pl. 1: 445. 1753.

Key to the species:

1a. Leaves alternate to subopposite; petiole short ……. *P. oleracea*

1b. Leaves opposite; petiole absent …… *P. quadrifida*

Portulaca oleracea L., Sp. Pl. 1: 445. 1753; Hook. *f. et* Thom. in Hook. *f.*, Fl. Brit. Ind. 1: 246. 1874; Hara, Fl. East. Himal. 1: 79. 1966; Grierson *et* Long, Fl. Bhut. 1(2): 196. 1984; Sharma *et al*., Fl. Ind. 3: 4. 1993; Prain, Beng. Pl. 1: 240. 1903. *Portulaca intermedia* Link *ex* Schltdl., Bot. Zeitung (Berlin) 11(38): 667. 1853. *Portulaca consanguinea* Schltdl., Linnaea 24: 693. 1851. *Portulaca marginata* Kunth, Nov. Gen. Sp. 6: 72. 1823. *Portulaca latifolia* Hornem., Hort. Bot. Hafn. 2: 491. 1815.

Annual herbs. Stems sometimes flushed red to purple, prostrate or decumbent, diffuse, much branched. Leaves alternate to subopposite; petiole short; lamina flat, obovate, 1 – 3 cm x 0.5 cm, obtuse-rounded, base cuneate. Flowers in clusters of 3 to 5. Sepals green, apex acute, keeled. Petals 5, yellow, obovate, slightly connate at base, apex retuse. Stamens 7 – 12; anthers yellow. Ovary glabrous. Stigmas 4. Capsule ovoid. Seeds glossy black when mature.

Flowers & Fruits: March to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0057*, dated 07. 02. 2009.

Local Distribution: Murti, Dhupjhora and Gorumara Beat Office Garden.

General Distribution: Tropical India; tropical and temperate regions worldwide.

Portulaca quadrifida L., Syst. Nat., ed. 12, 2: 328. 1767; Prain, Beng. Pl. 1: 240. 1903.

Annual herbs. Stems articulated, prostrate, rooting at nodes. Leaves opposite; petiole absent; lamina flat, ovate to ovate-elliptic, slightly narrowed toward base, entire, obtuse to acute. Flowers solitary, surrounded by involucre of 4 to5 bracts. Sepals obovate-oblong. Petals 4, yellow, oblong to broadly elliptic. Stamens numerous. Ovary ovoid. Stigma 4 lobed. Capsule globose.

Flowers & Fruits: Round the year.

Specimen Cited: Murti, *Goutam & AP Das 1057*, dated 07. 09. 2011.

Local Distribution: Murti, Dhupjhora and Gorumara Beat Office Garden.

General Distribution: Probably native to Africa, now pantropical.

'Third' clade:

Molluginaceae Bartl. *et* H.L. Wendl. Beitr. Bot. 2: 158. 1825 ; *nom. cons*.

GLINUS L., Sp. Pl. 1: 463. 1753.

Key to the Species:

1a. Plant densely stellate tomentose; styles 5; capsule 5 valved ..... *G. lotoides*

1b. Plant subglabrous or pilose; styles 3 or 4; capsule 3 valved ..... *G. oppositifolius*

Glinus lotoides L., Sp. Pl. 463. 1753; Bora *et al*., Flor. Din. Ass. 169. 2003; Grierson *et* Long, Fl. Bhut. 1(2): 195. 1984. *Mollugo lotoides* (L.) Kuntze, Revis. Gen. Pl. 1: 264. 1891. *Molluga hirta* Thunb., Prodr. Pl. Cap. 24. 1794; Clarke in Hook. *f.*, Fl. Brit. Ind. 2: 662. 1879; Kanjilal *et al.,* Fl. Ass. 2: 338. 1938 ; Prain, Beng. Pl. 1: 533. 1903. *Mollugo hirta* var. *lotoides* (L.) C.B. Clarke in Hook.f., Fl. Brit. India 2(6): 662. 1879. *Glinus dictamnoides* Burm. *f*., Fl. Indica 113. 1768. *Mollugo glinus* A. Rich., Tent. Fl. Abyss. 1: 48. 1847.

Herbs, densely stellate tomentose. Stems decumbent, 10 – 30 cm, much branched. Petiole very short; basal leaves in a rosette, drying soon; upper leaves verticillate to opposite, obovate to oblong-spatulate, base attenuate, decurrent, margin entire, obtuse, rounded or acute. Flowers several, subsessile. Tepals elliptic to oblong. Stamens usually free. Ovary ovoid, 5 loculed; styles 5, free. Capsule ovoid, 5 valved. Seeds numerous, chestnut Br., reniform.

Flowers & Fruits: March to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0083*, dated 06. 02. 2009; Murti, *Goutam & AP Das 0129*, dated 07. 02. 2009.

Local Distribution: Moist open soil on river bed; abundant.

General Distribution: India, Bhutan, Nepal, Bangladesh, Indonesia, Malaysia, Philippines, Sri Lanka; North and tropical Africa, S to S.E. Asia, S. Europe, tropical America, Oceania.

Glinus oppositifolius (L.) DC., Bull. Herb. Boiss. 2, 1: 552. 1901; Guha Bakshi, Fl. Mur. Dist. 148. 1984. *Mollugo oppositifolia* L., Sp. Pl. 89. 1753. *Molluga spergula* L., Syst. ed. 10: 881. 1759; C.B. Clarke in Hook. *f.*, Fl. Brit. Ind. 2: 662. 1879. *Glinus mollugo* Fenzl, Ann. Wiener Mus. Naturgesch. 1: 359. 1836. *Mollugo glinoides* Rich., Tent. Fl. Abyss. 1: 48. 1847.

Local name: Gima.

Rosette herbs with many radiating prostrate branches, 10 – 30 cm, pilose to subglabrous. Leaves in pseudowhorls of 3 – 6; leaf blade spatulate-oblanceolate to elliptic, 1 – 2.5 cm × 3 – 6 mm, base attenuate, margin with sparse teeth, obtuse to acute. Pedicel slender. Flowers usually 2 – 7 in a cyme. Tepals greenish white, oblong, margin membranous, 3 veined. Stamens 3 to 5. Styles 3. Capsule ellipsoid, slightly shorter than persistent tepals. Seeds chestnut-Br., subreniform, granulose.

Flowers & Fruits: January to June.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0021*, dated 05. 02. 2009.

Local Distribution: Moist soil in gardens and river beds; common.

General Distribution: Tropical parts of India; Bhutan, Bangladesh, China, Pantropical Africa and Asia, N Australia.

Note: Edible as vegetable.

Nyctaginaceae Juss., Gen. Pl. 90. 1789; *nom. cons*.

Key to the Genera:

1.a. Small tree ……..…….....…… *Nyctanthes*

1.b. Climbing shrubs or herbs ……..…….....…. 2

2.a. Climbing shrubs …….....…… *Bougainvillea*

2.b. Prostrate or erect herbs …….....…… 3

3.a. Flowers enclosed by a calyxlike involucre; fruit globose, obovoid, oblong, fusiform or terete, sometimes ribbed, without sticky glands …….....… *Mirabilis*

3.b. Flowers in cymose umbels; fruit clavate, obconic to obovoid, 5 or 10 ribbed, with sticky glands …….....……*Boerhavia*

BOERHAVIA L., Sp. Pl. 1: 3. 1753.

Boerhavia diffusa L., Sp. Pl. 1: 3. 1753; Grierson *et* Long, Fl. Bhut. 1(2): 194. 1984; Prain, Beng. Pl. 1: 533. 1903.

Local name: Punarnaba

Perennial herb, stems up to 50 cm, diffuse. Leaves opposite, ovate elliptic to broadly ovate, 3 – 5 x 2 – 3cm, subacute, base cordate, subglabrous, petiole 2 cm. Flowers in cymose, umbels, 3 – 5 flowered, bract minute. Perianth campanulate, purple, fruit 3mm., obconic to obovoid, 5 or 10 ribbed, with sticky glands.

Flowers & Fruits: April to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0017*, dated 05. 02. 2009.

Local Distribution: In most of the open areas and road sides; abundant.

General Distribution: India: throughout; Native of tropical America.

Note: Plants has medicinal values.

BOUGAINVILLEA Comm. *ex* Juss., Gen. Pl. 91. 1789 [*"Buginvillaea"*], *nom. et orth. cons.*

Key to the Species:

1.a. Leaves sparsely pubescent; bracts oblong to elliptic, as long as flowers; perianth tube distinctly angled ..... *B. glabra*

1.b. Leaves densely pubescent; bracts elliptic-ovate, longer than flowers; perianth tube rounded ..... *B. spectabilis*

Bougainvillea glabra Choisy, Prodr. 13(2): 437 1849; Grierson *et* Long, Fl. Bhut. 1(2): 194. 1984; Prain, Beng. Pl. 2: 863.1903. *Bougainvillea brachycarpa* Heimerl, Bot. Jahrb. Syst. 11: 88. 1889.

Local name: Kagajful.

Large scrambling shrubs. Leaves alternate, ovate, 3 – 5 x 2 – 3cm, acute, base attenuated, sparsely pubescent, petiole ± 1cm. Flowers in terminal. Bracts papery, oblong to elliptic, subacute, base cordate, red, sessile, flowers on its midrib. Perianth 2 cm, minutely puberulous, distinctly angled.

Flowers & Fruits: February to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0051*, dated 05. 02. 2009.

Local Distribution: Murti and Dhupjhora Beat Office.

General Distribution: India: cultivated throughout; Native of tropical America.

Note: Widely cultivated as garden plants.

Bougainvillea spectabilis Willd., Sp. Pl. 2: 348. 1799; Grierson *et* Long, Fl. Bhut. 1(2): 194. 1984 ; Prain, Beng. Pl. 2: 863.1903. *Bougainvillea bracteata* Pers., Syn. Pl. 1: 418. 1805. *Bougainvillea virescens* Choisy, Prodr. 13(2): 437. 1849.

Local name: Kagajful.

Large climbing shrubs. Leaves alternate, ovate, 3 – 5 x 2 – 3cm, acute, base rounded, densely pubescent; petiole 1cm. Flowers in terminal. Bracts papery, elliptic – ovate, subacute, base cordate, red, sessile, longer than flowers; flowers on its midrib. Perianth 2 cm, pubescent, perianth tube rounded.

Flowers & Fruits: February to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0048*, dated 05. 02. 2009.

Local Distribution: Dhupjhora Beat Office.

General Distribution: India: cultivated throughout. Native of tropical America.

Note: Widely cultivated as garden plants.

MIRABILIS L., Sp. Pl. 1: 177. 1753.

Mirabilis jalapa L., Sp. Pl. 177. 1753; Hara *et al*., Enn. Fl. Pl. Nep. 3: 167. 1982; Grierson *et* Long, Fl. Bhut. 1(2): 192. 1984; Prain, Beng. Pl. 2: 862.1903. *Nyctago jalapae* (L.) DC., Fl. Franç. ed. 3, 3: 426. 1805.

Local name: Sandhya malati.

Robust erect herb, up to150cm. Leaves opposite, triangular ovate, 5 – 9 x 2 – 4 cm, acuminate, base truncate, glabrous, petioles 2 –3cm. Flowers in terminal corymbose cymes. Involucre campanulate, 1cm. Perianth red , narrowly funnel – shaped, tube 5cm, limb 5 lobed. Stamens 5. Fruit globose, obovoid, oblong, fusiform or terete, sometimes ribbed, without sticky glands.

Flowers & Fruits: April to February.

Specimen Cited: Gorumara, Murti and Dhupjhora, *Goutam & AP Das 0034*, dated 05. 02. 2009.

Local Distribution: Dhupjhora Beat Office and Gardens.

General Distribution: India: cultivated throughout. Native of tropical America.

Note: Widely cultivated.

NYCTANTHES L., Sp. Pl. 1: 6. 1753.

Nyctanthes arbor-tristis L., Sp. Pl. 1: 6. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 3: 603. 1882; Long in Grierson *et* Long, Fl. Bhut. 2(2): 937. 1999; Prain, Beng. Pl. 2: 660.1903. *Nyctanthes dentata* Bl., Mus. Bot. 1: 282 1851. *Nyctanthes tristis* Salisb., Prodr. Stirp. Chap. Allerton 11 1796. *Scabrita triflora* L., Mant. Pl. 1: 37 1767.

Local name: Shefali.

Shrubs; branches quadrangular. Leaves rigid, ovate, acuminate, base rounded or cuneate, margin entire or coarsely serrate, scabrid-hairy above, appressed pubescent on veins beneath. Flowers fragrant, sessile; corolla tube orange; lobes white. Capsule elliptic or suborbicular, 2 – lobed.

Flowers & Fruits: September – January.

General Distribution: India, cultivated in tropical area.

Flowers & Fruits: September to December.

Specimen Cited: Murti, *Goutam & AP Das 0047*, dated 05. 02. 2009.

Local Distribution: Planted in forest villages.

General Distribution: India: cultivated throughout. Native of tropical America.

Note: Widely cultivated.

Droseraceae Salisb. in Hook., Parad. Lond. t. 95. 1808 ('Drosereae').

DROSERA L., Sp. Pl. 1: 281. 1753.

Drosera burmanni Vahl, Symb. Bot. 3: 50. 1794; Long in Grierson *et* Long, Fl. Bhut. 1(2): 379. 1984; Prain, Beng. Pl. 1: 472.1903. *Drosera burmanni* var. *dietrichiana* (Rchb. *f*.) Diels, Pflanzenr. IV, 112: 76. 1906. *Drosera dietrichiana* Rchb. *f*., Beitr. Syst. Pflanzenk. 73. 1871.

Local name: Surja Shisir.

Small herbs. Stem unbranched, extremely short. Leaves forming a flat rosette, subsessile, lamina yellowish green or red to reddish violet, 8 – 9 x 6 – 8 mm, obovate, obtuse, prostrate, densely covered with glandular hairs, greenish pink; petioles absent. Flowers few in erect racemes; scape 6-8 cm high; calyx glandular. Sepals 5, united at base, light green, red, or reddish violet, narrowly oblong. Petals white to light red to reddish violet, obovate; style 3, free.

Flowering & Fruiting: August to December.

Specimen Cited: Murti, *Goutam & AP Das 0111*, dated 07. 02. 2009.

Local Distribution: All over the riverine grass land and khunia grass land.

General Distribution: India: tropical part throughout; Bhutan, S. E. Asia and Australia.

Note: Carnivorous plants of this region.

Tamaricaceae S.F. Gray, Arr. Brit. P1. 2: 554. 1821 ('Tamaricinae'); *nom. cons*.

TAMARIX L., Sp. Pl. 1: 270. 1753.

Tamarix dioica Roxb. *ex* Roth, Nov. Pl. Sp. 185. 1821; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 249. 1874; Prain, Beng. Pl. 1: 162. 1963; Shetty *et* Pandey in Sharma *et al*., Fl. Ind. 3: 24. 1993. Long in Grierson *et* Long, Fl. Bhut. 1(3): 636. 1987.

Local Name: Jhaoa.

Shrubs or small tree. Branches gray-green, robust. Leaves of growing branches lanceolate; those of vegetative branches lanceolate to ovate-lanceolate, unequal in size, 1– 4 mm, acuminate, base decurrent, amplexicaul, auriculate, imbricate. Racemes in branches of previous year and at apices of growing branches of current year forming a lax panicle. Flowers 4 merous. Sepals triangular-ovate, base slightly united, green, membranous, denticulate, apex obtuse. Petals obovate orbicular to elliptic, pink or purplish, deciduous after anthesis. Disk purple-red, thick. Stamens 4

or 5. Styles 3. Capsule large.

Flowers & Fruits: July to January.

Specimen Cited: Medlajhora, *Goutam & AP Das 0186*, dated 09. 02. 2009.

Local Distribution: Riverine Grassland.

General Distribution: India: tropical part; Bangladesh, Nepal, Pakistan, Myanmar and Afghanistan.

Note: Mainly found in river bed.

Plumbaginaceae Juss., Gen. P1. 92. 1789 ('Plumbagines'); *nom. cons*.

PLUMBAGO L., Sp. Pl. 1: 151. 1753.

Plumbago zeylanica L., Sp. Pl. 1: 151. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 3: 480. 1882; Fl. East Himal. 249. 1966; Enn. Fl. Pl. Nep. 3: 61. 1982; Rae *et* Aitken in Grierson *et* Long, Fl. Bhut. 2(2): 570. 1999. *Plumbago scandens* L., Sp. Pl. ed. 2, 215. 1762. *Findlaya alba* Bowdich, Exc. Madeira 258. 1825.

Local name: Sada chita

Scrambling bushy shrubs. Leaves ovate, entire, acute or acuminate, base cuneate or attenuate, glabrous. Petioles narrowly winged above, broadly auriculate at base. Racemes many-flowered, glandular. Corolla white. Capsules pale yellow-Br., ellipsoid.

Flowers & Fruits: September to February.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0727*, dated 14. 02. 2008.

Local Distribution: Khunia, Dhupjhora.

General Distribution: Pantropical.

Note: Cultivated as medicinal plants.

Polygonaceae Juss., Gen. P1. 82. 1789 ('Polygoneae'); *nom. cons*.

Key to the genera

1a. Perianth 3 – 5 cleft; stigma capitate 2

1b. Perianth 6 cleft; stigma fimbriate ..... ***Rumex***

2a. Petioles bearing reflexed prickles or bristles ..... ***Persicaria***

2b. Petioles articulate ..... ***Polygonum***

PERSICARIA (L.) Mill., Gard. Dict. Abr., ed. 4. vol. 3. 1754.

Key to the species

1a. Flowers in axillary fascicles; ocrea 2-cleft ..... *P. plebeium*

1b. Inflorescence spicate, capitate, or paniculate; ocrea not 2-cleft 2

2a. Stems and petioles with retrorse prickles ... . *P. strigosum*

2b. Stems and petioles without retrorse prickles 3

3a. Perennial herb ..... *P. barbatum*

3b. Annual herb 4

4a. Peduncles glandular hairy or glandular ..... *P. lapathifolium*

4b. Peduncles not glandular hairy and glandular 5

5a. Apex of ocrea usually with green leaflike wing ..... *P. orientale*

5b. Apex of ocrea without wing 6

6a. Perianth punctuate ..... *P. hydropiper*

6b. Perianth not punctuate ..... *P. chinense*

Persicaria chinensis (L.) Gross in Engl. Bot. Jaharb. Syst. 49(2): 269. 277 & 315. 1913; Grierson *et* Long, Fl. Bhut. 1(1): 163. 1983. *Polygonum chinense* L., Sp. Pl. ed. 1, 1: 363. 1753; Hook. *f.*, Fl. Br. Ind. 5: 44. 1886; Hara *et al.,* Enn. Fl. Pl. Nep. 3: 175. 1982. *Persicaria chinensis* var. *ovalifolia* (Meisn.) Hara, Fl. E. Him. 71. 1966; 2: 22. 1971; Hara *et al.,* Enum. Fl. Pl. Nepal 3: 175. 1982. *Polygonum chinense* var. *ovalifolia* Meisn. *sensu* Hook. *f.*, Fl. Br. Ind. 5: 45. 1885.

Scandent shrubs; stem glabrous. Stipules obliquely truncate tube and enclosed to entire internode, white. Lamina ovate, oblique, abruptly acuminate, cordate at base, glabrous except the midrib below; nerves many. Ochrea 2-3 cm long, membranous, ribbed, oblique at mouth, glabrous. Spike panicled, globose; peduncles glandularhairy; bracts ovate, obtuse, 1-flowered; flowers pedicelled; tepals 4, white, oblong, obtuse, glabrous; stamens 8, styles 3. Nut trigonous, glabrous, acute, Br..

Flowers & Fruits: Throughout the year.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0395*, dated 22.07.2009.

Local Distribution: All over the forests.

General Distribution: India, Bhutan, Nepal, China, Japan, Malaysia.

Persicaria strigosa (R.Br.) Nakai, Rigakkwai 24: 299. 1926. *Polygonum strigosum* R.Br., Prodr. Fl. Nov. Holl. 420. 1810. *Polygonum bodinieri* Lév *et* Vaniot in Bull. Acad. Int. Géogr. Bot. 11: 343. 1902. Prain, Beng. Pl. 2: 888. 1963. *Truellum strigosum* (R.Br.) Soják in Preslia 46: 149. 1974. *Tracaulon strigosum* (R. Br.) Greene, Leafl. Bot. Observ. Crit. 1: 22. 1904.

Annual herbs. Stems decumbent, branched, angulate, with retrorse prickles along angles. Petiole with recurved prickles; leaf blade elliptic or lanceolate, 6 × 2 – 3 cm, acuminate or acute, retrorse prickles along midvein, base weakly cordate or truncate, ciliate; ocrea tubular, membranous, with dense retrorse prickles at base, apex truncate, long ciliate. Inflorescence spicate; peduncle branched, each 2 or 3 flowered. Perianth pinkish, 5 parted; tepals elliptic. Styles 2 or 3; stigmas capitate. Achenes dark Br..

Flowers & Fruits: August to October.

Specimen Cited: Medlajhora, *Goutam & AP Das 0421*, dated 22.07.2009.

Local Distribution: Throughout the Beel Margin.

General Distribution: India: Bangladesh, Nepal, Bhutan, Indonesia, Malaysia, Myanmar, New Guinea, Thailand, Vietnam, Australia.

Persicaria barbata (L.) Hara, Fl. E. Him. 1: 70. 1966. *Polygonum barbatum* L., Sp. Pl. 362. 1753; Hook. *f*, Fl. Brit. Ind. 5: 37. 1886; Prain, Beng. Pl. 2: 663. 1903. *Polygonum rivulare* Roxb. Fl. Ind. 2: 290. 1824. *Polygonum kotoshoense* Ohki, Bot. Mag. (Tokyo) 39: 362. 1925. *Persicaria omerostroma* (Ohki) Sasaki, List Pl. Formos. 170. 1928.

Erect stout herbs. Lamina subsessile, 6-12 x 2-3 cm, elliptic-lanceolate, acuminate at both ends, glabrate or pubescent; nerves many, slender; ochrea strigose, mouth oblique, shortly bristled, pubescent. Spike 2- 4 cm long, shortly peduncled, stout, in 15-20 cm long panicles; bracts obovate, obtuse, long-ciliate; flowers white, 4 – 10 in each bracts, longpedicelled; pedicels persistent; tepals 5, free, oblong, obtuse, glandular; stamens 8; styles 3. Nut trigonous, acute, glabrous.

Flowers & Fruits: July to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0415*, dated 22.07.2009.

Local Distribution: Throughout the Beel Margin.

General Distribution: India (Warmer part), Tropical part of Asia, Africa and America.

Persicaria hydropiper (L.) Delarbre, Fl. Auvergne ed. 2: 518. 1800. *Persicaria hydropiper* (L.) Spach, Hist. Veg. 10: 536. 1841; Hara, Fl. East. Himal. 2: 23. 1971; Grierson *et* Long, Fl. Bhut. 1(1): 162. 1983. *Polygonum hydropiper* L., Sp. Pl. 1: 361. 1753; Hook. *f.*, Fl. Brit. Ind. 5: 39. 1886; Prain, Beng. Pl. 2: 664. 1903. *Persicaria hydropiper* (L.) Opiz, Seznam 72. 1852. *Polygonum schinzii* Schust., Bull. Herb. Boissier 2(8): 711. 1908.

Local name: Bishjhar.

Slender erect herbs. Lamina subsessile, 3 – 7 x 1.5 – 2.5 cm, elliptic, acuminate, base acute, scabrous along the nerves, nerves many, slender. Ochrea with immersed hairs, mouth ciliate. Racemes 3 – 10 cm long, panicled, slender, sometimes drooping; bracts obovate, ciliate; flowers solitary or paired in each bract; tepals oblong, obtuse, red-glandular; stamens 5; styles 3-fid. Nut trigonous, apiculate.

Flowers & Fruits: May to December.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0130*, dated 07. 02. 2009.

Local Distribution: Throughout the Beel Margin.

General Distribution: India (Plains and wet places), Pantropica Europe and N. Africa.

Note: Extract of this plant used to catching fish.

Persicaria lapathifolia (L.) Delarbre, Fl. Auvergne ed. 2: 519. 1800. *Persicaria lapathifolia* (L.) Gray, Nat. Arr. Br. Pl. 2: 270. 1821; Grierson *et* Long, Fl. Bhut. 1(1): 161.1983. *Polygonum lapathifolia* L., Sp. Pl. 360.1753; Hook. *f.*, Fl. Brit. Ind. 5: 35. 1886. *Polygonum nodosum* Pers., Syn. Pl. 1: 440. 1805. *Polygonum incarnatum* Elliott, Sketch Bot. S. Carolina 1(5): 456. 1817.

Annual herbs. Stems erect, branched, swollen at nodes. Lamina lanceolate or broadly lanceolate,

ciliate, acuminate or acute, base cuneate; ocrea brownish, tubular, membranous, glabrous, apex truncate. Inflorescence terminal or axillary, densely flowered, several spikes aggregated panicle like; bracts funnel-shaped, margin sparsely shortly ciliate. Perianth pink or white. Stamens usually 6. Styles 2, connate at base. Achenes black-Br., shiny, broadly ovoid, biconcave.

Flowers & Fruits: June to December.

Specimen Cited: Murti, *Goutam & AP Das 0074*, dated 06. 02. 2009.

Local Distribution: Near Tourist Bunlow.

General Distribution: India: Bhutan, Nepal, Bangladesh, Pakistan, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, Myanmar, New Guinea, Philippines, Russia, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; N Africa, Australia, Europe, North America.

Persicaria orientalis (L.) Spach, Hist. Nat. Vég. 10: 537 1841. *Persicaria orientalis* (L.) Assenov, Fl. Reip. Pop. Bulgar. 3: 250. 1966; Grierson & Long, Fl. Bhut. 1(1): 161. 1983. *Polygonum orientale* L., Sp. Pl. 1: 362. 1753. Hook. *f*, Fl. Brit. Ind. 5: 30. 1886; Prain, Beng. Pl. 2: 663. 1903. *Persicaria tibetica* Rendle, J. Bot. 428. 1900. *Polygonum orientale* var. *pilosum* (Roxb. *ex* Meisn.) Meisn., Prodr. 14(1): 123. 1856. *Polygonum pilosum* Roxb. *ex* Meisn., Fl. Ind., ed. 1820 2: 286. 1824.

Annual herbs. Stems erect, much branched above, densely spreading villous. Lamina broadly ovate to ovate-lanceolate, 10 – 20 × 5 – 10 cm, both surfaces densely pubescent, densely ciliate, acuminate, base rounded or subcordate, slightly decurrent. Ocrea tubular, membranous, margin truncate, long ciliate, usually with green leaflike wing. Inflorescence terminal or axillary, slightly pendulous, several spikes aggregated and panicle-like; bracts green, broadly funnel shaped. Flowers dimorphic. Perianth white. Stamens 7, exserted. Styles 2, connate to below middle; stigmas capitate. Achenes, black-Br., shiny.

Flowers & Fruits: June to August.

Specimen Cited: Murti, *Goutam & AP Das 0041*, dated 05. 02. 2009.

Local Distribution: Murti River bank.

General Distribution: India through out; Bhutan, Bangladesh, China, Indonesia, Japan, Korea, Myanmar, Philippines, Russia, Sri Lanka, Thailand, SW Asia, Australia and Europe.

POLYGONUM L., Sp. Pl. 1: 359. 1753, *nom. cons*.

Key to the species

1a. Flowers in axillary fascicles, 2 cleft ..... *P. plebeium*

1b. Inflorescence spicate, pendulous; ocrea truncate to ciliate ..... *P. pubescens*

Polygonum plebeium R. Br., Prodr. Fl. Nov. Holl. 420. 1810 ("*Plebejum*"); Hook. *f.*, Fl. Brit. Ind. 5: 27. 1886; Prain, Beng. Pl. 2: 855. 1903; Grierson ***et*** Long, Fl. Bhut. 1(1): 170. 1983; Guha Bakshi, Fl. Mur. Dist. 274. 1984. *Avicularia indica* Didrich., Bot. Not. 1850: 187. 1850. *Polygonum herniarioides* Spreng., Syst. Veg. 2: 256. 1825.

Local name: Ratoful.

Prostrate woody herbs with radiate branches; stems glabrous. Lamina 0.8 – 1 x 0.3 – 0.5 cm, oblong, sessile, acute, glabrous. Ochrea chartaceous, white, ciliate. Flowers 3 – 7 together, sessile, axillary; tepals 5, ovate, acute, glabrous; stamens 5. Nut trigonous, acute, glabrous, Br..

Flowers & Fruits: October to March.

Flowers & Fruits: June to November.

Specimen Cited: Murti, *Goutam & AP Das 0081*, dated 06. 02. 2009.

Local Distribution: Riverine sandy lands.

General Distribution: India: tropical part; Tropical and Sub Tropical Asia, Africa and Australia.

Polygonum pubescens Bl., Bijdr. Fl. Ned. Ind. 2: 532. 1925; Steward in Contr. Gray Herb. 88: 62.1930. *Persicaria pubescens* (Bl.) Hara in Jour. Jap. Bot. 17(6): 335. 1941; Hara, Fl. East. Himal. 73: 1966. *Polygonum burbatum sensu* Willd. in Roxb. Fl. Ind. 2: 289. 1832 *non* L; Grierson *et* Long, Fl. Bhut. 1(1): 162. 1983. *Polygonum flaccidum* Meisn., Prodr. 14(1): 107. 1856; Hook. *f.*, Fl. Brit. Ind. 5: 39. 1886; Prain, Beng. Pl. 2: 664. 1903. *Polygonum hispidum* Buch.-Ham. *ex* Don, Prodr. Fl. Nepal. 71. 1825. *Polygonum flaccidum* var. *hispidum* (Buch.-Ham. *ex* Don) Hook. *f.*, Fl. Brit. India 5: 40. 1886.

Annual or perennial herbs. Stems erect, hispidulous. Lamina 3 – 8 × 1- 4 cm ovate-lanceolate or broadly lanceolate, both surfaces hispidulous, ciliate, acuminate or acute, base cuneate. Ocrea tubular, hispid, apex truncate, ciliate. Inflorescence terminal or axillary, spicate, pendulous, lax; funnel-shaped, margin ciliate, each 3 or 4 flowered; pedicels longer than bracts. Perianth green, red above, 5 parted, densely purplish glandular punctate; tepals elliptic; stamens 8, included; styles 3, connate to below middle. Achenes black, ovoid.

Flowers & Fruits: March to October.

Specimen Cited: Murti, *Goutam & AP Das 0062*, dated 07. 02. 2009.

Local Distribution: Riverine lowland and allover the beel margins.

General Distribution: India, Malaya and Archipelago.

RUMEX L., Sp. Pl. 1: 333. 1753.

Key to the species

1a. Inner fruiting sepals margin narrow, few toothed ..... *R. maritimus*

1b. Inner fruiting sepals margin wide, more toothed ..... *R. dentatus*

Rumex dentatus L., Mant. Pl. 2: 226. 1771; Hook. *f*., Fl. Brit. Ind. 5: 59. 1886; Prain, Beng. Pl. 2: 665. 1903. Grierson *et* Long, Fl. Bhut. 1(1): 174. 1983. *Rumex klotzschianus* Meisn., Prodr. 14(1): 57. 1856. *Rumex dentatus* subsp. *klotzschianus* (Meisn.) Rechard *f.* in Beib. Bot. Jahr. 49(2): 19. 1932.

Annual herbs. Stems erect, branched from base, grooved; branches ascending to nearly divaricate, glabrous. Lower leaves: lamina oblong to narrowly elliptic, 4 – 12 × 2 – 3 cm, both surfaces glabrous, slightly undulate, obtuse or acute, base rounded, truncate or subcordate; cauline leaves smaller; ocrea fugacious, membranous. Inflorescence racemose, several racemes aggregated and panicle like. Flowers bisexual. Outer tepals elliptic; inner tepals enlarged in fruit; valves triangular ovate, base rounded, each margin with 2 to 4 teeth, apex acute to subacute. Achenes yellow-Br., shiny, ovoid, sharply trigonous.

Flowers & Fruits: May to August.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0040*, dated 05. 02. 2009.

Local Distribution: Along the beel margins; common.

General Distribution: India; tropical. Nepal, Afghanistan, India, Kazakhstan, Kyrgyzstan, Russia; N Africa, SE Europe.

Rumex maritimus L., Sp. Pl. 335. 1753; Hook. *f*., Fl. Brit. Ind. 5: 59. 1986; Prain, Beng. Pl. 2: 665. 1903. *Lapathum minus* Lam., Fl. Franç. 3: 4. 1778. *Rumex aureus* Mill., Gard. Dict. (ed. 8) no. 7 no. 7. 1768. *Rumex fueginus* Philip, Anales Univ. Chile 91: 493-494. 1895. *Rumex trisetifer* Stokes *sensu* Grierson *et* Long, Fl. Bhut. 1(1): 174. 1983.

Annual herbs. Stems erect, branched below middle, grooved, glabrous. Lower leaves: lamina lanceolate to lanceolate-oblong, both surfaces glabrous, entire and smooth or occasionally slightly undulate, acute, base narrowly cuneate; cauline leaves shortly petiolate, smaller than basal ones; ocrea fugacious, membranous. Inflorescence paniculate. Flowers bisexual. Outer tepals elliptic; inner tepals enlarged in fruit; valves narrowly triangular ovate, base truncate. Achenes yellowbrown, shiny, ellipsoid, sharply trigonous.

Flowers & Fruits: May to July.

Specimen Cited: Gorati Beel, *Goutam & AP Das 0050*, dated 05. 02. 2009.

Local Distribution: Throughout the beel margins; abundant.

General Distribution: India: throughout; Bhutan, Bangladesh, Kazakhstan, Mongolia, Myanmar, Russia, Europe, introduced in North America.

Order 29: Saxifragales Dumort. (1829)

possible subclass 1:

Crassulaceae DC., Bull. Soc. Philom. no. 49: 1. 1801; *nom. cons.*

BRYOPHYLLUM Salisb., Parad. Lond. t. 3. 1805.

Bryophyllum pinnatum (Lam.) Oken, Allg. Naturgesch. 3(3): 1966. 1841. *Bryophyllum pinnatum* (Lam.) Kurz in Jour. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40(2): 52. 1871. *Kalanchoe pinnata* (Lam.) Pers., Syn. 446. 1805. Grierson & Long, Fl. Bhut. 1(3): 473. 1987. *Cotyledon pinnata* Lam., Dict. 2: 141. 1786.

*Local name:*Pathar kuchi.

Herbs, up to 140 cm, glabrous. Stems usually branched. Leaves pinnately compound with 3 – 5 leaflets; petiolules 3 cm; leaflet blades oblong to elliptic, 4 – 8 × 2 – 5 cm, margin crenate, apex obtuse. Inflorescences terminal, paniculate, up to 40 cm, many flowered. Flowers pendulous. Calyx tubular. Corolla reddish to purple, base sparsely ciliate; lobes ovate-lanceolate. Stamens inserted basally on corolla. Nectar scales oblong. Follicles included in calyx and corolla tube. Seeds striate.

Flowers & Fruits: January to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0223*, dated 09. 02. 2009.

Local Distribution: Semi-naturalized in forest villages; common.

General Distribution: Native of Africa and naturalized throughout the tropics.

Note: Cultivated as medicinal plants.

possible subclass 3:

Rosids:

Order 30: Vitales Juss. ex Bercht. & J.Presl (1820)

Vitaceae Juss., Gen. P1. 267. 1789 (‘Vites’).

Key to the genera

1a. Plants climbers; tendril present 2

1b. Plants shrubs or trees; tendril absent ..... ***Leea***

2a. Tendril unbranched ……..…….…... 3

2b. Tendril 2 – 3 furcate ……..…….. ***Cayratia***

3a. Inflorescence a loose thyrse or panicle, base subtended by a tendril ..... ***Ampelocissus***

3b. Inflorescence a loose dichasium, corymbose cyme, or umbel, base without tendrils 4

4a. Inflorescence leaf-opposed ..... ***Cissus***

4b. Inflorescence usually axillary or pseudo-axillary ..... ***Tetrastigma***

CAYRATIA Juss. in Cuvier, Dict. Sci. Nat. 10: 103. 1818, nom. cons.

Cayratia japonica (Thunb.) Gagnep., Notul. Syst. (Paris) 1: 349. 1911.

Herbaceous vines. Branchlets terete, with longitudinal ridges; tendrils 2- or 3-furcate. Leaves pedately 5-foliolate to 3-foliolate; stipules caducous; leaflets with lateral veins 5–9 pairs; central leaflet elliptic to elliptic-lanceolate, base cuneate, dentate, acute to acuminate; lateral leaflets elliptic or narrowly so. Compound dichasium axillary. Calyx cupular, papillose or nearly glabrous, margin entire or undulate. Petals triangular-oval. Anthers oval. Lower part of ovary adnate to disk. Berry globose.

*Flowers & Fruits:*March to July.

Specimen Cited: Murti, *Goutam & AP Das 0786*, dated 11.05.2008.

Local Distribution: All over the forests.

General Distribution: Bhutan, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; Australia.

LEEA D. Royen *ex* L., Syst. Nat., ed. 12, 2: 608, 627; Mant. Pl. 1: 17, 124. 1767, *nom. cons*.

Key to the species

1a. Small tree ……..2

1b. Shrubs ……3

2a. Branchlets almost glabrous ……..…….. *L. guineensis*

2b. Branchlets longitudinal ridges obtuse ……..……. *L. indica*

3a. Abaxial leaflet surface pubescent with dense peltate glands ..... *L. aequata*

3b. Abaxial leaflet surface pubescent without peltate glands 4

4a. Leaves simple to 1–3-pinnate, blade large and broadly ovate ..... *L. macrophylla*

4b. Leaves pinnate, blade ovate-oblong ..... *L. asiatica*

Leea asiatica (L.) Ridsdale, Bot. Hist. Hort. Malab. 189. 1980; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 163. 1991. *Leea aspera* Edgewirth, Trans. Linn. Soc. London 20(1): 36. 1846. *Leea crispa* L., Mant. Pl. 1: 124. 1767. *Leea herbacea* Buch.-Ham., Trans. Linn. Soc. London 14(1): 228-229. 1823; Prain, Beng. Pl. 1: 340. 1963. *Phytolacca asiatica* L., Sp. Pl. 1: 441. 1753.

Erect shrubs. Branchlets terete with longitudinal ridges. Leaves pinnate; stipules large and obovate; simple lamila ovate-oblong, 40 – 60 × 30 – 50 cm, acuminate, dentate, base rounded. Inflorescences opposite to leaves, compound corymbose-dichasial; bracts triangular to narrow. Calyx tube cupulate, with 5 triangular teeth. Petals elliptic. Stamens 5; anthers elliptic. Ovary nearly globose. Berry oblate, 6 seeded.

*Flowers & Fruits:*June to November.

Specimen Cited: Gorumara, *Goutam & AP Das 0375*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: India: through out idle to Eastern India; Bhutan, China, Nepal, Cambodia, Laos, Myanmar, Thailand.

Leea aequata L., Syst. Nat. (ed. 12) 2: 627. 1767; Mant. Pl. 1: 124. 1767; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 149. 1991; Prain, Beng. Pl. 1: 340. 1963. *Leea hirta* Roxb. *ex* Horn., Hort. Bot. Hafn. 1: 231. 1813. *Leea hispida* Gagnep., Notul. Syst. (Paris) 1: 229. 1910.

Small trees, up to 5m. Leaves 1 to 2 pinnate; stipules cuneate to lanceolate; lamilets elliptic-lanceolate to ovate-lanceolate, 6 – 25 × 3 – 7 cm, acuminate or caudate acuminate, irregular teeth, base cuneate to rounded. Inflorescence leaf-opposed; densely ferruginous pubescent. Calyx tube cupulate; sepals triangular and densely with glands. Petals elliptic, glabrous. Staminodial tube 2 – 2.5 mm. Stamens 5; anthers elliptic. Ovary globose; stigma slightly capitate. Berry oblate, 4–6-seeded.

*Flowers & Fruits:*April to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0386*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: India: tropical part; Bhutan, Nepal, Bangladesh, Cambodia, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Leea guineensis G. Don, Gen. Hist. 1: 712. 1831; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 163. 1991.

Small trees. Branchlets terete, almost glabrous. Leaves 2 to 3-pinnate; glabrous; leaflets oval elliptic to long and roundly lanceolate, 5–18 × 2.5–7.5 cm, base broadly cuneate, margin with acute teeth, apex acuminate. Inflorescences a corymboselike compound dichasium. Pedicel very short. Calyx tube cupulate; sepal triangular, glabrous. Petals 5, elliptic, red. Stamens 5. Ovary ovate; stigma expanded slightly. Berry subglobose.

*Flowers & Fruits:*April to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0386*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; Africa, Madagascar.

Leea indica (Burm.) Merrill, Philipp. J. Sci. 14: 245. 1919; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 164. 1991. *Staphylea indica* Burm., Fl. Indica, 75. 1768;

Erect shrubs to small trees. Branchlets terete, longitudinal ridges obtuse, glabrous. Leaves 2 to 3-pinnate, glabrous; stipules broadly obovate, apex rounded, glabrous; leaflets elliptic to elliptic-lanceolate, 6–30 × 3–8 cm, base rounded, or rarely broadly cuneate, teethed, acuminate to caudate. Inflorescences opposite to leaves, compound dichasial or umbelliform. Involucre elliptic-lanceolate, shortly acute and acuminate, glabrous, deciduous. Petals elliptic, glabrous. Stamens 5; anthers elliptic. Ovary globose.

*Flowers & Fruits:*April to August.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0386*, dated 21.07.2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Bichhabhanga, Budhuram.

General Distribution: Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands.

Leea macrophylla Roxb. *ex* Horn., Hort. Bot. Hafn. 1: 231. 1813; Long *et* Rae in Grierson *et* Long, Fl.Bhut. 2(1): 164. 1991; Prain, Beng. Pl. 1: 341. 1963. *Leea aspera* Wall. *ex* G. Don, Gen. Hist. 1: 713. 1831.*Leea robusta* Roxb., Fl. Ind., ed. 1820 2: 468. 1824. *Leea integrifolia* Roxb., Fl. Ind., ed. 1820. 2: 472. 1820.

Erect shrubs to small trees, up to 4m. Leaves variable in shape and size, simple, 3 foliolate, or 1 to 3 pinnate; stipules large and obovate; simple lamila broadly ovate, 35 – 60 × 30 – 50 cm, acuminate, dentate, base rounded. Inflorescences opposite to leaves, compound corymbose-ichasial. Calyx tube cupulate, with 5 triangular teeth. Petals elliptic. Stamens 5; anthers elliptic. Ovary nearly globose; stigma slightly capitate. Berry oblate, 6-seeded.

*Flowers & Fruits:*October to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0442*, dated 22.07.2009.

Local Distribution: All over the forests.

General Distribution: India: tropical parts; Bhutan, China, Nepal, Cambodia, Laos, Myanmar, Thailand.

AMPELOCISSUS Planch., Vigne Amér. Vitic. Eur. 8: 371. 1884, *nom. cons*.

Ampelocissus sikkimensis (Lawson) Planch. in J. Vigne Amer. Vitic. Eur. 8: 375. 1884; Singh *et al*. Flora India 5: 317. 2000; *Vitis sikkimensis* Lawson in Hook. *f.*, Fl. Brit. India 1(3): 650. 1875.

Woody lianas. Branchlets terete, with longitudinal ridges, glabrous. Leaves simple; petiole 6 cm, glabrous; leaflets cordate-oval, 20 × 15 cm, glabrous, basal veins 5, veinlets slightly prominent abaxially, inconspicuous adaxially, base cordate, margin finely toothed, apex mucronate. Compound dichasium leaf-opposed, base with a bifurcate tendril. Pedicel 2 - 5 mm, nearly glabrous. Berry red, globose, 2 seeded. Seeds oblong, base rostrate, apex subrounded.

Flowers & Fruits: November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0519*, dated 23.07.2009.

Local Distribution: All over the forests.

General Distribution: Tropical Asia and America.

TETRASTIGMA (Miq.) Planch. in Candolle *et* Candolle, Monogr. Phan. 5: 320, 423. 1887.

Key to the species

1a. Stem flat …… *T. planicaule*

1a. Stem terete …….. 2

2a. Leaves pedately 5 foliolate; tendrils biforked .....,,,,,..... *T. serrulatum*

2b. Leaves palmately 3 to 5 foliolate; tendrils unbranched .....,,,... *T. campylocarpum*

Tetrastigma campylocarpum (Kurz) Planchon in Candolle *et* Candolle, Monogr. Phan. 5: 437. 1887; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 156. 1991. *Vitis campylocarpa* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 302. 1872.

Woody lianas. Branchlets terete, with longitudinal ridges; tendrils unbranched. Leaves palmately 3 to 5 foliolate; lamilets obovate – elliptic, 8 – 16 × 5 – 8 cm, base broadly cuneate; lateral leaflets rhombic-ovate, acute, base asymmetric and subrounded. Inflorescence a large compound dichasium, axillary. Flowers small. Calyx teeth inconspicuous, pubescent, margin undulate. Petals galeate, pubescent. Anthers yellow, ovoid. Disk well developed. Ovary cylindrical; style absent; stigma truncate. Berry purple-black when mature, elliptic. Seeds elliptic and flat.

Flowers & Fruits: October to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0376*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: India: tropical part; Bhutan, China, Myanmar, Thailand.

Tetrastigma planicaule (Hook. *f*.) Gagnep., Notul. Syst. (Paris) 1: 319. 1910. Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 156. 1991. *Vitis planicaulis* Hook. *f*., Bot. Mag. 94: t. 5685. 1868.

Woody, robust lianas. Stem flat. Branchlets terete to slightly flat with longitudinal ridges, glabrous; tendrils unbranched. Leaves palmately 5-foliolate; leaflets elliptic-lanceolate, lanceolate to ovate-lanceolate, 9–15 × 2.5 – 6 cm, glabrous, base cuneate, teeth inconspicuous to fine, acuminate to acute. Inflorescence umbelliform, axillary. Buds oval. Calyx shallow and saucer-shaped. Petals ovate-triangular, sparsely papillose. Filaments filiform; anthers yellow and abortive in female flowers. Disk well developed, 4-lobed. Ovary broadly coniform, base papillose; stigma 4-lobed. Berry globose.

Flowers & Fruits: April to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1316*, dated 21.07.2011.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: India, Laos, Sri Lanka, Vietnam.

Tetrastigma serrulatum (Roxb.) Planch. in DC., Monogr. Phan. 5: 432. 1887; Hara in Fl. E. Him. 1: 201. 1966; 2: 80. 1971; 3: 82. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 95. 1979; Long *et* Ray in Grierson *et* Long , Fl. Bhutna 2(1): 155. 1991. *Cissus serrulata* Roxb., Fl. Ind. ed. Carey, 1: 432. 1820. *Vitis capreolata* Don, Prodr. Fl. Nep. 188. 1825; Lawson in Hook.*f.,* Fl. Brit. India 1: 659. 1875.

Slender lianas. Branchlets terete, with longitudinal ridges; tendrils biforked or sometimes unbranched. Leaves pedately 5 foliolate; petiole 3 - 5 cm; leaflets ovate-lanceolate, 3 – 6 × 1 – 4 cm, lateral veins 4 to 8 pairs, veinlets conspicuously raised, base rounded or cuneate, base of lateral leaflets asymmetric, margin undulate fine teeth on each side, apex caudate, acuminate. Inflorescence umbelliform, axillary; peduncle up to 5 cm. Buds ovoid-elliptic. Calyx minute; teeth inconspicuous. Petals ovate-elliptic, apex corniculate, glabrous. Filaments filiform; anthers yellow, oval. Disk developed. Lower part of ovary adnate to disk; style short; stigma expanded and irregularly divided. Berry purple-black at maturity, spheroid. Seeds obovoidelliptic, base attenuate to a short rostrum, apex subrounded.

Flowers & Fruits: March to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0391*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: India: West Bengal, Assam, Bihar; Bhutan, Nepal, Myanmar, Thailand.

CISSUS L., Sp. Pl. 1: 117. 1753.

Key to the species

1a. Ramblers; branches quadrangular with angles usually winged,

succulent; tendrils simple ..... *C. quadrangularis*

1b. Woody lianas; branchlets terete, not angled or winged;

tendrils racemosely 5 branched ..... *C. repens*

Cissus quadrangularis L., Syst. Nat. ed. 12(2): 124. 1767. *Cissus quadrangula* L., Mant. Pl. 1: 39. 1767; Fl. Ind. 5: 288. 2000; Prain, Beng. Pl. 1: 338. 1963. *Vitis quadrangularis* (L.) Wall. *ex* Wight, Cat. Indian Pl. 26 26 1833. *Cissus tetraptera* Hook. *f*., Niger Fl. 263. 1849.

*Local name:*Harjora.

Ramblers; branches quadrangular with angles usually winged, succulent; tendrils stout, simple. Leaves ovate to reniform, sometimes 3 – 7 – lobed, acute-obtuse at apex, truncate-cordate at base, subentire – denticulate at margins, glabrous; stipules broadly ovate, obtuse. Flowers glabrous; petals ovate-oblong. Berries obovoid or globose, apiculate, 1 – 2 – seeded. Seeds obovoid.

Flowers & Fruits: June to January.

Specimen Cited: Murti, *Goutam & AP Das 0461*, dated 23.07.2009.

Local Distribution: Cultivated in Murti and Dhupjhora forest villages.

General Distribution: India: cultivated throughout; Bhutan, Bangladesh, China,Myanmar, Sri Lanka, Africa, Indonesia and Philippines.

Cissus repens Lam., Encycl. 1: 31. 1783; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 159. 1991. *Cissus cordata* Roxb., Fl. Ind. 1: 425. 1820. *Cissus glauca* Roxb., Fl. Ind. 1: 406. 1820. *Vitis repens* (Lamarck) Wight *et* Arnott, Prodr. Fl. Ind. Orient. 1: 125-126. 1834; Prain, Beng. Pl. 1: 338. 1963.

Woody lianas. Branchlets terete, villous; tendrils racemosely 5 branched. Leaves simple, undivided to slightly 3-lobed; petiole 7 cm; stipules ovate-elliptic to oval, herbaceous, apex rounded; leaf blade ovateorbicular, 5 – 15 × 3 – 7 cm, adaxially with sparse versatile and villous, then glabrescent, basal veins 5 to 7, lateral veins 4 to 5 pairs, veinlets inconspicuously raised, base cordate, margin with irregular teeth or undulate, fine teeth in curves of wavy margin, apex acuminate to acute. Compound umbel terminal or leaf-opposed. Pedicel up to 6 mm. Buds oval, apex rounded. Calyx teeth inconspicuous. Petals oval. Anthers oval, abortive in female flowers. Disk undulately 4 lobed. Lower part of ovary adnate to disk; style conical, base slightly thick; stigma slightly expanded. Berry 1 seeded. Seed surface with slightly raised ridges.

Flowers & Fruits: July to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0384*, dated 21.07.2009.

Local Distribution: All over the forests.

General Distribution: India: West Bengal; Assam, Bihar, Orissa, Maharastra; Bhutan, Nepal, Cambodia, Laos, Malaysia, Philippines, Thailand, Vietnam, Australia, Tropical and sub-tropical parts of the world.

Core-Eudicots: Rosids: Eurosids (I) (fr.: Fabidées ou Eurosidées I)

Order 32: Celastrales Link (1829)

Celastraceae R.Br. in Flinders, Voy. Terra Austr. 2: 554. 1814 ('Celastrineae'); *nom. cons*.

CELASTRUS L., Sp. Pl. 1: 196. 1753, *nom. cons*.

Celastrus paniculatus Willd., Sp. Pl. 1: 1125. 1798. Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(1): 122. 1991; Prain, Beng. Pl. 1: 329. 1963. *Ceanothus paniculatus* Roth, Nov. Pl. Sp. 154. 1821. *Celastrus alnifolius* Don, Prodr. Fl. Nepal. 190. 1825. *Diosma serrata* Blanco, Fl. Filip. 168. 1837. *Celastrus paniculatus* Willd., Sp. Pl. 1: 1125. 1797.

Large deciduous twining shrubs; bark pale Br., rough and cracked, exfoliating in small scales. Lamina elliptic – oblong to ovate, 5 – 10 × 2 – 5 cm, glabrous, serrate, mucronate to acuminate, base cuneate. Thyrses terminal, 5–10 cm. Flowers greenish, 5 merous, dioecious; sepals free; petals oblong to obovate-rectangular. Disk membranous, cupulate, slightly 5 lobed. Stamens inserted on margin of disk. Ovary globose. Capsule globose, 3 valved.

*Flowers & Fruits:*April to August.

Specimen Cited: Murti, *Goutam & AP Das 0539*, dated 23.07.2009.

Local Distribution: Through out forests.

General Distribution: India: through out; Bhutan, Nepal, Sri Lanka, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; Australia, Pacific islands.

Order 33: Oxalidales Bercht. *et* Presl (1820)

Elaeocarpaceae Juss. *ex* DC., Prodr. 1: 519. 1824 ('Elaeocarpeae'); *nom. cons.*

ELAEOCARPUS L., Sp. Pl. 1: 515. 1753.

Elaeocarpus floribundus Bl., Bijdr. 120. 1825; Dyer in Hook.*f.*, Fl. Brit. Ind. 1: 401. 1874; Miller in Grierson *et* Long, Fl. Bhut. 2(1): 170. 1991. *Elaeocarpus rigidus* Ridl. in J. Straits Branch Roy.

Asiat. Soc. 54: 28 1910. *Elaeocarpus ramsoii* Kunth in Fedd. Repert. 44: 131. 1938. *Elaeocarpus floribundus* var. *tahanensis* (Hend.) Ng, in Tree Fl. Malaya 4: 88. 1989. *Elaeocarpus lobbianus* Turcz. in Bull. Soc. Imp. Naturalistes Moscou 31(1): 235. 1858.

*Local name:*Jalpaai

Trees upto 20 m high. Lamina ovate to elliptic-ovate, acute to acuminate, base cuneate or rounded, glabrous, glandular-punctate beneath. Racemes 20 – 25-flowered. Sepals lanceolate, glabrescent or thinly appressed hairy. Petals white, obtriangular, hairy on margins only. Ovaries 3-celled. Fruits ellipsoid- obovoid.

Flowers & Fruits: March to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0085*, dated 06. 02. 2009.

Local Distribution: Commonly panted in forest villages.

General Distribution: India: cultivated throughout; Bangladesh, Bhutan, Myanmar, Malaysia and Indonesia.

Oxalidaceae R.Br. in Tuckey, Narr. Exped. Congo 433. 1818 ('Oxalideae'); *nom. cons.*

Key to the genera

1a. Leaves fascicled at top of stem, even-pinnate ..... ***Biophytum***

1b. Leaves basal or cauline along stem, 3-foliolate ..... ***Oxalis***

OXALIS L., Sp. Pl. 1: 433. 1753.

Key to the species

1a. Subterranean bulb 1 – 3 cm; leaves basal 2

1b. Rootstock a slender taproot, leaves from creeping branch ..... *O. corniculata*

2a. Lamina triangular, apex flat, strait ..... *O. latifolia*

2b. Lamina obcordate, apex deeply emarginated ..... *O. corymbosa*

Oxalis corniculata L., Sp. Pl. 435. 1753; Hook. *f*., Fl. Brit. Ind. 1: 436. 1874; Hara, Fl. East. Himal. 1:168. 1966; Hara *et al.*, Enn. Fl. Pl. Nep. 2: 77. 1979; FI 4: 242. 1997; Fl. West Bengal, 1:373. 1997; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 1(3): 742.1987.

Local name: Amruli/ Ambali.

Annuals herbs, up to 50 cm, creeping, ascending to semierect. Rootstock a slender taproot, sometimes woody; stolons absent. Stipules small. Leaves petiole 3 – 8 cm; lamina obcordate, 0.3 – 2 × 0.4 – 2 cm, green, variably adaxially and abaxially pubescent, deeply emarginate. Inflorescences umbellate, 1–5- flowered; peduncle usually slightly longer than petioles; bracts linear-lanceolate. Sepals oblonglanceolate, margin ciliate especially at apex. Petals bright yellow, oblong-obovate. Capsule long cylindric, 5 angled, a few septate hairs on dehiscence sutures. Seeds Br. to brownish red, ovoid-oblong, transversely ridged.

Flowers & Fruits: February to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0706*, dated 14. 02. 2008.

Local Distribution: Throughout the forests.

General Distribution: India: throughout; Bhutan, China, Nepal, Pakistan, Japan, Korea, Malaysia, Myanmar, Russia, Thailand.

Note: Plants are edible.

Oxalis latifolia H B K., Nov. Gen. Sp. 5:184, t. 467. 1821; Hara, Fl. East Himal. 1: 168. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 2:77. 1979; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 1(3): 743. 1987.

Perennials herbs, up to 25 cm, stemless, pubescent. Subterranean bulb 1 – 3 cm; scales loose, papery, 3-veined. Leaves basal; petiole 5 – 15 cm, with moderately dense spreading white trichomes; lamina triangular, 2 – 4 × 1 – 3 cm, flat, strait. Inflorescences corymbose cymes, irregularly branched; peduncle 10 – 15 cm or longer; bracts lanceolate, membranous. Pedicels, bracts, and sepals pubescent. Sepals lanceolate, apex with 2 reddish Br. calli. Petals purplish pink with darker veins, obcordate. Ovary pubescent.

Flowers & Fruits: March to December.

Specimen Cited: Murti, *Goutam & AP Das 0675*, dated 13. 02. 2008.

Local Distribution: Garden.

General Distribution: Tropical India; SE Asia, Africa.

Oxalis corymbosa DC., Prodr. 1:696. 1824; Hara, Fl. East. Himal. 1: 168. 1966; Hara *etal.*, Enn. Fl. Pl. Nep. 2:77. 1979; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 1(3): 743.1987.

Perennials herbs, up to 25 cm, stemless, pubescent. Subterranean bulb 1 – 3 cm; scales loose, papery, 3-veined. Leaves basal; petiole 5 – 15 cm, with moderately dense spreading white trichomes; leaflet blades obcordate, 2 – 4 × 1 – 3 cm, both surfaces covered with trichomes, apex deeply emarginate. Inflorescences corymbose cymes, irregularly branched; peduncle 10 – 15 cm or longer; bracts lanceolate, membranous. Pedicels, bracts, and sepals pubescent. Sepals lanceolate, apex with 2 reddish Br. calli. Petals purplish pink with darker veins, obcordate. Ovary pubescent.

Flowers & Fruits: March to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0680*, dated 14. 02. 2008.

Local Distribution: Murti and Dhupjhora Beat office Gardens.

General Distribution: Tropical India; Native of tropical America naturalized in Asia.

BIOPHYTUM DC., Prodr. 1: 689. 1824.

Biophytum sensitivum (L.) DC., Prodr. 1: 690. 1824; Hook. *f*., Fl. Brit. Ind. 1: 436. 1874; Hajra *et al.,* 4: 238. 1997. *Oxalis sensitiva* L., Sp. Pl. 434. 1753.

Annuals herbs, up to 25 cm, base woody. Stem simple, slender to robust. Leaves fascicled at top of stem, even-pinnate, 3 – 10 cm; rachis slender, moderately hispid; leaflets 6 – 14 pairs; leaflet blades oblong to obovate-oblong, 3 – 12 × 2 – 6 mm, usually glabrous, sparsely covered with trichomes, base almost symmetric. Umbels several flowered; peduncle subequal to leaf length; bracts several, lanceolate, densely crowded at apex of peduncle. Pedicel 1 mm at anthesis but to 3 mm in fruit. Sepals with glandular septate trichomes. Petals yellow, longer than sepals. Capsule ellipsoid-obovoid, pubescent.

Flowers & Fruits: July to December.

Specimen Cited: Bichha bhanga, *Goutam & AP Das 0579*, dated 25.07.2009.

Local Distribution: Roadside open vegetation; common.

General Distribution: India: tropical; Bhutan, China, Nepal, Sri Lanka, Indonesia, Malaysia, Philippines, Thailand, Vietnam; tropical Africa.

Order 34: Malpighiales Juss. *ex* Bercht. ***et*** Presl (1820)

Clusiaceae Lindl., Nat. Syst. ed. 2. 74. 1836 (*nom. alt. prop*. Lindl. vs. Guttiferae); *nom. cons*.

MESUA L., Sp. Pl. 1: 515. 1753.

Mesua ferrea L., Sp. Pl. (ed. 2) 1: 734. 1762; Grierson *et* Long, Fl. Bhut. 1(2): 371. 1984. *Mesua nagassarium* (Burm. *f*.) Kosterman, Ceylon J. Sci., Biol. Sci. 12: 71. 1976. *Calophyllum nagassarium* Burm. *f*., Fl. Indica 121. 1768.

***Local name*:** Nageswar.

Tree, up to 20m. Leaves elliptic lanceolate, 8 – 14 x 3 – 4cm, acuminate, base rounded, glossy above, whitish waxy beneath, young leaves pinkish. Flowers large, fragrant, terminal or axial. Pedicels 5 mm. Sepals thickened, puberulous. Petals white, obovate. Anthers large, conspicuous, yellow. Style curve, peltate stigma. Fruits ovoid, dehiscent, woody and nut like, pointed apex, 1 – 4 seeded.

Flowers & Fruits: February to April.

Specimen Cited: Murti, *Goutam & AP Das 0065*, dated 07. 02. 2009.

Local Distribution: Planted in forest village near Tourist lodge.

General Distribution: India: cultivated; Bhutan, China, Myanmar.

Elatinaceae Cambess., Mem. Mus. Hist. Nat. Paris 18: 225. 1829 (‘Elatineae’).

BERGIA L., Mant. Pl. 2: 152, 241. 1771.

Bergia ammannioides Roxb. [Hort. Beng. 34. 1814, *nom nud*.] *ex* Roth, Nov. pl. Sp. 219. 1821; Roxb., Fl. Ind. 2: 457. 1832, “*ammanoides*”; Dyer in Hook.f., Fl. Brit. Ind. 1: 251. 1874. *Elatine ammannoides* (Roxb. *ex* Roth) Wight *et* Arn., prodr. 41.1834. *Bergia ammannioides* Roxb. *ex* Roth var. *pentandra* Wight, Ill. India. Bot. 54, t. 25a.1840. Sharma *et al*., Fl. Ind. 3: 33.1993. *Elatine ammannioides* Wight *et* Arn., Prodr. Fl. Ind. Orient. 41. 1834. *Bergia pentandra* Cambess. *ex* Guillemin *et* Berger Perrot, Fl. Seneg. Tent. 42. 1831. Prain, Beng. Pl. 1: 243. 1903.

Annual herbs. Stem branched at base; branches erect or obliquely ascending, densely glandular hairy. Stipules 2-fid, lobes lanceolate, margin laciniate-denticulate; lamina oblanceolate, to obovate-lanceolate or narrowly elliptic, 0.6 – 2 cm × 2 – 6 mm, serrate, acute, base oblique or attenuate. Flowers numerous and clustered in leaf axils, small. Sepals narrowly ovate, margin membranous, apex acuminate. Petals reddish, narrowly ovate or elliptic, apex mucronate. Stamens 5; filaments filiform, base slightly widened. Ovary ovoid; styles 5; stigmas capitate. Capsule subglobose. Seeds Br., narrowly ovoid.

Flowers & Fruits: September to January.

Specimen Cited: Murti, *Goutam & AP Das 0144*, dated 08. 02. 2009.

Local Distribution: Planted in forest village.

General Distribution: Tropical India; Tropical Asia from Iran to China, Philippines, Australia and Tropical Africa.

Euphorbiaceae Juss., Gen. P1. 384. 1789 (‘Euphorbiae’); *nom. cons*.

Key to the genera

1a. Plants usually dioecious; stamens 15–250 ..... ***Mallotus***

1b. Plants evergreen; stamens 3–15 2

2a. Lamina palmately lobed …… ……..……. 3

2b. Lamina not palmately lobed ……. 4

3a. Filament branched; Perianth monochlamydous ……..…...... ***Ricinus***

3b. Filament simple; perianth into distinct calyx & corolla …….. ***Jatropha***

4a. Inflorescence cyathia …… ……***Euphorbia***

4b. Inflorescence racemose ……...……5

5a. Raceme terminal; lamina lanceolate …… ***Croton***

5b. Raceme axillary; leaves ovate to ovate – elliptic 6

6a. Fruiting calyx accrescent ..... ***Baliospermum***

6b. Fruiting calyx not accrescent 7

7a. Style column 4-5 lobed ……. 8

7b. Style column 1-3 lobed …… 9

8a. Stipules linear …… ***Antidesma***

8b. Stipule ovate ……..… ***Glochidion***

9a. Stipules caducous ..... *Balakata*

9b. Stipules triangular ..... *Acalypha*

GLOCHIDION Forster *et* Forster, Char. Gen. Pl. 57. 1775, *nom. cons*.

Glochidion acuminatum Muell. Argov., in Linnaea 32: 68. 1863; Hook. *f*. in Fl. Brit. India 5: 323. 1887; Kitamura in Hara Enum. Fl. Pl. Nepal 3: 196. 1982; Long in Grierson *et* Long, Fl. Bhutan 1(3): 779. 1987.

*Local Name:*Lalikaath

Tree evergreen medium size 6 – 10 m, with pubescent drooping branchlets. Leaves alternate; lamina 4 – 13 x 2 – 4 cm, lanceolate, entire, acuminate pinnately veined, greenish above, pale and hoary pubescent beneath. Flowers in axillary dense fascicles. Sepals 6; unequal, obovate greenish. Petals 0; male flowers with 3 anthers; styles connate, columnar, column 4-5 lobed, lobes erect, short. Fruits globose, with persistent style.

Flowers & Fruits: April to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0144*, dated 08. 02. 2009.

Local Distribution: Budhuram, Gorumara.

General Distribution: India; Nepal, Bhutan, China.

ANTIDESMA Burm. *ex* L., Sp. Pl. 2: 1027. 1753.

Antidesma acidum Retz., Observ. Bot. 5: 30. 1789. Long in Grierson *et* Long, Fl. Bhutan 1(3): 778. 1987. Prain, Beng. Pl. 2: 939. 1903.

Shrubs, up to 6 m. Stipules linear; lamina obovate to elliptic-oblong, 5–13 × 2.5–5 cm, base acute to obtuse, entire, rounded to acute, sometimes mucronate. Inflorescences terminal to axillary. Male flowers: pedicels 1mm; cupular to globose, 4 lobed; disk cushion-shaped; stamens 2; rudimentary ovary terete. Female flowers: pedicels 1.5 mm; cupular to nearly urceolate, 4 – 5 lobed; ovary glabrous; stigmas 3 or 4. Drupes ellipsoid; style terminal to slightly subterminal.

Flowers & Fruits: May to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0144*, dated 08. 02. 2009.

Local Distribution: Budhuram, Gorumara.

General Distribution: Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Myanmar, Nepal, Thailand, Vietnam.

ACALYPHA L., Sp. Pl. 2: 1003. 1753.

Key to the species

1a. Inflorescences usually bisexual; plants herbs ..... *A. indica*

1b. Inflorescences unisexual; plants shrubs ..... *A. hispida*

Acalypha hispida Burm. *f*., Fl. Ind.: 303, t. 61, fig. 1. 1768; Hook. *f*., Fl. Brit. Ind. 5: 417. 1887; Grierson *et* Long, Fl. Bhutan 1(3): 797. 1987. *Ricinocarpus hispidus* (Burm. *f*.) Kuntze, Revis. Gen. Pl. 2: 618. 1891.

Local name: Morog jhunti.

Shrubs, up to 3 m. Stipules triangular. Leaves petioles 2 – 11 cm, longitudinally grooved above; lamina ovate to broadly ovate, 7 – 10 x 1 – 4 cm, coriaceous, acute or acuminate, crenulate-serrate, base retuse or obtuse. Inflorescences unisexual, solitary, with only pistillate flowers, axillary, pendulous. Staminate flowers unknown. Pistillate flowers 3 – 8 per node; bracts minute, ovate, sepals 3, ovate; ovary subglobular, tomentose, stigmas dark red.

Flowers & Fruits: April to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0585*, dated 25.07.2009.

Local Distribution: Dhupjhora Beat Office.

General Distribution: India: cultivated throughout; Bhutan, China, Bangladesh, Malay Peninsula, New guinea.

Acalypha indica L., Sp. Pl.: 1003. 1753; Drury, Useful Pl. Ind.: 10. 1873; Hook. *f*., Fl. Brit. Ind. 5: 416. 1887; Prain, Beng. Pl. 2: 948. 1903. *Ricinocarpus indicus* (L.) Kuntze, Revis. Gen. Pl. 2: 618. 1891. *Acalypha chinensis* Benth., Fl. Hongk.: 303. 1861.

Local name: Mukta jhuri.

Erect, annual herbs, up to 90 cm; stem longitudinally grooved. Stipules narrowly triangular. Petioles longitudinally grooved above, pubescent; blades rhomboid, 3 – 7 x 2 – 6 cm, acute or obtuse, crenulate-serrate, base cuneate. Inflorescences 1 to 2 together, bisexual, axillary, pistillate flowers at base. Staminate flowers 6–10 per node; bracts ovate-oblong to ovate – lanceolate; sepals 4, ovate. Pistillate flowers 1 – 4 per node; bracts cup-shaped; sepals 3, ovate; ovary subglobular. Fruits 3-lobed, oblate or subglobular. Seeds ovoid.

*Flowers & Fruits:*April to September.

Specimen Cited: Bichhbhanga, *Goutam & AP Das 0544*, dated 23.07.2009.

Local Distribution: Beat office area.

General Distribution: India: tropical part; Bhutan, China, Sri Lanka, Japan, Taiwan, Malaysia, Singapore, Philippines, Sumatra, Java, Tropical Africa.

BALIOSPERMUM Bl., Bijdr. 603. 1826.

Baliospermum solanifolium (Burm.) Suresh in Regnum Veg. 119: 106. 1988. *Croton solanifolius* Burm., Fl. Malab. 6. 1769. *Jatropha montana* Willd., Sp. Pl. 4: 563. 1805; Long in Grierson *et* Long, Fl. Bhutan 1(3): 811. 1987. *Croton solanifolius* (Burm.) Geiseler, Croton Monogr.: 74. 1807 (*non* J. Burm. 1769). *Baliospermum axillare* Bl., Bijdr.: 604. 1826; Prain, Beng. Pl. 2: 946. 1903. *Croton polyandrus* Roxb., Fl. Ind. ed. 2. 3: 682. 1832. *Baliospermum indicum* Decne. in Jacquem., Voy. Inde: 154, t. 155. 1841. *Baliospermum moritzianum* Baill., Étude Euphorb.: 395. 1858. *Baliospermum montanum* (Willd.) Müll.-Arg. in DC. Prodr. 15(2): 1125. 1866; *Baliospermum polyandrum* (Roxb.) Wight, Icon. Pl. Ind. Or. 5. 2: 23, t. 1885.

Shrubs, up to 2 m, monoecious; young branches green. Petiole pubescent; lamina elliptic, oblong to broadly ovate, 5 – 15 × 1 – 5 cm, papery, acute to acuminate, undulate-crenulate, base rounded to broadly cuneate. Panicles axillary, male flower narrow, pubescent; sepals 5, ovate; disk urceolate. Female flowers 1 – 3, axillary; sepals 5, ovate to triangular; disk annular; ovary densely pubescent; style apex bifid. Fruiting calyx accrescent; capsule pendulous, subglobose. Seeds elliptic-ovoid.

Flowers & Fruits: March to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0661*, dated 13. 02. 2008.

Local Distribution: Rarely found but all over the forests margins.

General Distribution: India: tropical; Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka, Myanmar, Cambodia, Laos, Vietnam, Malay Peninsular, Borneo, Sumatra, Java, Celebes, Moluccas, Lesser Sunda Islands.

CROTON L., Sp. Pl. 2: 1004. 1753.

Croton bonplandianus Baill. in Adansonia 4: 339. 1864; Guha Bakshi, Fl. Mur. Dist. 283. 1984; Panda & Das, Fl. Sambalp. 328. 2004. *Croton sparsiflorus* Morung in *Ann. New York* Acad. Sci. 7: 221.1893; Haines, Bot. Bihar & Orissa Pt. II: 105. 1921; *Oxydectes bonplandiana* (Baill.) Kuntze, Revis. Gen. Pl. 2: 610. 1891.

Local name: Bontulsi.

Annual or perennial, erect herbs with watery latex. Leaves alternate, lamina lanceolate. Inflorescence terminal raceme with lower female and upper male flower; male flower with 5 sepals, 5-petals; numerous stamens. Female flower with 5 sepals, carpel-3. Fruits schizocarpic with three one seeds cocci.

Flowers & Fruits: January to December.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0504*, dated 23.07.2009.

Local Distribution: Throughout the forest margins.

General Distribution: India: throughout; Native to S. America and Pantropical.

JATROPHA L., Sp. Pl. 2: 1006. 1753, *nom. cons*.

Jatropha curcas L., Sp. P1. ed. 1: 1006.1753; Hook. *f*., Fl. Brit. Ind. 5: 383.1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 790. 1987. *Curcas indica* Rich., Hist. Fis. Cuba, Bot. 11: 208. 1850. *Jatropha acerifolia* Salisb., Prodr. Stirp. Chap. Allerton 389. 1796.

Local name: Sada Varenda.

Erect, bushy, raddish, undershrubs. Leaves alternate, palmately lobed, cordate at base; petiole, stipules glandular hairy. Flower in cyme; bracts lanceolate. Sepals with glandular hairs, persistent; corolla purplish red; stamens basally connete. Capsules oblong, 3 – lobed.

Flowers & Fruits: June to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0319*, dated 21.07.2009.

Local Distribution: Cultivated in forest villages.

General Distribution: Tropical and sub-tropical parts of the world.

RICINUS L., Sp. Pl. 2: 1007. 1753.

Ricinus communis L., Sp. Pl. 2: 1007. 1753; Hook. *f*., Fl. Brit. Ind. 5: 457. 1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 808. 1987; Prain, Beng. Pl. 2: 946. 1903.Haines, Bot. Bihar & Orissa Pt. II: 112. 1921; Panda *et* Das, Fl. Sambalp., 340. 2004. *Cataputia minor* Ludwig, Def. Gen. Pl. ed. 3: 81. 1760. *Croton spinosus* L., Sp. Pl. 2: 1005. 1753. *Ricinus africanus* Mill., Gard. Dict. ed. 8: 5. 1768. *Ricinus communis* L., Sp. Pl. 2: 1007. 1753.

Local name: Reri.

Tall perennial, erect, fleshy, glabrous herbs. Lamina simple, palmately 7 – 9 lobed. Inflorescence terminal raceme with lower female and upper male flower. Male flower with bract, actinomorphic, parienth-5; stamens-5; female flower with 5-perianth, carpel-3. Fruits schizocarpic with 3 one seeded cocci.

Flowers & Fruits: January to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0371*, dated 21.07.2009.

Local Distribution: Cultivated in village areas and naturalized in Murti River bank.

General Distribution: Tropical India and Africa.

BALAKATA Esser, Blumea 44: 154. 1999.

Balakata baccata (Roxb.) Esser, Blumea 44: 155, map 1. 1998. *Sapium baccatum* Roxb., Fl. Ind. ed. 2, 3: 694. 1832; Hook. *f*., Fl. Br. India 5: 470. 1888; Long in Grierson *et* Long, Fl. Bhutan 1(3): 812. 1987; Prain, Beng. Pl. 2: 954. 1903. *Sapium populifolium* Wight, Icon. Pl. Ind. Orient. 5, 2: tab. 1950, fig. 2. 1853. *Excoecaria affinis* Griff., Not. Pl. As. 4: 486. 1854, nom. superfl. *Stillingia paniculata* Miq., Fl. Ned. Ind., Eerste bijv.: 183, 461. 1861. *Excoecaria baccata* (Roxb.) Müll.-Arg. in DC., Prodr. 15, 2: 1211. 1866. *Carumbium baccatum* (Roxb.) Kurz, Fl. Burm. 2: 412. 1877.

Trees, up to 26 m. Leaves ovate to elliptic, 8 – 20 x 4 – 11 cm, leathery, acuminate, margin flat, base obtuse to acute. Staminate flowers pedicel 0.5 – 1.5 mm long; calyx 0.5 – 1 mm; filaments 0.4 – 0.6 mm. Pistillate flowers white, pedicel 0.6 – 1 mm long; calyx 1 mm; style 0.1 – 0.5 mm; stigmata 0.75 – 2 mm. Fruits flattened globular; sulcate, 2 seeded.

*Flowers & Fruits:*March to October.

Specimen Cited: Murti, *Goutam & AP Das 0231*, dated 09. 02. 2009.

Local Distribution: All over forests.

General Distribution: India: West Bengal, Bihar, Orissa, Maharastra; Bangladesh, China, Thailand, W. Malaysia, Sumatra, Borneo.

EUPHORBIA L., Sp. Pl. 1: 450. 1753.

Key to the species

1a. Stem prostrate; cyathia solitary ..... *E. heyneana*

1b. Stem ascending to suberect; cyathia in pedunculate cymes..... 2

2a. Capsule pubescent ..... *E. hirta*

2b. Capsule glabrous ..... *E. hypericifolia*

Euphorbia heyneana Spreng., Syst. Veg (ed. 16) 3: 791. 1826; Panda *et* Das, Fl. Sambalp., 330. 2004. *Euphorbia microphylla* Heyne *ex* Roth, Nov. Pl. Sp. 229. 1821, *non* Lam., 1788 (*nom. Illeg.*); Hook. *f.*, Fl. Brit. Ind. 5: 252. 1887; Haines, Bot. Bihar & Orissa pt. II: 148. 1921; Prain, Beng. Pl. 2: 925. 1903. *Chamaesyce heyneana* (Spreng.) Soják, Cas. Nár. Mus., Odd. Prír. 140: 169. 1972.

Annual, prostrate, spreading herbs; stem glabrous, internodes ribbed, stipules lacinate. Leaves opposite, lamina ovate to oblanceolate, serrulate, base rounded, oblique. Cyathia radish, axillary, involucre bracts tubular, glands 4. male flowers in 4-groups, staked. Female flower laterally pendulous, ovary glabrous. Capsules glabrous, seeds 3.

Flowers & Fruits: January to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0717*, dated 14. 02. 2008.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: India: tropical; Bhutan, China, Bangladesh, Malaysia, Myanmar, Pakistan.

Euphorbia hirta L., Sp. Pl. 454. 1753; Haines, Bot. Bihar & Orissa pt. II: 147. 1921; Guha Bakshi, Fl. Mur. Dist. 286. 1984; Long in Grierson *et* Long, Fl. Bhutan1(3): 766. 1987. *Euphorbia pilulifera auct. non* L. 1753; Hook.*f.*, Fl. Brit. Ind. 5: 250. 1887. *Euphorbia capitata* Lam., Encycl. 2: 422. 1788. *Euphorbia nodiflora* Steud., Nomencl. Bot. ed. 2, 1: 613. 1840. Prain, Beng. Pl. 2: 925. 1903.

Local name: Dudhali.

Annual, erect herbs. Stem jointed, hairy, purplish. Leaves opposite, simple, base oblique, lanceolate, serrulate, acute, pubescent, stipules subulate. Flowers in terminal and axillary clustered cyathia; perianth green; stamens – 1. Fruits depressed, globose, hairy; cocci trigonous.

Flowers & Fruits: January to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0382*, dated 21.07.2009.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: tropical and subtropical regions in both hemispheres.

Euphorbia hypericifolia L., Sp. Pl. 454. 1753; Hook. *f.*, Fl. Brit. Ind. 5: 249. 1887; Prain, Beng. Pl., 2: 924. 1903; Guha Bakshi, Fl. Mur. Dist. 286. 1984. *Euphorbia parviflora* L., Syst. ed. 10, 2: 1047. 1759. *Chamaesyce hypericifolia* (L.) Millsp., Publ. Field Columb. Mus., Bot. Ser. 2: 302. 1909. *Ditritea obliqua* Raf.-Schmaltz, Sylva Tellur. 115. 1838. *Euphorbia indica* Lam., Encycl. 2: 423. 1788.

Annual herbs, up to 50 cm. Root fibrous. Stems many from base, spreading to erect, often purplish tinged. Leaves opposite; stipules triangular; lamina ovate, 3 –5 × 1.5 – 2.5 cm, rounded, obscurely toothed, base obliquely rounded. Cyathia in axillary or terminal pedunculate capitates cymes; involucre cuplike, marginal lobes triangular; glands 4, green, rounded. Male flowers slightly exserted. Female flower exserted from involucre; ovary pubescent; styles free; stigma deeply 2 lobed. Capsule 3 angular-ovoid. Seeds ovoid-tetragonal.

Flowers & Fruits: January to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0713*, dated 14. 02. 2008.

Local Distribution: Dhupjhora, Murti, Gorumara, Budhuram.

General Distribution: Tropical weed in Africa and Asia.

MALLOTUS Lour., Fl. Cochinch. 2: 635. 1790.

Mallotus philippensis (Lam.) Müll.-Arg. in Linnaea 34: 196. 1865; Hook. *f*., Fl. Brit. Ind. 5: 442. 1887. *Croton philippense* Lam., Encycl. 2: 206. 1786. *Croton punctatus* Retz. ('*punctatum*'), Obs. Bot. 5: 30. 1789. *Croton coccineus* Vahl, Symb. Bot. 2: 97. 1791. *Rottlera tinctoria* Roxb., Pl. Corom. 2: 36, t. 168. 1802. *Croton montanum* Willd., Sp. Pl. 4: 547. 1805. *Rottlera philippensis* (Lam.) Juss. *ex* Spreng. in Syst. Veg. (ed. 16) 3: 877. 1826. *Rottlera tinctoria* Roxb. var. *monstruosa* Ham. *ex* Dillwyn, Rev. Hortus Malab.: 22. 1839. *Rottlera aurantiaca* Hook. *et* Arn., Bot. Beech. Voy.: 270. 1841.

Local name: Sindure

Small trees, up to 15 m. Stipules triangular. Leaves alternate; lamina ovate to elliptic, 4 – 22 x 2 – 10 cm, acuminate to cuspidate, entire, base usually rounded. Inflorescences axillary and terminal, single to 2 branches. Staminate inflorescences up to 18 cm long; flowers in small groups of 3 to 4; bracts triangular. Staminate flowers green; sepals 2 – 4, elliptic to obovate; stamens 15 – 20, whitish to light green, anthers light yellow. Pistillate inflorescences up to 21 cm long; bracts triangular. Pistillate flowers, yellow to red, scented; sepals 3 – 6, ovate, yellow-green; ovary 2 – 3 locular. Fruits capsules. Seeds subellipsoid.

*Flowers & Fruits:*March to August.

Specimen Cited: Murti, *Goutam & AP Das 0735*, dated 14. 02. 2008.

Local Distribution: All over forests.

General Distribution: India: throughout; Bhutan, Nepal, Bangladesh, China, Sri Lanka to Taiwan, throughout Malesia to Australia and W. Pacific.

Hypericaceae Juss., Gen. P1. 254. 1789 ('Hyperica').

HYPERICUM L., Sp. Pl. 2: 783. 1753.

Hypericum japonicum Thunb. in Syst. Veg. ed. 14: 702. 1784. *Hypericum nervatum* Hance in Ann. Bot. Syst. 2: 188. 1851. *Hypericum chinense* Osbeck, Dagb. Ostind. Resa 244. 1757. *Brathys orysetum* Bl., Mus. Bot. 2: 20. 1856. *Hypericum japonicum* Murray, Syst. Veg. ed. 14: 702. 1784; Dyer in Hook.*f*., Fl. Brit. Ind. 1: 256.1874; Hara *etal*., Enn. Fl. Pl. Nep. 2: 62. 1979; Sharma *et al.,* 3: 69. 1993; Grierson *et* Long, Fl. Bhut. 1(2): 376. 1984.

Annula herbs, 5 –25 cm. Suberect or diffuse, sometimes prostrate, stems quadrangular, branches dichotomous, rooting at basal nodes. Leaves sessile, 3 – 8 x 1 – 5mm, lamina elliptic-ovate to oblanceolate, obtuse or rounded, cordate. Flowers in terminal dichotomous often broad cymes; bracts linear, sepals elliptic-obovate, acute to sub obtuse; petals yellow. Capsules ovaoid.

Flowers & Fruits: throughout the year.

Specimen Cited: Murti, *Goutam & AP Das 0095*, dated 07. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia.

General Distribution: India: tropical states; Nepal, Bhutan, Bangladesh, Sri Lanka, Myanmar, China, Taiwan, Vietnam.

Passifloraceae Juss., Ann. Mus. Hist. Nat. Paris 6: 102. t. 37-41. 1805 ('Passifloreae'); *nom. cons*.

PASSIFLORA L., Sp. Pl. 2: 955. 1753, nom. cons.

Passiflora foetida L., Sp. Pl. 959. 1753; Prain, Beng. Pl., 1: 512. 1903. *Dysosmia hircina* Sweet *ex* Roem., Fam. Nat. Syn. Monogr. 2: 150. 1846. *Passiflora balansae* Chodat, Bull. Herb. Boissier 2: 744. 1902. *Passiflora hirsuta* Lodd., Bot. Cab. 2(4): , t. 138. 1818. *Passiflora variegata* Mill., Gard. Dict. (ed. 8) no. 8 no. 8. 1768.

Herbaceous vines, foul smelling. Stem slender, spreading pubescent. Stipules partly clasping, deeply parted. Leaves simple, opposite; lamina broadly ovate to oblong-ovate, 5 – 12 × 3 – 8 cm, irregularly undulate, acute, base cordate, membranous. Inflorescence reduced to a single flower, opposite tendril. Flowers white. Sepals awned. Petals 1 – 1.5 cm. Corona 3 – 5 seriate, membranous. Stamens coherent at base, flat; anthers oblong. Ovary shortly stipitate, ellipsoid. Berry orange-red, ovoid-globose.

Flowers & Fruits: August to February.

Specimen Cited: Murti, *Goutam & AP Das 0112*, dated 07. 02. 2009.

Local Distribution: Throughout the Forests.

General Distribution: India: native to the West Indies and N South America.

Phyllanthaceae Agardh, Theoria Syst. PI. Fam. Phan. 249. 1858 ('Phyllantheae').

Key to the genera

1a. Leaves 3-foliolate; plant with red or reddish juice ..... ***Bischofia***

1b. Leaves simple; plant without red juice 2

2a. Flowers with petals and disk ..... ***Bridelia***

2b. Flowers without petals 3

3a. Flowers without disk ..... ***Sauropus***

3b. Flowers with a prominent, usually fleshy disk..... 4

4a. Male flowers with prominent pistillode ..... ***Flueggea***

4b. Male flowers without pistillode ..... ***Phyllanthus***

BRIDELIA Willd., Sp. Pl. 4: 978. 1806.

Bridelia retusa (L.) Juss., Euphorb. Gen.: 109, t. 7, f. 22. 1824; Prain, Beng. Pl., 2: 927. 1903; *Clutia retusa* L., Sp. Pl.:1042. 1753. *Clutia spinosa* Roxb., Pl. Corom. 2: 38, t. 172. 1802. *Bridelia spinosa* (Roxb.) Willd., Sp. Pl. 4: 979. 1806. *Bridelia retusa* (L.) Spreng., Syst. Veg. 3: 48. 1826, pro comb. nov.; *Bridelia squamosa* (Lam.) Gehrmann, Bot. Jahrb. Syst. 41, Beibl. 95: 30. 1908. *Bridelia cambodiana* Gagnep., Bull. Soc. Bot. France 70: 432. 1923. *Bridelia pierrei* Gagnep., Bull. Soc. Bot. France 70: 434. 1923;

Small tree, up to 15 m. Stipules ovate triangular, whitish woolly, early caducous. Petiole glabrous; lamina obovate, 6 – 22 x 3 – 11 cm, emarginate to obtuse or acute, entire to shallowly crenate, base rounded to obtuse. Inflorescences on leafless branches and spike-like. Staminate flowers pale yellowish green to Br.; pistillate flowers reddish to Br.. Sepals ovate-triangular. Petals variable in shape, base spathulate. Stamens white; anthers ovoid, reddish to purplish. Ovary globose; styles 2, only basally united, stigmas shortly bifid. Fruits depressed-globose. Seeds semigloboid.

*Flowers & Fruits:*May to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0575*, dated 25.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: India, Bhutan, S. China, Sri Lanka, Myanmar, Indochina, Thailand, Malay Peninsula, Sumatra.

FLUEGGEA Willd., Sp. Pl. 4: 637, 757. 1805.

Flueggea virosa (Roxb. *ex* Willd.) Voigt, Hort. Suburb. Calc.: 152. 1845. Long in Grierson & Long, Fl. Bhutan 1(3): 775. 1987; *Phyllanthus virosus* Roxb. *ex* Willd., Sp. Pl. 4: 578. 1805. *Xylophylla obovata* Willd., Enum. Hort. Berol.: 329. 1809. *Flueggea microcarpa* Blume, Bijdr.: 580. 1825; Prain, Beng. Pl. 2: 931. 1903. *Securinega virosa* (Roxb. *ex* Willd.) Baill., Adansonia 6: 334. 1866; *Securinega microcarpa* (Bl.) Müll.-Arg. in DC., Prod. 15, 2: 434. 1866. *Securinega obovata* (Willd.) Müll.-Arg. in DC., Prod. 15, 2: 449. 1866. *Flueggea obovata* (Willd.) Wall. *ex* Vill., Novis. App.: 189. 1880.

Tall shrubs, up to 4 m, dioecious. Leaves distichous; lamina elliptic to obovate, 1 — 8 x 0.6 — 5 cm, papery; rounded to slightly acuminate, margin flat, base usually attenuate. Inflorescences fascicles. Flowers white; sepals outer two smaller than inner 3. Staminate greenish to yellowish, pendulous, sweet scented; filaments white; disc glands fleshy, yellow; pistillode deeply divided into 3 branches. Pistillate flowers green; sepals 0.7 — 1 mm diameter, disc annular; ovary 1 x 0.8 mm wide. Fruits globular.

*Flowers & Fruits:*April to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0704*, dated 14. 02. 2008.

Local Distribution: Throughout the Forests.

General Distribution: India, Bhutan, China, Tropical Africa and Asia to Japan, Australia and Polynesia.

SAUROPUS Bl., Bijdr. 595. 1826.

Sauropus quadrangularis (Willd.) Müll.-Arg. in Linnaea 32: 73 1863; Hook. *f*., Fl. Br. Ind. 5: 335. 1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 783. 1987; Prain, Beng. Pl. 2: 932. 1903. *Phyllanthus quadrangularis* Willd., Sp. Pl. 4: 585. 1805. *Phyllanthus rhamnoides* Roxb., Fl. Ind. 3: 663. 1832, *nom. illeg*., *non* Willd.. *Ceratogynum rhamnoides* Roxb. *ex* Wight, Icon. Pl. Ind. Orient. 5: t. 1900. 1852. *Sauropus ceratogynum* (Roxb. *ex* Wight) Baill., Étude Euphorb.: 635. 1858. *Phyllanthus leschenaultia* Müll.-Arg. var. *tenellus* Wall. *ex* Müll.-Arg., Linnaea 32: 38. 1863. *Sauropus rigidus* Thwaites, Enum. Pl. Zeyl.: 284. 1864. *Sauropus compressus* Müll.-Arg. in DC, Prodr. 15, 2: 243. 1866. *Sauropus quadrangularis* (Willd.) Müll.-Arg. var. *puberulus* Kurz, Forest Fl. Burma 2: 350. 1877. *Sauropus pubescens* Hook. *f*., Fl. Brit. Ind. 5: 335. 1887. *Sauropus compressus* Müll.-Arg. var. *compressus*: Chakraborty *et* Gangopau in J. Econ. Tax. Bot. 20: 526, fig. 4. 1996.

Woody herbs to small shrubs, up to 2 m. Stipules triangular to sometimes strongly falcate. Lamina elliptic to obovate, 0.6 – 4 x 0.5 – 2 cm, slightly emarginated to rounded, often mucronulate, revolute, base often slightly oblique and asymmetric, rounded to cuneate. Flowers in small axillary fascicles with both sexes, yellow to deep red. Staminate flowers glabrous; calyx flat, lobes heart-shaped. Pistillate flowers glabrous; ovary 1 x 1.7 mm; stigmas erect. Fruits ovoid.

*Flowers & Fruits:*March to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0366*, dated 21.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: India throughout; Bhutan, Nepal, China, Myanmar, Thailand, Laos, Cambodia, Vietnam.

PHYLLANTHUS L., Sp. Pl. 2: 981. 1753.

Key t the genera

1a. Large or small trees 2

1b. Herbs or small shrubs 3

2a. Stipules triangular-ovate, ciliate; fruit greenish yellow ..... *P. emblica*

2b. Stipules lanceolate to linear oblong; fruits blackish or purplish ..... *P. reticulatus*

3a. Axillari fasicle usually bisexual ..... *P. urinaria*

3b. Axillari fasicle usually unisexual 4

4a. Filament free …… ….....…….…...… *P. virgatus*

4b. Filament connate in column ……..…….....……. 5

5a. Capsules traiangular globose …….....…… *P. amarus*

5b. Capsules depressed globose .... *P. fraternus*

Phyllanthus amarus Schum. *et* Thonn., Kongl. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd. 4: 195. 1829; Hara *et al*., Enn. Fl. Pl. Nep. 3: 198. 1982. *Phyllanthus niruri auct. non* L., Hook. *f*., Fl. Brit. Ind. 5: 298. 1887; Hara, Fl. East. Himal. 181. 1966. *Phyllanthus nanus* Hook. *f*., Fl. Brit. India 5: 298. 1887. *Diasperus nanus* (Hook.*f*.) Kuntze, Revis. Gen. Pl. 2: 601. 1891.

Annual or biennial, erect or prostrate, herbs, up to 150 cm. Leaves distichous; stipules linear to linear-lanceolate, green; lamina oblong to elliptic-oblong, 3 – 8 × 2 – 4 mm, thinly papery, obtuse, base rounded. Plants monoecious. Flower fascicles along lower part of leafy shoots usually male, middle usually bisexual with 1 female and 1 male flower. Male flowers: sepals 5, elliptic to ovate, abruptly acute; disk glands 5; stamens 3; filaments completely connate into a column; anthers sessile. Female flowers: sepals 5, obovate-oblong to ovate; disk flat to subulate, deeply 5 lobed; ovary globose-triangular; styles free. Capsules traiangular globose, smooth. Seed sharply 3 angled.

Flowers & Fruits: Through out the year.

Specimen Cited: Gorumara, *Goutam & AP Das 0431*, dated 22.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: pantropical weed possibly originating in the Americas

Phyllanthus urinaria L., Sp. Pl. 2: 982. 1753; Hook. *f*., Fl. Brit. Ind. 5: 293. 1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 772. 1987; Prain, Beng. Pl. 2: 935. 1903. Haines, Bot. Bihar & Orissa pt. II: 125. 1921. *Diasperus urinaria* (L.) Kuntze, Revis. Gen. Pl. 2: 601. 1891. *Phyllanthus cantoniensis* Horn., Enum. Pl. Hort. Hafn. 29. 1807.

Annual, erect weak herbs; stem branched, terete, smooth. Leaves compound, alternate, leaflets obovate, oblong. Flowers in axillary, unisexual; all male flower succeeding axils with bisexual cymules, calyx lobes 5, sub equal, acute, stamen-3; Female flowers with 5 sepal, sub equal, style 3, free, shallowly bifid. Capsules obovate. Seeds triangular.

Flowers & Fruits: April to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0464*, dated 23.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Tropical India; Bhutan, Chian, Nepal, Sri Lanka, Indonesia, Japan, Laos, Malaysia, Thailand, Vietnam; Pantropical, Native to South America.

Phyllanthus fraternus Webster in Contr. Gray. Herb. 176: 53. 1955; & in J. Arnold Arbor. 38: 308. 1957. *Phyllanthus niruri auct non* L. Sp. Pl. 2: 982. 1753, Hook. *f*., Fl. Brit. Ind. 5: 298 1887; Prain, Beng. Pl. 2: 936. 1903. 1887. *Phyllanthus fraternus* subsp. *togoensis* Brunel *et* Roux, Bull. Soc. Bot. France 122: 161. 1975.

Annual, erect herbs. Leaves alternate, compound, subsessile, elliptic to oblong, base rounded. Male flowers greenish yellow, axillary, solitary, filament united to a column. Female flowers greenish yellow, axillary solitary, style 3, recurved. Capsules depressed globose.

Flowers & Fruits: June. to February.

Specimen Cited: Gorumara, *Goutam & AP Das 0508*, dated 23.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Pantropical, Native to South America.

Phyllanthus virgatus Froster *f*., Fl. Ins. Austrl. Prodr. 65. 1786. (*ut virgata*) Airy Shaw, Kew. Bull. 26: 325. 1972; Guha Bakshi, fl. Mus. Dist. 294.1984. *Phyllanthus simplex* Retz., Obs. Bot. 5: 29. 1789; (Var. *genurinus*); Hook. *f*., Fl. Brit. Ind. 5: 295. 1887; Prain, Beng. Pl. 2: 936. 1903. *Phyllanthus simplex* var. *virgatus* (Froster *f*.) Müll.-Arg., Linnaea 32: 32. 1863 and in Candolle, prodr. 15(2): 391. 1866. *Diasperus virgatus* (Forst.) Kuntze, Revis. Gen. Pl. 2: 597. 1891.

Small annual herbs, up to 80 cm, monoecious; stem slightly woody at base. Stipules membranous; petiole short; lamina thinly leathery, linear-lanceolate to narrowly elliptic, 5 – 25 × 2 – 6 mm, obtuse to acute, base slightly obliquely rounded. Inflorescences bisexual, axillary fascicles with 2 – 4 male and 1 female flower. Male flowers: sepals 6, broadly ovate to rotund; disk glands 6, oblong; stamens 3; filaments free; anthers subglobose. Female flowers: sepals 6, ovate-oblong, reflexed, purple with whitish membranous margins, persistent in fruit; ovary globose, 3 celled; styles 3. Capsules oblate. Seeds trigonous.

Flowers & Fruits: June to February.

Specimen Cited: Murti, *Goutam & AP Das 0419*, dated 22.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Tropical India; Bhutan, Nepal, Sri Lanka, Indonesia, Laos, Malaysia, Cambodia, Thailand, Vietnam; Pacific islands.

Phyllanthus emblica L., Sp. Pl. 2: 982. 1753; Hook. *f*., Fl. Brit. Ind. 5: 289. 1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 772. 1987. Prain, Beng. Pl. 2: 933. 1903. *Emblica officinalis* Gaertn., Fruct. 122-123, Pl. 108, f. 2. 1790. *Emblica officinalis* Gaertn., Fruct. Sem. Pl. 2: 122. 1790. *Emblica arborea* Raf.-Schmaltz, Sylva Tellur. 91. 1838.

Local name: Amlaki.

Small trees, up to 12 m, monoecious, deciduous; leafy shoots angular. Leaves distichous; stipules triangular-ovate, ciliate; lamina oblong to linear-oblong, 8 – 22 × 1.5 – 6 mm, papery to leathery,

truncate, mucronate to retuse at tip, narrowly revolute, base shallowly cordate, oblique. Fascicles with many male flowers and sometimes 1 or 2 larger female flowers. Male flowers: sepals 6, yellow; stamens 3; anthers erect, oblong. Female flowers: sepals 6, oblong or spatulate; ovary ovoid; styles 3, connate at base, deeply bifid. Fruit a drupe, globose, greenish yellow, exocarp fleshy. Seeds reddish.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0490*, dated 23.07.2009.

Local Distribution: Murti and Dhupjhora Forest Village and planted in Murti River bed.

General Distribution: India: tropical part; Bhutan, Nepal, Sri Lanka, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand; South America.

Phyllanthus reticulatus Poir. in Lam., Encycl. Méth. 5: 298. 1804; Hook. *f*., Fl. Brit. Ind. 5: 288. 1887; Long in Grierson *et* Long, Fl. Bhutan 1(3): 772. 1987; Prain, Beng. Pl. 2: 935. 1903. *Kirganelia reticulata* (Poir.) Baill., Étude Gén. Euphorb.: 613. 1858. *Cicca reticulata* (Poir.) Kurz, Forest Fl. Burma 2: 354. 1877. *Anisonema reticulatum* (Poir.) Juss., Euphorb. Gen. 4. 1824. *Diasperus reticulatus* (Poir.) Kuntze, Revis. Gen. Pl. 2: 600. 1891.

Small trees, up to 4 m. Stipules lanceolate to linear oblong. Lamina elliptic, 3 – 4 x 0.6 – 1 cm, obtuse or orbicular, entire, base cuneate. Flowers in bisexual cymes, each with several staminate flowers and 1 to 2 pistillate flowers. Staminate flowers: sepals 5 to 6, oblong to obovate or suborbicular; stamens 5. Pistillate flowers: sepals 5 or 6, oblong to elliptic; ovary glabrous. Fruits

depressed globose, blackish or purplish. Seeds plano-convex.

Flowers & Fruits: Through out the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0444*, dated 22.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Tropical India; Bhutan, China, Sri Lanka, Burma, Vietnam, Laos, Peninsular Malaysia.

Salicaceae Mirb., E1em. Phys. V6g. 2: 905. 1815 ('Salicineae'); *nom. cons*.

SALIX L., Sp. Pl. 2: 1015. 1753.

Salix tetrasperma Roxb., Pl. Corom. 1: 66, pl. 97: 66. 1795. Long in Grierson *et* Long, Fl. Bhutan 1(3): 868. 1987; Prain, Beng. Pl. 2: 989. 1903. *Pleiarina tetrasperma* (Roxb.) N. Chao & G.T. Gong in Jour. Sichuan For. Sci. Techn. 17(2): 6. 1996.

Trees up to 10m tall. Buds narrowly ovoid, glabrous, apex acute. Stipules obliquely ovate, glandular, serrate. Leaves simple, alternate; lamina ovate to linear lanceolate, 6 – 14 × 2 – 4 cm, serrate, acuminate, base cuneate or suborbicular, abaxially pale, adaxially green, glabrous, shiny. Male catkin 10cm; peduncle with 2 or 3 pilose leaflets; rachis densely pubescent or woolly; bracts elliptic. Stamens usually 8; anthers yellow, ovoid. Female catkin nearly as long as male catkin. Ovary ovoid; style short; stigma 2 lobed. Capsule ovoid, glabrous.

Flowers & Fruits: November to April.

Specimen Cited: Murti, *Goutam & AP Das 0270*, dated 10. 02. 2009.

Local Distribution: Murti River Banks under Murti Forest Beat; less common.

General Distribution: India: tropical parts; Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Thai-land, Vietnam.

Violaceae Lam. *et* DC., Fl. Franc. ed. 3. 5: 801. 1805.

VIOLA L., Sp. Pl. 2: 933. 1753.

Viola tricolor L., Sp. Pl. 935. 1753. *Viola tricolor* var. *hortensis* Candolle, Prodr. 1: 303. 1824.

Common name: Pansy

Annual or biennial herbs. Stems erect, angled, branched. Basal leaf blade narrowly ovate to lanceolate, long petiolate; stipules large, leaflike; cauline leaf blade ovate to oblonglanceolate,

remotely crenate, rounded or obtuse, base rounded. Flowers solitary in leaf axils, usually 3 colored (purple, white and yellow), with 3 – 10 flowers per stem. Sepals green, oblong-lanceolate, apex

acute. Corolla flat; upper petals deep purpleviolet, lateral petals and anterior one 3 colored. Ovary glabrous; styles short; stigmas enlarged, globose. Capsule ellipsoid.

Flowers & Fruits: April to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0186*, dated 09. 02. 2009.

Local Distribution: Dhupjhora, - an escape.

General Distribution: India: native to Europe.

Note: Common garden annual during winter.

Order 35: Fabales Bromhead (1838)

Fabaceae Rchb.f., Consp. Regni Veg. 149. 1828 (*nom. alt*. vs. Leguminosae *nom. cons. prop*.).

Key to the genera

1a. Leaves simple or with 2 to many leaflets 3

1b. Leaves pinnate 2

2a. Leaves evenly pinnate or bipinnate; flowers large, zygomorphic 17

2b. Leaves usually bipinnate; flowers small, regular 23

3a. Anthers dimorphic 4

3b. Anthers uniform in size and shape 32

4a. Legumes transversely septate and breaking up into 1-seeded joints 5

4b. Legumes not transversely septate 6

5a. Inflorescences racemose, lax; bracts membranous, usually persistent ..... ***Aeschynomene***

5b. Inflorescences usually scorpioid-cymose, congested; bracts scarious, caducous ..... ***Smithia***

6a. Climbing or weak plants or trees or tall shrub 7

6b. Erect subshrubs ..... ***Crotalaria***

7a. Style flattened 8

7b. Style generally terete 12

8a. Flowers generally resupinate ..... ***Clitoria***

8b. Flowers not resupinate 9

9a. Flowers mostly adapted to birds or bats for pollination 10

9b. Flowers mostly adapted to bees for pollination ..... ***Pueraria***

10a. Trees; stems with prickles ..... ***Erythrina***

10b. Climbers or trees; if trees, then stems without prickles 11

11a. Legume with many seeds, 2-valved ..... ***Mucuna***

11b. Legume samaroid with 1 apical seed ..... ***Butea***

12a. Legumes breaking up into 1-seeded segments when ripe 13

12b. Legumes not breaking up into separate segments when mature 14

13a. Joints of legume plicate-retrofracted ..... ***Uraria***
13b. Joints of legume not plicate-retrofracted ..... ***Desmodium***
14a. Stamens monadelphous and filaments partly connate ..... ***Tephrosia***
14b. Stamens diadelphous, mostly vexillary filament free 15
15a. Legumes indehiscent ..... ***Dalbergia***
15b. Legumes dehiscent 16
16a. Rachis of leaves ending in a tendril ..... ***Abrus***
16b. Rachis of leaves not ending in a tendril ..... ***Sesbania***
17a. Leaves simple, entire or 2-lobed or divided and 2-foliolate ..... ***Bauhinia***
17b. Leaves once pinnate or bipinnate 18
18a. Leaves usually bipinnate 20
18b. Leaves once pinnate 19
19a. Anthers dorsifixed, opening by lateral slits 21
19b. Anthers basifixed, opening by apical pores 22
20a. Plants unarmed; trees ..... ***Delonix***
20b. Plants usually armed with prickles; climbers ..... ***Caesalpinia***
21a. Bracteoles sepaloid or petaloid ..... ***Tamarindus***
21b. Bracteoles not sepaloid or petaloid ..... ***Saraca***
22a. Petioles and rachis of leaves without glands; stamens sigmoidally curved .... ***Cassia***
22b. Petioles and rachis of leaves with; filaments straight ..... ***Senna***
23a. Stamens 10 or fewer 25
23b. Stamens numerous, usually more than 10 24
24a. Filaments free or only connate at base ..... ***Acacia***
24b. Filaments connate into a tube 27
25a. Tall trees, more than 6m tall ..... ***Adenanthera***
25b. Small trees or shrubs, less than 6m tall 26
269a. Armed plant; leaflets sensitive ..... ***Mimosa***
26b. Unarmed plant; leaflets not sensitive ..... ***Leucaena***
27a. Legume septate between seeds, thick, fleshy ..... ***Samanea***
27b. Legume not septate between seeds, flat, thin ..... ***Albizia***

ABRUS Adanson, Fam. Pl. 2: 327, 511. 1763.

Key to the species

1a. Seeds conspicuously glossy black and red, subglobose ..... *A. precatorius*
1b. Seeds uniformly dark brown to almost black, compressed ..... *A. pulchellus*

Abrus pulchellus Wall. *ex* Thwaites, Enum. Pl. Zeyl. 91. 1859. Long in Grierson *et* Long, Fl. Bhutan 1(3): 665. 1987; Prain, Beng. Pl. 1: 369. 1903.

Large, slender, climbing, lianas. Leaves paripinnate, alternate; leaflets 6 – 10 paired, opposite; blades suboblong to obovateoblong, 0.5 – 3.5 × 0.3 – 1 cm, base rounded or subcordate, truncate and with mucro. Racemes axillary. Flowers dense. Calyx campanulate, 4 toothed. Corolla white or purple red. Stamens 9. Legumes oblong, dehiscent, with 4 – 8 seeds. Seeds black-Br., elliptic to ovoid.

Flowers & Fruits: April to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0114*, dated 07. 02. 2009.

Local Distribution: On open bushes; rare.

General Distribution: India: through out; Bhutan, China, Bangladesh, Nepal, Sri Lanka, Myanmar, Indonesia, Malaysia, Cambodia, Philippines, Thailand, Vietnam.

Abrus precatorius L., Syst. Nat., ed. 12, 2: 472. 1767. Long in Grierson *et* Long, Fl. Bhutan 1(3): 665. 1987; Prain, Beng. Pl. 1: 369. 1903. *Abrus tunguensis* Lima, Broteria, Ser. Bot. 19: 127. 1921. *Glycine abrus* L., Sp. Pl. 2: 753. 1753.

Local name: Lalkunch

Large, slender, much branched, climbing, lianas. Leaves paripinnate; leaflets 8 – 12 paired, opposite; blades suboblong, 1 – 2 × 0.3 – 0.8 cm, base rounded, truncate and with mucro. Racemes axillary. Flowers small, dense. Calyx campanulate, 4 toothed. Corolla purple; wings and keels narrower. Stamens 9. Ovary hairy. Legumes oblong, dehiscent, with 2 – 5 seeds. Seeds lustrous, black in lower part, red in upper part, subglobose.

Flowers & Fruits: March to August.

Specimen Cited: Khunia, *Goutam & AP Das 0255*, dated 10. 02. 2009.

Local Distribution: Khunia grass land.

General Distribution: Widespread in the tropical India; tropical Asia.

PELTOPHORUM (Vogel) Bentham, J. Bot. (Hooker) 2: 75. 1840, nom. cons.

Peltophorum pterocarpum (Candolle) Backer *ex* Heyne, Nutt. Pl. Ned.-Ind., ed. 2, 2: 755. 1927; Grierson *et* Long, Fl. Bhut. 1(3): 621. 1987. *Inga pterocarpa* Candolle, Prodr. 2: 441. 1825.

Trees, up to 12 m. Young shoots and inflorescences ferruginous hairy; yellowish, small lenticels in old branches. Leaves 32–40 cm; petiole robust; leaflets 8–18 pairs, oblong-obovate, leathery, abaxially pale and adaxially deep green, base oblique, margin entire, apex rounded, mucronate. Panicles terminal, densely ferruginous puberulent; bracts caducous. Flower buds globose. Sepals ovate, outside ferruginous tomentose. Petals obovate, densely ferruginous pubescent at middle of both surfaces. Filaments ca. 1.2 cm; anthers sagittate at base. Ovary stalked, hairy; style filiform; stigma discoid, 3-lobed. Legume winged, compressed.

Flowers & Fruits:

Specimen Cited: Budhuram, *Goutam & AP Das 0771*, dated 12. 11. 2009.

Local Distribution: Cultivated.

General Distribution: Bhutan, India, Indonesia, Malaysia, Sri Lanka, China, Thailand, Vietnam; Australia; introduced in E Africa and many other tropical countries.

ADENANTHERA L., Sp. Pl. 1: 384. 1753.

Adenanthera pavonina L. Sp. Pl. 1: 384. 1753; Grierson *et* Long, Fl. Bhut. 1(3): 636. 1987; Prain, Beng. Pl. 1: 452.1903. *Adenanthera microsperma* Teijsmann *et* Binnendijk, Natuurk. Tijdschr. Ned.-Indië 27: 58. 1864.

Deciduous trees, up to 20 m. Branchlets puberulent. Petiole and rachis puberulent; pinnae 3–5 pairs; leaflets 4–7 pairs, alternate, oblong to ovate, 2.3–3.4 × 1.4– 2.4 cm, both surfaces puberulent, both ends rounded-obtuse. Racemes simple, axillary or terminal. Flowers yellow, small, fragrant, shortly pedicellate. Calyx less than 5-8 mm. Petals oblong, slightly connate at base. Stamens 3–4 mm. Ovary nearly sessile, villous; style filiform; stigma small. Legume narrowly oblong.

Flowers & Fruits: April to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0764*, dated 12. 11. 2009.

Local Distribution: Cultivated.

General Distribution: India, Bhutan, China, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam.

ENTADA Adanson, Fam. Pl. 2: 318, 554. 1763, nom. cons.

Entada rheedii Spreng., Syst. Veg. 2: 325. 1825; Grierson *et* Long, Fl. Bhut. 1(3): 638. 1987; *Mimosa entada* L., Sp. Pl. 1: 518. 1753;

Woody climbers. Pinnae 2 pairs; leaflets 3–4 pairs in each pinna, opposite, obovate to elliptic-lanceolate, 3–7 × 1.6–3.5 cm, papery, abaxially glaucous, base rounded to broadly cuneate, apex acuminate to obtuse. Spikes solitary, axillary, 15– 24 cm. Flowers male or bisexual. Calyx green, cup-shaped. Petals white, narrowly elliptic to lanceolate. Stamens white. Ovary glabrous. Legume slightly curved; epicarp and endocarp woody. Seeds brown, sub orbicular, flat.

Flowers & Fruits: March to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0763*, dated 12. 11. 2009.

Local Distribution: Rarely found in Gorumara, Budhuram and Dhupjhora.

General Distribution: India, Nepal, Bhutan, China; tropical Asia; E Africa, Australia.

DERRIS Lour., Fl. Cochinch. 2: 423, 432. 1790, nom. cons.

Derris ferruginea Benth. in Miq., Pl. Jungh. 252. 1852; Grierson *et* Long, Fl. Bhut. 1(3): 657. 1987. *Robinia ferruginea* Roxb., Fl. Ind., ed. 1832, 3: 329. 1832, not Kunth (1823).

Lianas. Branchlets rust pubescent. Leaves 5–9 foliolate; leaflet blades elliptic to obovate-oblong, 7–12 × 2–5 cm, leathery, abaxially slightly rust puberulent, adaxially glabrous, base rounded, apex obtusely acuminate. Pseudopanicles axillary, 17–28 cm, densely rust puberulent. Pedicel slender. Flowers 0.8–1.3 cm. Calyx teeth minute. Corolla pale red to whitish. Ovary pubescent. Legume oblong to ligulate-oblong, leathery, flat.

Flowers & Fruits: April to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0863*, dated 14. 02. 2010.

Local Distribution: Rarely found in Dhupjhora forests.

General Distribution: Bangladesh, India, China, Laos, Myanmar, Thailand, Vietnam.

SESBANIA Scopoli, Intr. Hist. Nat. 308. 1777, *nom. cons*.

Key to the species:

1a. Stipules triangular-lanceolate, ovary globose …… *S. sesban*

1b. Stipules obliquely lanceolate, ovary linear …… *S. sesban*

Sesbania sesban (L.) Merrill, Philipp. J. Sci., C, 7: 235. 1912; Grierson *et* Long, Fl. Bhut. 1(3): 662. 1987. *Aeschynomene sesban* L. Sp. Pl. 2: 714. 1753.

Perennial herbs, suffrutescent, up to 4 m. Branches glabrescent. Stipules triangular-lanceolate, 3–4 mm, caducous, pubescent. Leaves 22–38 foliolate; petiole and rachis appressed pubescent; leaflet blades oblong to linear, 1.3–2.5 cm × 2.7– 5 mm, base obliquely rounded, apex rounded to retuse or mucronate. Racemes 5–10 flowered; bracts linear lanceolate, caducous, abaxially sparsely appressed pubescent. Calyx campanulate; teeth shortly triangular. Corolla yellow; wings oblong. Stamen 8–10 mm; anthers ellipsoid. Ovary glabrous; style ca. 5 mm, glabrous; stigma globose. Legume slightly curved at maturity.

Flowers & Fruits: July to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0868*, dated 14. 02. 2010.

Local Distribution: Cultivated at Dhupjhora forest village.

General Distribution: Bangladesh, Cambodia, India, Indonesia, China, Laos, Malaysia, Pakistan, Thailand, Vietnam; SW Asia, N Australia.

Sesbania grandiflora (L.) Pers., Syn. Pl. 2: 316. 1807. *Robinia grandiflora* L., Sp. Pl. 2: 722. 1753;

Trees, up to 10 m. Branches terete with conspicuous leaf and stipule scars. Stipules obliquely lanceolate, caducous. Leaves 20–38 cm, 22–56 foliolate; stipels acerose; leaflet blades oblong, 1.7–4.5 × 0.8–1.5 cm, smaller at both ends of rachis than in middle, base rounded to broadly cuneate, apex obtuse to retuse, mucronate. Racemes 5–7 cm, pendulous, 2–4 flowered; bract and bracteoles ovate to ovate-lanceolate. Flowers 7–12 cm. Calyx green, campanulate. Corolla white; standard oblong-obovate to broadly ovate, reflexed at anthesis. Stamens 7–9 mm; anthers linear. Pistil linear; ovary stipitate. Legume linear, slightly curved.

Flowers & Fruits: September to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0872*, dated 14. 02. 2010.

Local Distribution: Cultivated at forest villages throughout.

General Distribution: Probably native to Indonesia and Malaysia; Cultivated throughout.

INDIGOFERA L., Sp. Pl. 2: 751. 1753.

Indigofera linifolia (L. *f.*) Retzius, Observ. Bot. 4: 29. 1786; Grierson *et* Long, Fl. Bhut. 1(3): 663. 1987. *Hedysarum linifolium* L. *f.*, Suppl. Pl. 331. 1782;

Perennial erect herbs, many branched. Stems usually 4 angled. Stipules narrowly triangular. Leaves simple or 1-foliolate; stipels linear, glabrous; leaf or leaflet blade usually linear to elliptic, base narrowly cuneate, acuminate, mucronate. Racemes 1–1.5 cm; bracts ovate. Calyx teeth narrowly triangular. Corolla red; standard elliptic; wings and keel glabrous. Stamens 3–4 mm; anthers glabrous. Ovary with 1 ovule. Legume ovoid.

Flowers & Fruits: April to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0756*, dated 12. 11. 2009.

Local Distribution: Throughout the forests.

General Distribution: Afghanistan, Bhutan, India, China, Cambodia, Indonesia, Laos, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, Australia.

ALYSICARPUS Necker *ex* Desvaux, J. Bot. Agric. 1: 120. 1813, *nom. cons*.

Alysicarpus vaginalis (L.) Candolle, Prodr. 2: 353. 1825; Grierson *et* Long, Fl. Bhut. 1(3): 681. 1987; *Hedysarum vaginale* L. Sp. Pl. 2: 746. 1753.

Perennial, erect herbs; up to 70 cm. Leaves 1-foliolate; leaf blade often ovate-oblong to oblong-lanceolate on upper stem, cordate, ovate orbicular on lower stem. Racemes axillary and terminal, 6–10 flowered. Calyx 5–6 mm. Corolla purplish blue, slightly longer than calyx; standard obovate. Ovary pubescent, 4–7 ovuled. Legume compressed, cylindric.

Flowers & Fruits: September to November.

Specimen Cited: Budhuram, *Goutam & AP Das 0781*, dated 12. 11. 2009.

Local Distribution: Throughout the forests.

General Distribution: Bhutan, Nepal, India, China, Indonesia, Japan, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; E and W Africa, throughout Old World tropics; introduced in the Neotropics.

BUTEA Roxb. *ex* Willd., Sp. Pl. 3: 857, 917. 1802, *nom. cons*.

Butea buteiformis (Voigt) Grierson & D. G. Long, Notes Roy. Bot. Gard. Edinburgh 37: 346. 1979; Grierson *et* Long, Fl. Bhut. 1(3): 688. 1987; *Meizotropis buteiformis* Voigt, Hort. Suburb. Calcutt. 239. 1845 ["buteaeformis"];

Perennial shrubs. Stems erect or scandent. Petioles 10–18 cm; leaflets broadly ovate-elliptic, 18–42 × 12–36 cm, lateral veins 10–12 pairs, reticulate veins distinct abaxially, base rounded to truncate, apex acute. Racemes many flowered. Calyx 5–8 mm. Corolla orange-red; standard broadly elliptic, recurved; wings narrowly ovate, falcate; keel ovate. Legumes 5–10 × 2–2.5 cm, tomentose with brownish hairs.

Flowers & Fruits: April to October.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0790*, dated 23. 11. 2009.

Local Distribution: Cultivated in Bichhabhanga forest village.

General Distribution: Bangladesh, Bhutan, India, Myanmar, Nepal, China.

PACHYRHIZUS Richard *ex* Candolle, Prodr. 2: 402. 1825, *nom. cons*.

Pachyrhizus erosus (L.) Urban, Symb. Antill. 4: 311. 1905; Grierson *et* Long, Fl. Bhut. 1(3): 691. 1987; *Dolichos erosus* L., Sp. Pl. 2: 726. 1753.

Robust vines. Root tubers 8–17 cm in diam. Leaflets rhombic to ovate, 6–16 × 3–16 cm, upper margin often somewhat lobed, lateral ones oblique. Racemes axillary, 15–28 cm; flowers 3–5 at nodes. Calyx campanulate. Corolla purplish; standard suborbicular, with yellow-green spot; wings falcate; keel subfalcate. Ovary yellowish hirsute; style curved. Legumes compressed, hirsute.

Flowers & Fruits: August to November.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0859*, dated 14. 02. 2010.

Local Distribution: Rarely found in Dhupjhora forests.

General Distribution: Native to tropical America; widely cultivated in tropical regions.

SHUTERIA Wight *et* Arnott, Prodr. Fl. Ind. Orient. 207. Oct 1834, *nom. cons*., not *Shutereia* Choisy (Aug 1834).

Shuteria hirsuta Baker in Hook. *f*., Fl. Brit. India 2(4): 182. 1876; Grierson *et* Long, Fl. Bhut. 1(3): 695. 1987; *Shuteria ferruginea* (Kurz) Baker in Hook.*f*., Fl. Brit. India 2: 182. 1876. *Pueraria ferruginea* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 232. 1874;

Herbs, up to 3 m. Stems twining, slender, many branched. Leaves pinnately 3 foliolate; stipules lanceolate, persistent; stipels small; leaflets ovate, 6–10 × 3.5–7 cm, membranous, base rounded, acuminate. Raceme axillary. Bracts lanceolate, hirsute, persistent; bracteoles linear, hairy, persistent. Calyx tubular, 5-lobed; upper 2 lobes nearly connate, triangular, lower 3 lanceolate, shorter than tube. Corolla purple; standard obovate; wings linear; keels slightly shorter than wings. Ovary hairy. Legume oblong, compressed, slightly curved.

Flowers & Fruits: July to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0894*, dated 14. 02. 2010.

Local Distribution: Throughout the Dhupjhora and Murti forests.

General Distribution: Bhutan, India, China, Laos, Myanmar, Nepal, Thailand, Vietnam.

CAJANUS Adanson, Fam. Pl. 2: 326, 529. 1763 [“Cajan”], *nom. cons*.

Cajanus scarabaeoides (L.) Thouars, Dict. Sci. Nat. 6: 617. 1817; Grierson *et* Long, Fl. Bhut. 1(3): 703. 1987; *Dolichos scarabaeoides* L., Sp. Pl. 2: 720. 1753;

Woody vines, trailing, up to 2 m. Stems slender. Leaves pinnately 3 foliolate; stipules small, ovate, hairy, deciduous; petiolules extremely short; leaflets papery, with glandular spots, basal veins 3; terminal leaflet elliptic to obovate-elliptic 1.4–4 × 1–2 cm; lateral leaflets smaller, obliquely elliptic to obovate. Raceme axillary, 1–5 flowered. Calyx campanulate, 5-lobed; lobes linear-lanceolate. Corolla yellow; standard obovate; wings narrowly elliptic, slightly curved; keels curved at apex Ovules several. Legume oblong.

Flowers & Fruits: September to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0734*, dated 30. 09. 2009.

Local Distribution: Gorumara.

General Distribution: Bangladesh, Bhutan, India, Cambodia, China, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, Oceania.

FLEMINGIA Roxb. *ex* Aiton, Hort. Kew., ed. 2, 4: 349. 1812, *nom. cons*., not Roxb. *ex* Rottler (1803).

Key to the Species:

1a. Inflorescence a thyrse …… *F. strobilifera*

1b. Racemes usually with many clustered flowers ……. *F. macrophylla*

Flemingia strobilifera (L.) R. Br. *et* Aiton, Hort. Kew., ed. 2, 4: 349. 1812; Grierson *et* Long, Fl. Bhut. 1(3): 706. 1987; *Hedysarum strobiliferum* L., Sp. Pl. 2: 1053. 1753;

Erect shrubs, up to 3. Leaves simple; stipules linear-lanceolate, 1–2 cm, persistent; petiole densely hairy; leaf blade narrowly ovate to ovate-elliptic, 7–15 × 3–7 cm, thinly leathery, glabrous, base rounded or slightly cordate, entire, acuminate or acute. Inflorescence a thyrse; inflorescence axis 7–10 cm; each cymules enclosed by concave bract; papery to almost leathery, margin ciliate. Flowers small. Calyx pubescent; lobes ovate. Corolla longer than calyx; standard orbicular; wings narrower than keels. Legume elliptic, inflated.

Flowers & Fruits: February to November.

Specimen Cited: Gorumara, *Goutam & AP Das 0736*, dated 30. 09. 2009.

Local Distribution: Gorumara and Dhupjhora.

General Distribution: Bhutan, India, Indonesia, China, Cambodia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam.

Flemingia macrophylla (Willd.) Kuntze *ex* Merr. Philipp. J. Sci., C 5: 130. 1910; Grierson *et* Long, Fl. Bhut. 1(3): 707. 1987; *Flemingia macrophylla* (Willd.) Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 440. 1897. *(nom. inval.*) *Crotalaria macrophylla* Willd., Sp. Pl. 3: 982. 1802;

Erect shrubs, up to 2 m. Young branches densely villous. Leaves digitately 3 foliolate; stipules lanceolate, apex long acuminate, usually deciduous; petiole narrowly winged; leaflets papery; terminal leaflet broadly lanceolate to elliptic, 8–14 × 4–8 cm, glabrous, basal veins 3, base broadly cuneate, entire, acuminate; lateral leaflets smaller, oblique. Racemes usually with many clustered flowers; peduncle extremely short. Calyx campanulate; lobes linear-lanceolate, lower one longest. Corolla purple; standard oblon; wings narrowly elliptic; keel oblong. Ovary elliptic. Legume elliptic.

Flowers & Fruits: June to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0737*, dated 30. 09. 2009.

Local Distribution: Rarely found in Gorumara Beat.

General Distribution: Bangladesh, Bhutan, India, China, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam.

ZORNIA Gmelin, Syst. Nat. 2: 1076, 1096. 1792.

Zornia gibbosa Span., Linnaea 15: 192. 1841; Grierson *et* Long, Fl. Bhut. 1(3): 712. 1987.

Perennial herbs, up to 50 cm. Stems slender, many branched. Stipules lanceolate, glabrous, a long auricle at base. Leaves 2 foliolate; leaflet blades ovate-oblong to lanceolate, 1–2.5 × 0.3–1 cm, base oblique, entire, acute. Inflorescences axillary spikes, sparsely 3–8 flowered; bracts 2, ovate, margin ciliate. Calyx 1–3 mm. Corolla yellow; standard with striations; wings and keels small. Legume usually longer than bracts.

Flowers & Fruits: April to September.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0896*, dated 14. 02. 2010.

Local Distribution: Throughout the forests.

General Distribution: Bhutan, India, China, Japan, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand; Australia.

VICIA L., Sp. Pl. 2: 734. 1753.

Key to the species:

1a. Stipules lanceolate ……..……. *V. hirsuta*

1b. Stipules hastate ……..……... *V. sativa*

Vicia hirsuta (L.) Gray, Nat. Arr. Brit. Pl. 2: 614. 1821; Grierson *et* Long, Fl. Bhut. 1(3): 725. 1987; *Ervum hirsutum* L., Sp. Pl. 2: 738. 1753;

Annual, climbing herbs, up to 1m. Stem slender. Leaves paripinnate; stipules lanceolate; leaflets 4–8 paired, linear to narrowly oblong, 4–13 × 1–3 mm, glabrous; tendril branched. Raceme shorter than leaf, 2–6 flowered. Calyx campanulate. Corolla white or light purple; standard elliptic, as long as wings and longer than keel. Ovary sessile; ovules 2. Legume oblong-rhomboid.

Flowers & Fruits: February to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0902*, dated 14. 02. 2010.

Local Distribution: Cultivation land of Dhupjhora forest village.

General Distribution: Afghanistan, Bhutan, India, China, Japan, Korea, Nepal, Pakistan, Russia, Turkmenistan; Africa, C and SW Asia, N Atlantic islands, Europe; introduced and naturalized elsewhere.

Vicia sativa L., Sp. Pl. 2: 736. 1753; Grierson *et* Long, Fl. Bhut. 1(3): 725. 1987;

Annual, decumbent or climbing, herbs, up to 1 m. Stem branched. Leaves paripinnate, 3–8 cm; stipules hastate, lanceolate; leaflets 2–7 paired, linear to oblong cuneate, 1–2.5 × 0.3–1 cm, hairy, acute; tendril 2 to 3 branched. Flowers 1 or 2 in axillary fascicles. Calyx campanulate. Corolla blue-purple; standard long, subequaling or longer than wings; wings longer than keel. Ovary shortly stalked, linear. Legume black, linear-oblong, slightly curved.

Flowers & Fruits: January to September.

Specimen Cited: Murti, *Goutam & AP Das 0839*, dated 17. 12. 2009.

Local Distribution: Cultivation land of Murti and Dhupjhora forest village.

General Distribution: Afghanistan, Nepal, Bhutan, India, China, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Africa, SW Asia, N Atlantic islands, Europe; widely introduced and naturalized elsewhere.

MELILOTUS (L.) Miller, Gard. Dict. Abr., ed. 4. 1754.

Key to the Species:

1a. Stipules subulate ……..……. *M. albus*

1b. Stipules lanceolate ……..…….. *M. indicus*

Melilotus albus Medikus, Vorles. Churpfälz. Phys.-Öcon. Ges. 2: 382. 1787.

Annual or biennial, erect herbs, up to 2 m. Stem terete, hollow, branched. Stipules subulate, entire; petiole shorter than leaflet; leaflets lanceolate to oblanceolate-oblong, 1.5–3 × 0.5–1 cm, margins shallowly serrate. Racemes 10–20 cm; many flowered. Corolla white; standard larger than wings and keel. Ovary narrowly ovate; ovules 2–4. Legume elliptic to oblong.

Flowers & Fruits: May to September.

Specimen Cited: Budhuram, *Goutam & AP Das 0752*, dated 12. 11. 2009.

Local Distribution: Cultivation land of Budhuram forest village.

General Distribution: Pantropical in Asia; Europe.

Melilotus indicus (L.) Allioni, Fl. Pedem. 1: 308. 1785; Grierson *et* Long, Fl. Bhut. 1(3): 728. 1987; *Trifolium indicum* L., Sp. Pl. 2: 765. 1753 [T. "M. indica"].

Annual herbs, up to 60 cm. Stems erect or ascending, terete. Stipules lanceolate, margin membranous; leaflets obovate-cuneate to narrowly oblong, 1.2–3 × 0.8–1 cm, lateral veins 7–9 pairs, base cuneate, serrulate toward apex, obtuse to truncate. Racemes slender, dense; flowers 15–25; bracts filiform. Corolla yellow; standard broadly ovate, equal to wings and keel. Ovary narrowly ovate; ovules 2. Legume olivegreen, globose.

Flowers & Fruits: March to June.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0794*, dated 23. 11. 2009.

Local Distribution: Cultivation land of Bichhabhanga and Budhuram forest villages.

General Distribution: Bhutan, India, China, S and C Asia; Europe.

ACACIA Mill., Gard. Dict. Abr., ed. 4, [25]. 1754, *nom. cons*.

Key to the species

1a. Flowers in spikes ..... *A. catechu*

1b. Flowers in heads, then rearranged in panicles ..... *A. pennata*

Acacia catechu (L. *f*.) Willd., Sp. Pl. 4: 1079. 1806. Grierson *et* Long, Fl. Bhut. 1(2): 642. 1984; Prain, Beng. Pl. 1: 458.1903. *Mimosa catechu* L. *f*., Suppl. Pl. 439. 1782.

Local name: Khayer

Deciduous, small trees, up to 10 m. Branchlets with a pair of flat, hooked spines below stipules. Leaf glands near petiolar base and between several upper leaflets of rachis; pinnae 15 – 30 pairs; leaflets 30 – 50 pairs, linear, 2 – 6 × 1 – 1.5 mm. Spikes 1–4, axillary. Flowers white. Calyx campanulate. Petals lanceolate to oblanceolate. Stamens numerous. Ovary glabrous. Legume Br., dehiscent, apex rostrate. Seeds 3 –10.

Flowers & Fruits: April to Sepetember.

Specimen Cited: Murti, *Goutam & AP Das 0320*, dated 21.07.2009.

Local Distribution: Murti River bed.

General Distribution: India: through out; Bhutan, Bangladesh, Nepal, Pakistan, Sri Lanka, Myanmar, Thailand; introduced elsewhere.

Acacia pennata (L.) Willd., Sp. Pl. 4: 1090. 1806; Grierson *et* Long, Fl. Bhut. 1(2): 641. 1984; Prain, Beng. Pl. 1: 458.1903. *Mimosa pennata* L., Sp. Pl. 1: 522. 1753.

Large climbers, with copious, scattered prickles. Stipules lanceolate, cuspidate; petiolar glands subpulvinate; pinnae 10 – 20 pairs; leaflets 40 – 50 pairs, densely crowded, linear, 5 – 10 × 0.5 – 1 mm, base truncate, ciliate, sharply acute, asymmetric. Heads solitary or 2 to 3 fasciculate, globose, arranged in axillary or terminal panicles. Calyx subcampanulate, 5 toothed. Ovary puberulent. Legume strap shaped, 12 – 18 × 2 – 4 cm. Seeds black, 8 – 12, narrowly elliptic.

Flowers & Fruits: March to October.

Specimen Cited: Murti, *Goutam & AP Das 0289*, dated 10. 02. 2009.

Local Distribution: Throughout the Forests.

General Distribution: India: through out; Bhutan, Nepal, Sri Lanka, Cambodia, Malaysia, Myanmar, Thailand, Vietnam.

ALBIZIA Durazz., Mag. Tosc. 3(4): 13. 1772.

Key to the species

1a. Midvein of leaflets medial or eccentrically close to lower margin ..... *A. procera*

1b. Midvein of leaflets eccentrically close to upper margin 2

2a. Leaflets more than 2 cm large 3

2b. Leaflets less than 1 cm large ..... *A. chinensis*

3a. Inflorescens 30 – 40 flowered corymbs..... *A. lebbeck*

3b. Inflorescens 10 – 15 flowered panicles ..... *A. odoratissima*

Albizia chinensis (Osbeck) Merr. in Amer. J. Bot. 3: 575. 1916. Grierson *et* Long, Fl. Bhut. 1(2): 646. 1984; Prain, Beng. Pl. 1: 461.1903. *Mimosa chinensis* Osbeck, Dagb. Ostind. Resa, 233. 1757.

Local name: Kalosiris

Large deciduous, trees, up to 30 m. Stipules deciduous, cordate, large; glands just below junctions of pinnae; pinnae 6 – 12 pairs; leaflets 25 – 35 pairs, sessile, oblong-linear, base subtruncate, ciliate, apex acuminate. Heads 12 – 20 flowered, arranged in a terminal panicle. Flowers dimorphic, green-white. Calyx funnelshaped, shortly 5 toothed. Corolla just double of calyx; lobes ovate-deltoid. Stamens slightly longer than corolla tube. Ovary yellow-Br.. Legume indehiscent. Seeds elliptic, flat.

Flowers & Fruits: March to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0394*, dated 22.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Throughout India; most areas with a seasonal climate in S and SE Asia.

Albizia lebbeck (L.) Benth. in London J. Bot. 3: 87. 1844 [“lebbek”]. Grierson *et* Long, Fl. Bhut. 1(2): 646. 1984; Prain, Beng. Pl. 1: 461.1903. *Mimosa lebbeck* L., Sp. Pl. 1: 516. 1753.

Small, deciduous, trees, up to 12 m. Stipules caducous, small; leaf rachis with disklike glands near base and at base of pinnae; pinnae 2 – 4 pairs; leaflets 4 – 8 pairs, narrowly elliptic to slightly obliquely oblong, 2 – 5 × 1 – 2 cm, base oblique, obtuse to retuse. Corymbs 30 – 40 flowered. Flowers dimorphic, fragrant. Calyx funnel shaped, with short teeth. Corolla green yellow; lobes deltoid-ovate. Stamens white; tube shorter than corolla tube. Ovary glabrous, sessile. Legume straw-colored, strap-shaped, flat. Seeds Br..

Flowers & Fruits: May to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0649*, dated 12. 02. 2008.

Local Distribution: Throughout the Forests.

General Distribution: Throughout India; native to tropical Africa; introduced or naturalized in Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka.

Albizia odoratissima (L.*f*.) Benth. in London J. Bot. 3: 88. 1844. Grierson *et* Long, Fl. Bhut. 1(2): 644. 1984; Prain, Beng. Pl. 1: 461.1903. *Mimosa odoratissima* L. *f*., Suppl. Pl. 437. 1782.

Local name: Sada Siris

Small evergreen, trees, up to 15 m. Stipules filiform; leaf glands 2 cm above base of petiole and rachis between first and second pinnae, elliptic; pinnae 2 – 4 pairs; leaflets sessile, 6 – 14 pairs, oblong, base obliquely truncate, obtuse, sometimes mucronate. Heads arranged in panicles. Flowers dimorphic, 10 – 15, sessile, yellowish. Calyx cupshaped. Corolla funnel-shaped; lobes lanceolate. Staminal tube as long as corolla tube. Ovary ferruginous tomentose. Legume oblong, compressed. Seeds 6 – 12, ovate in outline.

Flowers & Fruits: June to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0545*, dated 23.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Throughout India; Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka, Thailand, Laos, Myanmar, Vietnam.

Albizia procera (Roxb.) Benth. in London J. Bot. 3: 89. 1844. Grierson *et* Long, Fl. Bhut. 1(2): 645. 1984; Prain, Beng. Pl. 1: 461.1903. *Mimosa procera* Roxb., Pl. Corom. 2: 12. 1799.

Local name: Kalosiris

Small deciduous, trees, up to 15 m. Leaf petiole with an oblong gland 1 cm above base; pinnae 3 – 5 pairs; leaflets 6 – 12 pairs, ovate to subrhombic, 3 – 5 × 1 – 2 cm, base oblique, obtuse to emarginate. Heads 20 flowered, arranged in axillary or terminal panicles. Flowers uniform, sessile. Calyx 2 – 3 mm. Corolla yellow-white; lobes lanceolate. Staminal tube longer than corolla tube. Ovary glabrous, subsessile. Legume ligulate. Seeds 8 – 12, obovoid-elliptic.

Flowers & Fruits: May to August.

Specimen Cited: Lataguri, *Goutam & AP Das 0693*, dated 14. 02. 2008.

Local Distribution: Throughout Forest.

General Distribution: Throughout India; Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka, Thailand, Laos, Myanmar, Vietnam.

TEPHROSIA Pers., Syn. Pl. 2: 328. 1807, nom. cons.

Tephrosia candida DC., Prodr. 2: 249. 1825; Grierson *et* Long, Fl. Bhut. 1(2): 659. 1984; Prain, Beng. Pl. 1: 405.1903. 1(3): 659. 1987.

Perennial. Leaflets blades oblong. Pseudoracemes terminal or lateral. Calyx teeth equal. Corolla white. Ovary tomentose, with numerous ovules. Legume linear, straight, Br. tomentose.

Flowers & Fruits: October to December

Specimen Cited: Dhupjhora, *Goutam & AP Das 0208*, dated 09. 02. 2009.

Local Distribution: Throughout riverine forest margins and ofen cultivated in forest villages.

General Distribution: Tropical and sub-tropical parts of the world.

TAMARINDUS L., Sp. Pl. 1: 34. 1753.

Tamarindus indica L., Sp. Pl. 1: 34. 1753; Hook. *f*., Hook. *f*., Fl. Brit. India 2: 273. 1878; Grierson et Long, Fl. Bhut. 1(3): 636. 1987.

*Local name:*Tetul.

Trees. Leaflets oblong, small, glabrous, base obliquely rounded, apex rounded. Flowers few, yellowish tinged with purplish red stripes. Petals obovate, subequal to calyx lobes, margin repand, curled. Ovaries slightly incurved, terete. Pods brownish, straight or arcuate.

Flowers & Fruits: May to December.

Specimen Cited: Murti, *Goutam & AP Das 0244*, dated 09. 02. 2009.

Local Distribution: Cultivated in forest villages.

General Distribution: Tropical and sub-tropical parts of the world.

BAUHINIA L., Sp. Pl. 1: 374. 1753.

Key to the Species:

1a. Liana ………………………………………………………........……….. *B. vahlii*

1b. Small tree ……………………………………………………….......….. 2

2a.Lamina lobes apex acuminate ……………………………………......…… *B. acuminate*

2b. Lamina lobes apex round or acute ………………………………….….…… 3

3a. Petals with white or purplish spots, Fertile stamens 5 ……………....….... *B. variegata*

3b. Petals pink. Fertile stamens 3 ……………………………………....... *B. purpurea*

Bauhinia acuminata L., Sp. Pl. 1: 376. 1753; Hook. *f*., Fl. Brit. India 2(4): 277. 1878.

Local name: Swet Kanchan

Large shrubs up to 3 m. Young branches zigzag. Lamina ovate-cordate to cordate, 8 – 12 × 6 –12 cm, subleathery, primary veins 9 – 11, base cordate, bifid, lobes acuminate or slightly acute. Inflorescence a raceme, with 3 – 9 flowers, axillary; bracts and bracteoles linear. Hypanthium tubular. Calyx spathe open on one side, shortly 5 toothed. Petals white, obovate-elliptic. Fertile stamens 10 in 2 whorls. Ovary prominently stalked. Legume straight to slightly curved. Seeds 6 – 10, compressed.

Flowers & Fruits: April to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0677*, dated 14. 02. 2008.

Local Distribution: Planted in Dhupjhora Beat Office.

General Distribution: India: through out; Bhutan, China, Bangladesh, Sri Lanka, Indonesia, Laos, Malaysia, Philippines, Thailand, Vietnam.

Bauhinia purpurea L., Sp. Pl. 1: 375. 1753. Hook. *f*., Fl. Brit. India 2(4): 278. 1878; Grierson *et* Long, Fl. Bhut. 1(3): 633. 1987; Prain, Beng. Pl. 1: 442.1903.

Local name: Rakta Kanchan

Small trees, up to 10 m. Petiole 3 – 4 cm; lamina suborbicular, 10 – 16 × 8 – 14 cm, stiffly papery, base shallowly cordate, apex bifid, lobes slightly acute. Inflorescence a raceme with few flowers, axillary and terminal. Calyx open as a spathe into 2 lobes. Petals pink. Fertile stamens 3; filaments as long as petals. Staminodes 5 or 6. Ovary stalked; style curved. Legume linear, flat; valves woody. Seeds compressed, suborbicular.

Flowers & Fruits: September to March.

Specimen Cited: Murti, *Goutam & AP Das 0325*, dated 21.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: India: through out; probably only native from Nepal through continental monsoon Asia, now introduce to Cambodia, Laos, Myanmar, Thailand, Vietnam.

Bauhinia variegata L., Sp. Pl. 1: 375. 1753. Hook. *f*., Fl. Brit. India 2(4): 279. 1878; Grierson *et* Long, Fl. Bhut. 1(3): 634. 1987; Prain, Beng. Pl. 1: 442.1903.

Local name: Kanchan

Small, deciduous, trees, up to 15 m. Lamina suborbicular to broadly ovate, 6 – 10 × 7 – 10 cm, subleathery, base shallowly to deeply cordate, apex bifid, lobes rounded. Inflorescence a raceme, few flowered, axillary and terminal. Calyx open as a spathe into 2 lobes. Petals white, or purplish spots, oblanceolate. Fertile stamens 5; filaments as long as petals, slender. Ovary stalked; style curved; stigma small. Legume linear, flat; valves woody. Seeds 10–15, compressed.

Flowers & Fruits: February to July.

Specimen Cited: Murti, *Goutam & AP Das 0311*, dated 10. 02. 2009.

Local Distribution: Throughout the Forests.

General Distribution: India: through out; Bhutan, China, Cambodia, Laos, Myanmar, Thailand, Vietnam; widely cultivated in the tropics and subtropics.

Bauhinia vahlii Wight *et* Arnt., Prodr. 297. 1834; Baker in Hook. *f*. Fl. Brit. India 2:279. 1878; Hara in Fl. E.Him. 1:141. 1966; 3:57. 1957. 1975; Hara *et* Ohashi, Enum. Fl. Pl. Nepal 2: 108. 1979; Grierson & Long, Fl. Bhutan 1(3):634. 1987.

Local Name: Bharla

Liana, brown pubescent young shoot; tendrils circinate, in opposite pairs. Petioles to 2.5 cm long; lamina 10 - 17 x 16 - 24 cm, suborbicular, entire, lobed at apex, lobes rounded or obtuse, base cordate, pubescent, basally 10-13 nerved. Flowers in corymbose terminal, many-flowered. Bracteoles acuminate. Peduncles long to 13 cm, terate. Calyx 2 lobed, slender, pubescent. Corolla obovate, whitish, with distinct midvein, pubescent outside; fertile stamens 2 or 3; anthers red; ovary shortly stalked; style coiled. Pods to 28 cm long, oblong, brownish; seeds upto 12, oblong. brown.

Flowers & Fruits: July to November.

Specimen Cited: Murti, *Goutam & AP Das 1371*, dated 21. 02. 2011.

Local Distribution: Murti, Dhupjhora, Gorumara.

General Distribution: India; Bhutan.

CAESALPINIA L., Sp. Pl. 1: 380. 1753..

Caesalpinia cucullata Roxb., Fl. Ind., ed. 1832, 2: 358. 1832. Hook. *f*., Fl. Brit. India 2(4): 274. 1878; Grierson *et* Long, Fl. Bhut. 1(3): 623. 1987; Prain, Beng. Pl. 1: 447.1903.

Local name: Bhainse Kanta

Medium climbers, up to 5 m, with recurved prickles on old stems. Pinnae 2 – 5 pairs, stalked; stipules absent; leaflets 3 – 6 pairs, broadly ovate to oblong, 4 – 10 × 2.5 – 4 cm, leathery, base broadly cuneate to obtuse-rounded, acuminate. Panicles terminal racemes. Receptacle deeply discoid or shallowly campanulate. Sepals 5, unequal. Petals yellow, oblong, glabrous. Stamens 10, exserted.

Ovary compressed; style slender; stigma truncate. Legume reddish Br., elliptic-oblong, indehiscent, winged along ventral suture.

Flowers & Fruits: Round the year.

Specimen Cited: Gorumara, *Goutam & AP Das 0286*, dated 10. 02. 2009.

Local Distribution: Throughout the Forests.

General Distribution: India: through out; Bhutan, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam.

CASSIA L., Sp. Pl. 1: 376. 1753, *nom. cons*.

Key to the species:

1a. Leaflets 5 – 10 pairs; ovary linear ……...…….. *C. javanica* subsp. *nodosa*

1b. Leaflets 3 – 4 pairs; ovary oval ……. *C. fistula*

Cassia javanica subsp. ***nodosa*** (Buch.-Ham. *ex* Roxb.) K. Larsen & S. S. Larsen, Nat. Hist. Bull. Siam Soc. 25(3–4): 205. 1975; Grierson *et* Long, Fl. Bhut. 1(2): 629. 1984. *Cassia nodosa* Buch.-Ham. *ex* Roxb., Fl. Ind. 2: 336. 1824; Prain, Beng. Pl. 1: 437.1903.

Local name: Radha chunda

Small, deciduous, trees. Leaves 20 – 25 cm; leaflets 5 – 10 pairs, 2 – 5 × 1 – 2 cm, subleathery, base slightly asymmetric, acute to obtuse. Racemes lateral on short side branches; inflorescence axis slender. Sepals ovate. Petals deep yellow, ovate. Stamens 10. Ovary linear, whitish pubescent. Legume blackish Brown, terete.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0122*, dated 07. 02. 2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: India: through out; Bhutan, China, Indonesia, Malaysia, Thailand; cultivated in the neotropics.

Note: Planted in village side.

Cassia fistula L., Sp. Pl. 1: 377. 1753. Grierson *et* Long, Fl. Bhut. 1(3): 628. 1987; Prain, Beng. Pl. 1: 437.1903.

Local name: Swarna jhuri

Small deciduous trees, up to 15 m. Leaves 30 – 40 cm, with 3 to 4 pairs of leaflets; leaflets broadly ovate to ovate-oblong, 8 – 12 × 4 – 8 cm, leathery, base broadly cuneate, acute. Racemes axillary, lax, pendent. Pedicels slender. Sepals narrowly ovate. Petals golden yellow, broadly ovate. Stamens 10, exceeding petals. Ovary stalked; stigma small. Legume pendulous, indehiscent. Seeds numerous, elliptic, flattened.

Flowers & Fruits: April to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0142*, dated 07. 02. 2009.

Local Distribution: Dhupjhora, Murti.

General Distribution: Native to India; cultivated throughout the tropics.

Note: Planted near forest villages.

SENNA Mill., Gard. Dict. Abr., ed. 4. 1754.

Key to the species:

1a. Tree ……..…. *S. siamea*

1b. Shrubs or under shrubs …….. 2

2a. Several axilary racemes forming a terminal panicle ……..… *S. alata*

2b. Axillary racemes do not form panicle …….…….. 3

3a. Racemes 2 – 3 flowered …….…… *S. tora*

3b. Racemes more than 3 flowers ……..…. 4

4a. Legume flattened ……..….. *S. occidentalis*

4b. Legume terete ……..…….. *S. sophera*

Senna alata (L.) Roxb., Fl. Ind., ed. 1832, 2: 349. 1832. *Cassia alata* L., Sp. Pl. 1: 378. 1753. Hook.*f*., Fl. Brit. India 2(4): 278. 1878; Grierson *et* Long, Fl. Bhut. 1(3): 629. 1987; Prain, Beng. Pl. 1: 434.1903.

Local name: Dadmari

Small shrubs, up to 3 m. Leaves 35 – 50 cm; stipules persistent, triangular; petiolar glands absent; lamina 6 – 15 pairs, oblong to obovate-oblong, 6 – 15 × 3 – 7 cm, base obliquely truncate, obtusely rounded. Racemes axillary, dense, many flowered or several racemes forming a terminal panicle. Sepals orange-yellow, oblong. Petals bright yellow, ovate-orbicular. Stamens 10, fertile stamens 7. Ovary puberulent, sessile; ovules many. Legume winged. Seeds 50 – 60, compressed, deltoid.

Flowers & Fruits: August to December.

Specimen Cited: Murti, *Goutam & AP Das 0213*, dated 09. 02. 2009.

Local Distribution: Throughout Forest margin of Murti.

General Distribution: India: through out; native to tropical America; widely introduced in the tropics elsewhere.

Senna occidentalis (L.) Link, Handb. 2: 140. 1831. *Cassia occidentalis* L., Sp. Pl. 1: 377. 1753. Hook. *f*., Fl. Brit. India 2(4): 279. 1878; Grierson *et* Long, Fl. Bhut. 1(3): 631. 1987; Prain, Beng. Pl. 1: 437.1903.

Local name: Kalokasunda

Small shrubs, erect, up to 1.5 m. Leaves 15 – 20 cm; stipules caducous, lanceolate; lamina 3 –5 pairs, ovate to ovate-oblong, 4 – 10 × 2 – 3 cm, base rounded, acuminate. Corymbose racemes, axillary or terminal; bracts caducous. Sepals unequal. Petals yellow, purplish veined. Fertile stamens 7, reduced stamens 3. Ovary tomentose; style glabrous. Legume Br., falcate, flattened. Seeds 30 – 40, flat, orbicular.

Flowers & Fruits: Round the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0162*, dated 08. 02. 2009.

Local Distribution: Forest throughout.

General Distribution: India: through out; native to tropical America; widely introduced in the tropics and subtropics elsewhere.

Senna siamea (Lam.) Irwin *et* Barneby in Mem. New York Bot. Gard. 35: 98. 1982. *Cassia siamea* Lam., Encycl. 1: 648. 1785; Prain, Beng. Pl. 1: 438.1903.

Small trees, up to 15 m. Leaves 20 – 30 cm; leaflets 6 – 12 pairs, oblong to ovate-oblong, 3 – 7 × 2 – 3 cm, leathery, base rounded, obtusely rounded, mucronate. Racemes in axils of apical leaves or a large terminal panicle on a robust peduncle; bracts linear. Sepals suborbicular. Petals yellow, broadly obovate. Stamens 10, among them 7 fertile. Ovary sessile. Legume flattened, purplish Br. when mature. Seeds 10 – 30, light Br., ovoid.

Flowers & Fruits: May to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0127*, dated 07. 02. 2009.

Local Distribution: Throughout Forest..

General Distribution: Tropical India; native to Myanmar and Thailand, and probably also to Cambodia, Laos, and Vietnam; widely cultivated in the tropics.

Senna sophera (L.) Roxb. Fl. Ind., ed. 2: 347. 1832. *Cassia sophera* L., Sp. Pl. 379. 1753; Hooker *f.*,Fl. Brit. Ind. 2: 262. 1878; Prain, Beng. Pl.1: 438. 1903. *Cassia purpurea* Roxb., Hort. Beng. 31. 1814, *nom.nud*. *Senna exculenta* Roxb., Fl. Ind. Ed. Carey 2: 346. 1832.

Loca name: Chakanda

Under shrubs, up to 2 m. Leaves 7 – 18 cm; petiole 3–5 cm, with a narrow clavate gland above petiole joint; lamina 4 – 10 pairs, lanceolate to elliptic-lanceolate, 2 –4 × 1 – 2 cm, base rounded, acute to shortly acuminate. Corymbs axillary, few flowered; bracts ovate. Sepals ovate-orbicular. Petals yellow, obovate. Stamens 10, 6 or 7 fertile. Ovary finely pubescent. Legume straight. Seeds 30 – 40, ovoid, compressed.

Flowers & Fruits: May to October.

Specimen Cited: Murti, *Goutam & AP Das 0193*, dated 09. 02. 2009.

Local Distribution: Throughout Forest.

General Distribution: native to tropical Asia; widely introduced in the tropics and subtropics elsewhere.

Senna tora (L.) Roxb., Fl. Ind., ed. 2: 340. 1832. *Cassia tora* L., Sp. Pl. 376. 1753; Hook.r *f.*, Fl. Brit. Ind., 2: 265. 1878; Prain, Beng. Pl. 1: 438. 1903. *Cassia obtusifolia* L., Sp. Pl. 377. 1753.

Local name: Jhun jhuni

Annual, erect, suffrutescent herbs, up to 2 m. Leaves 5 – 10 cm; stipules linear; rachis with a club-shaped gland between leaflets; leaflets 3 pairs, obovate to obovate-oblong, 2 – 5 × 2 – 3 cm, base cuneate to rounded and oblique, rounded. Racemes axillary, short, 2 to 3 flowered; bracts linear, acute. Sepals ovate to ovate-oblong. Petals yellow, unequal, obovate. Fertile stamens 7, staminodes absent. Ovary sessile; style glabrous. Legume terete, slender. Seeds 20 – 30, rhomboid.

Flowers & Fruits: June to November.

Specimen Cited: Murti, *Goutam & AP Das 0178*, dated 09. 02. 2009.

Local Distribution: Throughout Forest.

General Distribution: India: through out; native to tropical America; widely cultivated in the tropics and subtropics.

CROTALARIA L., Sp. Pl. 2: 714. 1753, *nom. cons*.

Crotalaria alata Buch.-Ham. *ex* Don, Prodr. Fl. Nepal. 241. 1825; Grierson *et* Long, Fl. Bhut. 1(3): 735. 1987; Prain, Beng. Pl. 1: 373. 1963.

Small, erect, up to 100 cm. Stipules decurrent on stem as a broad wing. Leaves simple, nearly sessile; lamina elliptic to obovate-elliptic, 3 – 10 × 1.5 – 5 cm, base attenuate to cuneate, obtuse and mucronate. Racemes terminal or leaf-opposed, 2 to 3 flowered; bracts ovate-lanceolate. Calyx 2 lipped; lobes lanceolate. Corolla yellow; obovate-orbicular; wings oblong; keel ovate. Ovary glabrous. Legume oblong, 3 – 4 cm, 30 – 35 seeded. Seeds obliquely cordate, smooth.

Flowers & Fruits: June to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0709*, dated 14. 02. 2008.

Local Distribution: Gorumara, Murti, Dhupjhora, Bichhabhanga, Budhuram, Khunia.

General Distribution: Throughout India; Bhutan, Bangladesh, Nepal, Sri Lanka, Cambodia, Indonesia, Malaysia, Myanmar, Thailand, Vietnam; cultivated and naturalized in Africa and Madagascar.

DALBERGIA L.*f*., Suppl. Pl. 52, 316. 1782, *nom. cons*.

Dalbergia sissoo Roxb. *ex* Candolle, Prodr. 2: 416. 1825; Grierson *et* Long, Fl. Bhut. 1(3): 652. 1987; Prain, Beng. Pl. 1: 411. 1963.

Local name: Sisu.

Trees, up to 20 m. Leaves 12 – 15 cm; leaflets 3 – 5; lamina rhombic obovate, rounded, shortly caudate. Panicles axillary. Flowers nearly sessile, fragrant; bracts caducous, lanceolate. Calyx campanulate, broadly ovate, 5 toothed. Corolla yellowish white; broadly obovate, emarginate; wings and keel oblanceolate. Stamens 9, monadelphous. Ovary oblong, 4 – 6 ovuled; style very short; stigma capitate. Legume linear-oblong. Seeds reniform, compressed.

Flowers & Fruits: March to November.

Specimen Cited: Murti, *Goutam & AP Das 0151*, dated 08. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara.

General Distribution: Native to India; widely cultivated in the tropics.

DELONIX Raf. in Fl. Tellur. 2: 92. 1837.

Delonix regia (Bojer) Raf., Fl. Tellur. 2: 92. 1837; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 622. 1987. *Poinciana regia* Bojer, Bot. Mag. 56: t. 2884. 1829; Prain, Beng. Pl. 1: 446. 1963.

Local name: Krishnachurha

Large, deciduous, trees, up to 20 m. Leaves 20 – 60 cm; petiole 7 – 12 cm; petiolules short; pinnae opposite, 15 – 20 pairs, 5 – 10 cm; leaflets 25 pairs, opposite, oblong, 5 – 9 × 3 – 4 mm, base oblique, entire, obtuse. Corymbose racemes terminal or axillary. Flowers bright red. Receptacle discoid. Sepals reddish inside, margin greenish yellow. Petals reflexed after anthesis, red, tinged with yellow and white spotted, spatulate. Stamens curved upward. Stigma small. Legume dark reddish Br.. Seeds 20 – 40.

Flowers & Fruits: June to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0139*, dated 07. 02. 2009.

Local Distribution: Planted in Dhupjhora and Murti Beat Offices.

General Distribution: Native to Madagascar; often cultivated in the tropics.

DESMODIUM Desv. in Jour. Bot. Agric. 1: 122. 1813, *nom. cons*.

Key to the species:

1a. Leaves 3 foliolate 2

1b. Leaves 1 foliolate ..... *D. gangeticum*

2a. Terminal leaflet blade obcordate to obovate ..... *D. triflorum*

2b. Terminal leaflet blade ovate to ovate–elliptic ..... *D. laxiflorum*

Desmodium laxiflorum Candolle, Ann. Sci. Nat. (Paris) 4: 100. 1825; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 678. 1987; Prain, Beng. Pl. 1: 425. 1963.

Erect, shrubs, up to 100 cm. Leaves 3 foliolate; terminal leaflet ovate to ovate–elliptic, 10 – 17 × 3 – 7 cm, shortly acuminate. Racemes terminal and axillary, 2 – 7 flowered, fascicled. Calyx densely villous; upper lobes entire. Corolla white to violet; broadly obovate to orbicular; wings auriculate. Legume linear.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0261*, dated 10. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: India: through out; Bhutan, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam.

Desmodium gangeticum (L.) Candolle, Prodr. 2: 327. 1825; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 672. 1987; Prain, Beng. Pl. 1: 425. 1963. *Hedysarum gangeticum* L., Sp. Pl. 2: 746. 1753.

Erect, much branched, shrubs, up to 1 m. Leaves 1 foliolate; lamina narrowly elliptic-ovate, 5 – 12 × 3 – 7 cm, base rounded, acute. Racemes terminal and axillary, 10 – 30 cm, 2 – 6 flowered at each node. Calyx 4 lobed. Corolla green-white; standard obovate; wings oblong; keel narrowly obovate. Ovary hairy. Legume linear, slightly curved.

Flowers & Fruits: April to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0218*, dated 09. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: India: through out; Bhutan, Nepal, Sri Lanka,Cambodia, Kashmir, Laos, Malaysia, Myanmar, Thailand, Vietnam; tropical Africa, Australia, Pacific islands; naturalized in the West Indies.

Desmodium triflorum (L.) Candolle, Prodr. 2: 334. 1825; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 673. 1987; Prain, Beng. Pl. 1: 424. 1963. *Hedysarum triflorum* L., Sp. Pl. 2: 749. 1753

Perennial, prostrate, herbs, up to 50 cm. Leaves 3 foliolate; terminal leaflet blade obcordate to obovate, 3 – 10 × 2.5 – 9 mm, base cuneate, ‘truncate, round or slightly emarginate. Flowers solitary or 2 in leaf axils. Calyx 5 parted; lobes narrowly lanceolate. Corolla purple-red, nearly as long as calyx; standard obcordate; wings elliptic; keel longer than wings, curved. Stamens diadelphous. Legume narrowly oblong, flat.

Flowers & Fruits: June to November.

Specimen Cited: Murti, *Goutam & AP Das 0154*, dated 08. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: Throughout India; Nepal, Sri Lanka, Malaysia, Myanmar, Thailand, Vietnam; tropics of Africa, Americas, SW Asia, Australia, Pacific islands.

LEUCAENA Benth. in Jour. Bot. (Hook.) 4: 416. 1842, *nom. cons*.

Leucaena leucocephala (Lam.) Wit, Taxon 10: 54. 1961; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 640. 1987. *Mimosa leucocephala* Lam., Encycl. 1: 12. 1783.

Small trees, up to 8 m. Stipules caducous, deltoid; leaflets 5 – 12 pairs, linear-oblong, 8 – 12 × 1.5 – 3 mm, base cuneate, ciliate, acute. Heads usually 1 or 2, axillary. Flowers white. Calyx 5 toothed. Petals narrowly oblanceolate. Stamens 10. Ovary shortly stipitate; stigma cupular. Legume straight, narrowly ovoid, flat.

Flowers & Fruits: June to September.

Specimen Cited: Lataguri, *Goutam & AP Das 0448*, dated 22.07.2009.

Local Distribution: Throughout the Forests.

General Distribution: Tropical India; originally from tropical America, widely distributed in tropical and subtropical regions.

URARIA Desv. in J. Bot. Agric. 1: 122. 1813.

Uraria picta (Jacq.) Desv. *ex* Candolle, Prodr. 2: 324. 1825; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 678. 1987. *Hedysarum pictum* Jacq., Collectanea 2: 262. 1788.

Erect, slender shrubs, up to 2 m. Leaves imparipinnate, 5 or 7 foliolate; leaflet blades linear-oblong to narrowly lanceolate, terminal one 6 – 12 × 1 – 2 cm, base rounded, apex narrowly acute. Racemes terminal, 15 – 30 cm. Calyx 5 parted, ciliate. Corolla pink or pale blue; standard obovate; keel as long as wings. Ovary glabrous, 3 to 5 ovuled. Legume lead-colored.

Flowers & Fruits: April to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0608*, dated 26.07.2009

Local Distribution: Throughout Forests.

General Distribution: Throughout India; Bhutan, Bangladesh, Nepal, Pakistan, Sri Lanka, Cambodia, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam; tropical Africa, Australia

MIMOSA L., Sp. Pl. 1: 516. 1753.

Key to the species

1a. Pinnae and leaflets strongly sensitive; digitate ..... *M. pudica*

1b. Pinnae and leaflets not sensitive; pinnate ..... *M. invisa*

Mimosa invisa Colla, Flora oder Allgemeine Botanische Zeitung 20. 1837. *Mimosa diplotricha* Wright *ex* Sauvalle, Anales Acad. Ci. Med. Habana 5: 405. 1868.

Local name: Sada lajjabati.

Scandent or prostrate subshrubs; stems 4-angulate, hirsute, with or without prickles along angles. Leaves 10 – 15 cm; petiole and rachis with 4 rows of recurved prickles; pinnae 5 to 10 pairs; leaflets 20 – 30 pairs per pinna, linear-oblong, 3 – 4 × 1 – 2 mm. Heads 1 or 2, axillary. Flowers bisexual. Calyx minute. Corolla narrowly funnelshaped, 4 lobed. Stamens 8; filaments pale purple-pink. Legumes in clusters, slightly curved, oblong. Seeds yellow-Br..

Flowers & Fruits: March to October.

Specimen Cited: Khunia, *Goutam & AP Das 0271*, dated 10. 02. 2009.

Local Distribution: All over forests and Grasslands.

General Distribution: Native to tropical America; introduced throughout the tropics.

Mimosa pudica L., Sp. Pl. 1: 518. 1753; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 639. 1987; Prain, Beng. Pl. 1: 456. 1963.

Local name: Lajjabati.

Diffuse, branched, herbs with reflexed bristles and scattered, curved prickles. Stipules lanceolate; pinnae and leaflets sensitive; pinnae usually 2 pairs, digitate; leaflets 10 – 20 pairs, linear-lanceolate, margin ciliate, acute. Heads solitary or 2, axillary, globose; peduncle long; bracts linear. Flowers numerous, pink. Calyx minute. Corolla campanulate. Stamens 4, exserted. Ovary shortly stipitate; ovules 3 to 4; style filiform. Legumes arranged in a star, slightly recurved, flat, oblong. Seeds light Br., ovoid.

Flowers & Fruits: March to November.

Specimen Cited: Khunia, *Goutam & AP Das 0110*, dated 07. 02. 2009.

Local Distribution: Throughout forests.

General Distribution: Throughout India; native to tropical America; naturalized in tropical regions of the world.

ERYTHRINA L., Sp. Pl. 2: 706. 1753.

Key to the species

1a. Flowers paired; wings and keels subequal ..... *E. variegata*

1b. Flowers clusters of 3 to 4; keels much longer than wings ..... *E. stricta*

Erythrina variegata L., Herb. Amboin. 10. 1754; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 684. 1987.

Local name: Mandar

Trees, up to 20 m. Branches with straight and minute prickles. Leaves pinnately 3 foliolate, usually clustered at branch tip; stipules lanceolate, deciduous; leaflets broadly ovate to rhomboid-ovate, 15 – 28 × 15 – 26 cm, membranous, both surfaces glabrous, basal veins 3, lateral veins 5 pairs, base broadly cuneate, entire, acuminate to obtuse; base of leaflet with a pair of glands similar to stipules. Raceme terminal; peduncle robust; flowers paired. Calyx spathelike. Corolla red; standard elliptic, obtuse, shortly clawed; wings and keels subequal; keel petals separate. Ovary micro-villous; style glabrous. Legume black.

Flowers & Fruits: March to August.

Specimen Cited: Gorumara, *Goutam & AP Das 0407*, dated 22.07.2009.

Local Distribution: Gorumara, Murti, Bichhabhanga.

General Distribution: Throughout India; Bhutan, China, Bangladesh, Sri Lanka, Cambodia, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Australia, Pacific islands; introduced to Africa and Central and South America.

Erythrina stricta Roxb., Fl. Ind., ed. 1832, 3: 251. 1832; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 683. 1987; Prain, Beng. Pl. 1: 398. 1963.

Local name: Mandar.

Small trees, up to 12 m. Branches with short whitish prickles. Leaves pinnately 3-foliolate; stipules deciduous; terminal leaflet broadly triangular, almost rhomboid, 9 – 20 × 8 – 25 cm, both surfaces glabrous, lateral veins 5– 8 pairs, base nearly cordate to broadly cuneate, entire, acute to caudate with mucro. Raceme with clusters of 3 to 4 flowers. Calyx spathelike, undivided or apex slightly 2-lobed. Corolla red; standard elliptic-lanceolate to ovate-triangular; wings subobovate, shorter than calyx; keels much longer than wings. Ovary hairy; style narrow. Legume glabrous. Seeds 1 – 4, dark Brown.

Flowers & Fruits: March to September.

Specimen Cited: Murti, *Goutam & AP Das 0491*, dated 23.07.2009.

Local Distribution: Murti and Dhupjhora forest villages.

General Distribution: Tropical India; Bhutan, Nepal, Thailand, Cambodia, Laos, Myanmar, Vietnam.

MUCUNA Adanson, Fam. Pl. 2: 325, 579. 1763, nom. cons.

Mucuna pruriens (L.) Candolle, Prodr. 2: 405. 1825; Grierson *et* Long in Grierson **et** Long, Fl. Bhut. 1(3): 671. 1987; Prain, Beng. Pl. 1: 400. 1963.

Local name: Bandar chulkani.

Semiwoody twining vines. Leaves up to 46 cm; stipels robust; leaflets papery, lateral veins 5 – 8 on each side, running into margin; terminal leaflet elliptic to ovate-rhombic, 8 – 16 × 7 – 10 cm, base broadly cuneate to rounded, acute to shortly acuminate; lateral leaflets 7 – 19 cm. Inflorescence axillary, long and pendulous; bracts and bracteoles linear-lanceolate. Calyx tube lobed; lateral 2 lobes broadly triangular. Corolla deep purple; standard 2/3 of keel length; wings shorter than keel; keel 3 –4 cm. Legume linear-oblong. Seeds 3 – 6.

Flowers & Fruits: September to April.

Specimen Cited: Gorumara, *Goutam & AP Das 0714*, dated 14. 02. 2008.

Local Distribution: Throughout forests.

General Distribution: Widely distributed in the tropics.

PUERARIA Candolle, Ann. Sci. Nat. (Paris) 4: 97. 1825.

Pueraria phaseoloides (Roxb.) Benth., J. Linn. Soc., Bot. 9: 125. 1865; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 693. 1987; Prain, Beng. Pl. 1: 396. 1963. *Dolichos phaseoloides* Roxb., Fl. Ind., ed. 1832, 3: 316. 1832.

Herbaceous vines. Stipules basifixed, ovate-lanceolate; stipels linear; leaflets broadly ovate to ovate-rhomboid, terminal one broader, 6 – 10 × 5 – 9 cm, lateral ones smaller, oblique, entire or 3-lobed. Racemes solitary. Bracts and bracteoles linear-lanceolate. Flowers with short pedicels, clustered at slightly distant nodes. Calyx pilose; lower tooth as long as tube, others deltoid, shorter than tube. Corolla bluish; standard suborbicular; wings obovate-oblong, slightly longer than keel. Ovary linear. Legumes subcylindric. Seeds 15–20, oblong-elliptic.

Flowers & Fruits: August to November.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0583*, dated 25.07.2009

Local Distribution: Bichhabhanga, Dhupjhora.

General Distribution: India; Bhutan, Nepal, Cambodia, Laos, Malaysia, Myanmar, Thailand, Vietnam.

AESCHYNOMENE L., Sp. Pl. 2: 713. 1753.

Aeschynomene indica L., Sp. Pl. 713. 1753; Baker in Hook. *f*., Fl. Brit. Ind. 2: 151. 1876; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 710. 1987; Prain, Beng. Pl. 1: 418. 1903; Majumdar, Bull. Bot. Soc. Bengal 20 (2): 64. 1966.

Under shrub, annual herbs; stem nodules present. Leaflets numerous small, sessile, alternate, linear, obtuse, the upper one smallest; stipules linear lanceolate, acuminate, with acute auricled base. Flowers yellow, in axillary racemes; calys glabrous. Pods 6-10 jointed, dotted with black.

Flowers & Fruits: September to December.

Specimen Cited: Gorati, *Goutam & AP Das 0121*, dated 07. 02. 2009.

Local Distribution: Gorati Beel.

General Distribution: India: Bengal, Assam and South India; Bangladesh, Myanmar, Malaya and Tropical Africa.

SAMANEA (Benth.) Merrill, J. Wash. Acad. Sci. 6: 46. 1916.

Samanea saman (Jacq.) Merrill, J. Wash. Acad. Sci. 6: 47. 1916; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(3): 647. 1987. *Mimosa saman* Jacq., Fragm. Bot. 15. 1800.

Trees, up to 25 m. Pinnae 3 – 5 pairs, to 15 cm; glands at junctions of pinnae and leaflets; leaflets 3 – 8 pairs per pinna, asymmetrically obLong, Fl. Bhut. 2 – 4 x 1 – 2 cm, base half rounded, rounded to obtuse, often emarginate and mucronulate. Heads 1 – 5, axillary. Marginal flowers pedicellate; calyx funnel-shaped; corolla red or yellowish red; stamens white at base. Central flowers sessile. Legume black, oblong, compressed.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0215*, dated 09. 02. 2009.

Local Distribution: Throughout Forests.

General Distribution: Throughout India; native to N part of tropical South America; planted throughout the tropics.

Polygalaceae Juss., Ann. Mus. Hist. Nat. Paris 14: 389. 1809 (‘Polygaleae’).

POLYGALA L., Sp. Pl. 2: 701. 1753.

Polygala glomerata Lour., Fl. Cochinch. 426. 1790; Kit Tan in Grierson *et* Long, Fl. Bhut. 2 (1): 50. 1991. *Polygala chinensis* L., Sp. Pl. 2: 704. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 1: 204. 1872.

Small, erect annual herbs, upto to 30 cm tall, densely pubescent. Lamina sessile, linear –lanceolate, glabrous; racemes slightly extra-axillary, 2-3 flowered; flowers nodding, outer sepals acuminate, ciliate; wings acuminate, awned.

Flowers & Fruits: July to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0323*, dated 21.07.2009.

Local Distribution: Near Dhupjhora Watch Tower and Khunia grassland.

General Distribution: Pantropical.

Order 36: RosalesBercht. & J.Presl (1820)

Cannabaceae Mill., Gard. Dict. Abr., ed. 4. 1754.

CANNABIS L., Sp. Pl. 2: 1027. 1753.

Cannabis sativa L., Sp. Pl. ed. 1. 1027. 1753; Hook.*f*., Fl. Brit. Ind. 5: 487. 1888; Ohashi in Hara, Fl. E. Himal. 1: 53. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 134. 1983; Prain, Beng. Pl. 2: 960.1903. *Cannabis erratica* Sievers, Neueste Nord. Beytr. Phys. Geogr. Erd- Völkerbeschreib. 7: 174. 1793.

Local name: Bhang

Annual herbs, up to 1.5 m. Branchlets densely white pubescent. Stipules linear. Leaves alternate; petiole 2 cm; leaf blade abaxially whitish green, strigose; segments usually lanceolate to linear, 3 - 6 × 1 - 2 cm with longest in middle, margin coarsely serrate, apex acuminate. Male inflorescences 25 cm. Male flowers yellowish green, nodal; pedicel 2 mm, thin; sepals ovate to lanceolate, membranous, with sparse prostrate hairs; petals absent; anthers oblong. Female inflorescences crowded in apical leaf axils among leaflike bracts and bracteoles. Female flowers green, sessile; calyx sparsely pubescent; ovary globose, enclosed by appressed calyx, surrounded closely by bract and bracteoles. Persistent bracts yellow. Achene flattened ovoid; pericarp crustaceous, finely reticulate.

Flowers & Fruits: May to July.

Specimen Cited: Khunia, *Goutam & AP Das 0123*, dated 02. 07. 2006.

Local Distribution: Throughout the Forests.

General Distribution: Native to Central Asia and naturalized in temperate and tropical world.

Moraceae Gaudich., Gen. Pl. 13. 1835; *nom. cons*.

Key to the Genera:

1a. Inflorescences a fig with many minute flowers completely enclosed within a hollow receptacle opening by an apical pore closed by scale-like bracts ..... ***Ficus***

1b. Inflorescences a capitulum, spike, or raceme, rarely a cyme, or with flowers inserted on a discoid receptacle ……..…….…. 2

2a. Stamens straight in flower buds, rarely inflexed …….....… ***Artocarpus***

2b. Stamens inflexed in flower buds ……..…….…… 3

3a. Plant sometimes spiny, particularly on juvenile growth ..... ***Streblus***

3b. Plant unarmed ..... ……..... ***Morus***

ARTOCARPUS Forst. *et* Forst., Char. Gen. Pl. 51. 1775, nom. cons.

Key to the species:

1a. Branchlets furrowed when dry …….....…....…… *A. chama*

1b. Branchlets terete when dry …….....…….....…… 2

2a. Lamina obovate; fruits subglobose, 1.5 – 3 cm in diametre, irregularly lobed, smooth ……...…… *A. lacucha*

2b. Lamina ovate to elliptic; fruits large, globose to oblong, 15 – 30 cm diameter, unlobed …….....…… *A. heterophyllus*

Artocarpus chama Buch.-Ham., Mem. Wern. Nat. Hist. Soc. 5: 331. 1826; Grierson *et* Long, Fl. Bhut. 1(1): 100. 1983.

Local Name: Lator

Trees up to 40m. Branchlets furrowed when dry, pubescence rust-colored. Stipules amplexicaul. Leaves spirally arranged; petiole brown, densely pubescent; lamina elliptic – oblong to ovate, 13 – 35 x7 – 19 cm, abaxially densely rust-colored to grayish white pubescent but more densely so along veins, margin entire, acute to shortly acuminate. Inflorescences axillary, solitary. Male inflorescences ellipsoid to ovoid; bracts shield-shaped. Female inflorescences globose to ellipsoid; bracts peltate. Style exserted. In male flowers, filaments short; anthers ellipsoid. Fruiting syncarp yellow when young then rust-colored brown, globose. Drupes ellipsoid.

*Flowers & Fruits:*June to November.

Specimen Cited: Gorumara, *Goutam & AP Das 1276*, dated 21.07.2011.

Local Distribution: Gorumara, Dhupjhora, Budhuram.

General Distribution: Bangladesh, Bhutan, India, Laos, Malaysia, Myanmar, Thailand.

Artocarpus heterophyllus Lam., Encyl. Meth. B. 3: 209. 1789; Hara et al., Enn. Fl. Pl. Nep. 3: 208. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 100. 1983. *Artocarpus maximus* Blanco, Fl. Filip. 669. 1837. *Artocarpusphilippensis* Lam., Encycl. 3: 210. 1789.

Local name: Kanthal.

Trees; up to 35 m. Leaves ovate to elliptic, 8 – 14 x 4 –9 cm, apiculate, base cuneate, glabrous; petiole 1.5 – 2 cm, stipules broadly ovate, 2 – 6 cm; leaves of young plants with 1 – 2 pairs of lateral lobes. Male heads club-shaped, 2 – 6 x 1 – 2 cm, peduncles 2 – 4 cm. Synccarps oblong, 15 – 40 x 15 – 30 cm, surface rough with sharp perianth points formed from the tips of elongated sterile female flowers which surround the achenes, latter enclosed by sweet fleshy perianths. Compound fruits large, globose to oblong.

Flowers & Fruits: February to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0904*, dated 02. 07. 2010.

Local Distribution: Dhupjhora, Common.

General Distribution: India: cultivated in all northern States; Bhutan, Bangladesh, China.

Note: Fruits are edible.

Artocarpus lakoocha Roxb., Fl. Ind. 3: 524. 1832; Prain, Beng. Pl. 2: 971. 1903. *Artocarpus lacucha* Buch.–Ham., Mem. Wern. Soc. 5: 333, 1826; Hara *et al*., Enn. Fl. Pl. Nep. 3: 209. 1979; Grierson *et* Long, Fl. Bhut. 1(1): 100. 1983.

Local name: Daoa.

Tree, up to 40 m, shoots brownish hispid. Leaves obovate, 30 –35 x 20 – 22 cm, glabrous and rather glossy above; petioles 1.5 – 4 cm; stipules lateral. Leaves of young plants are shallowly pinnatifid. Fruits subglobose, 3 – 5 cm, brownish yellow with irregular lobed and smooth.

Flowers & Fruits: Throughout the year.

Specimen Cited: Dhuphora,*Goutam & AP Das 1338*, dated 27. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Note: Fruits are edible.

FICUS L., Sp. Pl. 2: 1059. 1753.

Key to the species:

1a. Male and female flowers on same plants 2

1b. Male and fertile female flowers on different plants 5

2a. Plants with long aerial roots which can form new trunks or strangle host plant ... 3

2b. Trees with well-defined main trunk ..... *F. hispida*

3a. Leaf blade with wax gland abaxially at base of midvein ..... *F. elastica*

3b. Leaf blade with out wax gland abaxially at base of midvein 4

4a. Lamina apex obtuse ..... *F. benghalensis*

4b. Lamina apex caudate with cauda ..... *F. religiosa*

5a. Root-climbers, usually with 2 types of leaves on creeping vegetative stems and on fertile stems ..... *F. hederacea*

5b. Trees or shrubs without aerial roots and all leaves similar 6

6a. Stipules green; lamina base cuneate to obtuse ..... *F. recemosa*

6b. Stipules yellow and white; lamina base very asymetric ..... *F. semicordata*

Ficus racemosa L., Sp. Pl. 2: 1060. 1753; Grierson *et* Long, Fl. Bhut. 1(1): 93. 1983.

Trees, uo to 30 m; monoecious. Bark grayish brown, smooth. Stipules ovate-lanceolate. Leaves alternate; lamina elliptic-obovate to narrowly elliptic, 10 – 15 x 2.5 – 6 cm, base cuneate to obtuse, margin entire, acuminate to obtuse. Figs in a tumorlike aggregate on short branch lets of old stem, often axillary on leafy shoot, paired, reddish orange when mature, pearshaped, apical pore navel-like, flat; involucral bracts triangular-ovate. Male, gall, and female flowers within same fig. Male flowers sessile; calyx lobes 3 to 4; stamens 2. Gall and female flowers: pedicellate; calyx lobes linear, apex 3 to 4 toothed; style lateral; stigma clavate.

Flowers & Fruits: May to June.

Specimen Cited: Gorumara, *Goutam & AP Das 0962*, dated 08. 02. 2009.

Local Distribution: Gorumara, Budhuram.

General Distribution: India, Indonesia, Myanmar, Nepal, New Guinea, Pakistan, Sri Lanka, Thailand, Vietnam; Australia.

Ficus benghalensis L., Sp. Pl. 1059. 1753; Hook. *f*., Fl. Brit. Ind. 5: 499. 1888; Prain, Beng. Pl. 2: 979. 1903; Hara *et al*., Enn. Fl. Pl. Nep. 3: 209. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 97. 1983. *Ficus banyana* Oken, Allg. Naturgesch. 3(3): 1561. 1841. *Urostigma benghalense* (L.) Gasp., Nov. Gen. Fic. 7. 1844.

Local name: Bot

Wide branching tree, up to 30m, branches formoing additional proproots. Leaves ovate, 8.5 – 20 x 7 – 15 cm, obtuse, base rounded, finely puberulous beneath at first, glabrous and shiny above, lateral veins 5 pairs, 5 veined at base, petioles 2 – 5cm; stipules ovate – lanceolate, 2 cm. Figs globose, 2 cm, solitary or in axillary pairs, sessile, pubescent, basal bracts 3, rounded.

Flowers & Fruits: Throughout the year.

Specimen Cited: Dhuphora, *Goutam & AP Das 1328*, dated 27. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Ficus semicordata Buch.–Ham. *ex* Sm. in Rees, Cycl. 14: *Ficus* no. 71. 1810; H. Ohashi in Hara, Fl. E. Himal. 1: 54. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 90. 1983. *Covellia cunia* (Buch.–Ham. *ex* Roxb.) Miq. in London Jour. Bot. 7: 459. 1848. *Ficus cunia* Buch.-Ham. *ex* Roxb.. Fl. Ind. 3: 561. 1832; Prain, Beng. Pl. 2: 982.1903. *Ficus semicordata* var. *conglomerata* (Roxb.) Corner, Gard. Bull. Singapore 17: 449. 1960.

Trees, up to 9 m tall, crown flat. Bark gray, smooth. Stipules red, lanceolate. Leaves distichous; petiole thick, densely covered with stiff hairs; leaf blade oblong-lanceolate, strongly asymmetric, 16 – 25 × 9 – 11 cm, papery, abaxially densely covered with stiff short hairs and small yellowish Br. convex spots, margin with small teeth or entire, apex acuminate. Figs on pendulous, eventually prostrate, leafless branchlets, sometimes underground at maturity, solitary, reddish purple when mature, globose. Male flowers: near apical pore; calyx lobes 3, red, oblanceolate, longer than stamens. Female flowers: calyx lobes 4 to 5; ovary ovoid-ellipsoid; style lateral, long; stigma cylindric, shallowly 2-lobed. Achenes broadly ovoid.

Flowers & Fruits: Throughout the year.

Specimen Cited: Gorumara, *Goutam & AP Das 1492*, dated 29. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Ficus elastica Roxb. *ex* Horn., Hort. Bot. Hafn. Suppl.: 7. 1819; Grierson *et* Long, Fl. Bhut. 1(1): 94. 1983. *Visiania elastica* (Roxb. *ex* Horn.) Gasp., Nov. Gen. Fic. 9. 1844. *Ficus elastica* var. *benghalensis* Bl., Bijdr. 446. 1825.

Local name: Raber/ Labor.

Tree, up to 20m. Aerial roots few; epiphytic when young. Bark pale gray, smooth. Branchlets strong. Stipules dark red, membranous; scar conspicuous. Petiole robust. Leaves ovate elliptic, 15 – 35 x 8 – 15 cm, acute, base rounded, glabrous, glossy, veins numerous, petioles 3 – 6cm; stipules conspicuous, 14 – 20 cm. Figs oblong – ellipsoid, 9 –12 x 5 – 7 mm, sessile, basal bracts ellipsoid, deciduous.

Flowers & Fruits: Throughout the year.

Specimen Cited: Gorumara,*Goutam & AP Das 1488*, dated 29. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Ficus heterophylla L. *f*., Suppl. Pl. 442.1782; Hook. *f*., Fl. Brit. Ind. 5: 518. 1888; Prain, Beng. Pl. 2: 981.1903 ; Haines, Bot. Bihar & Orissa pt. V: 835. 1924; Panda *et* Das, Fl. Sambalpur, 346. 2004; Grierson *et* Long, Fl. Bhut. 1(1): 92. 1983. *Ficus denticulata* Vahl, Symb. Bot. 1: 83. 1790. *Ficus elongata* Miq. in London Jour. Bot. 7: 231. 1848. *Ficus cannabina* Lour., Fl. Cochinch. 668. 1790.

Creeping shrub, procumbent; young stem pubescent. Branchlets becoming reddish Br., slender, shortly pubescent. Stipules caducous, short, membranous. Leaves distichous; leaves broadly ovate, 3 – 9 x 2 – 6.5 cm, acute, base obliquely cordate, 1 –4 lobed, denticulate, pubescent beneath; petioles 0.5 – 3.5cm. Figs solitary, axillary, obovoid 2.6 – 1.8 cm, pubescent, peduncles 1 – 1.5cm.

Flowers & Fruits: Throughout the year.

Specimen Cited: Gorumara,*Goutam & AP Das 1521*, dated 30. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Ficus hispida L. *f*., Suppl. 442.1782; Hook. *f*., Fl. Brit. Ind. 5: 522.1888; Prain, Beng. Pl. 2: 981.1903; Hara *et al*., Enn. Fl. Pl. Nep. 3: 210. 1982; H. Ohashi in Hara, Fl. E. Himal. 1: 54. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 89. 1983. *Covellia hispida* (L. *f*.) Miq., London Jour. Bot. 7: 462. 1848. *Covellia assamica* Miq., London Jour. Bot. 7: 464. 1848.

Local name: Dumur

Tree up to 10m; coarsely hairy; dioecious. Stipules usually 4 and decussate on leafless fruiting branchlets, ovatelanceolate. Leaves opposite, coriaceous, elliptic, 9 – 32x 5 –17cm, acute, base truncate, hirsute beneath, margins serrulate, veins 7 pairs, petioles 2 – 8cm. Figs many, short racemes in axillary position, globose, subsessile, 1 – 2cm, hirsute; apical scales rounded, prominent.

Flowers & Fruits: Throughout the year.

Specimen Cited: Gorumara, *Goutam & AP Das 1633*, dated 30. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Note: Fig edible.

Ficus religiosa L., Sp. Pl. 1059. 1753; Hook. *f*., Fl. Brit. Ind. 5: 513. 1888; Prain, Beng. Pl. 2: 980.1903; Ohashi in Hara, Fl. E. Himal. 1: 54. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 211. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 94. 1983. *Urostigma religiosum* (L.) Gasp., Ficus 82, pl. 7 82. 1844. *Ficus peepul* Griff., Not. Pl. Asiat. 4: 393. 1854. *Ficus religiosa* var. *cordata* Miq. in Ann. Mus. Bot. Lugduno-Batavi 3: 287. 1867.

Local name: Pakur

Trees, up to 18 m tall, epiphytic when young, crown wide when mature. Branchlets grayish Br., sparsely pubescent when young. Stipules ovate, small, apex acute. Petiole slender, sometimes longer than leaf blade, articulate; leaf blade triangular-ovate, 8 – 16 × 8 – 10 cm, leathery, abaxially green, adaxially dark green and shiny, base broadly cuneate to cordate, margin entire, apex caudate with cauda. Figs axillary on leafy branchlets, paired or solitary, red when mature, globose to depressed globose. Male, gall, and female flowers within same fig.

Flowers & Fruits: February to July.

Specimen Cited: Bichhabhanga,*Goutam & AP Das 1721*, dated 18. 12. 2010.

Local Distribution: Throughout the forests.

General Distribution: Throughout India; native to N. India, Nepal, Pakistan; cultivated throughout the tropics.

Ficus hederacea Roxb., Fl. Ind., ed. 1832, 3: 538. 1832; Prain, Beng. Pl. 2: 982.1903; Ohashi in Hara, Fl. E. Himal. 1: 53. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 98. 1983. *Ficus cantoniensis* Bodinier *ex* Lév, Mem. Real Acad. Ci. Barcelona 6: 148. 1907. *Ficus anabatos* Voigt, Hort. Suburb. Calcutt. 286. 1845. *Ficus longipes* Griff. in Not. Pl. Asiat. 4: 397. 1854.

Scandent shrubs. Stems and branchlets with aerial roots at nodes; branchlets ubescent when young. Stipules caducous, ovate. Leaves distichous; petiole thick; leaf blade elliptic to ovate-elliptic, 6 – 10

× 3 – 5 cm, thickly leathery, with hairs when young, base broadly cuneate to obtuse, margin entire, apex obtuse to occasionally rounded. Figs axillary on leafy or on leafless branchlets, solitary or paired, yellowish green to red when mature, globose, apical pore navel-like, slightly convex.

Flowers & Fruits: April to August.

Specimen Cited: Murti, *Goutam & AP Das 1714*, dated 16. 12. 2010.

Local Distribution: Gorumara, Bichhabhanga, very common.

General Distribution: India, Bhutan, Nepal, Laos, Myanmar, Thailand.

MORUS L., Sp. Pl. 2: 986. 1753.

Morus indica L., Sp. Pl. 986. 1753. *Morus longistylus* Diels, Notes Roy. Bot. Gard. Edinburgh 5(25): 293. 1912. *Morus australis* Poirat in Lam., Ency. 4: 380. 1796; Ohashi in Hara, Fl. E. Himal. 1: 55. 1966; Grierson *et* Long in Grierson *et* Long, Fl. Bhut. 1(1): 101. 1983. *Morus indica auct.non* L., Hook. *f.* in Hook. *f*., Fl. Brit. India 5: 492. 1888; Prain, Beng. Pl. 2: 968.1903.

Local name: Tut

Small trees, up to 10 m, unarmed. Leaves ovate, 3.5 – 10 x 3 – 6 cm, caudate – acuminate, base cordate, margin serrate, some leaves deeply 3 – lobedminutely strigose above and pubescent beneath, petioles 2 cm, stipules 1 cm. Flowers appearing with young leaves. Male spikes 2 cm, peduncles 1 cm, perianth segments 2 mm, stamens 4. Female spikes 7 – 10 mm, peduncles 3 mm, perianth segments ovate, style 4 mm, bifid. Fruiting spikes 2 x 1 cm, succulent perianth red at first, becoming blackish – purple.

Flowers & Fruits: February to May.

Specimen Cited: Murti, *Goutam & AP Das 0426*, dated 17. 12. 2006.

Local Distribution: Throughout the study area, abundant.

General Distribution: Cultivated throughout India; widely cultivated throughout the World.

STREBLUS Lour., Fl. Cochinch. 2: 754. 1790.

Streblus asper Lour., Fl. Cochinch. 1: 615. 1790; Hook. *f*., Fl. Brit. Ind. 5: 489. 1888; Prain, Beng. Pl. 2: 969.1903; H. Ohashi in Hara, Fl. E. Himal. 1: 55. 1966; 1967; Hara *et al*., Enn. Fl. Pl. Nep. 3: 212. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 102. 1983.

Local name: Seora

Small tree, up to 12 m, young shoots pubescent, sometimes spiny. Leaves elliptic obovate, 3 – 7 x 2 – 3.5 cm, acute, base cuneate, margin serrate, petioles 2 mm. Male clusters 5 mm, perianth pale yellow, tepal ovate, 2mm, pubescent. Female flowers ovoid, 2mm, style filiform, terminal. Achenes 3 mm.

Flowers & Fruits: March to May.

Specimen Cited: Murti, *Goutam & AP Das 1709*, dated 16. 12. 2010.

Local Distribution: Allover the forests.

General Distribution: Throughout India; Bhutan, Nepal, Bangladesh, Cambodia, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam.

Rhamnaceae Juss., Gen. P1. 376. 1789 (‘Rhamni’); *nom. cons.*

Key to the genera

1a. Fruit with longitudinal wings ..... *Gouania*

1b. Fruit without longitudinal wings 2

2a. Leaves distinctly triplinerved, stipules often spinose ..... *Ziziphus*

2b. Leaves pinnately veined, stipules never spinose ..... *Berchemia*

ZIZIPHUS Mill., Gard. Dict. Abr., ed. 4. 1754.

Key to the species

1a. Scandent or erect shrubs ..... *Z. oenopolia*

1b. Trees ..... *Z. mauritiana*

Ziziphus rugosa Lam., Encycl. 3: 319. 1789; Long et Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 140. 1991; Prain, Beng. Pl. 1: 334.1903.

Local name: Bonkul.

Small trees up to 10m, evergreen, spinose. Stipular spines 1 – 2, recurved; petiole short; lamina broadly ovate to broadly elliptic, 8–10 × 4.5–9cm, base subcordate to rounded, serrulate, rounded. Inflorescences to 20 cm. Flowers green, densely pubescent, few to 10 in terminal or axillary large cymose panicles. Sepals triangular, acute. Petals absent. Disk orbicular, rather thick, 5 lobed. Ovary globose. Drupe orange, turning black at maturity, obovoid-globose or subglobose.

*Flowers & Fruits:*March to June.

Specimen Cited: Murti, *Goutam & AP Das 0687*, dated 14. 02. 2008.

Local Distribution: Murti, Gorumara.

General Distribution: India, Laos, Myanmar, Sri Lanka, Thailand, Vietnam.

Zizyphus mauritiana Lam., Encycl. 3: 319. 1789; Fl. Ind. 5: 233. 2000; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 138. 1991. *Zizyphus jujuba* (L.) Gaertner, Fruct. 1: 203. 1788 (*non* Miller, 1768); Hook. *f*., Fl. Brit. Ind. 1: 632. 1875. *Rhamnus jujuba* L., Sp. Pl. 194. 1753.

Local Name: Kul.

Evergreen trees, up to 15 m. Stipular spines 2, one oblique and hooklike recurved; lamina ovate to oblong-elliptic, 3 – 6 × 1.5 – 5 cm, papery to thickly papery, 3-veined from base, rounded or acute, serrulate, base subrounded, slightly oblique. Flowers green-yellow, axillary dichotomous cymes. Sepals ovate-triangular. Petals oblong-spatulate. Stamens subequaling petals. Disk thick, fleshy, 10-lobed. Ovary globose, glabrous. Drupe turning black at maturity; mesocarp corky; endocarp thick.

Flowers & Fruits: August to March.

Specimen Cited: Gorumara, *Goutam & AP Das 0705*, dated 14. 02. 2008.

Local Distribution: Throughout Forests.

General Distribution: India,Bhutan, Nepal, Sri Lanka, Afghanistan, Indonesia, Malaysia, Myanmar, Thailand, Vietnam; Africa, Australia.

Ziziphus oenopolia (L.) Miller, Gard. Dict. (ed. 8) no. 3. 1768["oenoplia"]. *Rhamnus oenopolia* L., Sp. Pl. 1: 194. 1753.

Local name: Bonkul.

Erect or scandent shrubs, spinose. Stipular spines 1, sometimes 2, one recurved and one erect; lamina ovate-oblong to ovate-lanceolate, 3 – 9 × 2 – 4 cm, papery, 3 veined at base, acute to acuminate, inconspicuously crenate, base ± asymmetric, subrounded. Flowers greenish yellow, few to 10 in axillary cymes. Sepals ovate-triangular, acute. Petals spatulate, clawed, enfolding stamens. Stamens slightly shorter than petals. Disk pentagonous, thick, fleshy, often 5 lobed. Ovary globose; style 2 branched. Drupe black, globose; stone 1 to 2 seeded. Seeds globose.

*Flowers & Fruits:*August to February.

Specimen Cited: Murti, *Goutam & AP Das 0687*, dated 14. 02. 2008.

Local Distribution: Riverine Forests.

General Distribution: India, Bhutan, China, Sri Lanka, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Australia.

BERCHEMIA Necker ex DC., Prodr. 2: 22. 1825, *nom. cons*.

Berchemia floribunda (Wall.) Brongn. in Ann. Sci. Nat. (Paris) 10: 357. 1827. *Berchemia floribunda* var. *oblongifolia* Chen *et* Chou in Bull. Bot. Lab. N. E. Forest. Inst., Harbin 5: 19. 1979. *Berchemia laxa* Wall., Numer. List 4257. 1831.

Scandent Shrubs. Stipules narrowly lanceolate, persistent; lamina abaxially dark Br. when dry, adaxially green, ovate or ovate-elliptic to elliptic, 4 – 10 × 2 – 5 cm, papery, acute to acuminate, entire, base rounded to cordate. Inflorescences in terminal cymose panicles or axillary cymose racemes. Flowers numerous, glabrous, few in fascicles. Calyx tube shallowly patelliform; lobes narrowly triangular. Petals spatulate. Disk thick, fleshy. Ovary nearly completely immersed in disk; style cylindric, undivided; stigma 2 to 3 lobed. Drupe red, cylindric-elliptic to ovoid-oblong; stone 2-loculed.

*Flowers & Fruits:*May to October.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0476*, dated 23.07.2009.

Local Distribution: All over the forests.

General Distribution: India, Bhutan, Japan, Nepal, Thailand, Vietnam.

GOUANIA Jacq., Select. Stirp. Amer. Hist. 263. 1763.

Gouania tiliifolia Lam., Encycl. 3: 4. 1789. *Gouania scandens* (Gaert.) R.B. Drum, in Fl. Zambes. 2: 435. 1966. *Gouania sieberiana* Schltdle *ex* C. Presl, Abh. Königl. Böhm. Ges. Wiss. V, 3: 469. 1845. *Gouania leptostachya* Candolle, Prodr. 2: 40. 1825; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 146. 1991.

Climbing shrubs. Leaves alternate; stipules lanceolate and caducous; lamina abaxially pale green, adaxially dark green, ovate to ovate-oblong, 5 – 12 × 2.5 – 5 cm, papery, acuminate, crenate-serrate, base cordate. Flowers polygamous, 5 merous, solitary to few in fascicles, axillary cymose racemes, and terminal cymose panicles to 30 cm. Sepals ovate-triangular. Petals white, obovate. Disk distinctly pentagonous. Ovary completely immersed in but not fused with disk; styles short, 3 fid. Capsule 3 winged. Seeds brownish, obovoid.

*Flowers & Fruits:*August to December.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0420*, dated 22.07.2009.

Local Distribution: Throughout Forests.

General Distribution: India, Bhutan, Nepal, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

Rosaceae Juss., Gen. P1. 334. 1789; *nom. cons*.

DUCHESNEA Sm. in Trans. Linn. Soc. London 10: 372. 1811.

Duchesnea indica (Jackson) Focke, Nat. Pflanzenfam. 24[III,3]: 33. 1888; Grierson *et* Long, Fl. Bhut. 1 (3): 579. 1987. *Fragaria indica* Jackson, The botanist's repository; 1797 t.479 1807; *sensu* Hook. *f.* in Hook. *f*., Fl. Brit. India 2: 343. 1878. *Potentilla indica* var. *major* Makino, Bot. Mag. (Tokyo) 28: 184. 1914.

Local name: Tara Ful

Herbs perennial. Stipules narrowly ovate; leaflets petiolulate, obovate to rhombic-oblong, margin obtusely serrate, apex rounded. Flowers 1 – 2.5 cm in diam. Carpels numerous, free. Aggregate fruit ripening red. Achenes shining when fresh, ovoid.

Flowers & Fruits: June to October.

Specimen Cited: Murti, *Goutam & AP Das 0137*, dated 07. 02. 2009.

Local Distribution: Throughout forest ground cover.

General Distribution: Tropical and sub-tropical parts of the world.

Ulmaceae Mirb., Elém. Physiol. Vég. Bot. 2: 905. 1815; *nom. cons*.

TREMA Lour., Fl. Cochinch. 2: 539, 562. 1790.

Trema orientalis (L.) Bl., Mus. Bot. Lugd. Bot. 2: 62. 1856; Hook. *f*., Fl. Brit. Ind. 5: 484. 1888; Hara in Hara, Fl. E. Himal. 1: 52. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 207. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 86. 1983; Prain, Beng. Pl. 2: 960.1903. *Celtis orientalis* L., Sp. Pl. 2: 1044. 1753. *Trema africana* Bl., Mus. Bot. 58. 1856.

Local name: Khorigachh.

Small trees or shrubs, up to 20 m. Bark gray, smooth. Branchlets grayish Br., pubescent. Stipules linear-lanceolate. Petiole pubescent; lamina 11 – 17 × 5 – 10 cm, leathery and fragile, abaxially grayish white to grayish green when dry, pubescent, and surface hairy, adaxially green to grayish green when dry, scabrous, and usually rugate, base cordate and oblique, margin denticulate, apex acuminate to acute; basally 3 veined. Male inflorescences pubescent. Tepals 5. Ovary rudimentary, compressed. Female flowers pedicellate; tepals 4 or 5, triangular-ovate. Drupes black when mature, globose to ovoid-globose, compressed, rugose; perianth persistent. Seed broadly ovoid, compressed.

Flowers & Fruits: March to October.

Specimen Cited: Murti, *Goutam & AP Das Das 0413*, dated 17. 12. 2006.

Local Distribution: Throughout the forests.

General Distribution: India, Himalaya, Sri Lanka, Tropical Africa,W. and S. China and Australia.

Urticaceae Juss., Gen. Pl. 400. 1789 ; *nom. cons*.

Key to the Genera:

1a. Plants with stinging hairs; female flowers without staminodes …….....… 2

1b. Plants without stinging hairs; female flowers with or without staminodes …… 3

2a. Stipules simple; shrubs; fruit globose …..... ***Dendrocnide***

2b. Stipules 2-fid at apex; herbs or subshrubs; fruit winged ..... ***Laportea***

3a. Perianth lobes of female flowers free or connate at base,
staminodes present …….....…….....…….……... 4

3b. Perianth lobes of female flowers usually connate into a tube,
staminodes absent . ……..……..... 5

4a. Leaves opposite, rarely spirally alternate; leaf blade usually symmetric …..... ***Pilea***

4b. Leaves alternate, usually distichous …….....…….…. 6

5a. Lamina 3-veined from base ..... ***Gonostegia***

5b. Lamina with at least 2 major lateral veins arising clearly above base ..... ***Pouzolzia***

6a. Lamina usually asymmetric …….....…….....…. ***Elatostema***

6b. Lamina symmetric …….....…. ***Boehmeria***

BOEHMERIA Jacq., Enum. Syst. Pl. 9: 31. 1760.

Key to the species:

1a. Leaves alternate; stipules lanceolate; leaf blade ovate to
sub-elliptic, margin denticulate ...……..... *B. glomerulifera*

1b. Leaves opposite; stipules subulate-lanceolate; leaf blade obliquely
ovate to oblong, margin crenulate .....…..…….. *B. hamiltoniana*

Boehmeria glomerulifera Miq. in Zollinger, Syst. Verz. 2: 101, 104. 1854; Grierson *et* Long, Fl. Bhut. 1(1): 124. 1983. *Boehmeria depauperata* Weddell, Ann. Sci. Nat., Bot. IV, 1: 202. 1854. *Boehmeria travancarica* Bedd., Fl. Sylv. S. India 225. 1872.

Shrubs, up to 70 cm. Leaves alternate; stipules lanceolate; petiole pubescent to glabrous; lamina ovate to sub-elliptic, 7 – 20 × 3 – 7 cm, papery, slightly rough, base broadly cuneate, margin denticulate, apex acuminate to caudate-acuminate. Glomerules usually unisexual; male ones on proximal part of flower-bearing branches; female ones on distal part. Male flowers 4-merous, very shortly pedicellate, pubescent; rudimentary ovule ellipsoid. Female flowers broadly obovoid, pubescent, with short neck. Fruiting perianth Brown, obovoid, sessile.

Flowers & Fruits: November to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0622*, dated 22. 03. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Sikkim; Bhutan, Indonesia, Laos, Myanmar, Sri Lanka, Thailand, Vietnam

Boehmeria hamiltoniana Wedd., Ann. Sci. nat. ser. 4, 1: 199. 1854; Hook. *f.*, Fl. Brit. Ind. 5: 579. 1885; Tuyama in Hara, Fl. East. Himal. 1: 56. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 127. 1983. *Boehmeria platyphylla* var. *hamiltoniana* (Wedd.) Wedd., Prodr. 16(1): 213. 1869.

Shrubs, up to 1m; branches glabrous. Leaves opposite; stipules subulate-lanceolate; strigose, glabrous; leaf blade obliquely ovate to oblong, 5 – 15 × 3 – 7 cm, herbaceous, base broadly cuneate, margin crenulate, apex acuminate. Glomerules unisexual, on long inflorescences, usually with a few long

basal branches, widely separated; female spikes very slender. Male subsessile; perianth lobes elliptic, connate at base; rudimentary ovule ellipsoid. Fruiting perianth ellipsoid, compressed.

Flowers & Fruits: May to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0754*, dated 13. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: Tropical parts of India, Nepal, Bhutan, Bangladesh, China.

DENDROCNIDE Miq., Pl. Jungh. 1: 29. 1851.

Dendrocnide sinuata (Bl.) Chew, Gard. Bull. Sing.121; 206.1965; Hara, Fl. East. Himal. 3: 19. 1975; Grierson *et* Long, Fl. Bhut. 1(1): 111. 1983. *Urtica sinuata* Bl., Bijdr. Fl. Ned. Ind. 505. 1825. *Urtica crenulata* Roxb., Fl. Ind., ed. 1832 3: 591. 1832. *Laportea sinuata* (Bl.) Miq., Ann. Mus. Bot. Lugduno-Batavum 4: 301. 1869. *Laportea crenulata* Gaudich., Voy. Bonite, Bot. 498. 1826.

Local name: Daman.

Large shrubs, up to 3 m; branchlets spreading; bark gray-green; upper stem and branchlets sparsely armed with stinging hairs. Stipules brownish, ovate-lanceolate, subleathery, puberulent abaxially; petiole sparsely pubescent; leaf blade elliptic-oblong to obovate-lanceolate, 10 – 38 × 5 – 16 cm, leathery, sparsely armed with stinging hairs on veins, base cuneate, rounded to deeply cordate, margin entire, apex shortly acuminate. Inflorescences in distal axils of branchlets, long paniculate; armed with stinging hairs. Male flowers subsessile, perianth lobes 4, ovate, pubescent and stinging hairy; stamens 4. Female flowers pedicels fleshy; perianth lobes 4, unequal. Stigma ligulate. Achene asymmetrically.

Flowers & Fruits: September to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0655*, dated 23. 03. 2009.

Local Distribution: Throughout the forests

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

LAPORTEA Gaudich.-Beaupré, Voy. Uranie, Bot. 498. 1830, *nom. cons*.

Laportea interrupta (L.) Chew, Gard. Bull. Singapore 21(2): 200 – 201. 1965; Tuyama in Hara, Fl. E. Himal. 1: 60. 1966. *Urtica interrupta* L., Sp. Pl. 2: 985. 1753. *Fleurya interrupta* (L.) Wight, Icon. Pl. Ind. Or. 6: 10, t. 1975, 10. 1853; Prain, Beng. Pl. 2: 961.1903. *Schychowskia interrupta* (L.) Wight, Contri. U.S. Nation. Herb. 9: 371. 1905.

Annual herbs, monoecious. Stems straight, branched, up to 80 cm; upper stems and petioles sparsely armed with short stinging and pubescent hairs. Stipules ovate-oblong; petiole 3 – 10 cm; leaf blade ovate to cordate, 5 – 8 × 4 – 5 cm, herbaceous, 3-veined, lateral basal pair reaching middle margin, lateral veins 5 or 6 each side of midvein, reaching teeth, base abruptly cuneate to shallowly cordate, margin serrate, apex acuminate. Inflorescences axillary, 25 cm, sparsely armed with minutely stinging hairs. Male flowers pedicellate; perianth lobes 3 to 4, obovate; stamens 3 to 4. Female flowers: pedicel not winged; perianth lobes 4, free, unequal, dorsal lobe ovate, concave, enclosing the ovary, broadly ovate. Ovary asymmetrically triangular; stigma reflexed. Achene obliquely triangular, compressed.

Flowers & Fruits: September to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1655*, dated 23. 09. 2010.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

GONOSTEGIA Turcz., Bull. Soc. Imp. Naturalistes Moscou 19(2): 509. 1846.

Gonostegia hirta (Blume *ex* Hassk.) Miq., Ann. Mus. Bot. Lugduno – Batavi 4: 303. 1869; T. Tuyama in Hara, Fl. East. Himal. 1: 59. 1966. *Pouzolzia hirta* Blume *ex* Hasskal, Cat. Hort. Borger. 80. 1844; Hook. *f*., Fl. Brit. Ind. 5: 586.1888; Prain, Beng. Pl. 2: 965.1903; Grierson *et* Long, Fl. Bhut. 1(1): 129. 1983. *Utrica hirta* Blume, Brijdr. 495. 1825. *Gonostegia hirta* Miq., Ann. Mus. Bot. Lud. Bat. 4: 303. 1869. *Memorialis hirta* (Blume *ex* Hassk.) Wedd., Prodr. 16(2): 2356. 1869.

Herbs, often prostrate, up to 90 cm, monoecious or dioecious. Stems 4 angled distally, pubescent. Leaves opposite, stipules broadly ovate; leaf blade narrowly lanceolate to ovate-elliptic, 3 - 8 × 1 - 3 cm, herbaceous or thinly papery, 3 veined, subglabrous, base subcordate to rounded, apex acuminate to acute. Glomerules bisexual or unisexual. Male flowers perianth lobes 5, oblanceolate, apex acute. Female flowers sessile; perianth tube ovoid, apex 2 toothed. Achene white to black, ovoid.

Flowers & Fruits: September to November.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 1355*, dated 23. 03. 2010.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

POUZOLZIA Gaudichaud-Beaupré, Voy. Uranie, Bot. 503. 1830.

Pouzolzia zeylanica (L.) Benn., Pl. Jav. Rar. 66 - 67.1838; T. Tuyama in Hara, Fl. East. Himal. 1: 62. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 130. 1983. *Parietaria indica* L., Mant. Pl. 128. 1767. *Urtica glomerata* Klein ex Willd., Sp. Pl. 4(1): 361. 1805. *Pouzolzia indica* (L.) Gaudich., Freyc., Voy. Bot. 503. 1826; Hook. *f*. in Hook. *f*., Fl. Brit. Ind. 5: 581.1888; Prain, Beng. Pl. 2: 965.1903. *Perietaria zeylanica* L., Sp. Pl. 2: 1052. 1753.

Perennial herbs, erect, rarely prostrate, simple to few branched at base, up to 15 cm; rootstock often tuberous; strigillose. Leaves often opposite, sometimes alternate on lower stems; stipules triangular; leaf blade ovate to narrowly lanceolate, 2 – 5 × 1 - 3 cm, smallest ones on short branchlets, herbaceous, abaxial surface sparsely to densely strigillose, daxial surface glabrous; base cuneate to rounded, rarely subcordate, margin entire, apex subobtuse, acuminate. Glomerules often bisexual, bisexual ones in nodes of proximal leaves, female in distal axils; bracts triangular, ciliate. Male perianth lobes 4, narrowly oblong to oblong-oblanceolate, puberulent, apex acute. Female perianth tube ellipsoid to rhombic, puberulent. Achenes white, light to dark yellow, ovoid.

Flowers & Fruits: September to April.

Specimen Cited: Khunia, *Goutam & AP Das 0198*, dated 04. 07. 2006.

Local Distribution: Throughout the forests.

General Distribution: Tropical sub tropical india, Bhutan, Sri lanka, Bangladesh, Myanmar and China.

PILEA Lindl., Collect. Bot. t. 4. 1821, *nom. cons*.

Key to the species:

1a. Leaves 3-veined from base of blade ..... *P. cordifolia*

1b. Leaves pinnately veined ..... *P. microphylla*

Pilea microphylla (L.) Liebmann, Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 5, 5(2): 302. 1851. *Parietaria microphylla* L., Syst. Nat., ed. 10, 2: 1308. 1759.

Annual, monoecious herbs. Stems ascending, succulent. Stipules persistent, triangular; lamina abaxially pale green, adaxially green, unequal in size, 2 – 4 × 1 – 3 mm, obtuse, entire, somewhat recurved, base cuneate or attenuate. Inflorescences often androgynous, compactly cymosecapitate; glomerules few flowered. Male flowers pedicellate; rudimentary ovary minute. Female perianth lobes subequal, oblong. Achene ovoid.

Flowers & Fruits: January to October.

Specimen Cited: Murti, *Goutam & AP Das 0732*, dated 17. 09. 2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: Tropical India; S.E. Asia; native to tropical South America.

Pilea cordifolia Hook. *f*., Fl. Brit. Ind. 5: 558. 1888; Tuyama in Hara, Fl. E. Himal. 1: 61. 1966; Grierson *et* Long, Fl. Bhut. 1(1): 114. 1983.

Perennial herbs, stoloniferous, monoecious. Stems simple to branched, up to 40 cm, succulent, with galls on mid portion of internodes, glabrous, Stipules persistent, ovate-oblong, herbaceous, veinless; petioles unequal in length, sparsely puberulent; leaf blade abaxially pale green, obliquely ovate to elliptic, unequal, 7 – 12 × 4 – 6 cm, membranous, 3-veined, lateral veins many, base cordate to rounded, margin coarsely crenate-serrate, apex acuminate, acumen serrulate. Inflorescences solitary, male distal, a paniculate cyme; female inflorescence proximal, shorter. Male flowers reddish, pedicellate, stamens 4. Female flowers subsessile, perianth lobes connate at base, unequal, abaxial lobe cymbiform, longer; staminodes 3, scale-like, oblong. Achene brownish, obliquely ovoid, compressed, smooth.

Flowers & Fruits: June to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0632*, dated 22. 03. 2009.

Local Distribution: Throughout the forests.

General Distribution: Tropical India; Nepal, Bhutan, Bangladesh, China.

ELATOSTEMA Forst. *et* Forst., Char. Gen. Pl. 53. 1775, *nom. cons*.

Elatostema monandrum (Buch.-Ham. *ex* Don) Hara, Fl. East. Himal. 3: 21. 1975; Hara *et al.,* Enn. Fl. Pl. Nep. 3: 203. 1982; Grierson *et* Long, Fl. Bhut. 1(1): 122. 1983. *Procris monandra* Buch.–Ham. *ex* Don, Prodr. Fl. Nepal. 61. 1825. *Elastotema surculosum* Wight, Icon. t. 2091, f. 4. 1853; Hook. *f*., Fl. Brit. Ind. 5: 572. 1888. *Elatostema diversifolium* Wedd., Prodr. 16(2): 189. 1868. *Elatostema laetum* Wedd., Ann. Sci. Nat., Bot. IV, 1: 190. 1854.

Herbs very small, erect 5 - 15 cm. Stems either glabrous or puberulous. Leaves sessile, alternate, a small rudimentary leaf placed oppositely; lamina ovate - lanceolate, 2 - 4 x 0.3 - 1.2 cm, lower leaves smaller, sub-entire, margin deeply serrate from middle or often below middle, acute or acuminate, base obliquely cuneate-rounded ; rudimentary leaves to 0.8 cm long, oblong, entire. Flowers heads of male flowers usually sessile, rarely pedunculate, subtended by free broad bracts. Female receptacles sessile and enclosed by connate bracts. Achenes fusiform.

Flowers & Fruits: September to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1255*, dated 23. 10. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

Order 37: Cucurbitales Juss. ex Bercht. & J.Presl (1820)

Cucurbitaceae Juss., Gen. P1. 393. 1789; *nom. cons*.

Key to the genera

1a. Marginal segments of corolla fimbriate ..... ***Trichosanthes***

1b. Marginal segments of corolla not fimbriate 2

2a. Stamens 5 ..... ***Zanonia***

2b. Stamens 3 or 1 3

3a. Stamens united; leaf blade pedatipartite ..... ***Cyclanthera***

3b. Stamens free; leaves not pedately compound 4

4a. Flowers small less than 1cm in diam 5

4b. Flowers comparatively large, more than 2 cm in diam 6

5a. Male flowers without pistillode ..... ***Diplocyclos***

5b. Male flowers with pistillode ..... ***Mukia***

6a. Corolla campanulate ..... ***Coccinia***

6b. Corolla rotate 7

7a. Flowers with leaflike bract on pedicel ..... ***Momordica***

7b. Flowers without bract on pedicel 8

8a. Male flowers in racem to subumbell *9*

8b. Flowers solitary ..... ***Citrullus***

9a. Fruit dry, fibrous inside ..... ***Luffa***

9b. Fruit fleshy, fibrous absent inside of fruits ..... ***Hodgsonia***

HODGSONIA Hook. *f. et* Thom., Proc. Linn. Soc. London 2: 257. 1854.

Hodgsonia heteroclita (Roxb.) Hook.*f. et* Thoms., Proc. Linn. Soc. London 2: 257. 1854; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 263. 1991; Prain, Beng. Pl. 2: 516. 1903.

Trichosanthes heteroclita Roxburgh, Fl. Ind., ed. 1832, 3: 705. 1832.

Climber, up to 26m. Stem and branches glabrous. Petiole robust; lamina 15–26 × 14–23 cm, leathery, both surfaces glabrous, mostly 5-lobed; base truncate, acuminate. Male peduncle thick, glabrous; bracts oblong-lanceolate, fleshy; pedicels short, thick, glabrous or puberulent; calyx tube yellowish; segments triangular-lanceolate; corolla yellow outside, white inside. Female pedicels robust, short; ovary subglobose. Fruit reddish brown, compressed globose.

Flowers & Fruits: June to october.

Specimen Cited: Gorumara, *Goutam & AP Das 0834*, dated 12. 09. 2009.

Local Distribution: Gorumara, Dhupjhora.

General Distribution: Pantropical.

COCCINIA Wight *et* Arn., Prodr. Fl. Ind. Orient. 1: 347. 1834.

Coccinia grandis (L.) Voigt, Hort. Suburb. Calcutt. 59. 1845; Hara *et al.*, Enn. Fl. Pl. Nep. 2: 177. 1979. *Bryonia grandis* L., Mant. Pl. 126. 1767. *Coccinia cordifolia* Cogn., Monogr. Phan. 3: 529. 1881. *Cephalandra grandis* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2): 103. 1877.

Local Name: Telakucha.

Climbing herbs. Stem slender, slightly woody, branched. Tendrils simple, filiform, glabrous. Petioles slender; lamina broadly cordate, 5 – 12 x 4 – 10cm, usually 5 lobed, obtuse, base with several glands. Flowers dioecious, solitary. Male pedicel slender; calyx-tube broadly campanulate, segments linear-lanceolate; corolla white or slightly yellow, segments ovate, glabrous outside, pubescent inside; stamens 3, filaments and anthers connate, anthers subglobose. Female pedicel slender; staminodes 3, nearly subulate, villous at base; ovary fusiform, stigmas 3. Fruits fusiform. Seeds yellow, oblong.

Flowers & Fruits: January to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0719*, dated 12. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: Tropical and sub-tropical parts of the world.

DIPLOCYCLOS (Endl.) Post *et* Kuntze, Lex. Gen. Phan. 178. 1903 ["Diplocyclus"].

Diplocyclos palmatus (L.) Jeffrey in Kew Bull. 15: 352. 1962 ; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 255. 1991. *Bryonia palmata* L., Sp. Pl. 1012. 1753, excl. syn. *Bryonia laciniosa* L., Sp. Pl. 1013. 1753. *Ilocania pedata* Merr., Philipp. J. Sci. 13(1): 65-66. 1918.

Tuberous monoecious climbing herbs; stems slender, tendrils 2 – fid. Lamina deeply plamately 5 – lobed, denticulate or undulate, upper surface scabrous, lower smooth. In male flowers corolla campanulate, greenish-yellow, shortly papillose. Female flowers fasciculate, ovary globose. Fruits spherical, green; seeds grey.

Flowers & Fruits: September to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1105*, dated 23. 07. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

LUFFA Mill., Gard. Dict. Abr., ed. 4, [806]. 1754.

Key to the species

1a. Stamens 5; fruit smooth ..... *L. aegyptiaca*

1b. Stamens 3; fruit with 8–10 acute ribs ..... *L. acutangula*

Luffa cylindrica (L.) Roem., Fam. Nat. Syn. Monogr. 2: 63. 1846. *Momordica cylindrica* L., Sp. Pl. 1009. 1753. *Momordica luffa* L., Sp. Pl. 1009. 1753. *Luffa pentandra* Roxb., Fl. Ind. Ed. 1832, 3: 712. 1832. *Luffa aegyptiaca* Mill., Gard. Dict. ed. 8, 4: 500. 1785; Dyer in Hook. *f*., Fl. Brit. Ind. 2: 614. 1879; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 256. 1991; Prain, Beng. Pl. 2: 520. 1903.

Loca Name: Dhundol, Purul.

Annual scandent herbs; stem and branches scabrous, sulcate-angular, puberulent. Tendrils rather robust, usually 2 to 4 fid. Lamina triangular or suborbicular, 10 – 18 x 10 – 16cm, often palmately 5

to 7 lobed, lobes triangular, dentate, acute or acuminate, base deeply cordate. Male flowers usually in a raceme, calyx broadly campanulate, segments ovate lanceolate, acuminate, 3 nerved; corolla yellow, rotate, segments oblong. Stamens usually 5, connate at first, later free. Female flowers solitary; ovary long cylindric, stigmas 3. Fruit cylindric. Seeds ovate, smooth, black.

Flowers & Fruits: September to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1311*, dated 23. 07. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

Luffa acutangula (Linnaeus) Roxburgh, Fl. Ind. ed. 1832 3: 713. 1832; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 256. 1991. *Cucumis longus* var. *indicus* Grew, Mus. Reg. Soc. 229. 1681. *Luffa foetida* Cavanilles, Icon. 1: 7. 1791. *Momordica tubiflora* Wallich, List 6749. 1832. *Luffa acutangula* (Linnaeus) Roxburgh, Hort. Beng. 70. 1814. *Cucumis acutangulus* Linnaeus, Sp. Pl. ed. 1: 1001. 1753.

Local name: Jhinga.

Annual climber; stem sulcate-angular, pubescent. Tendrils large, 3 fid. Lamina membranous, 15 – 20 x 15 – 20 cm, palmately 5 - 7 lobed, median lobe broadly triangular, laterals smaller, dentate, acute. Male flowers in pedunculate raceme. Calyx tube campanulate, segments lanceolate, acuminate, slightly reflexed. Corolla yellow, rotate, segments obcordate, subglabrous; stamens 3, free, anthers puberulent. Female flowers: solitary; ovary terete, style short, stigmas 3, expanded. Fruits cylindric, strongly ribbed. Seeds ovate, black.

Flowers & Fruits: September to November.

Specimen Cited: Gorumara, *Goutam & AP Das 1104*, dated 23. 07. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

MOMORDICA L., Sp. Pl. 2: 1009. 1753.

Momordica charantia L., Sp. Pl. 1: 1009. 1753; Dyer in Hook. *f*., Fl. Brit. Ind. 2: 616.1879; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 252. 1991; Prain, Beng. Pl. 2: 522. 1903. *Momordica indica* L., Herb. Amb. 24. 1754.

Local Name: Uchchhe.

Annual scandent herbs, branched. Tendrils up to 20 cm, simple. Petiole slender. Lamina ovate-reniform or suborbicular, membranous, 4 – 10 x 4 – 9cm, lobes ovate-oblong, margin crenate or irregularly lobed, acute, sinus semicircular, nerves palmate. Male flowers solitary in axils of leaves, pedicel slender. Calyx segments ovate-lanceolate, acute. Corolla yellow, segments obovate; stamens 3, free. Female flowers solitary; ovary fusiform, stigmas expanded, 2 lobed. Fruits fusiform to cylindric, orange when mature. Seeds numerous, oblong.

Flowers & Fruits: May to October.

Specimen Cited: Khunia, *Goutam & AP Das 0113,* dated 02.07. 2006.

Local Distribution: Throughout the study area, very common.

General Distribution: Tropical and sub-tropical parts of the world.

MUKIA Arn., Madras Jour. Lit. Sci. 12: 50. 1840.

Mukia maderaspatana (L.) Roem., *Fam. Nat. Syn. Monogr. 2: 47. 1846*; Mill.*et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 258. 1991. *Cucumis maderaspatana* L., Sp. Pl. 1012. 1753. *Bryonia scabrella* L. *f*., Suppl. Pl. 424. 1781. *Mukia scabrella* (L. *f*.) Arn., Jour. Bot. (Hook.) 3: 276. 1841.

Annual scandent herbs, all parts densely yellow-Br. hispid. Stems branched. Tendrils simple. Lamina rigid, ovate to ovate cordate, usually 3 – 5 lobed, 5 – 10 x 5 – 8cm, irregularly denticulate, slightly obtuse, base cordate. Male flowers fascicled, pedicels short; calyx-tube campanulate, segments subulate, reflexed; corolla yellow, segments ovate-oblong, apex obtuse; stamens 3, filaments short, slightly pilose, anthers oblong, ciliate, connective distinct; rudimentary ovary globose. Female flowers solitary. Fruiting pedicels extremely short; fruit dark red, globose. Seeds ovate.

Flowers & Fruits: September to November.

Specimen Cited: Budhuram, *Goutam & AP Das 1112*, dated 23. 07. 2009.

Local Distribution: Throughout the forests.

General Distribution: India: West Bengal, Assam, Bihar; Nepal, Bhutan, Myanmar, Sri Lanka, Thailand, Malaysia.

TRICHOSANTHES L., Sp. Pl. 2: 1008. 1753.

Key to the species

1a. Lamina broadly ovate cordate; bracts entire ..... *T. cordata*

1b. Lamina suborbicular; bract dentate ..... *T. lepiniana*

Trichosanthes cordata Roxb., Fl. Ind. 3: 703. 1832; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 265. 1991. *Involucraria cordata* (Roxb.) Roem., Fam. Nat. Syn. Monogr. 2: 97. 1846. *Trichosanthes microsiphon* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 308. 1872.

Stem robust, angular. Lamina broadly ovate cordate, 8 – 20 x 7 – 18cm, minutely denticulate, apex acute to shortly acuminate, base cordate, papery. Male raceme 4 to 7 flowered; peduncle stout, striate, sparsely puberulent; pedicels thick; bracts oblong, entire, shortly hirsute; calyx tube attenuate from apex towards base; sepals linear-lanceolate. Female flower solitary; ovary oblong, slightly puberulent. Fruit globose, smooth, red.

Flowers & Fruits: July to August.

Specimen Cited: Budhuram, *Goutam & AP Das 1116*, dated 23. 07. 2009.

Local Distribution: Throughout roadside forests.

General Distribution: India, Laos, Malaysia, Myanmar, Singapore

Trichosanthes lepiniana (Naudin) Cogn. in DC., Monogr. Phan. 3:377. 1881; Ohashi in Hara, Fl. E. Himal. 1:325. 1966; Grierson in Grierson *et* Long, Fl. Bhutan 2(1): 266. 1991. *Involucraria lepiniana* Naudin, Cat. 2. 1868. *Trichosanthes tricuspidata* Lour., Fl. Cochinch. 589. 1790; Hara *et al*., Enn. Fl. Pl. Nep. 2: 180. 1979. *Trichosanthes palmata* Roxb., Fl. Ind. 3: 704. 1832; Dyer in Hooker *f*., Fl. Brit. Ind. 1: 606. 1879.

Local name: Makal.

Stem robust, branched, glabrous. Lamina suborbicular, 9 – 17 cm, shortly 3 to 5 lobed up to middle, adaxially deep green, rough, denticulate, acute to shortly acuminate, base cordate. Male raceme 15 cm; peduncle robust, striate; bracts suborbicular, margin lacerate; calyx tube puberulent; sepals

narrowly ovate, margin laciniate. Female flowers solitary; pedicel glabrous; bracts ovate, entire; ovary ovate, glabrous. Fruit ovoid, smooth, red. Seeds broadly ovate.

Flowers & Fruits: May to Nov.

Specimen Cited: Budhuram, *Goutam & AP Das 1107*, dated 23. 07. 2009.

Local Distribution: Throughout roadside forests.

General Distribution: India, Bhutan.

Core-Eudicots: Rosids: Eurosids (II)

Order 43: Myrtales Juss. *ex* Bercht. *et* Presl (1820)

Combretaceae R.Br., Prodr. 1: 351. 1810; *nom. cons*.

Key to the genera

1a. Trees .... ***Terminalia***

1b. Woody lianas ..... ***Combretum***

COMBRETUM Loef., Iter Hispan. 308. 1758, *nom. cons*.

Key to the species

1a. Stamens not exserted from calyx tube; style partly adnate to calyx tube ..... *C. indicum*

1b. Stamens usually exserted from calyx tube; style not adnate to calyx tube ..... *C. decandrum*

Combretum decandrum Jacq., Enum. Syst. Pl. 19. 1760; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 306. 1991; Prain, Beng. Pl. 1: 482. 1903. *Poivrea alternifolia* (Pers.) Candolle, Prodr. 3: 17. 1828. *Gonocarpus jacquinii* Ham., Prodr. Pl. Ind. Occid. 39. 1825. *Combretum palmeri* Rose, Contr. U. S. Natl. Herb. 5: 136. 1898. *Combretum roxburghii* Spreng., Syst. Veg. 2: 331. 1825.

Combretum decandrum Roxb., Pl. Corom. 1: 43. 1796, not Jacq. (1760); Pentaptera Woody lianas. Branchlets reddish villosulous when young. Leaves opposite; lamina oblong-elliptic to obovate-oblong, 5 – 15 × 3 – 6 cm, lateral veins in 6 or 7 pair, obtuse, base obtuse to obtuse-rounded. Inflorescences terminal and axillary, laxly compound spikes 5–15 cm, leafy panicle; bracts persistent at anthesis, tomentose. Calyx tube distally; lobes 5, broadly triangular. Petals 5, obovate-oblong. Stamens 10, only slightly exserted, not exceeding petals. Fruit glossy, cylindric, 5-winged.

*Flowers & Fruits:*August to November.

Specimen Cited: Murti, *Goutam & AP Das 0372*, dated 17.12.2006.

Local Distribution: Khunia, Murti, Gorumara, Dhupjhora, moderate.

General Distribution: India, Bhutan, China, Bangladesh, Nepal, Laos, Myanmar, Sri Lanka, Thailand, Vietnam.

Combretum indicum (L.) Filipps, Useful Pl. Dominica 277. 1998. *Quisqualis indica* L., Sp. Pl. ed. 2: 556. 1762; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 309. 1991. *Quisqualis glabra* Burm.*f*., Fl. Indica 104. 1768. *Quisqualis grandiflora* Miq., J. Bot. Néerl. 1: 119. 1861. *Quisqualis indica* L., Sp. Pl., ed. 2, 1: 556. 1762.

Local name: Madhabilata.

Lianas up to to 8 m. Lamina mostly oblong-elliptic to elliptic, 5 – 16 × 2 – 7 cm, lateral veins in 7 to 8 pairs, acuminate to shortly caudate base obtuse. Inflorescences lax; bracts deciduous, filiform-linear to ovate. Flowers fragrant. Calyx tube yellow pilose; lobes deltoid, acute to shortly acuminate. Petals opening white, later turning yellowish abaxially and reddish adaxially, obovate to oblanceolate. Fruit red when young, greenish black or Br. when ripe, sharply 5 ridged, apex mucronate.

Flowers & Fruits: November to May.

Specimen Cited: Gorumara,*Goutam & AP Das 0705*, dated 30. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

TERMINALIA L., Mant. Pl. 1: 21, 128. 1767, *nom. cons*.

Key to the species

1a. Fruit 3 to 5 winged 2

1b. Fruit 2 to 5 ridged 3

2a. Fruit 2 winged with a rudimentary wing between two ..... *T. myriocarpa*

2b. Fruit 4 to 5 winged without rudimentary wing ..... *T. arjuna*

3a. Lamina elliptic ..... *T. chebula*

3b. Lamina obovate ..... *T. bellirica*

Terminalia arjuna (Roxb. *ex* Candolle) Wight *et* Arnott, Prodr. Fl. Ind. Orient. 314. 1834; Prain, Beng. Pl. 1:481.1903; *Pentaptera arjuna* Roxb. (Hort. Beng. 34.1814, *nom. nud*.) *ex* Candolle, Prodr. 3: 15. 1828.

Loca name: Arjun.

Trees, trunk buttressed. Bark greenish-white. Leaves sub-opposite or alternate; lamina elliptic – oblong, 15 – 30 × 6 – 15 cm, obtuse or mucronate, base obtuse-rounded to attenuate. Flowers in pendulous axillary or terminal panicles of spikes. Calyx lobes 5, pale-yellow. Stamens 10, exserted. Drupes ovoid or obovoid – oblong, woody, strongly 5 ridged.

Flowers & Fruits: December to May.

Specimen Cited: Gorumara,*Goutam & AP Das 0706*, dated 30. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Terminalia bellirica (Gaertn.) Roxb., Pl. Coromandel 2: 54. 1805; Clarke in Hook. *f*, Fl. Brit. Ind. 2: 445. 1879; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 304. 1991. *Myrobalanus bellirica* Gaertner, Fruct. Sem. Pl. 2: 90. 1791. *Myrobalanus bellirica* Joseph Gaertner, Fruct. Sem. Pl. 2: 90. 1791.*Terminalia punctata* Roth, Nov. Pl. Sp. 381. 1821.

Local name: Bahera.

Large, deciduous trees, up to 35 m. Leaves spiraled, crowded into pseudowhorls at apices of branchlets; petiole 3–9 cm, glabrous but ferruginous tomentose when young, especially at base, with 2 glands above middle; lamina glossy, obovate, 15 – 30 × 6 – 15 cm, obtuse or mucronate, base obtuse-rounded to attenuate. Inflorescences axillary, simple spikes. Calyx lobes 5. Stamens 10, exserted. Fruit shortly stipitate, subglobose to broadly ellipsoid, weakly to strongly 5 ridged.

Flowers & Fruits: March to August.

Specimen Cited: Murti, *Goutam & AP Das 0376*, dated 17.12.2006.

Local Distribution: Murti, Khunia, Budhuram, Bichhabhanga abundant.

General Distribution: India, Bhutan, Bangladesh, Nepal, Sri Lanka, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; N Australia; introduced in E Africa.

Terminalia chebula Retzius, Observ. Bot. 5: 31. 1789; Clarke in Hooker *f*., Fl. Brit. Ind. 2: 446. 1879; H. Ohashi in Hara, Fl. E. Himal. 1: 220. 1966; Clement in Grierso net Long, Fl. Bhutan 2(1): 304. 1991.

Local name: Haritaki, Hartaki.

Large trees, up to 30 m. Leaves alternate to subopposite; petiole moderately stout; lamina elliptic, 7 – 16 × 4 – 10 cm, both surfaces glabrous, mucronate, base obtuse-rounded to cuneate, oblique. Inflorescences axillary or terminal, simple spikes, 5–10 cm, numerous flowered. Flowers bisexual. Calyx tube distally cupular; lobes 5. Stamens 10, exserted. Fruit not stipitate, blackish Br. when ripe, ovoid, obtusely 5-ridged.

Flowers & Fruits: December to May.

Specimen Cited: Budhuram,*Goutam & AP Das 0778*, dated 12. 11. 2009.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

Terminalia myriocarpa Van Heurck & Mueller Argoviensis, Observ. Bot. 215. 1871; Clement in GriersonetLong, Fl. Bhutan 2(1): 305. 1991.

Local name: Pukkasaj.

Large evergreen trees, up to 35 m. Leaves opposite; petiole stout, with 2 stalked glands at apex; lamina oblong-elliptic to oblong-lanceolate, 10 – 28 × 4 – 12 cm, thickly papery, short, oblique tip, entire to slightly undulate, rarely conspicuously toothed, base obtuse. Inflorescences terminal

or axillary, simple or compound, long. Calyx tube distally cupular; lobes 5. Stamens 10, exserted. Fruit not stipitate, yellowish when dry.

*Flowers & Fruits:*August to February.

Specimen Cited:

Local Distribution: Khunia, Gorumara, Budhuram, Common.

General Distribution: India, Bhutan, Bangladesh, Nepal, China, Indonesia, Laos, Malaysia, N Myanmar, Thailand, N Vietnam.

Lythraceae Jaume St. Hilaire, Expos. Fam. 2: 175. 1805 (‘Lythrariae’; *nom. cons. prop*. vs. Salicariaceae).

Key to the genera

1a. Tree or shrubs 2

1b. Herbs 3

2a. Leaves leathery; stamens 10 – 12 ..... ***Woodfordia***

2b. Leaves pappery; stamens 30 to 120 ..... ***Lagerstroemia***

3a. Aquatic floting herbs ..... ***Trapa***

3b. Marshy land or wet terrestrial herbs 4

4a. Flowers usually 3 or more per axil ..... ***Ammannia***

4b. Flowers usually solitary . ..... ***Rotala***

AMMANNIA L., Sp. Pl. 1: 119. 1753.

Key to the species

1a. Petals absent ..... *A. baccifera*

1b. Petals present ..... *A. multiflora*

Ammannia baccifera L., Sp. Pl. 120. 1753; C.B. Clarke in Hook. *f*., Fl. Brit. Ind. 2: 569. 1879; Long *et* Rae in Grierson et Long, Fl. Bhut. 2 (1): 271. 1991; Prain, Beng. Pl. 2: 500. 1903; Guha Bakshi, Fl. Mur. Dist. 131. 1984. *Ammannia indica* Lam., Tabl. Encycl. 1: 311. 1792. *Ammannia glauca* Wall. *ex* Wight *et* Arn., Prodr. Fl. Ind. Orient. 1: 305. 1834. *Ammannia baccifera* f. *glauca* (Wall. *ex* Wight *et* Arn.) Koehne, Bot. Jahrb. Syst. 1: 261. 1880.

Annual, herbs. Stem with numerous ascending branches. Leaves opposite on basal, opposite or alternate toward apices, narrowly elliptic or oblanceolate, 8 – 40 × 3 – 9 mm, base attenuate to subcordate. Flowers 3 to many in dense axillary cymes; pedicels subsessile; bracteoles minute. Floral tube campanulate, tapering at base; sepals 4; epicalyx absent. Petals absent. Stamens 4. Style absent or much shorter than ovary. Capsules exserted.

Flowers & Fruits: July to Dec.

Specimen Cited: Budhuram, *Goutam & AP Das 1114*, dated 23. 07. 2009.

Local Distribution: Budhuram, Dhupjhora, Gorati, very common.

General Distribution: India, Bhutan, Nepal, Bangladesh, China, Malaysia, Philippines, Thailand, Vietnam, Afghanistan, Cambodia, Laos; tropical Africa, Australia, Caribbean islands.

Ammannia multiflora Roxb., Fl. Ind. 1: 447. 1820; Clarke in Hook. *f*., Fl. Brit. Ind. 570.1879; Prain, Beng. Pl. 1: 500. 1903; Panda *et* Das, Fl. Sambalp. 340. 2004. *Cryptotheca dichotoma* Blume, Bijdr. 1129. 1827. *Ammannia parviflora* DC., Prodr. 2: 77. 1825.

Annual, herbs. Stems with numerous short branches. Leaves opposite, narrowly elliptic or broadly linear to lanceolate-oblong, 2 – 3 cm × 3 – 10 mm, base attenuate to cordate. Flowers 3 –7 in dense axillary cymes; pedicels 1–2 mm; bracteoles linear. Floral tube campanulate, 4 ribbed;

sepals 4. Petals 4, pink to whitish, obovate, minute. Stamens 4. Style 1/3–1/2 as long as ovary. Capsules redbrown, exserted.

Flowers & Fruits: November to September.

Specimen Cited: Budhuram, *Goutam & AP Das 1108*, dated 23. 07. 2009.

Local Distribution: Budhuram, Dhupjhora, Gorati, very common.

General Distribution: India, Bhutan, China, Japan, Malaysia and Australia. tropics and subtropics of Africa and Australia.

LAGERSTROEMIA L., Syst. Nat., ed. 10, 2: 1068, 1076, 1372. 1759.

Key to the species :

1a. Shrubs; stamens dimorphic ..... *L. indica*

1b. Trees; stamens monomorphic 2

2a. Stamens 40 to 60 ..... *L. parviflora*

2b. Stamens 75 to 120 ..... *L. speciosa*

Lagerstroemia indica L., Syst. Nat. ed. 10(2): 1076. 1759; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 276. 1991; *Lagerstroemia indica* var. *alba* Ram. Goyena, Fl. Nicarag. 410. 1909; *Lagerstroemia minor* Retz., Observ. Bot. 1: 20. 1779. Prain, Beng. Pl. 2: 504.1903.

Shrubs up to 7 m. Branchlets slender, 4 angled. Leaves semi sessile; lamina elliptic to oblong-obovate, mucronate, 3–7 × 1.5–3.5 cm, papery, lateral veins 3–7 pairs, acute with small mucro, base broadly cuneate to rounded. Panicles subpyramidal, densely flowered. Floral tube 6-merous; annulus present; epicalyx absent. Petals purple or white. Stamens 36–40, dimorphic. Ovary glabrous. Capsules ellipsoidal, 4–6-valved.

*Flowers & Fruits:*November to July.

Flowers & Fruits: June to November.

Specimen Cited: Budhuram,*Goutam & AP Das 0775*, dated 12. 11. 2009.

Local Distribution: Budhuram, Gorumara.

General Distribution: Pantropical in Asia.

Lagerstroemia parviflora Roxb., Pl. Coromandel 1: 48. 1796. Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 276. 1991; Prain, Beng. Pl. 1:503. 1903. *Murtughas parviflora* Kuntze, Revis. Gen. Pl. 1: 249. 1891.

Local name: Sidha.

Trees, up to 15 m. Petiole 1.2–1.5 cm; lamina ovate to oblong-elliptic, 5 – 12 × 3 – 6 cm, papery, round to mucronate, base acute to attenuate. Panicles 5–7 cm. Floral tube 6-merous; sepals narrowly deltate, ½ as long as floral tube; annulus absent; epicalyx segments absent or minute. Petals purple to bluish purple when dry, ovate. Stamens 40 to 60, monomorphic. Ovary glabrous. Capsules oblong, 6 valved.

*Flowers & Fruits:*March to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0697*, dated 11.09.2009.

Local Distribution: Throughout the forests.

General Distribution: Pantropical.

Lagerstroemia speciosa (L.) Pers., Syn. Pl. 2: 72. 1806. *Lagerstroemia hirsuta* (Lam.) Willd., Sp. Pl. 2: 1178. 1799; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 276. 1991. *Adambe hirsuta* Lam., Encycl. 1: 39. 1783. *Lagerstroemia flos-reginae* Retzius, Observ. Bot. 5: 25 1788.

Local Name: Jarul.

Trees, up to 15 m. Petiole 1.2–1.5 cm; lamina elliptic to oblong-elliptic, 8–22 × 5–10 cm, papery, lateral veins 10 to 11 pairs, shortly acuminate, base acute to attenuate. Panicles 10–15 cm. Floral tube 6-merous; sepals narrowly deltate, ½ as long as floral tube; annulus absent; epicalyx segments absent or minute. Petals purple to bluish purple when dry, ovate. Stamens 75 to ca. 120, monomorphic. Ovary glabrous. Capsules oblong, 6 valved.

Flowers & Fruits: June to August.

Specimen Cited: Bichhabhanga,*Goutam & AP Das 0787*, dated 23. 11. 2009.

Local Distribution: Throughout the forests.

General Distribution: Pantropical in Asia.

ROTALA L., Mant. Pl. 2: 143, 175. 1771.

Key to the species

1a. Flowers in terminal spikes ..... *R. rotundifolia*

1b. Flowers in axillary spikes 2

2a. Leaf margin translucent to opaque white; capsules 2 valved ..... *R. indica*

2b. Leaf margin green; capsules 3 to 4 valved ..... *R. densiflora*

Rotala densiflora (Roth) Koehne, Bot. Jahrd. Syst. 1(2): 164. 1880; Datta *et* Majumdar, Bull. Bot. Soc. Beng. 20(2): 89. 1966; Cook, Aqua. Wetl. Pl. Ind. 255. 1996. *Ammannia densiflora* Roth, Syst. Veg. 3: 394. 1818. *Ammannia pentandra* Roxb. Fl. Ind. 1: 488. 1820; Clark in Hook. *f*., Fl. Brit. Ind. 2: 568. 1879; Prain, Beng. Pl. 1: 500. 1903. *Rotala densiflora* subsp. *uliginosa* (Roth) Koehne, Bot. Jahrb. Syst. 1(2): 165. 1880.

Annual, amphibious, herbs, up to 25 cm. Stem usually creeping, sparsely to densely branched, 4 winged, wings not running into leaves. Leaves decussate, often alternate toward stem apex, narrowly elliptic to oblong – ovate, 10 – 25 x 2 – 5 mm, acute, base cordate to obtuse. Bracts of stem and lower branches like foliage leaves. Flowers solitary; bracteoles pink, lanceolate. Floral tube 5 merous, campanulate; epicalyx segments present between sepals. Petals 5, bright pink. Stamens 5. Ovary globose; style shorter than ovary. Capsules subglobose, 3-valved.

*Flowers & Fruits:*June to November.

Specimen Cited: Murti,*Goutam & AP Das 0821*, dated 17. 12. 2009.

Local Distribution: Gorati, Indong, Gorumara, moderate in riverine wetland.

General Distribution: India, Bangladesh, China, Vietnam, Laos, Thailand.

Rotala indica (Willd.) Koehne, Bot. Jahrb. Syst. 1(2): 172. 1880. Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 272. 1991; Cook, Aqua. Wetl. Pl. Ind. 257. 1996. *Peplis indica* Willd., Sp. Pl. 2(1): 244. 1799.

Annual, amphibious, herbs, up to 40 cm. Stem creeping and branched at base. Leaves decussate, obovate-elliptic to obovate – oblong, 5 – 20 x 3 – 8 mm, obtuse, translucent, base cuneate. Bracts foliage. Flowers in axillary spikes or sessile in bracts on main stem; bracteoles linear. Floral tube 4 merous, pink-red at anthesis, narrowly to broadly campanulate; sepals 4, lanceolate-deltate; epicalyx absent. Petals 4, pink, minute to 1/2 as long as sepals. Stamens 4. Ovary ellipsoidal. Capsule ellipsoidal, 2-valved.

Flowers & Fruits: August to April.

Specimen Cited: Gorati, Goutam & AP Das 1191, dated 19. 09. 2011.

Local Distribution: Gorati, Medlajhora.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Thailand, Vietnam, Laos, Cambodia, Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines; introduced in rice fields in Africa, Europe and North America.

Rotala rotundifolia (Buch. - Ham. *ex* Roxb.) Koehne, Bot. Jahrb. *Syst. 1(2):* 175. 1881; Islam, Fl. Majuli 137. 1990; Bora & Kumar, Flor. Div. Ass. 158. 2003. *Ammannia rotundifolia* Buch.-Ham. in Don Prodr. 220. 1825; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 566. 1828; Prain, Beng. Pl. 1: 500. 1903.

Annual, amphibious, herbs, up to 25 cm. Stem extensively creeping and rooting herbs with red stem. Lamina sessile, orbicular or broadly elliptic – rounded. Flowers pinkish sessile, closely packed in terminal simple or panicle spikes; calyx tube campanulate, petals 4, pink coloured. Capsules 4-valved ellipsoid; seeds elliptic peltate.

Flowers & Fruits: November to April.

Specimen Cited: Khunia, *Goutam & AP Das 0043*, dated 25. 06. 2006.

Local Distribution: Khunia, Gorumara.

General Distribution: India, Bhutan, Nepal, Bangladesh, Japan, Thailand, Laos, Myanmar, Vietnam.

WOODFORDIA Salisb., Parad. Lond. 1(2): t. 42. 1806.

Woodfordia fruticosa (Linnaeus) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40: 56. 1871. Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2 (1): 275. 1991. *Lythrum fruticosum* Linnaeus, Syst. Nat., ed. 10, 2: 1045. 1759.

Tall shrubs, up to 5 m. Leaves lanceolate to ovate-lanceolate, 3 – 12 × 1 – 4 cm, leathery, Acuminate, base rounded to subcordate. Inflorescences axillary, 3 – 15 flowers. Floral tube light red to red-orange, greenish basally; sepals oblong-ovate to deltate; epicalyx segments scarcely present. Petals 6, thin, linear-lanceolate. Stamens 12, inserted above ovary base, long-exserted. Ovary 2-loculed. Capsules elongate, elliptic. Seeds reddish Br..

*Flowers & Fruits:*January to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0730*, dated 12. 09. 2009.

Local Distribution: Throughout the study area, common.

General Distribution: India, Bhutan, Nepal, Pakistan, Indonesia, Laos, Myanmar, Thailand.

TRAPA L., Sp. Pl. 1: 120. 1753.

Trapa natans L., Sp. Pl. 120. 1753. *Trapa bicornis* Osbeck, Dagb. Ostind. Resa 191. 1757. *Trapa chinensis* Lour., Fl. Cochinch. 1: 86. 1790. *Trapa natans* var. *incisa* Makino, Bot. Mag. (Tokyo) 1: 105. 1887-1892. *Trapa bispinosa* Roxb. var. *incisa* (Sieb. *et* Zucc.) Franchet *et* Savatier, Nakai, Fl. Kor. 2: 490. 1911. Clarke in Fl. Brit. Ind. 2: 590. 1879; Prain, Beng. Pl. 1: 508. 1903. *Trapa incise* Sieb. *et* Zucc., Fl. Jap. 134. 1843.

Local name: Pani fol.

Aquatic floating herbs. Petiole swollen distally. Floating lamina in rosettes, rhomboid, leaf blade glossy and dark green, rhombic – triangular, glabrous or sparsely pubescent on veins, adaxially glabrous, margin coarsely and sharply incised-dentate distally. Petals white, 7–10 mm. Fruit shortly rhombic, 2 – 4 horned, surface variously ribbed to smooth, crest a prominent bulge to a thin rib, crown tetragonal to rounded, or dome-shaped. Horns horizontal, ascending, or recurved, flat-triangular or broadly conic.

Flowers & Fruits: May to November.

Specimen Cited: Budhuram, *Goutam & AP Das 1118*, dated 23. 07. 2009.

Local Distribution: Budhuram, Dhupjhora Gorumara, Indong; abundant in stagnant wetland areas.

General Distribution: India, Bangladesh, China, Pakistan, Indonesia, Japan, Korea, Laos, Malaysia, Thailand, Philippines, Russia and Vietnam. Africa, Europe; naturalized in Australia and North America.

Melastomataceae Juss., Gen. P1. 328. 1789 ('Melastomae'); *nom. cons*.

Key to the genera

1a. Stamens equal in length and shape; fruit a dry capsule ..... ***Osbeckia***

1b. Stamens unequal in length and shape; fruit a fleshy capsule ..... ***Melastoma***

MELASTOMA L., Sp. Pl. 1: 389. 1753.

Melastoma malabathricum L., Sp. Pl. 1: 390. 1753 ('malabathrica'); Clarke in Hook. *f*, Fl. Brit. Ind. 2: 523. 1879; Ohashi in Hara, Fl. E. Himal. 1: 221. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 2: 170. 1979; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 296. 1991. *Melastoma affine* Don, Mem. Wern. Nat. Hist. Soc. 4: 288. 1823. *Melastoma malabathricum* var. *normale* (Don) Srivastava, Novon 8(2): 203. 1998. *Melastoma normale* Don, Prodr. Fl. Nepal. 220. 1825. *Melastoma polyanthum* Bl., Flora 2: 481. 1831.

Local name: Futi.

Bushy shrubs. Stems densely appressed hairy. Leaves elliptic to lanceolate-elliptic, acute or shortly acuminate, base rounded, cuneate, veins 5; upper surface with rows of white cells at base of very short hairs. Calyx tube densely covered with appressed, fimbriate-margined, scale like hairs; lobes triangular – oblong. Petals mauve to rose – purple.

Flowers & Fruits: January to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0224*, dated 09. 02. 2009.

Local Distribution: Gorumara, Murti, Dhupjhora.

General Distribution: Tropical Himalayas, India, China, Sri Lanka, Myanmar, Malaysia and Australia.

OSBECKIA L., Sp. Pl. 1: 345. 1753.

Osbeckia nepalensis Hook.*f.*, Exot. Fl. 1: , pl. 31. 1823; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 295. 1991; Prain, Beng. Pl.1: 495. 1903.

Erect shrubs, up to 1m. Stems 4 sided, densely strigose. Lamina oblong-lanceolate to ovate-lanceolate, 5 – 13 × 2 – 4 cm, stiffly papery, both surfaces densely strigose, secondary veins 2 on each side of midvein, acuminate, entire and ciliate, base cordate to obtuse. Inflorescences terminal, a panicle of cymes; bracts leaflike. Bracteoles 2, broadly ovate. Calyx lobes 5, long ovate, ciliate, acuminate. Petals 5, white. Stamens 10, inclined to one side; filaments as long as anthers; anthers beaked. Ovary ovoid-globose, 5-celled. Capsule ovoid-globose, densely strigose.

*Flowers & Fruits:*June to February.

Specimen Cited: Gorumara, *Goutam & AP Das 0517*, dated 23.07.2009.

Local Distribution: Through out Forest.

General Distribution: India, Bhutan, Nepal, Myanmar, Thailand, Laos, Vietnam.

Myrtaceae Juss., Gen. P1. 322. 1789 ('Myrti'); *nom. cons*.

Key to the genera

1a. Fruit a capsule ..... ***Eucalyptus***

1b. Fruit not capsule 2

2a. Flowers solitary; Fruit a berry ..... ***Psidium***

2b. Flowers in axillary or terminal cymes; fruits a drupe ..... ***Syzygium***

EUCALYPTUS L'Héritier, Sert. Angl. 18. 1789.

Eucalyptus tereticornis Sm., Spec. Bot. New Holland 4: 41 1795. *Eucalyptus insignis* Naudin, Descr. Emploi Eucalypt. 30. 1891. *Eucalyptus populifolia* Desf., Tabl. École Bot. ed. 3: 408. 1829. *Leptospermum umbellatum* Gaertn., Fruct. Sem. Pl. 1: 174. 1788.

Large trees, up to 25 m. Bark grayish white, smooth. Branchlets terete, slender, pendulous. Lamina of young leaves ovate to broadly lanceolate, mature leaves narrowly lanceolate, 12 – 20 × 1.2 – 2 cm, slightly twisted. Inflorescences axillary, simple, umbels 5–8 flowered. Flowers buds long ovate, apex acuminate. Stamens with long obovate anthers, dehiscing longitudinally. Capsule subglobose to ovoid; disk broad; valves 4 to 5.

*Flowers & Fruits:*January to August.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0263*, dated 10. 02. 2009.

Local Distribution: Dhupjhora Beat Offices and villages.

General Distribution: India, Bhutan, China; native to E and SE Australia.

PSIDIUM L., Sp. Pl. 1: 470. 1753.

Psidium guajava L., Sp. Pl. 470. 1753; Clarke in Hook. *f,* Fl. Brit. Ind. 2: 468. 1879; Long *et* Rae in Grierson *et*Long, Fl. Bhutan 2(1): 287. 1991. Prain, Beng. Pl.1: 495. 1903. *Guajava pumila* (Vahl) Kuntze, Revis. Gen. Pl. 1: 240. 1891. *Psidium pumilum* Vahl, Symb. Bot. 2: 56. 1791. *Myrtus guajava* (L.) Kuntze, Revis. Gen. Pl. 3(2): 91. 1898. *Psidium cujavus* L., Herb. Amb. 7. 1754.

Local name: Peyara.

Small tree, up to 5 m; branchlets finely pubescent. Leaves oblong-elliptic, 8 – 12 x 3 – 5 cm, acute, base rounded, pubescent beneath, lateral veins parallel, prominent beneath; stipules minute, often caducous. Flowers mostly solitary on pubescent peduncle; bracteoles subulate, caducous. Calyx tube obovoid, constricted at apex, pubescent; lobes leathery, ovate, unequal. Petals white, obovate. Berry pear-shaped.

Flowers & Fruits: Throughout the year.

Specimen Cited: Murti village, *Goutam & AP Das 0258*, dated 10. 02. 2009.

Local Distribution: In the villages.

General Distribution: Native of tropical America, naturalized and cultivated in India.

SYZYGIUM P. Br. *ex* Gaertn., Fruct. Sem. Pl. 1: 166. 1788, *nom. cons*.

Key to the species

1a. Cymes borne in axils of older ..... *S. cumini*

1b. Cymes borne in terminal position of branches ..... *S. jambos*

Syzygium cumini (L.) Skeels, Bull. Bur. Pl. Industr. U.S.D.A. 248: 25 1912 & U.S. Dept. Agric. Bur. Pl. Ind. Bull. 248. 25. 1912; Long *et* Rae in Grierson *et*Long, Fl. Bhutan, 2(1): 284. 1991 Prain, Beng. Pl.1: 495. 1903. *Myrtus cumini* L., Sp. Pl. 471. 1753. *Eugenia jambolana* de .Lam., Encycl. 3: 198. 1789. *Eugenia obovata* Poir., Encycl. Suppl. 3: 124. 1813.

*Local name:*Jaam.

Tree, up to 20 m. Leaves coriaceous, elliptic to obovate, 5 – 10 x 3 – 5 cm, base cuneate, veins numerous, intra-marginal vein conspicuous. Cymes borne in axils of older and fallen leaves, many-flowered. Flowers sessile. Calyx funnel-shaped, tube tapering into stalk-like base, lobes shallow, persistent. Petals creamy. Stamens 2 – 5 mm. Fruit obovoid, crimson, becoming black when ripe.

Flowers & Fruits: June to December.

Specimen Cited: Murti, *Goutam & AP Das 0174*, dated 08. 02. 2009.

Local Distribution: All over the forests.

General Distribution: India (tropical and subtropical regions), Sri Lanka, Malaya and Australia.

Syzygium jambos (L.) Alston, Handb. Fl. Ceylon 6(Suppl.): 115 1931. Long *et* Rae in Grierson *et* Long, Fl. Bhutan 2 (1): 280. 1991. Prain, Beng. Pl. 1: 495. 1903; *Eugenia jambos* L., Sp. Pl. 470. 1753. *Eugenia vulgaris* Baill., Hist. Pl. 6: 345. 1876. *Eugenia jambosa* Crantz, Inst. Rei Herb. 2: 201. 1766.

Local name: Golabjam.

Trees, up to 10 m. Stems broadly branched. Branchlets terete. Lamina lanceolate to ovate-lanceolate, 8 – 25 × 2 – 5 cm, leathery, acuminate to long acuminate, entire, base narrow to broadly cuneate. Inflorescences usually terminal cymes with several flowers. Flowers white. Hypanthium obconic. Calyx lobes 4. Petals broadly ovate. Stamens 1.5 – 3 cm. Style 2–3.5 cm. Drupe pale yellow when ripe, globose to ellipsoid, 1 to 2 seeded, pericarp fleshy. Embryos numerous.

Flowers & Fruits: February to Novebmer.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0252*, dated 10. 02. 2009.

Local Distribution: In the forest villages and forests throughout.

General Distribution: India, Philippines; Malesia and SE Asia.

Onagraceae Juss., Gen. P1. 317. 1789 (‘Onagrae’); *nom. cons*.

LUDWIGIA L., Sp. Pl. 1: 118 [“Ludvigia”]; 2: [1204]. 1753.

Key to the species

1a. Floating; pneumatophores in at nodes of floating stems ..... *L. adscendens*

1b. Not floating; pneumatophores absent 2

2a. Stamens 8; stigma subglobose, 4 lobed ..... *L. octovalvis*

2b. Stamens many; stigma globose, not 4 lobed 3

3a. Capsule subcylindric, slightly 4 angled, seeds visible through walls ..... *L. prostrata*

3b. Capsule oblanceoloid, often nodding, seeds not visible through wall ..... *L. perennis*

Ludwigia adscendens (L.) Hara in J. Jap. Bot. 28(10): 291. 1953; Raven in Reinwardtia 6(4): 387. 1963; Guha Bakshi, Fl. Mur. Dist. 135. 1984. *Jussiaea repans* L., Sp. Pl. 1: 388. 1753; Clarke in Hook. *f*, Fl. Brit. Ind. 2: 587. 1879; Prain, Beng. Pl. 1: 368. 1903.

Perennial herbs, with creeping and floating stems, rooting at nodes, with white, erect, spindle shaped pneumatophores in clusters at nodes of floating stems. Lamina oblong to spatulate – oblong, 0.5 – 6

× 0.5 – 3 cm, glabrous, lateral veins 6–12 per side, obtuse to subacute, margin entire. Sepals 5, deltoid-acuminate. Petals creamy-white with yellow base, obovate. Stamens 10. Style white; stigma discoid. Capsule with Br. ribs, cylindric.

*Flowers & Fruits:*June to November .

Specimen Cited: Gorati Beel, *Goutam & AP Das 0304*, dated 10. 02. 2009.

Local Distribution: Throughout, in water bodies.

General Distribution: India: throughout; Nepal, Bhutan, Pakistan, China, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand; widespread in Africa, S and SE Asia, Australia.

Ludwigia octovalvis (Jacq.) Raven, Kew Bull. 15: 476. 1961 (publ. 1962); Hoch in Grierson *et* Long, Fl. Bhutan 2(1): 312. 1991; Cook, Aqua. Wetl. Pl. Ind. 277. 1996. *Ludwigia octovalvis* subsp. ***sessiliflora*** (Micheli) Raven, Kew Bull. 15: 476. 1962. *Jussiaea pubescens* L., Sp. Pl. (ed. 2) 1: 555. 1762. Chowdhery *et al*. in Hajra *et al*., Materials for the Fl. Arunachal Prad.1: 504. 1996. *Oenothera octavulvis* Jacq., Enum. 19. 1760. *Jussiaea suffruticosa* L., Sp. Pl. 388. 1753; Clarke in Hook. *f*., Fl. Brit. Ind.. 2: 587. 1879; Prain, Beng. Pl.1: 368. 1903.

Perennial, erect herbs. Stems up to 90 cm, well branched. Lamina linear to subovate, 4 – 13 × 1 – 4 cm, submarginal vein prominent, attenuate, base narrowly cuneate. Sepals 4, ovate to lanceolate. Petals yellow, broadly obovate. Stamens 8. Stigma subglobose, shallowly 4 lobed. Capsule pale Br., cylindric, terete. Seeds in 2 to more rows per locule, free.

Flowers & Fruits: June to February.

Specimen Cited: Medlajhora, *Goutam & AP Das 0307*, dated 10. 02. 2009.

Local Distribution: Lowland forests throughout.

General Distribution: India:throughout; Bhutan, China, S.E. Asia, tropical Africa.

Ludwigia perennis L., Sp. Pl. 1: 119.1753; Raven in Reinw. 6: 367. 1964; Hoch in Grierson *et* Long, Fl. Bhutan 2(1): 312. 1991; Cook, Aqua. Wetl. Pl. Ind. 278. 1996; Guha Bakshi, Fl. Mur. Dist. 136. 1984. *Ludwigia oppositifolia* L., Syst. Nat. ed. 12: 125. 1767. *Ludwigia parviflora* Roxb., Hort. Beng. 11. 1814,nom. nud. & Fl. Ind.1: 440. 1820; Clarke in Hook. *f*., Fl. Brit. Ind.. 2: 588. 1879; Prain, Beng. Pl. 1: 368. 1903. *Jussiaea perennis* (L.) Brenan, Kew Bull. 1953: 163. 1953. *Jussiaea caryophyllea* Lam., Encycl. 3(1): 331-332. 1789.

Annual erect herbs, with taproot. Stems up to 80 cm, branched, subglabrous. Petiole winged; leaf Annual erect herbs. Stems up to 80 cm, branched. Petiole winged; lamina narrowly elliptic to lanceolate, 3 – 10 × 1 – 3 cm, subacute, base narrowly cuneate. Sepals 4, rarely 5, deltate. Petals yellow, elliptic. Stamens many. Stigma globose. Capsule often nodding, pale Br., oblanceoloid, terete. Seeds in 2 to more rows per locule, free.

Flowers & Fruits: Juli to April.

Specimen Cited: Medlajhora, *Goutam & AP Das 0346*, dated 21.07.2009.

Local Distribution: Medlajhora margin.

General Distribution: India: throughout; Bhutan, China, Sri Lanka, Madagascar, S. E. Asia, Malaysia to tropical Africa, Australia and New Caledonia.

Ludwigia prostrata Roxb., Fl. Ind., ed. 1820 1: 441. 1820; Hoch in Grierson *et* Long, Fl. Bhutan 2(1): 312. 1991; Cook, Aqua. Wetl. Pl. Ind. 279. 1996. *Jussiaea prostrata* (Roxb.) Lév., Feddes Repert. Spec. Nov. Regni Veg. 8: 138. 1910. *Nematopyxis prostrata* Miq., Fl. Ned. Ind. 37. 1855.

Annual or short-lived perennial herbs, erect. Stems often red tinged, up to 50 cm. Lamina elliptic to narrowly elliptic, 2 – 12 × 0.3 – 2.5 cm, lateral veins 8–12 per side, acute, base narrowly cuneate. Sepals 4, deltate. Petals yellow, narrowly spatulate. Stamens as many as sepals. Stigma globose. Capsule pale Br., subcylindric, slightly 4 angled, seeds clearly visible in outline through walls. Seeds in one row per locule, free.

*Flowers & Fruits:*June to December.

Specimen Cited: Medlajhora, *Goutam & AP Das 0287*, dated 10. 02. 2009.

Local Distribution: Marshy low land areas.

General Distribution: India: tropicals; Bhutan, Nepal, China, Indonesia, Philippines, Sri Lanka.

Order 44: Brassicales Bromhead (1838)

Brassicaceae Lindl., Nat. Syst. ed. 2. 58. 1836 (*nom. alt*. vs. Cruciferae *nom. cons*.)

Key to the genera

1a. Basal leaves rosulate; fruit indehiscent ..... ***Cardamine***

1b. Basal leaves cauline; fruit dehiscent 2

2a. Cauline leaves entire ..... ***Brassica***

2b. Some cauline leaves coarsely dentate to pinnately divided ..... ***Rorippa***

BRASSICA L., Sp. Pl. 2: 666. 1753.

Brassica rapa L., Sp. Pl. 666. 1753; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 420. 1984. *Brassica chinensis* L., Cent. Pl. I: 19. 1755. *Brassica pekinensis* (Lour.) Rupr., Fl. Ingr. 96. 1860. *Brassica arvensis* Hablitz, Descr. Phys. Taur. 146. 1788.

Local name: Sorshe.

Annual or biennial herbs. Stems erect, simple or branched above. Basal and lowermost cauline leaves petiolate; petiole slender or thickened and fleshy, sometimes strongly winged; lamina ovate to oblong lanceolate, 10 – 30 × 3 – 10cm, entire, repand or dentate, sometimes pinnatifid

or pinnatisect and with a large terminal lobe and smaller, 1–6, oblong or ovate lateral lobes on each side of midvein. Upper cauline leaves sessile, ovate, oblong, or lanceolate, base amplexicaul, deeply cordate, or auriculate, margin entire or repand. Flowers in racemes. Sepals oblong. Petals bright yellow, obovate, apex rounded. Fruit linear terete, sessile. Seeds dark Br., globose.

Flowers & Fruits: March to June.

Specimen Cited: Dhupjhora village, *Goutam & AP Das 0173*, dated 08. 02. 2009.

Local Distribution: Villages and crop fields.

General Distribution: India: widely cultivated.

CARDAMINE L., Sp. Pl. 2: 654. 1753.

Cardamine hirsuta L., Sp. Pl. 655. 1753; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 431. 1984. *Cardamine multicaulis* Hoppe *ex* Schur, Enum. Pl. Transsilv. 47. 1866. *Cardamine tenella* Clarke, Trav. Var. Eur. 2: 117. 1812.

Annual herbs. Stems erect, ascending or decumbent. Basal leaves rosulate; petiole ciliate; lamina 2.5 – 8 cm, lyrate pinnatisect; terminal lobe reniform or orbicular, entire, repand or 3 – 5 lobed.

Fruiting pedicels erect or ascending, slender. Sepals oblong. Petals white, spatulate. Stamens 4. Ovules 14 – 40 per ovary. Fruit linear; valves glabrous. Seeds light Br..

Flowers & Fruits: March to August.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0119*, dated 07. 02. 2009.

Local Distribution: Dhupjhora Beat Office and Garden areas.

General Distribution: India: pantropical areas; Bhutan, China, Sri Lanka, Pakistan, Indonesia, Malaysia,Japan, Laos, New Guinea, Philippines, Thailand, Turkmenistan, Vietnam; SWAsia, Europe; naturalized in S Africa, Australia, North and South America.

RORIPPA Scopoli, Fl. Carniol. 520. 1760.

Rorippa benghalensis (DC.) Hara, Jour. Jap. Bot. 49: 132. 1974. *Nasturtium benghalense* DC., Syst. Nat. 2: 198. 1821. *Sinapis benghalensis* Roxb. *ex* DC., Syst. Nat. 2: 198. 1821 (prosyn.). *Nasturtium indicum* var. *benghalensis* (DC.) Hooker *f. et* Anderson in Hook. *f.*, Fl. Brit. Ind. 1: 134. 1872.

Annual herbs. Stems simple at base, few to many branched above. Basal leaves soon withered. Lowermost cauline leaves auriculate; lamina oblong to oblong obovate, lyrate-pinnatipartite; terminal lobe broadly ovate or oblong; lateral lobes 1 – 4, oblong or ovate, margin serrate or

dentate. Racemes bracteate throughout; bracts lanceolate linear to oblong-linear, subentire or denticulate. Sepals elliptic or oblong. Petals pale yellow, spatulate or oblanceolate. Ovules 100 – 170 per ovary. Fruit linear, straight or curved. Seeds reddish Br..

Flowers & Fruits: March to May.

Specimen Cited: Garden, *Goutam & AP Das 0107*, dated 07. 02. 2009.

Local Distribution: Dhupjhora Beat Office and Garden areas.

General Distribution: India:tropical parts; Nepal, Bhutan, Bangladesh, Indo- china and Java, Thailand, Vietnam.

Capparaceae Juss., Gen. P1. 242. 1789 (‘Capparides’); *nom. cons*.

Key to the genera:

1a. Leaves compound, with 3 leaflets ..... ***Crateva***

1b. Leaves simple ..... ***Capparis***

CAPPARIS L., Sp. Pl. 1: 503. 1753.

Key to the species:

1a. Inflorescences with 6–10 flowers ……..…… *C. multiflora*

1b. Inflorescences with 2 or 3 flowers …… *C. zeylanica*

Capparis multiflora Hook. *f.et* Thom. in Hook.*f.*, Fl. Brit. India 1: 178. 1872; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 414. 1984.

Large shrubs to small trees, up to 6m. Branches terete, slender, spineless or sometimes with small stipular spines; cataphylls subulate. lamina broadly lanceolate to oblong, 5–10 × 2.5–4 cm, base cuneate to abruptly contracted, entire, acuminate to abruptly acuminate. Inflorescences superaxillary

rows of 6–10 flowers. Sepals slightly unequal; sepals of outer whorl round, slightly larger; sepals of inner whorl round, ovate to obovate, margin membranous. Petals white, oblong. Stamens 10–12. Gynophore 6–10 mm; ovary ovoid; placentae 2; ovules several. Fruit globose.

Flowers & Fruits: January to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0504*, dated 23.07.2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: Bhutan, NE India, Myanmar, Nepal, Vietnam.

Capparis zeylanica L., Sp. Pl. ed. 2: 720. 1762. *Capparis acuminata* Roxb., Fl. Ind. 2: 566. 1824. *Capparis aeylanica* Roxb., Fl. Ind. 2: 567. 1824. *Capparis polymorpha* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42(2): 227. 1873.

Scandent shrubs or trailing. Stipular spines strong, sharp, recurved. Leaves simple; lamina elliptic-lanceolate to obovate-lanceolate, 3 – 8 × 2 – 4cm, acute, base cuneate to rounded, subleathery. Inflorescences superaxillary racemes, 2 or 3 flowered, near apex of young branches.

Sepals slightly unequal; sepals of outer whorl nearly orbicular acute to obtuse; sepals of inner whorl elliptic. Petals white to yellowish white, oblong. Stamens 30 – 45. Gynophore base gray tomentose; ovary ellipsoid; ovules many. Fruit red to purplish red when mature, globose to ellipsoid.

Flowers & Fruits: February to July.

Specimen Cited: Murti, *Goutam & AP Das 0241*, dated 09. 02. 2009.

Local Distribution: Throughout the forests.

General Distribution: Tropical India; Bhutan, China, Nepal, Indonesia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam.

CRATEVA L., Sp. Pl. 1: 444. 1753.

Crateva religiosa Forster, Diss. Pl. Esc. 45. 1786; Grierson in Grierson *et* Long, Fl. Bhut. 1(2): 412. 1984.

Local name: Barna.

Large trees; up to 25m. Petiole with minute triangular glands near rachis; lamina 5 – 9 × 3 – 4 cm, thin and leathery, abaxially gray, acuminate to abruptly acuminate. 10–25-flowere in corymbs; bracts leaflike, caducous. Flowers open as leaves emerge. Sepals ovate, acuminate. Petal white to yellow. Stamens 16–22. Fruit ovoid to obovoid. Seeds 22 – 28 per fruit, dark Br..

Flowers & Fruits: April to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0207*, dated 09. 02. 2009.

Local Distribution: Thoughout the forests.

General Distribution: India: tropical; Bhutan, Nepal, Sri Lanka, Cambodia, Indonesia, Myanmar, Thailand, Vietnam.

Caricaceae Dumort., Anal. Fam. P1. 36. 1829 (*nom. cons. prop*. vs. Papayaceae).

CARICA L., Sp. Pl. 2: 1036. 1753.

Carica papaya L., Sp. P1. 1036. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 599. 1879; Grierson *et* Long, Fl. Bhut. 2(1): 236. 1991. *Carica citriformis* Jacq., Ecl. Pl. Rar. 1: 101, t. 68-69, 1816. *Papaya*

carica Gaertn., Fruct. Sem. Pl. 2: 191, pl. 122, f. 2. 191. 1790. *Papaya edulis* Bojer, Hortus Maurit. 277. 1837. *Vasconcellea peltata* (Hook.*f. et* Arn.) DC., Prodr. 15(1): 416. 1864. *Papaya peltata* (Hook.*f. et* Arn.) Kuntze, Revis. Gen. Pl. 1: 253. 1891. *Carica peltata* Hook. *f. et* Arnot, Bot. Beechey Voy. 425. 1840.

*Local name:*Pnepe.

Shurbs. Leaves ovate or orbicular in outline, deeply palmately divided into 7 – 9 sharp tooth, pinnatifid lobes. Flowers fragrant; panicles 30 – 40 cm, lobes spreading. Female flowers on peduncles; petals lanceolate. Fruit yellow when ripe, ellipsoid or narrowly obovoid, flesh thick, orange. Seeds ellipsoid, black, wrinkled.

Flowers & Fruits: January to December.

Specimen Cited: Murti village, *Goutam & AP Das 0096*, dated 07. 02. 2009.

Local Distribution: Panted in Villages.

General Distribution: A native of West Indies; widely cultivated in warmer areas.

Moringaceae R.Br. in Denham *&* Clapperton, Trav. N. and Central Afr. 238. 1826 (‘Moringeae’); *nom. cons*.

MORINGA Adanson, Fam. Pl. 2: 318. 1763.

Moringa oleifera Lam., Encycl. 1: 398. 1785; Grierson *et* Long, Fl. Bhut. 1(2): 445. 1984. *Guilandina moringa* L., Sp. Pl. 1: 381. 1753. *Moringa zeylanica* Burm., Thes. Zeylan. 162, t. 75: 162. 1736. *Moringa moringa* (L.) Millspaugh, Field Mus. Nat. Hist., Bot. Ser. 1(7): 490. 1902. *Moringa pterygosperma* Gaertn., Fruct. Sem. Pl. 2: 314-315, pl. 147, f. 2: 314. 1791.

Local name: Sajna.

Trees. Leaves petiolate, 3 – pinnate; lamina 4–6 pairs, ovate to elliptic oblong, rounded to emarginate, base rounded to cuneate. Inflorescence a widely spreading panicle, bracteate. Flowers white to cream, fragrant. Sepals lanceolate to linear-lanceolate. Petals spatulate. Ovary hairy. Capsule 3 – valved, dehiscent. Seeds subglobose, 3 – angled.

Flowers & Fruits: June to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0171*, dated 08. 02. 2009.

Local Distribution: Cultivated at forest villages.

General Distribution: native to India; Tropical and sub-tropical parts of the world.

Order 45: Malvales Juss. *ex* Bercht. & J.Presl (1820)

Order: Malvales Juss. *ex* Bercht. & J.Presl (1820)

Bixaceae Kunth, Diss. Malv. etc. 17. 1822 (‘Bixineae’).

BIXA L., Sp. Pl. 1: 512. 1753.

Bixa orellana L., Sp. Pl. 512. 1753; Prain, Beng. Pl. 1: 230. 1903. *Bixa purpurea* Sweet, Hort. Brit. 33. 1826. *Orellana americana* (Poir.) Kuntze, Revis. Gen. Pl. 1: 44. 1891. *Orellana orellana* (L.) Kuntze, Revis. Gen. Pl. 3(2): 9. 1898.

Local name: Sindure

Shrubs or small trees, evergreen. Leaves simple, alternate; lamina abaxially pale green, adaxially deep green, cordate ovate to triangular ovate, 10 – 25 × 4 – 12 cm, palmately 5-veined, glabrous,

entire, acuminate, base rounded or subtruncate, sometimes slightly cordate. Panicles robust, often flat-topped. Sepals obovate. Petals bright pink, obovate. Stamens many; anthers yellow, apically dehiscent. Capsule subglobose or ovoid, slightly laterally compressed. Seeds numerous, red-Br..

Flowers & Fruits: Throughout the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0106*, dated 07. 02. 2009.

Local Distribution: Cultivate in forests Village.

General Distribution: India: native to tropical America; cultivated pantropically.

Dipterocarpaceae Bl., Bijdr. 1: 222. 1825 ('Dipterocarpeae').

SHOREA Roxb. *ex* Gaertn., Suppl. Carp. 47. 1805.

Shorea robusta Roxb. *ex* Gaertn. f., Suppl. Carp. 3: 48.t. 186. 1805; Clarke in Hook. *f*., Fl. Brit. Ind. 1: 306. 1874; Grierson *et* Long, Fl. Bhut. 1(2): 361. 1984.

*Local name:*Saal.

Trees, up to 40 m, deciduous; crown spreading. Stipules lanceolate, small. Leaves simple, alternate; lamina 8 – 20 × 3 – 12 cm, ovate to oblong, entire, acuminate, base obtuse to cordate, thinly leathery, midvein prominent abaxially and conspicuous adaxially, glabrous. Flowers subsessile; branches racemose, secund; bracts caducous, minute. Petals strongly contorted, linear. Sepals ovate, subequal. Stamens many. Ovary ovoid. Fruit sepals unequal, spatulate, sparsely pubescent; nut ovoid.

Flowers & Fruits: February to July.

Specimen Cited: Murti forest, *Goutam & AP Das 0648*, dated 12. 02. 2008.

Local Distribution: Forests throughout.

General Distribution: Tropical and sub-tropical parts of the world.

Malvaceae Juss., Gen. P1l. 271. 1789.

Key to the genera

1a. Leaves simple 2

1b. Leaves digitately compound 10

2a. Stamens in 2 or more bundle..... 3

2b. Stamens in single bundle..... 4

3a. Androgynophore absent; fruit a smooth capsule ..... ***Corchorus***

3b. Androgynophore present; fruit a spiny or bristly capsule ..... ***Triumfetta***

4a. Fruit a loculicidal capsule; ovary with 3–5 fused carpels 5

4b. Fruit a schizocarp, sometimes berrylike, carpels separating into separate mericarps 6

5a. Calyx caducous; capsule long and sharp-angled ..... ***Abelmoschus***

5b. Calyx persistent; capsule usually cylindrical to globose ..... ***Hibiscus***

6a. Filament tube with anthers inserted along sides 7

6b. Filament tube with anthers inserted at apex 8

7a. Epicalyx 5-lobed ..... ***Urena***

7b. Epicalyx 7–12-lobed ..... ***Malvaviscus***

8a. Epicalyx absent ..... ***Sida***

8b. Epicalyx present 9

9a. Epicalyx lobes 6 ..... ***Alcea***

9b. Epicalyx lobes 3 ..... ***Malva***

10a. Seeds with cotton 11

10b. Seeds without cotton 12

11a. Flowers bright red..... ***Bombax***

11b. Flowers pale yellow..... ***Cieba***

12a. Flowers without petals; fruit apocarpous with separate follicles 13

12b. Flowers with petals; fruit syncarpous 15

13a. Follicle 2-seeded, compressed ..... ***Firmiana***

13b. Follicle many-seeded 14

14a. Branches glabrous; seeds winged..... ***Pterygota***

14b. Branches tomentose; seeds wingless ..... ***Sterculia***

15a. Follicle spirally twisted; petals unequal ..... ***Helicteres***

15b. Follicle not spirally twisted; petals equal..... 16

16a. Flowers without staminodes ..... ***Melochia***

16b. Flowers with staminodes 17

17a. Seeds with long membranous wing ..... ***Pterospermum***

17b. Seeds wingless ..... ***Abroma***

FIRMIANA Marsili in Saggi Sci. Lett. Accad. Padova 1: 114, 116. 1786.

Firmiana colorata (Roxb.) R. Br. in Bennett *et* Brown, Pl. Jav. Rar. 235. 1844; Malick in Sharma *et* Sanjappa, Fl. India 3: 420. 1993. *Sterculia colorata* Roxb., Pl. Corom. t. 25. 1795; Mast. in Hook. *f*., Fl. Brit. India 1: 359. 1874. *Sterculia rubicunda* Wall. *ex* Mast. in Hooker *f*., Fl. Brit. India 1: 360. 1874.

Medium sized trees. Leaves 15-19 x 22-25 cm, 3lobed, base cordate, lobes acuminate; petiole 15 to 20 cm. Flowers unisexual, terminal panicled racemes; calyx tubular, reddish, tomentose outside; gynophore 1.5 – 2.5 cm; stamens 16, filaments connate into a cup around the pistillode; carpels 5, free, flattened; style short, curved. Follicle 4 – 6 cm long, compressed; seeds 2, compressed.

Flowers & Fruits: January to June.

Specimen Cited: Murti, *Goutam & AP Das 0207*, dated 09. 02. 2009.

Local Distribution: Khunia, Murti, Dhupjhora, Gorumara.

General Distribution: India: tropical; Bhutan, Nepal, Sri Lanka, Cambodia, Indonesia, Myanmar, Thailand, Vietnam.

GREWIA L., Sp. Pl. 2: 964. 1753.

Grewia serrulata DC., Prodr. 1: 510. 1824; Daniel *et* Chandra. in Sharma *et* Sanjappa, Fl. India 3: 509. 1993. *Grewia glabra* Bl., Bijdr. 115. 1825. *Grewia laevigata* sensu Mast. in Hook. *f*., Fl. Brit. India 1: 389. 1874, non Vahl 1790.

Erect shrubs to small tree, branchlets slender, glabrous. Leaves 12 – 14 x 3 – 6 cm, elliptic, serrate, sharply acuminate. Peduncle 2 – 3 cm, slender, glabrous; sepals oblong, tomentose outside; petals ovate, white; gynandrophore densely hairy; stigma fimbriate. Drupelets globose, glabrous.

Flowers & Fruits: August to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0828*, dated 09. 02. 2009.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: Indo-Malesia and Tropical Africa.

CEIBA Miller, Gard. Dict. Abr., ed. 4, [287]. 1754.

Ceiba pentandra (L.) Gaertner, Fruct. Sem. Pl. 2: 244. 1791; Nayar *et* Biswas in Sharma *et* Sanjappa, Fl. India 3: 400. 1993. *Bombax pentandrum* L., Sp. Pl. 1: 511. 1753; Mast. in Hook. *f*., Fl. Brit. India 1: 350. 1874. *Eriodendron pentandrum* (L.) Kurz, J. Asiat. Soc. Bengal, Pt. 2. Nat. Hist. 43: 113. 1874. *Ceiba pentandra* (L.) Gaertn. var. indica (DC.) Bakh. *f*., Bull. Jard. Bot. Buitenz. ser.3, 6: 195. 1924.

Trees, up to 30 m; buttresses small or absent; main branches spreading horizontally; young branches spiny. Petiole 7–18cm, longer than leaflet blade; leaflets 5–9; blades oblong to lanceolate, 5–20 × 2–6 cm, glabrous, base acuminate, entire to very minutely toothed near apex, shortly acuminate. Flowers subterminal, solitary to 15 flowered fascicles. Calyx adaxially glabrous. Petals pink to white, obovate-oblong. Filaments on staminal tube varying in length; anthers reniform. Ovary glabrous; stigma rod-shaped, 5 lobed. Capsule oblong, fruiting pedicel 7–25 cm, endocarp leathery. Seeds globose.

Flowers & Fruits: March to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1007*, dated 19. 02. 2010.

Local Distribution: Dhupjhora, Bichhabhanga.

General Distribution: Native to tropical America and possibly West Africa; now pantropical.

HELICTERES L., Sp. Pl. 2: 963. 1753.

Helicteres isora L., Sp. Pl. 2: 963. 1753; Mast. in Hook. *f*., Fl. Brit. India 1: 365. 1874; Malick in Sharma *et* Sanjappa, Fl. India 3: 426. 1993;

Shrubs to small trees, up to 6 m. Branchlets stellate puberulent. Stipules linear, caducous; petiole puberulent; lamina broadly oblong-obovate to almost circular, 10–16 × 7–15cm, thinly leathery, base rounded to obliquely cordate, serrate, truncate with shortly acuminate tip and usually lateral lobes. Inflorescences axillary, usually 2 to 3 per axil, densely clustered. Flowers 3–4 cm in diam. Epicalyx lobes subulate. Sepals usually 4–5lobed, lobes triangular, 2lipped. Petals red or purple, unequal in length, upper 2 larger, obliquely falcate. Androgynophore curved at tip. Stamens 10; staminodes 5. Ovary slightly twisted after pollination. Capsule cylindric, conspicuously spirally twisted, black when mature, with beak to 1 cm, densely. Seeds many, angular, wrinkled.

Flowers & Fruits: April to August.

Specimen Cited: Gorumara, *Goutam & AP Das 0957*, dated 09. 02. 2010.

Local Distribution: Budhuram, Gorumara, Khunia.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Indonesia, Malaysia, Thailand, Vietnam, Cambodia, Australia.

PTERYGOTA Schott *et* Endlicher, Melet. Bot. 32. 1832.

Pterygota alata (Roxb.) R. Br. in Bennett *et* Brown, Pterocymbium Jav. Rar., 234. Jun 1844; Malick in Sharma *et* Sanjappa, Fl. India 3: 455. 1993. *Sterculia alata* Roxb., Pl. Coromandel 3: 84. 1811 ["1819"]; Mast in Hook. *f*., Fl. Brit. India 1: 360. 1874. *Sterculia heynei* Bedd., Fl. Sylv. t. 230.1874.

Trees, up to 30 m. Stipules subulate, caducous; petiole 7–14 cm; lamina cordate to broadly ovate, 12–32 × 10–16 cm, both surfaces glabrescent, base cordate, entire, acute. Inflorescence axillary, paniculate, shorter than petiole. Flowers red; pedicels nearly absent. Calyx campanulate, lobes linear-lanceolate. Male flowers: androgynophore cylindric cone-shaped, puberulent. Anthers 3–5 grouped into fascicles on androgynophore top; undeveloped carpels apparent. Female flowers: androgynophore very short. Ovary globose; ovules 40–50 per carpel, in 3 rows; styles 5, curved. Follicle woody, compressed globose, adaxially corklike. Seeds many, oblong, flat.

Flowers & Fruits: November to January.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0907*, dated 09. 02. 2010.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: India, Bangladesh, Bhutan, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

ABELMOSCHUS Medikus, Malvenfam. 45. 1787.

Abelmoschus moschatus Medik., Malv. 1: 46. 1787; Blumea 14: 90. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 66. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 308. 1993. *Hibiscus abelmoschus* L., Sp. Pl. 696. 1753; Roxb., Fl. Ind. ed. 2, 3: 202. 1832; Dyer in Fl. Brit. Ind. 1: 347. 1874; J. Bom. Nat. Hist. Soc. 51: 781. 1953; *Bamia abelmoschus* (L.) R.Br. *ex* Wall., Cat. 52. 1829. *Abelmoschus betulifolia* Wall., Numer. List 87. 1829. *Abelmoschus ciliaris* Walp., Repert. Bot. Syst. 2: 308. 1843. *Hibiscus moschatus* (Medik.) Salisb., Prodr. Stirp. Chap. Allerton 387. 1796. *Hibiscus chinensis* Roxb., Hort. Beng. 51. 1814.

Local name: Muskdana.

Annual or perennial shrub. Stems glandular hairy. Lamina broadly ovate or orbicular, 4 –17 x 3 –18 cm; lamina angular, 3 – 7 lobed, upper leaves narrower, lobes linear, lanceolate, ovate to obovate – oblong, serrate or dentate, acute or acuminate, base broadly cordate. Flowers solitary, axillary. Epicalyx segments linear, persistent. Calyx stellate – tomentose outside, sericeous inside. Corolla yellow with dark purple centre, petals obovate, rounded at apex, fleshy and ciliate at base. Capsules ovoid to globose, acuminate. Seeds musk scented.

*Flowers & Fruits***:** October to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0379*, dated 21.07.2009.

Local Distribution: Plantation Sector.

General Distribution: India: tropical region; Bangladesh, China, Indo – China, Thailand, Malaysia and Fiji Islands.

HIBISCUS L., Sp. Pl. 2: 693. 1753, *nom. cons*.

Key to the species:

1a. Plants herbaceous ..... *H. sabdariffa*

1b. Plants large shrubs or trees 2

2a. Flowers pendulous; staminal column longer than corolla;

leaf blade not lobed ..... *H. rosa-sinensis*

2b. Flowers erect; staminal column shorter than corolla; leaf blade lobed ..... *H. mutabeelis*

Hibiscus mutabeelis L., Sp.Pl. 694. 1753; Roxb., Fl. Ind. ed. 2, 3: 201. 1832; Dyer in Hook. *f*. Fl. Brit. Ind. 1: 344. 1874; Hara, Fl. East. Himal. 1: 204. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2:67. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 390. 1993. *Ketmia mutabeelis* (L.) Moench, Methodus 617. 1794. *Hibiscus sinensis* Mill., Gard. Dict. ed. 8: 2. 1768. *Hibiscus javanicus* Weinm., Syll. Pl. Nov. 2: 172. 1828. *Abelmoschus mutabeelis* (L.) Wall. *ex* Hassk., Cat. Hort. Bot. Bogor. 198. 1844. *Hibiscus immutabeelis* Dehnhigh, Mem. sop. alc. piant. nuov. 4. 1836.

Local name: Sthal Padma.

Perennial, shrubs, 6 m tall. Lamina suborbicular, 12 – 25cm across, palmately 3 – 7 lobed. Flowers solitary, axillary or sub corymbose at the top. Epicalyx segments 8 – 12, linear – lanceolate. Calyx lobes 3 – 4 x 1 cm, ovate – lanceolate. Petals obovate, 6 – 8 cm, white to pink, changing colour to more or less red in late evening. Staminal column shorter than corolla. Capsules subglobose. Seeds reniform.

Flowers & Fruits: September to December.

Specimen Cited: Murti Village, *Goutam & AP Das 0487*, dated 23.07.2009.

Local Distribution: Village area.

General Distribution: India: tropical regions; South China, Taiwan, South Japan. Widely cultivated and occasionally naturalised in the tropics.

Hibiscus rosa-sinensis L., Sp. Pl. 694. 1753; Roxb., Fl. Ind. ed. 2, 3: 194. 1832; Dyer in Fl. Brit. Ind. 1: 334. 1874; Hara, Fl. East. Himal. 1: 204. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 67. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 391. 1993; Grierson *et* Long, Fl. Bhut. 2 (1): 182. 1991. *Hibiscus boryanus* DC., Prodr. 1: 446. 1824. *Hibiscus festalis* Salisb., Prodr. Stirp. Chap. Allerton 383. 1796. *Hibiscus storckii* Seemon, Fl. Vit. 17. 1865.

Local name: Jaba.

Perennial, erect, glabrous shrubs, 2 – 3m tall. Lamina ovate to ovate – lanceolate, 4 – 10 x 3 – 5 cm; regularly serrate, acute, base rounded. Flowers solitary, axillary. Epicalyx segments 5 – 10, lanceolate, free half as long as calyx. Calyx campanulate, lanceolate. Petals obovate, red. Staminal column 5 – 9 cm long, exserted, pollen bearing in upper half only. Fruit not found.

Flowers & Fruits: Throughout the year.

Specimen Cited: Murti Village, *Goutam & AP Das 0326*, dated 21.07.2009.

Local Distribution: Village area.

General Distribution: India: Tropical India; possibly Eastern African origin. Widely cultivated throughout the tropics and subtropics.

Hibiscus sabdariffa L., Sp. Pl. 695. 1753; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 340. 1874; Hara, Fl. East Himal. 1: 204. 1966; Hara & Ohashi, Enn. Fl. Pl. Nep. 2: 67. 1979; Paul in Sharma & Sanjappa, Fl. India 3: 391. 1993; Grierson & Long, Fl. Bhut. 2 (1): 182. 1991. *Hibiscus fraternus* L., Pl. Surin. 90. 1775. *Abelmoschus cruentus* (Bertoloni) Walp., Repert. Bot. Syst. 1: 310. 1842. *Hibiscus cruentus* Bertoloni, Fl. Guatimal. 28. 1840.

Local name: Chukar, Tak-dhenrhas

Annual herbs, 1 – 2m tall. Lamina polymorphic, 5 – 10 x 1 – 2 cm, palmately 3 – 5 lobed, lobes lanceolate, ovate or oblong. Flowers solitary , axillary or in raceme by reduction of the upper leaves. Epicalyx segments 8 – 11, lanceolate to oblong elliptic. Calyx cup – shaped, fleshy after flowering. Petals obovate, 4 – 5 cm long, yellow with purple base. Staminal column shorter than petals. Capsules ovoid. Seeds reniform.

Flowers & Fruits: October to January.

Specimen Cited: Dhupjhora Village, *Goutam & AP Das 0317*, dated 21.07.2009.

Local Distribution: Village area.

General Distribution: India: tropical India; unknown origin, cultivated in the tropics.

MALVAVISCUS Fabricius, Enum. 155. 1759.

Malvaviscus arboreus Cavan., Diss. 3: 13, t. 48. f. 1. 1787; Hara, Fl. East Himal. 1: 205. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 68. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 393. 1993; Grierson *et* Long, Fl. Bhut. 2 (1): 194. 1991.

***Local name*:** Lonka joba

Erect, shrubs; shoots stellate – pubescent and with simple hairs. Lamina ovate to broadly ovate, entire or 3 – 5 lobed, 3 – 10 x 1.5 – 8 cm, acute, base rounded or cordate, margin serrate, thinly pubescent; petiole 1 – 4 cm; stipules filiform 2 – 5 mm. Pedicels 1 cm. Epicalyx segments 5 – 10, linear – oblong, 1 cm. Calyx 1 – 2 cm. Petals scarlet.

Flowers & Fruits: Throughout the year.

Specimen Cited: Murti Village, *Goutam & AP Das 0329*, dated 21.07.2009.

Local Distribution: Village area.

General Distribution: India: Cultivated throughout in India; Native in tropical America; South America, Widely cultivated in the tropics.

Note: Cultivated in forest villages.

URENA L., Sp. Pl. 2: 692. 1753.

Urena lobata L.,Sp. Pl. 692. 1753, s.l.; Masters in Hook. *f*., Fl. Brit. India 1: 329. 1872; Roxb., Fl. Ind. ed. 2, 3: 182. 1832; Hara, Fl. East Himal. 1: 206. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 69. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 380. 1993; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2(1): 194. 1991. *Urena trilobata* Velloso, Fl. Flumin. 7: t. 44t. 44. 1825. *Urena grandiflora* Candolle, Prodr. 1: 442. 1824.

Perennial undershrubs. Stems pubescent. Leaves extremely variable in size and shape, lamina 2 – 9 x 1 – 7 cm, ovate to orbicular, shallowly lobed, lobes 3 – 5, serrate to crenate, obtuse to acute, base shallowly cordate to rounded, hairy on both surfaces; stipules linear to lanceolate, acute. Flowers axillary, solitary or 2 – 3 in clusters. Epicalyx segments linear to lanceolate, acute, simple and stellate hairs towards apex inside. Calyx tubular to campanulate, lobes ovate to deltoid, shortly acuminate, hairs similar to epicalyx. Corolla pink with a purple centre; obovate, rounded at apex. Schizocarps globose, spines with 4 – 5 retrores, short, sharp hooks at the top. Seeds reniform.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0277*, dated 10. 02. 2009.

Local Distribution: Plantation sector & conservation area.

General Distribution: India: throughout in India; pantropical weed.

SIDA L., Sp. Pl. 2: 683. 1753.

Key to the species

1a. Calyx adaxially with long simple hairs along veins; mericarps smooth ..... *S. cordata*

1b. Calyx adaxially stellate pubescent or glabrous; mericarps smooth 2

2a. Mericarp awns conspicuous ..... *S. cordifolia*

2b. Mericarp awns absent 3

3a. Leaves distichous; stipules unequal ..... *S. acuta*

3b. Leaves spiral; stipules equal ..... *S. rhombifolia*

Sida acuta Burm. *f*., Fl. Ind. 147. 1768; Hara, Fl. East Himal. 1: 205. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 68. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 281. 1993; Mill. *et* Long in Grierson & Long, Fl. Bhutan 2 (1): 192. 1991; Prain, Beng. Pl. 1: 256.1903. *Sida lanceolata* Retz., Obs. Bot. 4: 119. 1786. *Sida carpinifolia* auct. *non* L. *f.* 1785; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 323. 1874. *Malvinda carpinifolia* (L. *f*.) Medik., Malvenfam. 24. 1787. *Sida carpinifolia* L. *f*., Suppl. Pl. 307. 1782.

Local name: Swet Berala.

Erect under shrubs, branched throughout, shoots thinly stellate-pubescent becoming glabrous. Lamina narrowly lanceolate to lanceolate, serrate, acute, base cuneate, rarely rounded, glabrescent, stipules of each pair unequal, filiform to linear-lanceolate. Flowers axillary, solitary or 2 – 5 flowered. Petals yellow, obovate.

Flowers & Fruits: September to May.

Specimen Cited: Road near Gate, *Goutam & AP Das 0079*, dated 06. 02. 2009.

Local Distribution: All Terrestrial Sectors.

General Distribution: India: Along roadsides up to 1200m, open places throughout; Pantropical.

Sida cordifolia L., Sp. Pl. 684. 1753; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 324. 1874; Hara, Fl. East Himal. 1: 205. 1966; Hara *et* Ohashi, Enn. Fl. Pl. Nep. 2: 68. 1979; Paul in Sharma *et* Sanjappa, Fl. India 3: 285. 1993; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2 (1): 192. 1991; Prain, Beng. Pl. 1: 256.1903. *Sida pellita* Kunth, Nov. Gen. Sp. 5: 263 1822. *Sida holosericea* Willd. *ex* Spreng., Syst. Veg. 3: 112. 1826. *Sida rotundifolia* Lam. *ex* Cavan., Diss. 1: 19, pl. 3, f. 6: 19. 1785.

Local name: Swet Berala.

Erect, under shrubs. Lamina ovate to oblong or orbicular; crenate serrate; obtuse or acute; shallowly cordate at base. Flowers axillary, solitary or 2 – 5 in clusters. Corolla yellow or cream yellow, petals obliquely obovate, truncate at apex; ciliate at base. Staminal column simple hairy or glabrous.

Flowers & Fruits: Throughout the year.

Specimen Cited: Road near Gate, *Goutam & AP Das 0100*, dated 07. 02. 2009.

Local Distribution: All terrestrial sector.

General Distribution: India: Throughout the dry waste places; Pantropical.

Sida rhomboidea Roxb. *ex* Fleming, Asiat. Res. 11. 178. 1810; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2 (1): 192. 1991; Prain, Beng. Pl. 1: 256.1903. *Sida rhombifolia* var. *rhomboidea* (Roxb. *ex* Flem.) Mast. in Hook. *f*., Fl. Brit. India 1: 324. 1874. *Sida rhombifolia* L. ssp. *rhombifolia sensu* Borss., Blumea 14: 193. 1966.

Erect or prostrate under-shrubs, much branched. Stipules linear; leaf simple, lamina rhombic to oblong lanceolate or obovate, 1–5 × 1 – 2 cm, dentate, obtuse to acute, base broadly cuneate. Flowers solitary, axillary. Pedicel 1 – 2 cm. Calyx cup-shaped, lobes triangular, apices acute. Petals yellow,

obovate, base attenuate, apex rounded. Filament tube 4 – 5 mm, glabrous. Style branches 8 – 10. Fruit semiglobose to broadly turbinate, shallowly grooved to near base. Seeds reniform, blackish.

Flowers & Fruits: September to March.

Specimen Cited: Road near Gate, *Goutam & AP Das 0132*, dated 07. 02. 2009.

Local Distribution: Road side.

General Distribution: India: Bhutan, Cambodia, Laos, Nepal, Thailand, Vietnam; pantropical.

Sida cordata (Burm. *f.*) Borss.Waalk., Blumea 14: 182. 1966; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2 (1): 192. 1991; Prain, Beng. Pl. 1: 256.1903.. *Melochia cordata* Burm. *f*., Fl. Indica 143. 1768. *Sida multicaulis* Cavan., Diss. 1: 10, pl. 1, f. 6: 10. 1785. *Sida humilis* Cav. var. *veronicaefolia* (Lamk.) Mast. in Hook. *f*., Fl. Brit. India 1: 322. 1874.

Local name: Swet Berala

Procumbent shrubs. Stems slender. Stipule filiform; leaf simple, alternate, lamina broadly ovate, 2 – 5 × 1.8 – 5 cm, crenate or dentate, acuminate, base cordate. Flowers usually solitary, axillary. Pedicel slender. Calyx cup shaped, lobes acute. Corolla yellow. Filament tube glabrous or sparsely pilose. Schizocarp nearly globose.

Flowers & Fruits: July to February.

Specimen Cited: Road near Gate, *Goutam & AP Das 0126*, dated 07. 02. 2009.

Local Distribution: Road side.

General Distribution: India: Philippines, Sri Lanka, Thailand; pantropical species of unknown origin.

ALCEA L., Sp. Pl. 2: 687. 1753.

Alcea rosea L., Sp. Pl. 687. 1753; Paul in Sharma *et* Sanjappa, Fl. India 3: 386. 1993; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2 (1): 190. 1991. *Althaea rosea* (L.) Cavan., Diss. 2. 91. t. 28. f. 1. 1786; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 319. 1874. *Althaea rosea* var. *sinensis* (Cavan.) S.Y. Hu, Fl. China Family 153: 10. 1955. *Althaea sinensis* Blanco, Fl. Filip. 552. 1837.

Erect herbs, up to 2 m tall. Leaves simple; lamina 3 – 10 x 3 – 8 cm, ovate to suborbicular, deeply 3 –7 lobed, crenate, acute, base cordate or rounded; glabrous or sparsely stellate above. Flowers solitary, axillary or in terminal raceme by replacing the upper leaves. Epicalyx segments 6 –7, ovate to lanceolate. Petals red. Staminal column 5 angled. Schizocarps depressed globose, longitudinally sulcate.

Flowers & Fruits: March to September.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0165*, dated 08. 02. 2009.

Local Distribution: Dhupjhora Beat Office.

General Distribution: Extensively cultivated.

MALVA L., Sp. Pl. 2: 687. 1753.

Malva verticillata L., Sp. Pl. 689. 1753; Masters in Fl. Brit. Ind. 1: 320. 1874; Prain, Beng. Pl. 1: 256. 1903. *Malva neilgherrensis* Wight, Icon. Ind. Orient., t. 950. 1845. Sharma *et al*., Fl. Ind. 3: 363. 1993.

Local name: Laffa sak

Biennial herbs; stem sparsely stellate velutinous. Stipules ovate-lanceolate. Leaves simple; lamina reniform to round, 5 – 11 × 5 – 10 cm, 5 – 7 lobed, lobes rounded or acute, margin crenateserrate.

Flowers 3 to many-fascicled, axillary. Epicalyx lobes filiform-lanceolate. Calyx cup-shaped. Corolla whitish to reddish, slightly longer than sepals. Filament tube 3 – 4 mm, glabrous. Style branches 10. Schizocarp flat globose. Seeds purple-Br., reniform.

Flowers & Fruits: December to March.

Specimen Cited: Murti Village, *Goutam & AP Das 0205*, dated 09. 02. 2009.

Local Distribution: Cultivate at villages.

General Distribution: India: cultivated throughout; Bhutan, Korea, Mongolia, Myanmar, Pakistan; Asia, Europe, Egypt and South Africa.

CORCHORUS L., Sp. Pl. 1: 529. 1753.

Corchorus aestuens L., syst. Nat. ed. 10. 2: 1079. 1759; Sharma *et al*., Fl. Ind. 3: 485. 1993. *Corchorus acutangularis* Lam., encycl. 2: 104. 1786. Mast. in Hook. *f*., Fl. Brit. Ind. 1: 398. 1874.; Prain, Beng. Pl. 1: 259.1903.. *Corchorus acutangulus* Lam., Encycl. 2: 104. 1786. *Corchorus oppositiflorus* Hassk., Tijdschr. Natuurl. Gesch. Physiol. 12: 126. 1845. *Corchorus fuscus* Roxb., Fl. Ind. 2: 582. 1824. *Corchorus furcatus* G.Don, Gen. Hist. 1: 544. 1831. *Corchorus aesticans* Hill, Veg. Syst. ed. 14: 23. 1769.

Local name: Jangli paat

Annual herbs, up to 1 m tall. Stem brownish; branches slender. Leaves simple, alternate. Lamina ovate or broadly ovate, 4 – 6 × 3 – 4 cm, serrate, shortly acuminate or acute, base rounded, basal pair of teeth usually elongating into filiform or caudate appendages. Flowers solitary or several together in cymes, axillary or leaf-opposed. Sepals 5, narrowly oblong. Petals 5, yellow, nearly as long as sepals, obovate. Stamens many, yellow. Ovary 3 – 5 loculed, long cylindrical. Capsule cylindrical, angled, 3 – 5 valved. Seeds separated by transverse septum.

Flowers & Fruits: August to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0164*, dated 08. 02. 2009.

Local Distribution: Gorumara, Gorati Beel.

General Distribution: India, Bangladesh, Bhutan, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Central America, West Indies.

TRIUMFETTA L., Sp. Pl. 1: 444. 1753.

Triumfetta rhomboidea Jacq., Enum. Syst. Pl. 22. 1760; Mast. in Hook. *f*., Fl. Brit. India 1: 395. 1874; Mill. *et* Long in Grierson *et* Long, Fl. Bhutan 2 (1): 196. 1991; Prain, Beng. Pl. 1: 258.1903. *Bartramia indica* L., Sp. Pl. 389. 1753. *Triumfetta angulata* Lam., Encycl. 3(2): 421. 1791. *Triumfetta bartramii* L., Syst. Nat. (ed. 10) 2: 1044. 1759. *Triumfetta indica* Lam., Encycl. 3: 420. 1791. *Bartramia rhombifolia* Stokes, Bot. Mat. Med. 3: 15. 1812.

Subshrubs. Branchlets gray-Br. tomentose. Leaves simple, alternate; lamina of lower leaf broadly ovate orbicular to rhomboid, 3 lobed, 3 – 8 × 2 – 7 cm, rregularly bluntly serrate, acute, base broadly cuneate or rounded; upper leaf blades oblong-lanceolate, not lobed. Cymes 3 – 5 per axil. Sepals narrowly oblong, villous. Petals yellow, slightly shorter than sepals, hairy along margins. Stamens 10. Ovary spiny. Capsule globose, spiny, indehiscent, tip hooked.

Flowers & Fruits: August to May.

Specimen Cited: Road near Gate, *Goutam & AP Das 0078*, dated 06. 02. 2009.

Local Distribution: Road side.

General Distribution: India; throughout tropics; type from West Indies.

BOMBAX L., Sp. Pl. 1: 511. 1753, *nom. cons*.

Bombax ceiba L., Sp. Pl. 1: 511. 1753; Nayar *et* Biswas in Sharma *et* Sanjappa, Fl. India 3: 398. 1993; Grierson *et* Long, Fl. Bhut. 2(1): 195. 1991. *Bombax ceiba* Burm.*f*., Fl. Indica 145. 1768. *Bombax malabaricum* DC., Prodr. 1: 479. 1824. *Gossampinus malabarica* Merr. in Lingnan Sci. Jour. 5: 126. 1927 (publ. 1928). *Gossampinus rubra* Buch.-Ham. in Trans. Linn. Soc. London 15: 128. 1826. *Melaleuca grandiflora* Blanco, Fl. Filip. 615. 1837.

Localn ame: Simul.

Large tree, up to 25m; branches whorled, spreading horizontally; trunk buttressed at base. Leaves clustered towards branch ends, with 5 – 7 leaflets; leaflets elliptic, 9 – 16 x 4 – 5 cm, entire, caudate. Flowers appearing before leaves, solitary, axillary, borne towards branch ends. Calyx green. Petals crimson, thick, narrowly oblong – obovate. Stamens shortly united at base. Style 4 – 6 mm. Capsule ellipsoid, thickly white woolly within; seeds numerous.

Flowers & Fruits: March to April.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0435*, dated 22.07.2009.

Local Distribution: Forest and Road side near Leopard cage.

General Distribution: Tropical and sub-tropical parts of the world.

ABROMA L. *f*., Suppl. Pl. 54. 1782.

Abroma augusta L. *f*., Suppl. Pl. 341. 1782; Grierson & Long, Fl. Bhut. 2(1): 206. 1991; Prain, Beng. Pl. 1: 278.1903 (*Abroma augusta*).

Local name: Ulat Khambal

Shrubs, upto 4 m. Branchlets densely stellate velutinous. Stipules linear, caducous; Leaves simple; lamina cordate or ovate-cordate, 3 – 5 lobed, 10 – 20 × 8 – 17cm, basal veins 3 – 7, prominently raised on both surfaces, acute or acuminate, base cordate. Inflorescence cymose, 1 – 5 flowered. Flowers pendulous. Sepals lanceolate, both surfaces densely puberulent. Petals dark bluish purple, basal part as broad as long and hairy, upper part ellipticspatulate, apex acute or obtuse. Staminodes nearly spatulate, both surfaces hairy. Ovary oblong, slightly hairy; style triangular-tongue-shaped. Capsule erect, stellate hairy, 5 winged. Seeds oblong, black.

Flowers & Fruits: June to January.

Specimen Cited: Dhupjhora Village, *Goutam & AP Das 0073*, dated 06. 02. 2009.

Local Distribution: Panted in Villages.

General Distribution: India, Nepal, Bhutan, China, Malaysia.

MELOCHIA L., Sp. Pl. 2: 674 [“774”]. 1753, *nom. cons*.

Melochia corchorifolia L., Sp. Pl. 675. 1753; Mast. in Hook. *f*., Fl. Brit. Ind. 1: 374. 1874; Sharma *et al*., Fl. Ind. 3: 441. 1993; Grierson ***et*** Long, Fl. Bhut. 2(1): 206. 1991; Prain, Beng. Pl. 1: 277.1903. Guha Bakshi, Fl. Mur. Dist. 71. 1984. *Riedleia corchorifolia* (L.) DC., Prodr. 1: 491. 1824. *Geruma subtriloba* Blanco, Fl. Filip. 182. 1837. *Melochia supina* L., Sp. Pl. 675. 1753. *Melochia erecta* Burm. *f*., Fl. Indica 143. 1768. *Riedleia corchorifolia* (L.) DC., Prodr. 1: 491. 1824.

Subshrubs, less than 1 m, erect or decumbent. Branches yellow-Br., sparsely stellate puberulent. Stipules linear. Leaves simple; lamina ovate to ovate lanceolate, 2 – 6 × 1 – 2 cm, dentate, acute, base rounded or cordate, thinly papery, basal veins 5. Inflorescence a dense terminal or axillary cyme. Epicalyx lobes 4, linear, hairy. Calyx campanulate, 5 lobed, lobes triangular. Petals 5, white,

drying reddish, oblong, narrowed at base. Stamens 5, connate at base, opposite petals. Ovary sessile; styles 5, filiform. Capsule globose, 5 angular. Seeds Br.-black, ovoid, slightly triangular.

Flowers & Fruits: June to December.

Specimen Cited: Murti, *Goutam & AP Das 0383*, dated 21.07.2009.

Local Distribution: Throughout the Beel Margin.

General Distribution: India: Paleotropical.

PTEROSPERMUM Schreber, Gen. Pl. 2: 461. 1791, *nom. cons*.

Pterospermum acerifolium Willd., Sp. Pl. 3: 729. 1800; Grierson *et* Long, Fl. Bhut. 2(1): 206. 1991; Prain, Beng. Pl. 1: 278. 1903.. *Pentapetes acerifolia* L., Sp. Pl. 698. 1753. *Pterospermadendron acerifolium* (L.) Kuntze, Revis. Gen. Pl. 1: 80. 1891. *Dombeya acerifolia* (L.) Gaertn., Fruct. Sem. Pl. 2: 260. 1791.

Local name: Hati Pehenlay

Big trees. Branchlets densely velutinous. Stipules linear; petiole robust, striate; lamina nearly orbicular to oblong, 20 – 35 × 12 – 27 cm, entire or crenate, truncate, nearly pointed, base cordate, leathery; juvenile leaves palmately lobed, peltate. Flowers solitary, fragrant; epicalyx lobes fimbriate or palmately divided. Sepals linear oblong. Petals white, linearoblong, slightly cuneate, glabrous. Staminodes hairy. Ovary oblong, 5 angular; ovules many per locule. Capsule woody, cylindrical, 5 grooved, apex rounded. Seeds many per locule, obliquely ovate, flat, Br., smooth.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0473*, dated 23.07.2009.

Local Distribution: Pantation forests.

General Distribution: India, Bhutan, Bangladesh, Nepal, Laos, Malaysia, Myanmar, Thailand.

STERCULIA L., Sp. Pl. 2: 1007. 1753.

Sterculia villosa Roxb., Fl. Ind., ed. 1832, 3: 153. 1832; Dyer in Hook. *f*., Fl. Brit. Ind. 1: 355. 1874; Grierson *et* Long, Fl. Bhut. 2(1): 199. 1991; Prain, Beng. Pl. 1: 274.1903.. *Sterculia armata* Mast. In Hook. *f*., Fl. Brit. India 1: 357. 357. *Sterculia lantsangensis* Hu in Bull. Fan Mem. Inst. Biol., Bot. 8(1): 42. 1937.

*Local name:*Odal

Trees. Branchlets robust, with leaf scars, Br. stellate pubescent when young. Leaves simple; stipules lanceolate; lamina palmately 3 – 7 lobed, 17 – 22 cm, caudate, base broadly cordate, central lobe broadly ovate. Inflorescence subterminal on branchlets, paniculate. Calyx campanulate, apex acuminate. Male flowers: androgynophore curved, glabrous. Stamens 10. Female flowers: ovary globose. Style curved downward, hairy. Follicles narrowly ellipsoid, apex shortly beaked. Seeds black, oblong.

Flowers & Fruits: February to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0468*, dated 23.07.2009.

Local Distribution: Forests.

General Distribution: India, Bhutan, Cambodia, Myanmar, Nepal, Thailand. Tropical and sub-tropical parts of the world.

*Note:*Bark is used as rope

BOMBAX L., Sp. Pl. 1: 511. 1753, *nom. cons*.

Bombax ceiba L., Sp. Pl. 1: 511. 1753; Nayar & Biswas in Sharma & Sanjappa, Fl. India 3: 398. 1993; Grierson & Long, Fl. Bhut. 2(1): 195. 1991; Prain, Beng. Pl. 1: 274.1903.. *Bombax ceiba* Burm.*f*., Fl. Indica 145. 1768. *Bombax malabaricum* DC., Prodr. 1: 479. 1824. *Gossampinus malabarica* Merr. in Lingnan Sci. Jour. 5: 126. 1927 (publ. 1928). *Gossampinus rubra* Buch.-Ham. in Trans. Linn. Soc. London 15: 128. 1826. *Melaleuca grandiflora* Blanco, Fl. Filip. 615. 1837.

Local name: Simul.

Large tree, up to 25m; branches whorled, spreading horizontally; trunk buttressed at base. Leaves clustered towards branch ends, with 5 – 7 leaflets; leaflets elliptic, 9 – 16 x 4 – 5 cm, entire, caudate. Flowers appearing before leaves, solitary, axillary, borne towards branch ends. Calyx green. Petals crimson, thick, narrowly oblong – obovate. Stamens shortly united at base. Style 4 – 6 mm. Capsule ellipsoid, thickly white woolly within; seeds numerous.

Flowers & Fruits: March to April.

Specimen Cited: Gorumara, *Goutam & AP Das 0753*, dated 13.09.2009.

Local Distribution: Dhupjhora, Bichhabhanga, Gorumara, Khunia, very common.

General Distribution: Tropical and sub-tropical parts of the world.

Order 46: Sapindales Juss. *ex* Bercht. *et* Presl (1820)

Anacardiaceae R.Br. in Tuckey, Narr. Exped. Congo 431. 1818 ('Anacardieae'); *nom. cons*.

Key to the genera

1a. Leaves pinnately compound ..... ***Lannea***

1b. Leaves simple ..... ***Mangifera***

LANNEA A.Rich. in Guillemin et al., Fl. Seneg. Tent. 153. 1831, *nom. cons*.

Lannea coromandelica (Houtt.) Merr. in Jour. Arnold Arb. 19: 353. 1939; Grierson *et* Long, Fl. Bhut. 2(1): 61. 1991. *Dialium coromandelicum* Houtt., Nat. Hist. Ser. 2(2): 39. t.5. f.2. 1774. *Odina wodier* Roxb., Fl. Ind. 2: 293. 1832; Hook. *f*., Fl. Brit. India 2: 29. 1876.

*Local name:*Jiga

Deciduous trees, up to 10 m. Leaves imparipinnately compound; lamilets usually 7 pairs, ovate to oblong-ovate, 5 – 9 × 2.5 – 4 cm, entire, acuminate, base cuneate; membranous or papery. Inflorescences paniculate or racemose, appearing before leaves. Flowers unisexual, tetramerous. Calyx lobes ovate to broadly ovate. Petals yellow, ovate-oblong. Ovary glabrous, ovoid, 4- locular, usually only 1 ovule fertile. Drupes ovaoid – obovoid, red in maturity.

Flowers & Fruits: January to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0567*. dated 21. 03. 2007: *Goutam & AP Das 0595. dated 22. 03. 2007.*

Local Distribution: Dhupjhora, Murti.

General Distribution: India, Bhutan, India, Myanmar, Nepal, Sri Lanka; cultivated elsewhere in continental SE Asia, such as in Cambodia, Laos, Malaysia, Thailand, Vietnam, where it is probably naturalized.

MANGIFERA L., Sp. Pl. 1: 200. 1753.

Mangifera indica L., Sp. Pl. 1: 200. 1753; Hook. *f*., Fl. Brit. India 2: 13. 1876; Grierson *et* Long, Fl. Bhut. 2(1): 59. 1991; Chandra *et* Mukh. in Singh et al., Fl. India 5: 466. 2000; Prain, Beng. Pl. 1: 352.1903.

Local name: Aam

Trees, up to 20 m. Petiole grooved apically, inflated basally; lamina oblong to oblong-lanceolate, 12 – 20 × 3 – 5 cm, leathery, acute to long acuminate, entire, undulate, base cuneate to obtuse. Inflorescence paniculate, terminal, glabrous to tomentose-pilose; bracts lanceolate, pubescent. Pedicels articulate. Sepals ovate-lanceolate, glabrous to pubescent, acuminate. Petals light yellow, oblong to oblong-lanceolate, glabrous. Fertile stamen 1, with ovate anther; staminodes 4. Disk inflated, fleshy, 5 lobed. Ovary oblique, ovate. Drupe oblong to subreniform, greenish yellow to red.

Flowers & Fruits: March to July.

Specimen Cited: Murti village, *Goutam & AP Das 0334*, dated 21.07.2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: India, Nepal, Bangladesh, Myanmar and Malaysia.

Meliaceae Juss., Gen. Pl. 263. 1789 ('Meliae'); *nom. cons*.

Key to the genera:

1a. Fruit a capsule; seeds winged 2

1b. Fruit a drupe or berry; seeds not winged 4

2a. Filaments free ..... ***Toona***

2b. Filaments connate into a staminal tube 3

3a. Anthers inserted on apical margin of staminal tube ..... ***Chukrasia***

3b. Anthers inserted inside staminal tube ..... ***Swietenia***

4a. Fruits a capsule ..... ***Aphanamixis***

4b. Fruits a drupe 5

5a. Leaves bipinnate .... ***Melia***

5b. Leaves pinnate..... ..... ***Azadirachta***

AZADIRACHTA Juss. Mim. Mel. 68. t. 2. 1830.

Azadirachta indica Jussieu in Mem. Mus. Hist. Nat. 19: 221.t.13.f. 5. 1830; Jain *et* Bennett in Hajra *et al.,* Fl. Ind. 4: 478. 1997; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 32. 1991. *Melia azadirachta* L., Sp. Pl. 385. 1753; Hook. *f.*, Fl. Brit. Ind. 1: 544. 1875; Prain, Beng. Pl. 1: 314.1903.

Local name: Nim.

Trees, up to 10 m, deciduous. Leaves odd-pinnate, pinnate; leaflets opposite; lamilets ovate – elliptic to lanceolate, 3 – 7 × 2 – 3 cm, shortly acuminate, crenate to entire, base ± oblique and cuneate to broadly cuneate. Flowers fragrant. Calyx 5 parted; sepals ovate to oblongovate, acute. Petals lilac-colored, obovate spatulate. Staminal tube purple; anthers 10. Ovary spherical, glabrous, 5 – 8 locular, with 2 ovules per locule; style acerose; stigma capitate. Drupe globose to ellipsoid. Seed ellipsoid.

*Flowers & Fruits:*March to December.

Specimen Cited: Murti village, *Goutam & AP Das 0452*, dated 22.07.2009.

Local Distribution: Murti, Dhupjhora, Budhuram.

General Distribution: Pantropical.

Note: Cultivated widely.

CHUKRASIA Juss., Bull. Sci. Nat. Géol. 23: 239. 1830.

Chukrasia tabularis Jussieu in Mem. Mus. Hist. Nat. 19: 251. t. 22. 1830; Hook. *f.* in Hook. *f*., Fl. Brit. India 1: 568. 1875; Jain *et* Bennett in Hajra *et al.,* Fl. Ind. 4: 481. 1997; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 39. 1991.

Local name: Chikrasi.

Trees, up to 25 m. Leaves usually 30 – 50 cm; lamilets 10 – 15; lamilet ovate to oblong- lanceolate, 6 – 12 × 3 – 5 cm, papery, acute to acuminate, entire, base oblique. Thyrses lax; bracts linear. Flowers fragrant. Calyx puberulent. Petals cream-colored to ± lavender, linear-oblong to spatulate, 12 – 15 × 5 – 6 mm. Staminal tube cylindric; anthers 10, oblong. Ovary on a short disk, elongate. Capsule yellowish gray to Br., subglobose to oblong, usually 3-valved, woody. Seeds flat, oblong.

*Flowers & Fruits:*April to January.

Specimen Cited: Murti, *Goutam & AP Das 0454*, dated 22.07.2009.

Local Distribution: Murti, Dhupjhora, Budhuram, Gorumara, Khunia, Bichhabhanga.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Indonesia, Laos, Malaysia, Thailand, Vietnam.

MELIA L., Sp. Pl. 1: 384. 1753.

Melia azedarach L., Sp. Pl. 384. 1753; Hook. *f*., Fl. Brit. Ind. 1: 544. 1875; Jain *et* Bennett in Hajra *et al.,* 4: 494. 1997; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 30. 1991; Prain, Beng. Pl. 1: 313.1903.

*Local name:*Ghoranim.

Trees, up to 10 m, deciduous. Leaves odd-pinnate, 2 to 3-pinnate; leaflets opposite; lamilets ovate – elliptic to lanceolate, 3 – 7 × 2 – 3 cm, shortly acuminate, crenate to entire, base ± oblique and cuneate to broadly cuneate. Flowers fragrant. Calyx 5 parted; sepals ovate to oblongovate, acute. Petals lilac-colored, obovate spatulate. Staminal tube purple; anthers 10. Ovary spherical, glabrous, 5 – 8 locular, with 2 ovules per locule; style acerose; stigma capitate. Drupe globose to ellipsoid. Seed ellipsoid.

*Flowers & Fruits:*March to December.

Specimen Cited: Murti village, *Goutam & AP Das 0243*, dated 09. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Bichhabhanga.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Indonesia, Laos, Papua New Guinea, Philippines, Thailand, Vietnam; tropical Australia, Pacific islands.

SWIETENIA Jacq., Enum. Syst. Pl. 4. 1760.

Swietenia mahagoni (L.) Jacq., Enum. Syst. Pl. 20. 1760; Jain *et* Bennett in Hajra *et al.,* 4: 525. 1997. *Cedrela mahagoni* L., Syst. Nat., ed. 10, 2: 940. 1759.

Local name: Mehagoni.

Large trees, up to 25 m. Leaves alternate, base slightly swelling; leaflets 8 – 12; leaflet blades ovate to lanceolate, 10 – 18 × 4 – 6 cm, leathery, long acuminate, entire or with 1 to 2 serrations, base oblique. Thyrses axillary. Flowers small. Calyx cup-shaped, 5 lobed; lobes short and truncate, apex

rounded. Petals greenish white, obovate. Staminal tube subcylindric, glabrous; anthers 10. Disk annular. Ovary conic to ovoid. Capsule Br., ovoid. Seeds apically winged.

*Flowers & Fruits:*May to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0390*, dated 21.07.2009.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: India, tropical Asia. Native to tropical America.

TOONA (Endl..) Roem., Fam. Nat. Syn. Monogr. 1: 131. 1846.

Toona ciliata Roemer, Fam. Nat. Syn. Monogr. 1: 139. 1846; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 38. 1991. *Cedrela toona* Roxb. *ex* Rottler, Ges. Natur f. Freunde Berlin Neue Schriften 4: 198. 1803; Hook. *f*., Fl. Brit. Ind. 1: 568. 1875; Prain, Beng. Pl. 1: 320.1903.

Local name: Tun.

Trees, up to 25m. Leaves pilose; leaflets usually 7 – 15 pairs, glabrescent; leaflet blades lanceolate to ovate-lanceolate, 9 – 11 × 3 – 5 cm, acute to acuminate, entire, base usually asymmetric. Inflorescences pendent. Flowers sweetly scented. Sepals spatulate, margins shortly ciliate. Petals white to creamy white. Disk reddish orange. Seeds winged at both ends; wings unequal, apex narrowly obtuse.

Flowers & Fruits: January to November.

Specimen Cited: Dhupjhora Beat Office, *Goutam & AP Das 0267*, dated 10.02. 2009.

Local Distribution: Dhupjhora, Murti.

General Distribution: Tropical and sub-tropical parts of the world. India, Bangladesh, Bhutan, Nepal, Sri Lanka, Pakistan, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; E Australia, W Pacific islands.

APHANAMIXIS Bl., Bijdr. 165. 1825.

Aphanamixis polystachya (Wall.) Parker, Indian Forester 57: 486. 1931; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 35. 1991. *Amoora rohituka* (Roxb.) Wight *et* Arnott in Wight, Cat. Ind. Pl. 24. 1833; Hook. *f*., Fl. Brit. Ind. 1: 559. 1875. *Andersonia rohituka* Roxb., Fl. Ind. 2: 213. 1832. *Aglaia polystachya* Wall. in Roxburgh, Fl. Ind. 2: 429. 1824.

Local name: Lahsune

Medium trees, up to 30 m. Leaves odd- or evenpinnate, 30 – 60 cm; leaflets 7 – 21, opposite; leaflet blades oblong-elliptic to ovate, 12 – 23 × 4 – 10 cm with basal pair smallest, subleathery to leathery when mature, caudate-acuminate to obtuse, entire, base oblique and cuneate to broadly cuneate or sometimes one side rounded. Inflorescences axillary. Sepals 5, suborbicular. Petals concave. Staminal tube globose, glabrous. Ovary 3 locular. Capsule spherical-pyriform to nearly ovoid. Seeds grayish Br., oblate.

*Flowers & Fruits:*May to October.

Specimen Cited: Murti, *Goutam & AP Das 0532*, dated 23.07.2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: India,Bhutan, Indonesia, Sri Lanka, Laos, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam; Pacific islands.

Rutaceae Juss., Gen. P1. 296. 1789; *nom. cons*.

Key to the genera:

1a. Fruit follicular or drupaceous; endocarp cartilaginous; seeds with endosperm ... ***Toddalia***

1b. Fruit baccate; endocarp membranous or fleshy; seeds without endosperm 2

2a. Leaves digitately 3-foliolate 3

2b. Leaves odd-pinnately with 5 to 7 leaflets 4

3a. Plants evergreen; fruit with leathery exocarp and spongy mesocarp ..... ***Citrus***

3b. Plants deciduous; fruit with thin, parenchymatous exocarp and woody mesocarp ..... ***Aegle***

4a. Style persistent in fruit ..... ***Glycosmis***

4b. Style deciduous in fruit 5

5a. Flower buds globose ..... ***Clausena***

5b. Flower buds ellipsoid to obovoid ..... ***Murraya***

AEGLE Corrêa, Trans. Linn. Soc. London 5: 222. 1800, *nom. cons*.

Aegle marmelos (L.) Correa in Trans. Linn. Soc. London 5:223.1800; Hook. *f*., Fl. Brit. Ind. 1:516.1875; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 10. 1991. *Crateva marmelos* L., Sp. P1. 444.1753. Fl. Ind. 4: 264. 1997.

Local name: Bel.

Trees; shoots dimorphic, some spineless others bearing straight spines. Lamina ovate – elliptic, crenate, bluntly acuminate, base cuneate, glabrous or sparsely pubescent; petioles unwinged. Calyx cup-shaped. Petals elliptic oblong, white. Fruits ellipsoid or broadly ovoid.

Flowers & Fruits: March to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0598*, dated 26.07.2009.

Local Distribution: Dhupjhora, Khunia.

General Distribution: India, Myanmar and Sri Lanka.

CITRUS L., Sp. Pl. 2: 782. 1753.

Key to the species

1a. Shrubs ..... *C. limon*

1b. Trees ..... *C. maxima*

Citrus limon (L.) Osbeck, Reis Ostindien China, 250. 1765; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 22. 1991. *Citrus medica* L. var. *limon* L., Sp. Pl. 2: 782. 1753.

Local name: Lebu.

Shrubs. Branches spiny. Leaf blade ovate to elliptic, margin conspicuously crenulate, apex usually mucronate. Flowers solitary. Calyx cup-shaped. Petals purplish, inside white. Ovary subcylindric or barrel-shaped. Fruit yellow, ellipsoid to ovoid.

Flowers & Fruits: April to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0594*, dated 25.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia.

General Distribution: Tropical and sub-tropical parts of the world.

Citrus maxima (Burm.) Merrill, Interpr. Herb. Amboin. 296.1917; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 21. 1991. *Aurantium maximum* Burm. in Rumphius *et* Burm., Herb. Amboin. Auctuar. 7: Index [16]. 1755.

Local name: Jambura, Batabi Lebu

Trees; twigs spiny. Leaves obtuse, base rounded, margin obscurely crenate, pubescent along midrib beneath; petiole broadly winged. Flowers solitary or in axillary clusters. Petals white, oblong. Ovary subglobose, sharply delimited from deciduous style. Fruit globose or subpyriform; peel yellow, thick.

Flowers & Fruits: April to December.

Specimen Cited: Dhupjhora village, *Goutam & AP Das 0600*, dated 26.07.2009.

Local Distribution: Khunia, Dhupjhora, Murti.

General Distribution: Pantropical.

CLAUSENA Burm., Fl. Indica, 87, 243. 1768.

Clausena excavate Burm. *f*., Fl. Ind. 87, t. 29, 2. 1768; Hook. *f*., Fl. Brit. Ind. 1: 504. 1875; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 16. 1991; Hajra *et al.,* Fl. Ind. 4: 325. 1997; Prain, Beng. Pl. 1: 301.1903.

Local name: Bonkari.

Shrubs, up to 2 m. Leaves 21 – 27 foliolate but on young plants to 41 foliolate; lamina ovate - lanceolate to rhomboid, asymmetric, 2 – 9 × 1 – 3 cm, both surfaces pubescent, Obtuse to shortly acuminate, repand, base oblique. Inflorescences terminal; bracts opposite. Flowers globose in bud. Petals pale yellowish white, ovate to obovate. Stamens 8; filaments basally dilated, geniculate at middle, apically linear. Style stout. Fruit ellipsoid; 1 to 2 seeded.

*Flowers & Fruits:*April to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0528*, dated 23.07.2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia, Budhuram, Bichhabhanga.

General Distribution: India: tropical; Bhutan, Bangladesh, Nepal, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

GLYCOSMIS Corrêa, Ann. Mus. Natl. Hist. Nat. 6: 384. 1805, *nom. cons*.

Glycosmis pentaphylla (Retz.) Candolle, Prodr. 1: 538. 1924 ; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1) : 15. 1991. *Limonia pentaphylla* Retz., Observ. Bot. 5: 24. 1789.

Trees, up to 5m. Leaves 3 to 5 foliolate; leaflet blades oblong, 10–25 × 3–7 cm, papery, mucronate, serrate, base cuneate. Inflorescences axillary or terminal paniculate. Flowers globose in bud. Sepals broadly ovate. Petals white or pale yellow. Stamens 10. Ovary globose to broadly ovoid; style extremely short; stigma slightly expanded. Fruit reddish, subglobose.

Flowers & Fruits: July to March.

Specimen Cited: Murti forest, *Goutam & AP Das 0561*, dated 24.07.2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical parts of the world. India, Bhutan, Sri Lanka, Indonesia, Cambodia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, NW Vietnam.

MURRAYA Koenig ex L., Mant. Pl. 2: 554, 563. 1771 ["Murraea"], *nom. cons*.

Key to the species

1a. Fruits bluish black, ovoid to oblong ..... *M. koenigii*

1b. Fruit orange, narrowly ellipsoid ..... *M. paniculata*

Murraya koenigii (L.) Spreng., Syst. Veg. 2: 315. 1817; Hook. *f.*, Fl. Brit. Ind. 1: 503. 1875; Ohashi in Hara, Fl. E. Himal. 3: 75. 1975; Hara *et al*., Enn. Fl. Pl. Nep. 2: 82. 1979; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 17. 1991; Prain, Beng. Pl. 1: 302.1903. *Bergera koenigii* L., Mant. Pl. 2: 555, 563. 1771.

Local name: Kaaripata.

Shrubs, up to 5m. Leaves 17 – 31-foliolate; lamina ovate, 2–5 × 0.5–2 cm, entire, base obtuse to rounded and oblique. Inflorescences terminal, many flowered. Flowers 5 – merous, ellipsoid in bud. Sepals ovate. Petals white, oblanceolate to oblong. Stamens 10. Stigma capitate. Fruits bluish black, ovoid to oblong.

Flowers & Fruits: March to August.

Specimen Cited: Murti, *Goutam & AP Das 0679*, dated 14. 02. 2008.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical parts of the world. India, Bhutan, Nepal, Pakistan, Sri Lanka, Thailand, Laos, Vietnam.

Note: Leaves are edible

Murraya paniculata (L.) Jack, Malayan Misc. 1: 31. 1820; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 17. 1991. *Chalcas paniculata* L., Mant. Pl. 1: 68. 1767.

Local name: Kamini**.**

Shrubs, up to 6 m. Leaves 2 – 5 foliolate; petiolules less than 1 cm; lamina mostly suborbicular-ovate to elliptic, 2 – 6 × 1.5 – 3 cm, rounded to acuminate, entire to crenulate. Inflorescences terminal or axillary. Flowers 5 merous, fragrant. Sepals ovate to lanceolate, persistent in fruit. Petals white, narrowly elliptic to oblanceolate. Stamens 10. Fruit orange, narrowly ellipsoid or rarely ovoid. Seeds villous.

*Flowers & Fruits:*May to February.

Specimen Cited: Murti, *Goutam & AP Das 0642*, dated 12. 02. 2008.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Pakistan, Cambodia, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Australia, SW Pacific islands.

TODDALIA Juss., Gen. Pl. 371. 1789*, nom. cons*.

Toddalia asiatica (L.) Lam., Tabl. Encycl. 2: 116. 1797; Grierson in Grierson *et* Long, Fl. Bhut. 2 (1): 9. 1991. *Paullinia asiatica* L., Sp. Pl. 1: 365. 1753, typ. *cons*.

Local name: Belkanta.

Woody climbers, usually armed. Petiole 1 – 4 cm; leaflet blades usually sessile to subsessile, elliptic to obovate or oblanceolate, 3 – 12 × 1 – 4 cm, acuminate or rarely acute to obtuse, base narrowly cuneate to attenuate. Inflorescences up to 17 cm. Sepals 0.3 – 0.5 mm. Petals cream-white, ovate to elliptic. Stamens in male flowers 3 – 4 mm, in female flowers ligulate. Gynoecium in female flowers ovoid to ellipsoid. Fruit 5–10 mm in diam.

Flowers & Fruits: August to January.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0724*, dated 14.02. 2008.

Local Distribution: Dhupjhora, Murti.

General Distribution: Tropical and sub-tropical parts of India, Bhutan, Nepal, Bangladesh, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Madagascar.

Sapindaceae Juss., Gen. P1. 246. 1789 ('Sapindi'); *nom. cons*.

LITCHI Sonn., Voy. Indes Orient. 3: 255. 1782.

Litchi chinensis Sonnerat, Voy. Indes Orient. 3: 255-258. 1782; Long in Grierson *et* Long, Fl. Bhut. 2 (1): 72. 1991. *Nephelium litchi* Cambess, Mém. Mus. Hist. Nat. 18: 30. 1829.

Local name: Lichu

Evergreen tree, up to 30 m. Leaflets coriaceous, elliptic – lanceolate, 6–15 × 2–4 cm, sharply acuminate, base obliquely cuneate, lateral veins inconspicuous. Inflorescences terminal panicles. Calyx greenish-white. Stamens 6 to 7; filaments ca. 4 mm. Ovary densely tuberculous and hispid. Fruit globose ; pericarp dry and brittle when ripe, warted ; aril whitish, fleshy.

Flowers & Fruits: February to July.

Specimen Cited: Murti village, *Goutam & AP Das 0313*, dated 10. 02. 2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: S.E. Asia; widely cultivated in subtropical regions. Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam, New Guinea,; widely cultivated in subtropical regions.

Note: Cultivated in villages

Core-Eudicots: Asterids (fr.: Astéridées)

Order 47: Cornales Link (1829)

Cornaceae Dumort., Anal. Fam. P1. 33. 1829 ('Corneae'); Link, Handb. 2: 2. 1831.

ALANGIUM Lam., Encycl. 1: 174. 1783, *nom. cons*.

Alangium chinense (Lour.) Harms in Ber. Deutsh. Bot. Ges. 15: 24. 1897; Clement in Grierson *et* Long, Fl. Bhutan 2(1): 332. 1991. *Stylidium chinense* Lour., Fl. Cochinch. 1: 221. 1790. *Marlea begoniaefolia* Roxb., Cor. Pl. 3: 80t. 203. 1819; Clarke in Hook. *f*, Fl. Brit. Ind. 2: 743. 1879; *Stylidium chinense* Loureiro, Fl. Cochinch. 221. 1790. *Guettarda jasminiflora* Blanco, Fl. Filip. 722. 1837.

Small trees. Leaves alternate; pubescent, ovate – suborbicular or broadly subquadrate, margin entire to angular lobed, tip long acuminate, base oblique, truncate or deeply cordate, glabrous above. Flowers white, inflorescence axillary. Fruits ovoid, dark purple when ripe, glabrous.

Flowers & Fruits: March to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0640*, dated 12. 02. 2008.

Local Distribution: Dhupjhora, Murti, Gorumara.

General Distribution: India: tropical; Bhutan, Nepal, Myanmar, Malaysia, Tropical Africa.

Order 48: Ericales Bercht. ***et*** .Presl (1820)

Balsaminaceae DC., Prodr. 1: 685. 1824 ('Balsamineae'); *nom. cons*.

IMPATIENS L., Sp. Pl. 2: 937. 1753.

Key to the species

1a. Upper petal cucullate; ovary glabrous ..... *I. trilobata*

1b. Upper petal orbicular, mucronulate; ovary densly pubescent ..... *I. balsamina*

Impatiens balsamina L., Sp. Pl. 2: 938. 1753; Grey-Wilson in Grierson *et* Long, Fl. Bhut. 2 (1): 103. 1991; Prain, Beng. Pl. 1: 296.1903.

*Local name:*Dopati.

Annual herbs, up to 100 cm. Stem succulent. Leaves alternate, sometimes lowest ones opposite; lamina narrowly elliptic to oblanceolate, 4 – 12 × 1.5 – 3 cm, lateral veins 4 – 7 pairs, acuminate, deeply serrate, base cuneate. Inflorescences 1 to 3 flowered axillary fascicle without peduncles. Flowers pink, simple or double petalous. Lateral sepals 2. Lower sepal deeply navicular. Upper petal orbicular, mucronulate; lateral united petals shortly clawed, 2 lobed; basal lobes obovate-oblong, small; distal lobes suborbicular. Stamens 5; filaments linear; anthers ovoid, apex obtuse. Ovary fusiform. Capsule broadly fusiform. Seeds many, black-Br., globose.

*Flowers & Fruits:*July to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0840*, dated 12. 02. 2009.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: Native to SE Asia; cultivated worldwide.

Impatiens trilobata Colebr., Exot. Fl. 2: t. 141. 1825; Grey-Wilson in Grierson *et* Long, Fl. Bhut. 2 (1): 90. 1991. *Impatiens flavida* Hook. *f. et* Thom., J. Proc. Linn. Soc., Bot. 4: 127. 1860.

Local name: Dopati.

Annual herbs, up to 100 cm. Stem succulent. Leaves alternate, sometimes lowest ones opposite; lamina narrowly elliptic – lanceolate to oblanceolate, 3 – 10 × 1.5 – 2.5 cm, lateral veins 5 – 7 pairs, acuminate, serrate, base cuneate. Inflorescences 2 to 3 flowered axillary fascicle. Flowers pink, simple or double petalous. Lateral sepals 2. Lower sepal deeply navicular. Upper petal orbicular, mucronulate; lateral united petals shortly clawed, 2 lobed; basal lobes obovate-oblong, small; distal lobes suborbicular. Stamens 5; filaments linear; anthers ovoid, apex obtuse. Ovary fusiform. Capsule broadly fusiform. Seeds many, black, globose.

*Flowers & Fruits:*July to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0620*, dated 22.03.2009.

Local Distribution: Gorumara, Dhupjhora, Bichhabhanga; abundant.

General Distribution: Tropical Asia.

Ebenaceae Vent., Tabl. Regne V6g. 2: 443. 1799; *nom. cons*.

DIOSPYROS L., Sp. Pl. 2: 1057. 1753.

Diospyros malabarica (Desrouss.) Kosteletsky, Allg. Med. Pharm. Fl. 3: 1099. 1834; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(2): 576. 1999. *Garcinia malabarica* Desrouss. in Lam., Ency. 3: 701. 1792. *Diospyros embryopteris* Pers., Syn. 2: 624. 1807(*illegitimate*); C.B.Clarke in Hooker *f*., Fl. Brit. India 3: 556. 1882. *Embryopteris glutinifera* Roxburgh, Pl. Coromandel 1: 49. 1796. *Diospyros glutinifera* (Roxb.) Wallich, Numer. List. 4123. B. 1831.

Local name: Gaab

Trees; branchlets glabrous. Leaves coriaceous, oblong, acute-obtuse, base rounded, reticulate above; petiole stout. Flowers unisexual, fragrant, white; males in umbellate cymes, females solitary; calyx accrescent. Fruits globose, reddish, yellow when ripe.

Flowers & Fruits: May to July.

Specimen Cited: Murti, *Goutam & AP Das 0222*, dated 09. 02. 2009.

Local Distribution: Murti and Dhupjhora.

General Distribution: India, Sri Lanka, Thailand.

Lecythidaceae Poit., Mem. Mus. Hist. Nat. Paris 13: 141. t. 2-8. 1825; *nom. cons*.

Key to the genera

1a. Leaves clustered at apex of branchlets; fruits globose, many-seeded ..... ***Careya***

1b. Leaves not clustered at apex; fruits 4 angled, 1 seeded ..... ***Barringtonia***

BARRINGTONIA Forst. *et* G. Forst., Char. Gen. Pl. 38. 1775, *nom. cons*.

Barringtonia acutangula (L.) Gaertn., Fruct. 2: 97. 1791; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 508. 1879. *Eugenia acutangula* L., Sp. Pl. 471. 1753. *Butonica acutangula* (L.) Lam., Tabl. Encycl. t. 591. 1794. *Caryophyllus acutangulus* (L.) Stokes, Bot. Mat. Med. 3: 75. 1812. *Michelia acutangula* (L.) Kuntze, Revis. Gen. Pl. 1: 240. 1891.

*Local name:*Hijol.

Trees. Leaves alternate; lamina obovate or oblanceolate, obscurely denticulate, rounded, obtuse or acute, base cuneate. Racemes long, drooping, many-flowered. Sepals 4, oblong, connate below; petals 4, elliptic, obtuse, pink. Fruits 4 – angled, 1 – seeded.

Flowers & Fruits: May to December.

Specimen Cited: Murti, *Goutam & AP Das 0109*, dated 07. 02. 2009.

Local Distribution: Murti.

General Distribution: India, Bangladesh, Sri Lanka, Myanmar, Bangladesh, Australia.

CAREYA Roxb., Pl. Corom. 3: 13. 1811; *nom.cons*.

Careya arborea Roxb., Pl. Corom. 3: 14, t.218. 1819; Clarke in Hook. *f*., Fl. Brit. Ind. 2:511. 1879; Long *et* Rae in Grierson *et* Long, Fl. Bhutan 2(1): 290. 1991. *Barringtonia arborea* (Roxb.) Mueller, Fragm. 5: 184. 1866. *Careya orbiculata* Miers, Trans. Linn. Soc. London, Bot. 1: 98. 1875. *Cumbia coneanae* Buch.-Ham., Trans. Linn. Soc. London 15: 97. 1827. *Careya sphaerica* Roxb., Fl. Ind. 2: 636. 1824.

*Local name:*Kumbhi.

Deciduous trees; fibrous bark. Leaves clustered towards apex of branchlets; lamina obovate, crenate-denticulate to entire, shortly acuminate, base cuneate. Flowers sessile, in terminal cymes; calyx campanulate, lobes 4; petals 4, white. Berries globose, green, many-seeded.

Flowers & Fruits: April to July.

Specimen Cited: Murti, *Goutam & AP Das 0153*, dated 08. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Khunia, Bichhabhanga, Budhuram.

General Distribution: India, Bhutan, China, Sri Lanka, Bangladesh, Pakistan.

Primulaceae Vent., Tabl. Regne V6g. 2: 285. 1799; *nom. cons*.

Key to the genera

1a. Lamina elliptic to oblanceolate; petals nearly free ..... ***Ardisia***

1b. Lamina broadly ovate to oblong; petals campanulate ..... ***Maesa***

ARDISIA Sw., Prodr. Veg. Ind. Occ. 3: 48. 1788.

Ardisia solanacea Roxb., Pl. Coromandel 1: 27. 1795; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(2): 514. 1999.

Shrubs, glabrous. Lamina elliptic to oblanceolate, papery, base cuneate, margin subrevolute, entire, apex acute. Inflorescences at bases of new shoots, paniculate with racemose. Flowers leathery, pink. Sepals broadly ovate to reniform, ciliate, apex rounded. Petals nearly free; lobes broadly ovate, margin entire, hyaline, apex obtuse or acute. Fruits purplish red or blackish, densely black punctate.

Flowers & Fruits: February to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0249*, dated 10. 02. 2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Nepal, Singapore, Sri Lanka, cultivated in Hawaii.

MAESA Forssk., Fl. Aegypt. Arab. 66. 1775.

Maesa indica (Roxb.) Candolle, Trans. Linn. Soc. London 17(1): 134. 1834; Long *et* Rae in Grierson *et* Long, Fl. Bhut. 2(2): 507. 1999. *Baeobotrys indica* Roxb., Fl. Ind. 2: 230. 1824.

Shrubs, up to 2m tall, scandent. Leaves simple, alternate; lamina broadly ovate to oblong, 8 – 18 x 5 – 9cm, serrate-dentate or -denticulate, teeth not callose, acute or acuminate, base obtuse or subrounded, papery. Inflorescences axillary or subterminal, racemose or paniculate; bracteoles broadly ovate. Flowers white or light yellow-green. Calyx lobes broadly ovate, pellucid punctate, margin entire, sparsely ciliate. Corolla campanulate, orange punctate-lineate; lobes broadly ovate. Stamens inserted at middle of corolla tube. Style short; stigma lobed. Fruit globose or subglobose.

Flowers & Fruits: April to September.

Specimen Cited: Murti, *Goutam & AP Das 0177*, dated 08. 02. 2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India:throughout; Bhutan, China, Vietnam.

Sapotaceae Juss., Gen. Pl. 151. 1789 (‘Sapotae’); *nom. cons*.

MANILKARA Adanson, Fam. Pl. 2: 166. 1763, nom. cons.

Manilkara zapota (L.) P.Royen, Blumea 7: 410. 1953. *Achras sapota* L., Sp. Pl. ed. 2: 470. 1762. *Achras zapota* L., Sp. Pl. App.: 1190. 1753. *Pouteria mammosa* (L.) Cronquist, Lloydia 9: 287. 1946. *Sapota achras* Miller, Gard. Dict. ed. 8: 1. 1768.

Local name: Sabeda.

Shrubs or small trees. Branchlets glabrous. Leaves alternate, often closely clustered at end of branchlets; lamina obovate to obovate elliptic, 5 – 10 x 3 – 7 cm, glabrous, apex retuse, base broadly cuneate to obtuse. Flowers axillary, fascicled. Pedicel thick. Sepals ovate triangular. Corolla white or light yellow; lobes oblong. Stamens 4 – 5 mm; staminodes 2 parted, lobes linear. Ovary ovoid. Berry obovoid-oblong to ellipsoid, 1 or 2 seeded.

Flowers & Fruits: August to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0104*, dated 07. 02. 2009.

Local Distribution: Dhupjhora.

General Distribution: India: cultivate thoughout; Sri Lanka, Thailand, Vietnam, Cambodia.

Theaceae Mirb., Bull. Soc. Philom. 3: 381. 1813 (*nom. lect.* vs. Ternstroemiaceae, vide D. Don, 1825); *nom. cons*.

CAMELLIA L., Sp. Pl. 2: 698. 1753.

Camellia japonica L., Sp. Pl. 698. 1753. *Camellia florida* Salisb., Prodr. Stirp. Chap. Allerton 370. 1796. *Camellia bonnardii* Berlese *ex* Lemaire, Hort. Universel 3: 161. 1842.

Local name: Camelia.

Shrubs. Petiole glabrous or adaxially pubescent; leaf blade broadly elliptic to oblong-elliptic, 5 – 10 × 3 – 6 cm, serrulate, shortly acuminate and with an obtuse tip, base cuneate to broadly cuneate, leathery, secondary veins 6 – 9 on each side of midvein, slender, and visible on both surfaces. Flowers axillary or subterminal, solitary or paired, subsessile. Stamens glabrous; outer filament whorl basally connate. Gynoecium glabrous. Ovary ovoid, 3 loculed. Capsule globose. Seeds Brown.

Flowers & Fruits: February to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0060*, dated 07. 02. 2009.

Local Distribution: Dhupjhora.

General Distribution: India: cultivated throughout; China. Cultivated world wide.

Core-Eudicots: Asterids: Euasterids (I)

unassigned to order - Keine Ordnungseinteilung

Boraginaceae Juss., Gen. P1. 143. 1789 ('Borragineae'); *nom. cons.*

Key to the genera

1a. Inflorescences terminal and axillary, branched; flowers pedicilate ..... *Cynoglossum*

1b. Inflorescences terminal, solitary; flowers sessile ..... *Heliotropium*

CYNOGLOSSUM L., Sp. Pl. 1: 134. 1753.

Cynoglossum lanceolatum Forsskal, Fl. Aegypt. – Arab. 41.1775; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 156.1883; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 907.1999. *Cynoglossum micranthum* Desfontaines, Tab. Ecol. ed. 1: 220.1804; Hook. *f*., Fl. Brit. Ind. 4: 156.1883. *Cynoglossum racemosum* Roxb., Fl. Ind. 2: 6. 1824. *Cynoglossum hirsutum* Thunb., Prodr. Pl. Cap. 34. 1794.

Perennial herbs, up to 90 cm. Stems erect, branched, densely hispid, hairs discoid at base; branches spreading. Basal and lower stem leaves petiolate, oblong-lanceolate, 7 – 10 × 1 - 3 cm, densely pubescent, hairs discoid at base, base attenuate, apex acute; upper stem leaves sessile or short petiolate, lanceolate, smaller. Inflorescences terminal and axillary; branches spreading at an obtuse angle, ebracteate. Pedicel 1 mm. Calyx lobes ovate, pubescent outside, glabrous inside, slightly enlarged in fruit, apex obtuse. Corolla light blue, campanulate. Anthers ovoid. Style tetragonous. Nutlets ovoid-globose, 2–2.5 mm, abaxially concave, with dense glochids, marginal glochids not confluent at base.

Flowers & Fruits: April to December.

Specimen Cited: Khunia, *Goutam & AP Das 0062*, dated 26.06.2006.

Local Distribution: Dhupjhora, Gorumara, abundant.

General Distribution: India, Bhutan, China, Indo-Malayan.

HELIOTROPIUM L., Sp. Pl. 1: 130. 1753.

Heliotropium indicum L., Sp. Pl. 1: 139.1753; Clarke in Hook. *f*., Fl. Brit. Ind. 4:152.1883; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 878. 1999; Bora *et* Kumar, Flor. Div. Ass., 222. 2003. *Tiaridium indicum* Lehm., Pl. Asperif. Nacif. 14. 1818. *Heliotropium foetidum* Salisb., Prodr. Stirp. Chap. Allerton 112. 1796. *Tiaridium indicum* (L.) Lehman, Pl. Asperif. Nucif. 1: 14. 1818. *Heliophytum indicum* (L.) Candolle, Prodr. 9: 556. 1845.

Local Name: Hatisura.

Annual herbs, up to 50 cm. Stems erect, stout, much branched, strigose. Leaves alternate to subopposite; petiole 3 cm; leaf blade 5 – 10 × 3 – 4 cm, pubescent to strigose, base rounded to truncate, decurrent to petiole, margin undulate, apex acute. Cymes solitary, scorpioid, ebracteate. Flowers sessile, crowded. Calyx lobes lanceolate, strigose. Corolla light blue to bluepurple, salverform; lobes rotund, margin crispate. Anthers narrowly ovate. Ovary glabrous. Style 0.5 mm; stigma conical, pubescent. Fruit ribbed, glabrous; mericarps longitudinally ribbed.

Flowers & Fruits: September to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0810*, dated 26.07.2009.

Local Distribution: Gorumara, Dhupjhora, abundant.

General Distribution: India, Bhutan, Bangladesh, China, America, Tropical Africa and Malaysia.

Icacinaceae (Benth.) Miers, Ann. Mag. Nat. Hist. ser. 2. 9: 221. 1852; *nom. cons*.

NATSIATUM Buch.-Ham. ex Arn., Edinburgh New Philos. Jour. 16: 314. 1834.

Natsiatum herpeticum Buch.-Ham. *ex* Arnott, Edinburgh New Philos. J. 16: 314. 1834; Hook. *f.* in Hook. *f.*, Fl. Brit. India 1: 595. 1875; Ohashi in Hara, Fl. E. Himal. 1: 191. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 2: 87. 1979; Long in Grierson *et* Long, Fl. Bhut. 2(1): 135. 1991. *Natsiatum tonkinense* Gagnep., Notul. Syst. (Paris) 1: 205. 1910.

Young branches yellow – Br. strigose; old branches conspicuously lenticellate. Petiole slender; leaf blade cordate – ovate, apex acute. Flowers yellow – green. Sepals lanceolate, petals narrowly lanceolate. Drupes yellow – green, becoming black with age.

Flowers & Fruits: June to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0610*, dated 26.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Throughout India; Bhutan, China, Bangladesh, Nepal, Sri Lanka, NE Thailand, N Vietnam, NE Laos, S Myanmar.

Order 50: Gentianales Lindl. (1846)

Apocynaceae Juss., Gen. P1. 143. 1789 ('Apocineae'); *nom. cons.*

Key to the genera

1a. Carpels united only at stigmatic disc 2

1b. Carpels usually united by styles 4

2a. Erect shrubs ..... ***Calotropis***

2b. Climbing or prostrate herbs 3

3a. Corolla tube cylindrical, campanulate ..... ***Marsdenia***

3b. Corolla rotate to shallowly bowl-shaped ..... ***Dregea***

4a. Subshrubs or perennial herbs 5

4b. Climbers or Shrubs or trees 6

5a. Fruits a follicle ..... ***Catharanthus***

5b. Fruits a subglobose drupe ..... ***Rauvolfia***

6a. Leaves whorled, at least toward tips of branches ..... ***Alstonia***

6b. All leaves opposite 7

7a. Corolla lobes overlapping to left 8

7b. Corolla lobes overlapping to right 9

8a. Stamens well exserted; corona usually present ..... ***Wrightia***

8b. Stamens included or barely exserted; corona absent ..... ***Tabernaemontana***

9a. Trees; corolla lobes not caudate ..... ***Holarrhena***

9b. Climbers, corolla lobes caudate 10

10a. Corolla funnelform to subcampanulate ..... ***Vallaris***

10b. Corolla cylindric ..... ***Ichnocarpus***

CATHARANTHUS G. Don, Gen. Hist. 4: 95. 1837.

Catharanthus roseus (L.) G.Don, Gen. Hist. 4: 95. 1837; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 670. 1999. *Vinca rosea* L., Syst. Ed. 10: 944. 1759; Hook. *f*., Fl. Brit. Ind. 3: 640. 1882. *Ammocallis rosea* (L.) Small, Fl. S.E. U.S. 936. 1903. *Pervinca rosea* (L.) Moench, Methodus 463. 1794.

Local name: Nayantara.

Subshrubs or perennial herbs to 1 m tall, erect or decumbent. Young stems puberulent. Leaves obovate or elliptic, 6 x 3 cm, herbaceous, apex minutely apiculate; lateral veins 8–11 pairs. Corolla red to pink or white and then mostly with a pink; tube 2.5–3 cm, pilose inside, throat villous; lobes broadly obovate. Follicles 4 x 0.5 cm.

Flowers & Fruits: April to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1057*, dated 22.09.2010.

Local Distribution: Dhupjhora, Murti.

General Distribution: Throughout India; Bhutan, China, Bangladesh, Nepal, Sri Lanka, NE Thailand, N Vietnam, NE Laos, S Myanmar.

TABERNAEMONTANA Linnaeus, Sp. Pl. 1: 210. 1753.

Tabernamontana divaricata (L.) R. Br. in Roem. Schultes, Syst. Veg. 4: 427. 1819; Ohashi in Hara, Fl. E. Himal. 1: 259. 1966; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 675. 1999. *Nerium divaricatum* L., Sp.Pl. 209. 1753. *Tabernaemontana coronaria* (Jacq.) Willd., Enum. Hort. Bertol 275. 1809; Hooker *f*., Fl. Brit. Ind. 3: 646. 1882. *Tabernaemontana recurva* Roxb., Hort. Bengal. 20. 1814. *Nyctanthes acuminate* Burm. *f*., Fl. Indica 5. 1768. *Kopsia cochinchinensis* Kuntze, Revis. Gen. Pl. 2: 415. 1891.

Local name: Sadaful; Chaiti ful.

Shrubs or small trees 0.5–5 m tall, glabrous. Petiole 3–10 mm; leaf blade elliptic, 3–18 x 1–6 cm, apex acuminate; lateral veins 5 –17 pairs. Cymes dichotomous, 1–8-flowered; bracts scale like. Flower buds with an ovoid head, apex acute or obtuse. Calyx lobes often ciliate. Corolla white, tube 1.5–2.7 cm; lobes simple or double, obovate or broadly so, 1.5–2.7 x 0.8–2 cm. Stamens inserted at basal third of corolla tube. Follicles obliquely and narrowly ellipsoid.

Flowers & Fruits: April to November

Specimen Cited: Dhupjhora, *Goutam & AP Das 0922*, dated 25.03.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Native of Tropical Asia, widely naturalised.

CALOTROPIS R. Br., Mem. Wern. Nat. Hist. Soc. 1: 39. 1810 (preprint).

Calotropis gigantean (L.) Dryander in Aiton, Hortus Kew.ed. 2, 2: 78. 1811; Hook. *f*., Fl. Brit. Ind. 4: 17. 1883; Ohashi in Hara, Fl. E. Himal. 1: 260. 1966; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 700. 1999. *Asclepias gigantea* L., Sp. Pl. 214. 1753. *Calotropis gigantiea* (L.) R. Br. *ex* Schultes, Syst. Veg. 6: 91. 1820. *Periploca cochinchinensis* Lour., Fl. Cochinch. 1: 167. 1790.

Local name: Akanda.

Shrubs, 1–3 m tall. Leaf blade obovate-oblong or oblong, 7–25 x 3–12 cm, base cordate, apex obtuse, cottony tomentose when young, frequently glabrescent and glaucous green; lateral veins 6– 9 pairs. Cymes umbel-like, with fine woolly hairs; peduncle robust. Pedicel thick. Calyx almost flat. Flower buds cylindric. Corolla usually purplish or lilac with paler greenish base, fleshy, glabrous; lobes ovate, 1.5 x 1 cm, spreading or reflexed, margin revolute. Corona shorter than gynostegium. Follicles obliquely elliptic to oblong-lanceolate in outline, both ends incurved. Seeds broadly ovate; coma 3 – 4 cm.

Flowers & Fruits: Throughout the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0728*, dated 21.09.2008.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, Bangladesh, Nepal, Pakistan, Sri Lanka, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; tropical Africa.

DREGEA Meyer, Comm. Pl. Afr. Austr. 199. 1838, *nom. cons*.

Dregea volubilis (L. *f*.) Benth. *ex* Hook. *f*., Fl. Brit. India 4: 46. 1883. *Wattakaka volubilis* (L. *f*.) Stapf, Bot. Mag. 148: , sub pl. 8976. 1923; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 723. 1999. *Asclepias volubilis* L. *f*., Suppl. Pl. 170. 1782. *Marsdenia volubilis* (L. *f*.) Cooke, Fl. Bombay 2: 166. 1904. *Tylophora macrantha* Hance, J. Bot. 20(231): 79. 1882.

Lianas, up to 12 m. Lamina broadly ovate to suborbicular, 7 – 15 x 3 – 12 cm, acute to short acuminate, base shallowly cordate. Inflorescences pendent, many flowered. Sepals ovate-oblong. Corolla glabrous;

lobes broadly ovate, ciliate. Corona yellowish green. Anther appendages white; pollinia oblong. Ovaries pilose. Follicles narrowly ovoid. Seeds ovate, flattened, marginate.

Flowers & Fruits:May to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0610*, dated 26.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Throughout India; Bhutan, China, Bangladesh, Nepal, Sri Lanka, NE Thailand, N Vietnam, NE Laos, S Myanmar.

CHONEMORPHA G. Don, Gen. Hist. 4: 76. 1837, nom. cons.

Chonemorpha grandiflora (Roth) M. R. & Almeida, J. Bombay Nat. Hist. Soc. 90: 427. 1993. *Echites grandiflora* Roth, Nov. Pl. Sp. 136. 1821. *Chonemorpha fragrans* (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 203. 1929. *Echites fragrans* Moon, Cat. 20.1824. *Echites macrophylla* Roxb., Fl. Ind. 2:13. 1832. *Chonemorpha macrophylla* (Roxb.) G. Don, Gen. Syst. 4: 76. 1837; Wight, Ic.t. 432. 1841; Hook. *f*., Fl. Brit. India 3: 661. 1882; Gamble, Fl. Pres. Madras 818(575). 1923.

Large climbers; branches hispid. Leaves 15-20 x 14-18 cm, orbicular, obtuse, base cordate, densely tomentose above and below; nerves 10-12 pairs, regular, prominent arching below the margins; petiole 7-8 cm long. Flowers in terminal or axillary cymes; few together; pedicels stout, pubescent; calyx 5lobed, lobes obovate, obtuse; corolla tube ca. 2.5 cm long, cylindrical, glabrous lobes 5, 5-6 x 3-3.5 cm; stamens 5, included, anthers sagitate, acuminate spurred below; carpels free; style cleft below, stigma conical. Mericarps to 30 cm long, terete, glabrous; seeds many, obovate, comose; coma to 5 cm long, many, cottony.

Flowering & Fruiting: April-December.

Distribution: India, Myanmar, Sri Lanka and Andaman and Nicobar Islands. Occasional; in semi-evergreen forests. RNMK 3388, Manikkunnumala.

HOLARRHENA R.Br., Mem. Wern. Nat. Hist. Soc. 1: 62. 1811.

Holarrhena pubescens Wall. *ex* G. Don, Gen. Hist. 4: 78.1837; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 671. 1999. *Chonemorpha antidysenterica* G. Don, Gen. Hist. 4: 76. 1837.

Local name: Kurchi.

Shrubs or trees, up to 10 m tall. Branchlets with whitish, dotlike lenticels. Petiole 1–5 mm, grooved, glandular inside groove; leaf blade ovate or elliptic, 10–24 × 4–11.5 cm, membranous, pubescent, sometimes densely so abaxially, base rounded, apex acute or obtuse; lateral veins 10–15 pairs. Cymes 4–9 cm; peduncle 2 cm. Pedicel 1–3 cm. Sepals elliptic to linear. Corolla white, pubescent; lobes oblong. Anthers included, narrowly ovate, base rounded. Follicles linear, with whitish, dotlike lenticels. Seeds 1–1.6 cm.

Flowers & Fruits: April to December.

Specimen Cited: Khunia, *Goutam & AP Das 0054*, dated 28.06.2006.

Local Distribution: Khunia, Murti, Gorumara, Common.

General Distribution: , India, Bhutan, Nepal, Bangladesh, CambodiaLaos, Myanmar, Thailand.

ICHNOCARPUS R. Br., Mem. Wern. Nat. Hist. Soc. 1: 61. 1811, nom. cons.

Ichnocarpus frutescens (L.) Aiton in Aitonf., Hort. Kew. ed. 2, 2:69.1811; Hook. *f*., Fl. Brit. Ind. 3:669.1882; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 686.1999. *Apocynum frutescens* L., Sp. Pl. 213.1753. *Echites frutescens* (L.) Roxb., Hort. Bengal. 230: 20. 1814. *Gardenia volubilis* Lour., Fl. Cochinch. 148. 1790. *Ichnocarpus frutescens* (L.) R. Br., Mem. Wern. Nat. Hist. Soc. 1: 62. 1809.

Local name: Dudheli lata.

Extensively woody climber. Leaves lanceolate to elliptic – oblong 5.2 x 1.4 cm, acute – acuminate, base cuneate to obtuse, sub – coriaceous, to coriaceous, glabrous above, sparsely pubescent on main veins below; petiole 2 – 13 mm. Flowers small and fragrant, white. Calyx lobes ovate, obtuse to sub acute. Corolla tube cylindric; lobes lanceolate, tips curved, particularly around mouth. Follicles very slender, curved and divergent, 2.5 – 6 x 0.2 cm. Seeds narrow, with scanty white coma 1.2 – 1.8 cm long.

*Flowers & Fruits:*April to September.

Specimen Cited: Khunia, *Goutam & AP Das 0008*. dated 25. 06. 2006: Murti, *Goutam & AP Das 0416. dated 17. 12. 2006:* Khunia, *Goutam & AP Das 0140. dated 02. 07. 2006*

Local Distribution: Throughout the study area, abundant.

General Distribution: India, Bhutan, China, Bangladesh, Nepal, Sri Lanka, Myanmar, Java and Australia.

RAUVOLFIA L., Sp. Pl. 1: 208. 1753.

Rauvolfia serpentina (L.) Benth. ex Kurz, For. Fl. Burma 2: 171. 1877; Hook. *f*., Fl. Brit. India 3: 632. 1882; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 686.1999.

Small shrubs, up to to 1 m. Leaves in whorls of 3–5; petiole 2–5 mm; lamina ovate to oblong, 2–12 × 0.8 – 3 cm, membranous, acute or obtuse, base broadly cuneate to rounded; lateral veins 5 – 12 pairs. Peduncle 1–4 cm. Corolla white, tube urceolate, long hairy inside distal half; lobes ovate to suborbicular. Stamens inserted at corolla throat. Ovaries connate. Drupes subglobose, glabrous, connate. Seeds 2.

*Flowers & Fruits:*May to September.

Specimen Cited: Khunia, *Goutam & AP Das 77*, dated 26.06.2006.

Local Distribution: Khunia, Common.

General Distribution: Native to tropical America.

VALLARIS Burm., Fl. Indica 51. 1768.

Vallaris solanacea (Roth) Kuntze, Revis. Gen. Pl. 2: 417. 1891; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 678. 1999. *Peltanthera solanacea* Roth, Nov. Sp. 132. 1821. *Vallaris assamensis* Griff., Not. Pl. Asiat. 4: 77. 1854. *Vallaris solanacea* (Roth) Schuman, Nat. Pflanzenfam. 4(2): 186. 1895.

Climbing shrubs, often twining. Bark dirty whitish gray; flowering branchlets, slender, grayish pubescent. Petiole 0.2–1.5 cm; leaf blade elliptic to narrowly elliptic, 2–16 × 0.8–5 cm, densely pubescent on both surfaces, base cuneate or rounded; lateral veins 7–12 pairs. Flowers fragrant; pedicel 0.5 – 3 cm. Sepals ovate or narrowly elliptic. Corolla white or pale yellow, tube 5–10 mm, lobes rounded at apex. Staminal glands yellow, globose; disc shorter than ovary, apex pilose. Follicles oblong, 8 – 12 × 1.5 - 3 cm. Seeds ellipsoid, coma 3–4 cm.

Flowers & Fruits: March to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0594*. dated 22. 03. 2007: Gorumara, *Goutam & AP Das 0735. dated 12. 09. 2007:* Murti, *Goutam & AP Das 0350. dated 17. 12. 2006.*

Local Distribution: Dhupjhora, Gorumara, Murti, abundant.

General Distribution: Cambodia, India, Indonesia, Laos, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam.

WRIGHTIA R.Br., Mem. Wern. Nat. Hist. Soc. 1: 73. 1811.

Wrightia arborea (Dennstaedt) Mabberl. in Taxon 26(5/6): 533.1977. Watson in Grierson *et* Long, Fl. Bhut. 2(2): 676.1999. *Periploca arborea* Dennstaedt in Schluessel Hort. Malab. 13, 23 & 25.1818. *Wrightia tomentosa* Roem. *et* Schultes in L., Syst. Veg. 4/414. 1819; Clarke in Hook. *f*., Fl. Brit. India 3:653.1882. *Nerium tomentosum* (Roem. *et* Schultes) Roxb., Fl. Indica ed. 1832. 2: 6. 1832.

Local name: Khira.

Trees upto 20 m tall. Branches gray or Br., pubescent, lenticellate. Petiole 2 – 8mm; leaf blade elliptic to broadly elliptic - obovate, 5 – 18 × 3 – 8 cm, pubescent to glabrescent adaxially, tomentose abaxially; lateral veins 10–14 pairs. Cymes pubescent. Sepals ovate or broadly ovate. Corolla yellowish, rotate or subrotate; tube 3–8 mm, glabrous; lobes narrowly elliptic to ovate; corona scales 10, shorter than anthers, glabrous inside, apex dentate. Ovaries connate. Follicles connate, cylindric, lenticellate. Seeds linear-fusiform, coma 3 cm.

Flowers & Fruits: May to December.

Specimen Cited: Khunia, *Goutam & AP Das 0115*, dated 02. 07. 2006.

Local Distribution: Khunia, Gorumara, Budhuram, Common.

General Distribution: India, Bhutan, China, Bangladesh, Pakistan, Sri Lanka, Myanmar, Thailand.

MARSDENIA R.Br., Prodr. 460. 1810.

Marsdenia tinctoria R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 28-30. 1810; Hook. *f*., Fl. Brit. Ind. 4: 34. 1883; Ohashi in Hara, Fl. E. Himal. 1: 262. 1966; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 709. 1999. *Pergularia tinctoria* (R.Br.) Sprengel, Syst. Veg. 1: 844. 1824. *Marsdenia tinctoria* var. *tomentosa* Masamune *ex* Tsiang *et* Liis, Acta Phytotax. Sin. 12(1): 117. 1974. *Marsdenia globifera* Tsiang, Sunyatsenia 3(2-3): 199-202, pl. 22, f. 13, 199. 1936. *Asclepias tinctoria* Roxb., [H. Beng. 20. 1814. *nom. nud*.] Fl. Ind. ed. 2, 2: 43. 1832.

Climbing undershrub. Plant nearly glabrous, young parts often softly pubescent-tomentose. Leaves ovate to elliptic 7 – 17 x 3 – 9 cm, apex acuminate or caudate, base rounded to truncate, somewhat shallowly cordate, membranous, sparsely hairy, particularly on veins. Flowers white, very small, subsessile, in distinctive crowded spike-like cymose inflorescence; flowering axis 4 cm long; peduncle short; pedicels slender. Calyx lobes rouded-ovate, ciliate, sparsely puberulent. Corolla tube cylindrical, slightly swollen at base, glabrous outside; lobes very short, oblong-rounded, glabrous. Gynostegium 1.2 mm high; staminal coronal scales with caudate tips extending above; stigmatic head hidden by anthers. Follicles densely covered in fine pubescence.

Flowers & Fruits: August to Dec.

Specimen Cited: Khunia, *Goutam & AP Das 0115*. dated 02. 07. 2006.

Local Distribution: Dhupjhora, Common.

General Distribution: India, Bhutan, Nepal, Sri Lanka, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

ALSTONIA R.Br., Mem. Wern. Nat. Hist. Soc. 1: 75. 1811, *nom. cons*.

Alstonia scholaris (L.) R.Br., Mem. Wern. Nat. Hist. Soc. 1:76. 1811; Hook. *f.*, Fl. Brit. Ind. 3: 642. 1882; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 672. 1999. *Echites scholaris* L., Mant. Pl. 1:53.1767. *Pala scholaris* (L.) Roberty, Bull. Inst. Fran. Afrique Noire 15: 1426. 1953.

Local name: Chhatim.

Trees up to 40 m, glabrous. Bark gray; branchlets copiously lenticellate. Leaves in whorls of 3–10; petiole 2–3 cm; leaf blade narrowly obovate to very narrowly spatulate, 7–28 × 2–11 cm, leathery, base cuneate, apex usually rounded; lateral veins 25–50 pairs. Cymes dense, pubescent; peduncle 5–8 cm. Pedicel usually as long as or shorter than calyx. Corolla white; lobes broadly ovate or broadly obovate, overlapping to left. Ovaries distinct, pubescent. Follicles distinct, linear. Seeds oblong, margin ciliate.

Flowers & Fruits: June to December.

Specimen Cited: Gorumara,*Goutam & AP Das 0708*, dated 30. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: India, Bhutan, Bangladesh, Sri Lanka, Singapore, Malay Archipelago, tropical Australia and Africa.

Rubiaceae Juss., Gen. Pl. 196. 1789; *nom. cons*.

Key to the genera

1a. Herbs, soft subshrubs, or herbaceous vines 2

1b. Low to tall woody shrubs or trees 6

2a. Ovary and fruit densely covered by well-developed ..... ***Dentella***

2b. Ovary and fruit smooth and glabrous 3

3a. Plants extensively twininer or climber 4

3b. Plants erect or creepier but not climber 5

4a. Fruit capsular with several to numerous small angled seeds ..... ***Oldenlendia***

4b. Fruit schizocarpous, with 2 flattened winged pyrenes ..... ***Paederia***

5a. Ovules 2 or more in each locule of the ovary..... 7

5b. Ovules in 1 each locule of the ovary..... ***Mitracarpus***

6a. Calyx and corolla lobes each 6 ..... ***Richardia***

6b. Calyx and corolla lobes 3–5 ..... ***Spermacoce***

7a. Calyx tubes fused into a fleshy mass ……...…….. 8

7b. Calyx tubes distinct, free ……...……. 10

8a. Flowers fused together by their ovaries; fruit multiple ..... ***Morinda***

8b. Flowers free; fruit free 9

9a. Flowers in globose heads, terminal..... 12

9b. Flowers variously arranged in cymes, axillary 11

10a. Bracts present; corolla lobes valvate..... ***Haldina***

10b. Bracts absent; corolla lobes imbricate..... ***Neolamarckia***

11a. Style much longer than the corlla..... ***Pavetta***

11b. Style smaller corolla..... ***Coffea***

12a. Corolla lobes valvate..... ***Mussaenda***

12b. Corolla lobes twisted 13

13a. Plants armed with axillary spines …….. ***Catunaregam***

13b.Plants unarmed..... …….…..…... ***Ixora***

CATUNAREGAM Adanson, Fam. 2: 85. 1763.

Catunaregam spinosa (Thunb.) Tirveng., Bull. Mus. Hist. Nat. (Paris) Ser. 3. 35: 13. 1978; Long *et al.* in Grierson *et* Long, Fl. Bhut. 2(2): 737. 1999. *Gardenia spinosa* Thunb., Diss. Gard. 7: 16. t.2. f.4. 1780. *Gardenia dumetorum* Retz., Obs. Bot. 2: 14. 1781. *Randia dumetorum* (Retz.) Poir. var. *floribunda* (DC.) Gamble, Fl. Pres. Madras 616(434). 1921. *Randia brandisii* Gamble, Fl. Pres. Madras 616(434). 1921. *Randia spinosa* (Thunb.) Poir. in Lam., Encycl. Suppl. 2:329.1811; Hook. *f*., Fl. Brit. India 3:110.1880. *Xeromphis spinosa* (Thunb.) Keay, Bull. Jard. Bot. Brux. 28: 37. 1958.

Small trees with small straight axillary spines. Leaves opposite on short lateral branchlets, 4-4.5 x 1.5-2 cm, obovate, obtuse, tomentose below, petiolate; lateral nerves 7-9 pairs, domatia present in the nerve axils; petiole to 1.5 cm long; stipule ovate, cuspidate. Flowers solitary, terminal or lateral branches, pedicellate; calyx tube ca. 0.5 cm long, lobes obovate, hispid; corolla tube ca. 0.6 cm long, broad, densely villous at the base inside; lobes 5, ca. 1.2 cm long, obovate, twisted, white; stamens 5, anthers sessile at the mouth of the corolla; ovary 2-6-celled; ovules many; style ca. 1.2 cm long, stout; stigma fusiform, ribbed. Fruit an obovoid berry, ca. 4 x 3 cm, subglobose, glabrous; seeds many, embedded in pulp.

Flowers & Fruits: April to December.

Specimen Cited: Khunia, *Goutam & AP Das 0639*, dated 12. 02. 2008

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical Asia and Africa.

HALDINA Ridsdale, Blumea 24: 360. 1978.

Haldina cordifolia (Roxb.) Ridsd., Blumea 24: 361. 1978; Long et al. in Grierson *et* Long, Fl. Bhut. 2(2): 739. 1999. *Nauclea cordifolia* Roxb., Pl. Corom. t. 53. 1796. *Adina cordifolia* (Willd. *ex* Roxb.) Hook. *f.* in Benth. *et* Hook. *f*., Gen. PI. 2: 30.1873; Hook. *f*., Fl. Brit. India 3: 24. 1880. *Nauclea cordifolia* Willd. *ex* Roxb., PI. Corom. I: 40, t. 53 (1795); Takasi Yamazaki in Hara, Fl. E. Himal. 1: 306. 1966.

Large deciduous trees; bark pale brown; branchlets tomentose. Leaves 1315 cm across, orbicular, cordate at base, tomentose below; petiole 5-8 cm long; stipule ca. 1.3 cm long, obovate, obtuse. Heads ca. 2 cm across, globose, 2-3 together, axillary, peduncled; receptacle hispid; flowers 0.9-1 cm long, sessile; calyx tube obovoid, lobes spathulate; corolla tube ca. 0.8 cm long, 5ridged; lobes 5, ovate, acute, small; stamens 5, exserted; ovules many; style ca. 1.2 cm long, stigma globose. Capsule obovoid; seeds with tail at one end and a bifid wings at other end.

Flowers & Fruits: October to March.

Specimen Cited: Khunia, *Goutam & AP Das 0862*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Myanmar, Sri Lanka and Indo-China. Occasional; in moist deciduous forests.

IXORA L., Sp. P1. 110. 1753.

Key to the species:

1a. Calyx lobes equal to the tube ……..…… *I. coccinea*

1b. Calyx lobes minute …….. *I. nigricans*

Ixora coccinea L., Sp. Pl. 110. 1753; Hook. *f*., Fl. Brit. India 3: 145. 1880; Long *et al.* in Grierson *et* Long, Fl. Bhut. 2(2): 739. 1999.

Woody herbs to small shrubs. Leaves subsessile, oblong to oblanceolate, 58 x 2.5-3.5 cm, base subcordate, apex subacute. Cymes corymbiform, sessile; flowers dense; calyx lobes equal to the tube; corolla red, tube 3-3.5 cm long. Berry red, globose.

Flowers & Fruits: February to November.

Specimen Cited: Khunia, *Goutam & AP Das 0962*, dated 23.07.2010.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Peninsular India and Sri Lanka.

Ixora nigricans R. Br. *ex* Wight *et* Arn., Prodr. 428.1834; Hook. *f*., Fl. Brit. India 3: 148. 1880; Long *et al.* in Grierson *et* Long, Fl. Bhut. 2(2): 738. 1999.

Shrubs, young shoots glabrous. Leaves 13-16 x 4-5 cm, elliptic to oblanceolate, long-acuminate, attenuate at base; nerves 8-10 pairs, reticulate; petiole ca. 1 cm long; stipule ca. 7 mm long, ovate, acuminate. Cymes ca. 10 cm across; peduncles 4-6 cm long; flowers pedicelled, many; calyx lobes minute, acuminate; corolla tube ca. 1 cm long, slender; lobes ovate, acute; style ca. 1.6 cm long. Drupe ca. 1 cm across, subglobose. Flowering &

Flowers & Fruits: December to March.

Specimen Cited: Khunia, *Goutam & AP Das 0462*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Subtropical India, Bangladesh, Myanmar, Malesia.

MITRACARPUS Zuccarini in Schultes, Mant. 3: 210. 1827.

Mitracarpus hirtus (L.) DC., Prodr. 4: 572. 1830; Long et al. in Grierson *et* Long, Fl. Bhut. 2(2): 739. 1999. *Spermacoce hirta* L., Sp. Pl. ed. 2: 148. 1762. *Mitracarpus villosus* (Sw.) DC., Prodr. 4: 572. 1830. *Spermacoce villosa* Sw., Prodr. 29. 1788. *Mitracarpus verticillatus* (Schum. *et* Thonn.) Vatke, Linnaea 40: 196. 1876; Sebastine *et* Ramam., Bull. Bot. Surv. India 9:921. 1968; Manilal *et* Sivar., Fl. Calicut 134. 1982.

Erect herbs, 45-50 cm high, little or not branched; stems 4-angled. Leaves to 3-3.5 x 1.5-2 cm, elliptic, acute, sessile, 3-5-nerved, plicate; stipules connate, membranous, fimbriate. Flowers minute, in axillary clusters; calyx lobes 4, unequal; corolla ca. 2.5 mm long, white, tube slender, lobes ovate, obtuse; stamens 4, anthers sessile at mouth of corolla tube; ovary 2-celled; ovule solitary in each cell; style 2-fid at apex. Capsule ca. 2 mm long, obovoid, with persistent calyx lobes; seeds 2, oblong, rugose.

Flowers & Fruits: July to December.

Specimen Cited: Khunia, *Goutam & AP Das 1162*, dated 23.07.2011.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical and subtropical India, Tropical Africa and America.

MUSSAENDA L., Sp. Pl. 177. 1753.

Mussaenda Roxburghii Hook. *f*., Fl. Brit. Ind. 3: 87.1880; Takasi Yamazaki in Hara, Fl. E. Himal. 1: 312. 1966.

Climbing shrubs. Leaves 10-11 x 7-8 cm, broadly ovate, acuminate, rounded at base, thinly hairy; nerves 10-12 pairs, parallel; petiole ca. 5 cm long, slender; stipule ca. 1.2 cm long. Flowers pedicelled; larger calyx lobes 89 cm across, orbicular, hirsute, white; other calyx lobes ca. 1 cm long, linear; corolla tube 2.5-2.9 cm long, orange-yellow, slender, adpressed hairy, densely villous inside. Fruits ca. 8 x 6 mm, globose.

Flowers & Fruits: September to March.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1187*, dated 25.07.2011.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Nepal, Bhutan, Mayanmar.

NEOLAMARCKIA Bosser, Bull. Mus. Natl. Hist. Nat., B, Adansonia 6: 247. 1985.

Neolamarckia cadamba (Roxb.) Bosser in Bull. Mus. Nation. Hist. Nat. 4e ser., B. Adansonia 6: 247. 1984; Long *et al*. in Grierson *et* Long, Fl. Bhut. 2(2): 739. 1999. *Nanclea cadamba* Roxb., Fl. Ind. ed. Carey, 2: 121. 1824. *Sarcocephalus cadamba* (Roxb.) Kurz, Prelim. Rep. Forest Pegu App. A: lxxviii. 1875. *Samama cadamba* (Roxb.) Kuntze, Revis. Gen. Pl. 1: 296. 1891. *Anthocephalus cadamba* (Roxb.) Miquel, Fl. Ned. Ind. 2: 135. 1856.

Local name: Kadam.

Large decidous trees, up to 30 m; branches horizontally spreading. Lamina elliptic to oblong -elliptic, 12 – 20 x 5 - 11 cm, thinly leathery, acute, entire, base rounded; stipules lanceolate. Flowering heads solitary, terminal; peduncles stout. Calyx tube glabrous; lobes oblong, hairy. Corolla yellowish white, funnelform; lobes lanceolate. Fruiting head yellowish green at maturity. Seeds nearly 3 angled.

Flowers & Fruits: June to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0587*, dated 25.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical parts of the world.

PAVETTA L., Sp. Pl. 110. 1753.

Pavetta indica L., Sp. Pl. 110. 1753; Wight, Ic. t. 148. 1839; Hook. *f.,* Fl. Brit. India 3: 150. 1880; Takasi Yamazaki in Hara, Fl. E. Himal. 1: 314. 1966.

Shrubs, branchlets glabrescent. Leaves 13-16 x 7-9 cm, obovate or oblanceolate, apex acuminate, base acute, glabrescent in both surface; petiole 1.7- 2 cm long. Cymes corymbose, axillary and terminal; calyx ca. 3 mm, lobes obovate; corolla white, tube ca. 1.2 cm long, lobes obovate; stamens 4; ovary ca. 2 mm, style ca. 3 cm. Berry 6-8 mm across, subglobose.

Flowers & Fruits: April to July.

Specimen Cited: Dhupjhora, *Goutam & AP Das 1188*, dated 25.07.2011.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India and Sri Lanka.

SPERMACOCE L., Sp. Pl. 1: 102. 1753.

Key to the species

1a. Angles of stems narrowly winged ..... *S. alata*

1b. Angles of stems not winged ..... *S. ocymoides*

Spermacoce ocymoides Burm. *f*., Fl. Indica 34. 1768; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 819. 1999. *Bigelovia parviflora* Spreng., Syst. Veg. 1: 405. 1824. *Borreria ocymoides* (Burm. *f*.) DC., Prodr. 4: 544. 1830.

Diffuse herbs, stem distinctly 4 angled. Lamina lanceolate to elliptic – obLong, Fl. Bhut. 2 – 4 x 1 - 2 cm, acute, base cuneate; stipules membranous. Flowers in axillary clusters, sessile; tube cylindrical, limb 4 lobed. Corolla funnelform, white. Style 4 - 6 mm long; stigma 2, lobes linear. Capsule ellipsoid. Seeds ellipsoid.

Flowers & Fruits: May to June.

Specimen Cited: Khunia, *Goutam & AP Das 0632*, dated 12. 02. 2008

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Pantropical.

Spermacoce alata Aub., Hist. Pl. Guiane 60. 1775; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 818. 1999. *Borreria alata* (Aub.) Candolle, Prodr. 4: 544. 1830.

Diffuse herbs, stem distinctly 4 angled, angles narrowly winged. Lamina ovate – elliptic to oblong, 4 – 8 x 2 - 4 cm, obtuse, entire, base broadly cuneate; stipules triangular. Flowers in axillary clusters, sessile; tube cylindrical, limb 4 lobed. Corolla funnelform, white. Style 4 - 6 mm long; stigma 2, lobes linear. Capsule ovoid. Seeds ovoid to globose.

Flowers & Fruits: May to June.

Specimen Cited: Gorumara, *Goutam & AP Das 0529*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Pantropical.

COFFEA L., Sp. Pl. 1: 172. 1753.

Coffea bengalensis Roxb. *ex* Schultes, Syst. Veg. 5: 200. 1819 *et*. Fl. Ind. 1: 540. 1820; Clarke in Hook. *f*., Fl. Brit. India 3: 153. 1880; Takasi Yamazaki in Hara, Fl. E. Himal. 1: 308. 1966. *Psilanthus bengalensis* (Roxb. *ex* Schultes) Leroy, Bull. Mus. Natl. Hist. Nat., B, Adansonia 3: 252. 1981; Springate, Mill, Wood, Wright *et* Long in GriersonetLong, Fl. Bhut. 2(2): 803. 1999. *Coffea floreifoliosa* Chevalier, Rev. Bot. Appl. Agric. Trop. 18: 836. 1938. *Coffea semiexserta* Colebr. *ex* Roxb., Fl. Ind. 2: 195. 1824. *Psilanthus bababudanii* Sivarajan, Bijuet P.Mathew, Bot. Bull. Acad. Sin. n.s., 33: 212. 1992.

*Local name:*Chaiti ful.

Deciduous shrubs, up to 50 cm; branches spreading. Lamina elliptic to ovate-lanceolate, 4 – 10 x 2 – 5 cm, caudate-acuminate, entire, base rounded to acute, nerves hairy beneath. 2 – 5 flowered cymes in the axil, white. Calyx glabrous. Corolla white, funnelform, outside glabrous. Overy ellipsoid. Drupes ovoid or subglobose, black when ripe. Seeds grooved.

Flowers & Fruits: February to November.

Specimen Cited: Khunia, *Goutam & AP Das 0462*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Subtropical Himalaya, Bangladesh, Myanmar.

DENTELLA Forst. & G. Forst., Char. Gen. Pl. 13. 1775.

Key to the species

1a. Fruits densely multicellular transparent vollose ..... *D. repens*

1b. Fruits glabrous ..... *D. repens* var. *serpyllifolia*

Dentella repens (L.) Froster *et* G. Froster, Charact. Gen. Pl. 26, t. 13. 1775; Hook. *f*., in Hook. *f*., Fl. Brit. Ind. 3: 42. 1880; Prain, Beng. Pl. 1: 555. 1903; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 755. 1999. Haines, Bot. Bihar *et* Orissa Pt. IV: 443. 1922; Mooney, Suppl. Bot. Bihar *et* Orissa 71. 1950; Panda *et* Das, Fl. Sambalp., 168. 2004. *Oldenlandia repens* L., Mantius Pl. 1: 40. 1767. *Hedyotis repens* (L.) Lam., Tabl. Encycl. 1: 271. 1792.

Creeping, small herbs, much branched; adventitious roots at nodes. Leaves with short petiole; blade small, oblong-lanceolate to obovate – spatulate, 2 - 8 x 2 – 4 mm, apex acute, entire, base cuneate; stipules triangular. Flowers usually solitary in forks of branchlets, rarely axillary. Hypanthium covered in pellucid trichomes. Calyx tube 1 mm in diameter. Corolla white. Stamens included. Style 2 – 6mm. Fruit compressed globose, densely multicellular transparent vollose.

Flowers & Fruits: August to February.

Specimen Cited: Khunia, *Goutam & AP Das 0472*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical India; Bhutan, Sri Lanka, Myanmar, Singapore, Malayan Island to N. Australia and Polynesia.

Dentella repens var. ***serpyllifolia*** (Wall. *ex* Craib) Verdcourt, Kew Bull. 37: 545 1983; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 755. 1999. *Dentella serpyllifolia* Wall. *ex* Craib, Fl. Siam. 2: 27 1932.

Creeping, small herbs, much branched; adventitious roots at nodes. Leaves with short petiole; blade small, oblong-lanceolate to obovate – spatulate, 2 - 8 x 2 – 4 mm, apex acute, entire, base cuneate; stipules triangular. Flowers usually solitary in forks of branchlets, rarely axillary. Hypanthium glabrous. Calyx tube 1 mm in diameter. Corolla white. Stamens included. Style 2 – 6mm. Fruit compressed globose, glabrous.

Flowers & Fruits: August to February.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0644*, dated 12. 02. 2008.

Local Distribution: Dhupjhora.

General Distribution: Pantropical.

OLDENLENDIA L., Sp. Pl. 1: 119. 1753.

Key to the species

1a. Leaves linear; capsule globose 2

1b. Leaves elliptic to lanceolate; capsule ovate ..... *O. verticillata*

2a. Flowers in axillary corymbous Calyx lobes narrowly triangular ..... *O. corymbosa*

2b. Flowers solitary; calyx lobes ciliate ..... *O. diffusa*

Oldenlendia corymbosa L., Sp. Pl. 1: 119. 1753; Hook. *f*., Fl. Brit. Ind. 3: 64. 1880; Takasi Yamazaki in Hara, Fl. E. Himal.1: 309. 1966; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut.2(2): 766.1999. Prain, Beng. Pl. 1: 559. 1903 (Rep. ed. 1999). Guha Bakshi, Fl. Mur. Dist. 154. 1984. *Hedyotis corymbosa* (L.) Lam., Tab. Encl. 1: 272. 1791; Panda *et* Das, Fl. Sambalp., 172. 2004. *Gerontogea corymbosa* (L.) Chamisso & Schlechtendal, Linnaea 4: 154. 1829. *Hedyotis biflora* var. *corymbosa* (L.) Kurz, J. Asiat. Soc. Bengal 46(2): 133. 1877.

Diffuse, annual herbs, up to 40 cm. Leaves opposite, subsessile; lamina membranous, linear to narrowly lanceolate, 1 - 2 x 0.2 – 0.4 cm, acute, entire, base cuneate; stipules membranous, sheath-like. Inflorescence axillary, arranged in corymbous, 2 to 4 flowered; bracts minute. Flowers 4 merous. Calyx tube globose; lobes narrowly triangular. Corolla white, tubulate. Stamens inserted at corolla tube. Stigma 2 lobed. Capsule membranous, globose.

Flowers & Fruits: January to December.

Specimen Cited: Murti, *Goutam & AP Das 0599*, dated 26.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Sri Lanka, Tropical Asia, Africa, America.

Oldenlandia diffusa (Willd.) Roxb., Hort. Beng. 11. 1814; Fl. Ind. 1: 444.1820; Prain, Beng. Pl. 1: 559.1903; Hook. *f*. in Hook. *f*., Fl. Brit. Ind. 3: 65.1880; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 765. 1999. Haines, Bot. Bihar & Orissa Pt. 447. 1922; Guha Bakshi, Fl. Mur. Dist. 157. 1984. *Hedyotis duffusa* Willd., Sp. Pl. 1: 566. 1798; Panda *et* Das, Fl. Sambalp., 172. 2004. *Hedyotis diffusa* var. *extensa* (Hook. *f*.) Dutta, Taxon. Revis. Hedyotis Indian Subcont. 146. 2004. *Oldenlandia pauciflora* Roxb. *ex* Wight *et* Arnott, Prodr. Fl. Ind. Orient. 415. 1834. *Oldenlandia diffusa* var. *extensa* Hooker *f*., Fl. Brit. India 3: 65. 1880. *Oldenlandia diffusa* var. *polygonoides* Hooker *f*., Fl. Brit. India 3: 65. 1880.

Diffuse, annual herbs, up to 50 cm; stems slightly flattened. Leaves opposite, sessile; lamina membranous, linear, 1 - 5 x 0.3 mm, acute; stipules connate at base, apex aristate. Flowers 4 merous, solitary; pedicels slightly stout. Calyx tube globose, ciliate. Corolla white, tabulate; lobes ovate-oblong. Stamens inserted at corolla tube throat; anthers exserted, oblong. Stigma 2 lobed, lobes spreading. Capsule compressed globose. Seeds angled.

Flowers & Fruits: January to December.

Specimen Cited: Murti, *Goutam & AP Das 0526*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical India; S. China, Japan, Malaysia, Borneo and Philippines.

Oldenlandia verticillata L., Mant. Pl. 1: 40. 1767. *Hedyotis verticillata* (L.) Lam., Tabl. Encycl. 1: 271. 1792; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 763. 1999. *Hedyotis wallichii* Walpers, Repert. Bot. Syst. 2: 498. 1843. *Oldenlandia hispida* (Retz.) Lam., Encycl. 4: 536. 1798. *Scleromitrion crassifolium* Miq., Fl. Ned. Ind. 2: 185. 1857. *Hedyotis verticillata* (L.) Lam., Tabl. Encycl. 1: 271. 1792.

Annual, diffuse, prostrate herbs, up to 25 cm. Leaves opposite, sessile; lamina thinly leathery, elliptic to lanceolate, 2 – 5 x 1 – 2 cm, acuminate, base cuneate; stipules slightly hairy, connate at base.

Flowers sessile. Calyx tube obconical; lobes 4, lanceolate. Corolla white, lobes lanceolate. Stamens inserted at corolla tube throat; anthers exserted. Style apex inflated. Capsule ovate. Seeds many in each cell.

Flowers & Fruits: March to November.

Specimen Cited: Khunia, *Goutam & AP Das 0653*, dated 13. 02. 2008.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Nepal, Vietnam, Malaysia, Indonesia

PAEDERIA L., Syst. Nat., ed. 12, 2: 135, 189; Mant. Pl. 1: 7, 52. 1767, *nom. cons*.

Paederia foetida L., Mant. Pl. 1: 52. 1767; Fl. Ind. 2:517. 1824; Clarke in Hook. *f*., Fl. Brit. India 3:195. 1881; Takasi Yamazaki in Hara, Fl. E. Himal. 1:314. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 2:206. 1979; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2 (2): 812. 1991. *Psychotria volubilis* Roxb. *ex* Wight *et* Arnott, Prodr. Fl. Ind. Orient. 424. 1834. *Paederia tomentosa* Bl., Bijdr. 968. 1826. *Paederia scandens* var. *mairei* (Liveilli) Hara, Enum. Sperm. Jap. 2: 24. 1952. *Paederia scandens* f. *microphylla* (Honda) Hara, Enum. Sperm. Jap. 2: 25. 1952. *Paederia scandens* (Lour.) Merrill, Contr. Arnold Arbor. 8: 163. 1934. *Paederia prainii* Gandoger, Bull. Soc. Bot. France 65: 35. 1918. *Paederia foetida* var. *Sessiliflora* (Poiret) Baker, Fl. Mauritius 158. 1877.

Local name: Gondhopata.

Large climbers. Leaves opposite; lamina membranous, ovate to lanceolate, 5 – 11 x 2 – 4 cm, acute, base rounded to cordate; stipules ovate-lanceolate, bifid. Panicles axillary to terminal, spreading; bracteoles minute. Flowers subsessile. Calyx lobes triangular. Corolla outside purplish beneath whitish pubescence; lobes ovate with broad undulate margin. Fruits globose.

Flowers & Fruits: July to January.

Specimen Cited: Khunia, *Goutam & AP Das 0412*, dated 22.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Throughout India; China, Malaysia.

MORINDA L., Sp. Pl. 1: 176. 1753.

Morinda angustifolia Roxb., Pl. Coromandel 3: 32. 1815 *et*. Pl. Coromandel tab. 287. 1819; Clarke in Hook. *f*., Fl. Brit. India 3: 156. 1880; Springate, Mill, Wood, Wright *et* Long in Grierson *et* Long, Fl. Bhut. 2(2): 804. 1999. *Morinda angustifolia* var. *scabridula* Craib, Fl. Siam. 2: 174. 1934. *Morinda squarrosa* Buch.- Ham., Trans. Linn. Soc. London 13: 535. 1822.

Local name: Haldikath.

Erect, tall shrubs, up to 6 m. Leaves opposite, lamina oblong-elliptic to oblong-lanceolate, 15 - 35 x 7 - 12 cm, acuminate, entire, attenuate at base; stipules interpetiolar, acuminate. Capitulum many-flowered. Flowers sessile. Calyx tube appressed mutually at anthesis, truncate. Corolla white, incurved; limb 5 lobed; lobes ovate-lanceolate. Stamens 5; anthers linear. Style bifid at apex. Ovary 4 celled. Drupecetum white, mulberry-shaped; drupes obovate, 4 seeded.

Flowers & Fruits: March to June.

Specimen Cited: Khunia, *Goutam & AP Das 0662*, dated 13. 02. 2008.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical parts of the world.

RICHARDIA L., Sp. Pl. 1: 330. 1753.

Richardia scabra L., Sp. Pl. 330. 1753. *Spermacoce hirsuta* Willd. *ex* Roem. *et* Schultes, Syst. Veg. 3: 531. 1818. *Plethyrsis glauca* Raf., Autik. Bot. 13. 1840. *Richardia pilosa* Ruiz *et* Pavon, Fl. Peruv. 3: 50. 1802. *Richardsonia cubensis* Richard, Hist. Fis. Cuba, Bot. 11: 31. 1850.

Decumbent, annual herbs, up to 80cm; lamina ovate to elliptic lanceolate, 1 – 5 x 1 – 3cm, thickly papery, bluntly acute, ciliate, base attenuate; stipules fused with petioles into a sheath. Inflorescence a terminal, subsessile capitulum of many flowers, bracts broadly ovate. Flowers 5 merous. Calyx tube constricted at apex; lobes usually 6, lanceolate to narrowly lanceolate. Corolla white; lobes 6. Stamens 6. Ovary usually 3 celled. Stigma capitate, 3 lobed. Mericarp obovoid.

Flowers & Fruits: February to July.

Specimen Cited: Murti, *Goutam & AP Das 0494*, dated 23.07.2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Native to tropical America.

Order 51: Lamiales Bromhead (1838)

Acanthaceae Juss., Gen. P1. 102. 1789 (‘Acanthi’); *nom. cons*.

Key to the genera

1a. Large vines ..... ***Thunbergia***

1b. Prostrate or erect herbs, shrubs 2

2a. Hooklike retinacula present in fruits 3

2b. Retinacula absent in fruits ..... ***Nelsonia***

3a. Calyx lobes heteromorphic 4

3b. Calyx lobes homomorphic 5

4a. Upper lip of corolla 4-lobed and lower lip 1-lobed ..... ***Barleria***

4b. Upper lip of corolla 2-lobed and lower lip 3-lobed ..... ***Lepidagathis***

5a. Corolla lobes contorted in bud; stamens 4 6

5b. Corolla lobes not contorted in bud; stamens and staminodes 0 or 2 7

6a. Inflorescence secund with orbicular to reniform bracts ..... ***Phaulopsis***

6b. Inflorescence not second, bracts linier to oblong ..... ***Hygrophila***

7a. Ovules 3 to many per locule; seeds 6 to many per capsule ..... ***Phlogacanthus***

7b. Ovules 2 per locule; seeds 4 per capsule 8

8a. Stamens 4 11

8b. Stamens 2 9

9a. Flowers subtended by 2 involucre ..... ***Dicliptera***

9b. Flowers subtended by a single pair of bracteoles 10

10a. Inflorescence often dense with imbricate bracts 2 to 4-ranked ..... ***Rungia***

10b. Inflorescence a spike ..... ***Justicia***

11a. Bract lanceolate …… 12

11b. Bracts triangular ……... ***Asystasia***

12a. Calyx lobes linear ……..…… ***Peristrophe***

12b. Calyx lobes lanceolate ……..…….. ***Eranthemum***

PERISTROPHE Nees in Wall., Pl. Asiat. Rar. 3: 77, 112. 1832.

Peristrophe paniculata (Forsskål) Brummitt, Kew Bull. 38: 451. 1983. *Dianthera paniculata* Forssk., Fl. Aeg.-Arab. 7. 1775. *Peristrophe bicalyculata* (Retz.) Nees in Wall., Pl. Asiat. Rar. 3: 113. 1832; Clarke in Hooker *f*., Fl. Brit. India 4: 554. 1885; Takasi Yamazaki in Hara, Fl. E. Himal. 1:303. 1966.

Erect herbs, stem 6-angular. Leaves 4.5-6 x 2-3 cm, ovate, apex acute, base rounded or truncate, glabrescent above and tomentose below. Panicles axillary; pedicels 1.7-2 cm long; bracts 2, unequal, bracteoles 4, linear, hirsute; calyx lobes linear; corolla tube 5-7 mm long, hairy, lobes 6-7 mm long; filaments hairy, cells muticous; ovary oblong. Capsule ellipsoid, tomentose.

Flowers & Fruits: December to February.

Specimen Cited: Khunia, *Goutam & AP Das 0962*, dated 13. 02. 2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, Nepal, Cambodia, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Thailand, Vietnam; tropical Africa, Australia.

ERANTHEMUM L., Sp. Pl. 1: 9. 1753.

Eranthemum griffithii (Anders.) Bremek *et* Nonnenga Bremek in Verh. Nederl. Akad. Wetensch. Sect. 2, 95: 35. 1948; Takasi Yamazaki in Hara, Fl. E. Himal. 2:123. 1969;. *Daedalacanthus griffithii* Anders. in J. Linn. Soc. 9: 486. 1867; C1arke in Hook. *f*. Fl. Brit. Ind. 4: 418.1884.

Herbs up to 1 m. Stems 4 angled. Lamina lanceolate to linear-lanceolate to oblong, 6–20 × 2–4 cm, glabrous, base attenuate and decurrent onto petiole, entire or crenulate, acuminate. Spikes 3–8 cm; bracts yellowish white with green along veins, oblong to lanceolate; bracteoles lanceolate. Calyx 5 – 6 mm, outside pilose, 5 lobed to middle; lobes lanceolate. Corolla blue to light purple; lobes obovate. Stamens included; filaments glabrous. Ovary gland-tipped pubescent; style hirsute. Capsule 1–1.5 cm. Seeds gold to reddish brown to blackish.

Flowers & Fruits: December to March.

Specimen Cited: Khunia, *Goutam & AP Das 0968*, dated 13. 02. 2009.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical and sub-tropical parts of the world.

ASYSTASIA Bl., Bijdr. 796. 1826.

Asystasia macrocarpa Nees in Wall., Pl. As. Rar. 3: 89. 1832; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 495. 1885; Ohashi in Hara, Fl. E. Himal. 1: 300. 1966; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1282. 2001. *Mackaya macrocarpa* (Nees) Das, Fl. Assam 3: 447. 1939.

Ascending herbs. Stems branched, 4 angled. Lamina ovate to elliptic, 4–10 × 2–5 cm, glabrous, acuminate, entire, base truncate to rounded. Racemes axillary and terminal; bracts triangular; bracteoles linear-lanceolate. Calyx lobes linear-lanceolate, margin ciliate. Corolla white; tube basally cylindric; lobes obovate; middle lobe of lower lip with violet or maroon markings. Stamens included. Ovary ellipsoid; stigma slightly capitate, 2-lobed. Capsule pubescent. Seeds irregularly obovate.

Flowers & Fruits: June to September.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0629*. dated 22. 03. 2007.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Thailand, Indo-China peninsula to Malaysia.

BARLERIA L., Sp. Pl. 2: 636. 1753.

Key to the species

1a. Flowers in axillary and terminal dense spikes ..... *B. strigosa*

1b. Flowers in axillary cymes ..... *B. cristata*

Barleria cristata L., Sp. Pl. 636.1753; Clarke in Hook. *f*., Fl. Brit. India 4:488. 1884; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1281. 2001. *Barleria alba* Lodd., Bot. Cab. 4: t. 360. 1820. *Barleria ciliata* Roxb., Fl. Ind. 3: 38. 1832. *Barleria dichotoma* Roxb., Fl. Ind. ed. 1832 3: 39. 1832. *Barleria laciniata* Wall., Pl. Asiat. Rar. 3: 91. 1832. *Barleria indica* L. *ex* Anderson, J. Linn. Soc., Bot. 7: 115. 1864.

Local name: Jaati.

Branched, subshrubs. Leaves caducous; lamina elliptic to ovate, 2 – 10 x 1 – 4 cm, papery, acute to shortly acuminate, entire, base cuneate and decurrent. Flowers usually 2 in leaf axil or clustered on branched shoots. Bracts foliose. Two outer calyx segments ovate to lanceolate; adaxial 2 segments linear to lanceolate, margin ciliate. Corolla purple, 2 lipped; limb 5 lobed. Fertile stamens 4, didynamous. Staminode 1. Ovary compressed, long elliptic.

Flowers & Fruits: November to December.

Specimen Cited: Khunia, *Goutam & AP Das 0669*, dated 13. 02. 2008.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Indo-China, India; Islands of Indian Ocean.

Barleria strigosa Willd., Sp. Pl. 3: 379. 1800; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1281. 2001. *Barleria caerulea* Roxb., Fl. Ind. 3: 39. 1832. *Barleria polystachya* Hook. *ex* Nees, Prodr. 11: 226. 1847. *Barleria strigosa* var. *polystachya* (Nees) Clarke, Fl. Brit. India 4: 490. 1884. *Barleria strigosa* var. *terminalis* (Nees) Clarke, Fl. Brit. India 4: 490. 1884.

Much branched subshrubs. Stems subterete, coarsely fulvous strigose. Lamina elliptic to ovate, 6–15 × 2–5cm, both surfaces fulvous strigose especially along veins, acute, sub-entire, base cuneate. Flowers in axillary and terminal dense spikes; bracts oblong to elliptic-oblong; bracteoles elliptic, ciliate. Outer calyx lobes purple, ovate; inner calyx lobes yellowish Br., lanceolate. Corolla purplish red; tube basally cylindric; lobes obovate-oblong. Stamens 4; staminode 1. Ovary ovoid. Capsule ellipsoid, 4 seeded.

Flowers & Fruits: November to February.

Specimen Cited: Murti, *Goutam & AP Das 0477*. dated 18.12.2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, China, Nepal, Sri Lanka, Indonesia, Malaysia, Myanmar, Thailand, Cambodia and Vietnam.

DICLIPTERA Juss., Ann. Mus. Natl. Hist. Nat. 9: 267. 1807, *nom. cons*.

Dicliptera bupleuroides Nees in Wall., Pl. As. Rar. 3: 111. 1832; Ohashi in Hara, Fl. E. Himal. 1: 301. 1966; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1292. 2001. *Dicliptera roxburghii* Anderson, J. Linn. Soc., Bot. 9: 519. 1867. *Justicia canescens* Wall., Numer. List 72: n. 2423. 1830. *Dicliptera cardiocarpa* Nees,Pl. Asiat. Rar. 3: 111. 1832. *Dicliptera roxburghiana* var. *bupleuroides* (Nees) Clarke in Fl. Brit. India 4: 554. 1885.

Ascending herbs. Stems sulcate, pubescent. Lamina ovate, base cuneate, sub-entire, acuminate. Inflorescences axillary and subsessile, cymes, many flowered; bracts lanceolate. Calyx lobes subulate, pubescent. Corolla lip orbicular to oblong, 3 lobed, lobes ovate. Staminal filaments 2 – 2.3 mm; anther thecae spherical. Ovary pilose. Capsule pilose. Seeds ovate.

Flowers & Fruits: September to May.

Specimen Cited Murti, *Goutam & AP Das 0310*. dated 16. 12. 2006; *Khunia, Goutam & AP Das 0083*. dated 27. 06. 2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, Bangladesh, Himalayas, Afghanistan, Thailand, Indo-Chinese Peninsula.

HYGROPHILA R. Br., Prodr. 479. 1810.

Key to the species

1a. Herbs with axillary spines & flowers ……..…… *H. auriculata*

1b. Herbs with terminal dens spike, spine less ……..…… 2

2a. Flowers axillary, in whorls upward ..... *H. phlomoides*

2b. Inflorescences terminal, spikes ..... *H. polysperma*

Hygrophila auriculata (Schumach.) Heine, Kew Bull. 16(2): 172. 1962; Majumdar, Bull. Bot. Soc. Beng. 19(1): 13. 1965; Guha Bakshi, Fl. Mur. Dist. 239. 1984. Cook, Aqua. Wetl. Pl. Ind. 35. 1996. *Hygrophila spinosa* Anderson in Thwerts, Enum. Pl. Zeyl. 225. 1860 & J. Lin. Soc. (Bot) 7: 22. 1864; Hook. *f*., Fl. Brit. Ind. 4: 408. 1884; Prain, Beng. Plants 2: 802. 1903. *Astercanthus longifolia* (L.) Nees in Wall., Pl. As. Rar. 3: 90. 1832 & Candolle, Prodr. 11: 247. 1887.

Local name: Kulekhara

Vigorous perennial, spiny erect, hispid herbs. Leaves sessile, lanceolate or oblong- lanceolate, acute at both ends, sparsely hispid. Flowers in dense axillary whorls with 6 spines, bracts linear-lanceolate, hispid, calyx lobes linear-lanceolate, corolla bright bluish purple, glabrous or finely puberulent, Capsule linear oblong; 4 – 8 seeded.

Flowers & Fruits: July to December

Specimen Cited: Dhupjhora, *Goutam & AP Das 0297*. dated 16. 12. 2006.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: Tropical regions of Asia, Africa and America.

Hygrophila polysperma (Roxb.) Anderson, J. Linn. Soc. (Bot.) 9: 456. 1867; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 406. 1884; Prain, Beng. Pl. 2: 597. 1903; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1252. 2001; Majumdar, Bull. Bot. Soc. Bengal 20(2): 112. 1966. *Justicia polysperma* Roxb., Fl. Ind. 1; 119. 1832. *Hemiadelphis polyspermus* (Roxb.) Nees in Wall., Pl. As. Rar. 3: 80. 1832; Guha Bakshi, Fl. Mur. Dist. 238. 1984. *Ruellia uliginosa* Wall., Numer. List 2378. 1830.

Perennials, prostrate herbs, up to 1m. Stems 4 angled, slightly swollen above nodes. Lamina oblong-lanceolate to ovate, 2 – 4 × 1 – 1.5 cm, glabrous, subobtuse, entire, base attenuate. Inflorescences terminal, spikes; bracts ovate-elliptic to obovate. Calyx lobes lanceolate, unequal. Corolla white; lower lip 3-lobed; upper lip 2-lobed. Stamens 2, slightly exserted; staminodes 2, bristlelike. Capsule linear-oblong.

Flowers & Fruits: March to August.

Specimen Cited: Gorati, *Goutam & AP Das 0297*. dated 16. 12. 2006: *Goutam & AP Das 0308*. Dated 16. 12. 2006.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: Tropical regions of Asia, Africa and America.

Hygrophila phlomoides Nees, in Wall., Pl. Asiat. Rar. 3: 80. 1832; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1252. 2001. *Cardanthera longifolia* Buch.-Ham. *ex* Nees, Prodr. 11: 90. 1847. *Ruellia phlomoides* Wall., Numer. List 2376. 1830.

Perennial, erect herbs. Stems 4-angled, Br. strigose. Petiole hirsute; lamina elliptic to obovate – oblong, 2–10 × 1–4cm, papery, base usually attenuate, entire to slightly undulate, acute or obtuse. Flowers axillary, in whorls upward; bracteoles linear-oblong, hirsute. Calyx white hirsute, 5-lobed; lobes linear. Corolla pinkish, pubescent; lower lip oblong, 3-lobed; upper lip triangular, 2-lobed. Stamens 4. Ovary glabrous; style pubescent. Capsule pilose.

Flowers & Fruits: October to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0407*. dated 17. 12. 2006.

Local Distribution: Dhupjhora, Gorumara.

General Distribution: India, Bhutan, Indonisia, Philippines, Indo-Chine penisula, Pakistan, Thailand, Vietnam.

JUSTICIA L., Sp. Pl. 1: 15. 1753.

Key to the species

1a. Calyx unequally 5-lobed 2

1b. Calyx equally 5-lobed 3

2a. Spikes dense ..... *J. japonica*

2b. Spikes slender ..... *J. diffusa*

3a. Lamina narrowly lanceolate ..... *J. gendarussa*

3b. Lamina ovate to elliptic-ovate ..... *J. adhatoda*

Justicia adhatoda L., Sp. Pl. 1: 15. 1753, Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1287. 2001. *Adhatoda vasica* Nees in Pl. As. Rar., 3: 103. 1832; Clarke in Hook. *f*., Fl. Brit. India 4: 540. 1885. *Adhatoda zeylanica* Medik., Hist. & Commentat. Acad. Elect. Sci. Theod.-Palat. 6: 393. 1790. *Dianthera latifolia* Salisb., Prodr. Stirp. Chap. Allerton 103. 1796.

Local name: Basak.

Shrubs up to 3m. Petiole puberulent; lamina ovate to elliptic-ovate, 5–16 × 2–6 cm, acuminate, entire, base broadly cuneate. Spikes terminal; bracts ovate-oblong; bracteoles linear-lanceolate. Calyx 5 lobed; lobes linear-oblong. Corolla white, broadly tubular; upper lip ovate-oblong, shallowly 2

lobed; lower lip oblong-circular, 3-lobed, middle lobe subcircular. Stamens exserted; anther thecae ellipsoid. Ovary pubescent; style recurved. Capsule obovoid.

Flowers & Fruits: January to June.

Specimen Cited: Murti, *Goutam & AP Das 0437*. dated 17. 12. 2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Probably native to India, Tropical and sub-tropical parts of the world.

Justicia gendarussa Burm. *f*., Fl. Indica 10. 1768; Clarke in Hook. *f*., Fl. Brit. India 4: 532. 1885; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1287. 2001. *Gendarussa vulgaris* Nees in Wall., Pl. As. Rar. 3: 104. 1832. *Justicia gandarussa* L. *f*., Suppl. Pl. 85. 1782. *Ecbolium gendarussa* (Burm. *f.*) Kuntze, Revis. Gen. Pl. 2: 487. 1891.

Local name: Kalakasunda.

Subshrubs up to 1.5 cm tall, much branched. Stems swollen at nodes. Lamina narrowly lanceolate, 5–9 × 1–1.5 cm, glabrous, acute to shortly acuminate, subsinuate, base cuneate. Spikes terminal and axillary, usually in a leafy panicle; bracts triangular. Calyx 5 lobed. Corolla creamy white; tube basally cylindric; lower lip violet dotted basally, cuneate-obovate, 3 lobed; upper lip violet blotched, triangular. Stamens exserted. Ovary glabrous; style glabrous; stigma capitate. Capsule clavate.

Flowers & Fruits: February to April.

Specimen Cited: Murti, *Goutam & AP Das 0327*. dated 17. 12. 2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Nepal, Bhutan, Sri Lanka, Thailand, Cambodia, Myanmar; widely cultivated.

Justicia diffusa Willd., Sp. Pl. 1: 87. 1797; Clarke in Hook. *f*.,Fl. Brit. Ind. 4: 538. 1885; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1288. 2001. *Justicia procumbens* L., Sp. Pl. 1: 15. 1753. *Rostellaria diffusa* (Willd.) Nees, Pl. Asiat. Rar. 3: 100. 1832.

Woody herbs. Stems procumbent, diffuse. Petioles 2 mm; lamina lanceolate – elliptic to suborbicular – linear, 3 – 5cm, minutely pubescent. Spikes composed of cymes, slender; bracts oblong-lanceolate, less broad than calyx, base ovate. Calyx 5 parted, splitting to base; 4 segments lanceolate, lower 2 longer, 1 segment small. Calyx segments and bracts ciliate. Corolla flesh colored, small. Capsule oblong, glabrous.

Flowers & Fruits: July to November.

Specimen Cited: Gorumara, *Goutam & AP Das 0682*. dated 11. 09. 2007.

Local Distribution: Murti, Gorumara.

General Distribution: India, Nepal, Bhutan, Sri Lanka, Myanmar and Thailand.

Justicia japonica Thunb*., Fl. Jap. 20. 1784. Justicia simplex* Don, Prodr. Fl. Nepal. 118. 1825; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 539. 1885; Grierson *et* Long, Fl. Bhut. 2(3): 1288. 2001. *Justicia japonica* Thunb., Fl. Jap. 20.1784. *Rostellaria mollissima* Nees, *Pl. Asiat. Rar. 3: 101. 1832.*

Annual herbs. Stems repens. Leaves orbicular, scariously hirsute, blade 1cm, orbicular, apex rounded, with long petioles. Spike small, dense. Bracts minutely shorter calyx segments, base ovate to caudate, margin ciliate. Calyx 5-parted, segments slender. Capsule pure white, barbarte pubescent.

Flowers & Fruits: August to November.

Specimen Cited: Murti, *Goutam & AP Das 0531*, dated 23.07.2009.

Local Distribution: Murti.

General Distribution: India, Nepal, Bhutan, Sri Lanka, Myanmar, Thailand and Malaya.

LEPIDAGATHIS Willd., Sp. Pl. 3: 400. 1800.

Lepidagathis incurva Buch.-Ham. *ex* Don, Prodr. Fl. Nepal. 119. 1825; Ohashi in Hara, Fl. Nep. 3:142.1982; Hara, Fl. E. Himal. 1: 303. 1966; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1286. 1991. *Lepidagathis hyaline* Nees in Wall., Pl. As. Rar. 3: 95. 1832; Clarke in Hook. *f*., Fl. Brit. India 4: 521. 1885.

Ascending herbs, up to 90 cm, anisophyllous. Stems 4-angled, sulcate. Lamina ovate to elliptic, 3–10 × 1–5cm, base cuneate, entire and slightly sinuate, acute to shortly acuminate. Spikes elongate, secund; bracts oblong-lanceolate, 1-veined, long acuminate. Calyx glabrescent; posterior lobe oblong-lanceolate, 3-veined; lateral lobes lanceolate; anterior lobes connate at base. Corolla white streaked with purple. Stamens slightly exserted. Ovary pubescent. Capsule 5mm, distally pubescent. Seeds subcircular.

Flowers & Fruits: November to April.

Specimen Cited: Murti, *Goutam & AP Das 0543*. dated 16. 12. 2006: *Gorumara, Goutam & AP Das 0684*. dated 11. 09. 2007.

Local Distribution: Beel margins through out.

General Distribution: India, China, Mayanmer, Malaysia, Phillipins.

NELSONIA R.Br., Prodr. 480. 1810.

Nelsonia canescens (Lam.) Sprengel in L., Syst. Veg. ed. 16. 1: 42. 1824; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1250. 2001. *Justicia canescens* Lam., Tab. Encycl. Method Bot. 1: 41. 1791. *Nelsonia campestris* R. Br., Prodr. Fl. Nov. Hall. 1: 481. 1810; Clarke in Hook. *f.*, Fl. Brit. Ind. 4: 394. 1884; Prain, Beng. Pl. 2: 594.1903. *Justicia lamiifolia* Roxb., Fl. Ind., ed. 1820 1: 135. 1820. *Dianthera tomentosa* Roxb. *ex* Clarke in Hook. *f*., Fl. Brit. India 4: 395. 1884. *Nelsonia lamiifolia* (Roxb.) Sprengel, Syst. Veg. 1: 42. 1824. *Nelsonia rotundifolia* R. Br., Prodr. 481. 1810.

Annual herbs, creeping, prostrate to decumbent. Stems subterete, villous. Petiole villous; lamina elliptic to ovate, 1–3 × 1–1.5cm, lamina of basal leaves 6–10 × 3–5 cm, both surfaces villous, base cuneate, entire, acute. Spikes 3 – 4cm; bracts elliptic. Calyx 2-lobed. Corolla bluish purple or white; tube cylindric. Stamens inserted at base of throat; filaments glabrous. Ovary glabrous; ovules 4–8 per locule. Capsule 6–14 seeded. Seeds broadly ellipsoid.

Flowers & Fruits: February to April.

Specimen Cited: Murti, *Goutam & AP Das 0240*. dated 16. 12. 2006: *Goutam & AP Das 0433*. dated 17. 12. 2006.

Local Distribution: Road side forest ground throughout.

General Distribution: India, Bhutan, China, Nepal, Indonesia, Laos, Malaysia, Myanmar, Cambodia, Philippines, Thailand, Vietnam; Africa, Madagascar.

PHAULOPSIS Willd., Sp. Pl. 3: 4, 342. 1800 [“Phaylopsis”], *nom. cons*.

Phaulopsis imbricate (Forsskal) Sweet, Hort. Brit. Ed. 1. 327.1826; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1275. 2001. *Ruellia imbricata* Forsskal, Fl. Aegypt – Arab. 113. 1775. *Aetheilema mucronatum* Griff., Not. Pl. Asiat. 4: 137. 1854. *Aetheilema reniforme* Nees, Pl. Asiat.

Rar. 3: 94. 1832. *Phaulopsis parviflora* Willd., Sp. Pl. 3: 342. 1800. *Aetheilema reniforme* Nees, Pl. Asiat. Rar. 3: 94. 1832.

Ascending herbs, up to 50 cm, slightly anisophyllous. Stems ascending, 4-angled. Petiole 4–5 cm; lamina ovate to elliptic, 7–10 × 3–5 cm, papery, acuminate, entire, base cuneate to attenuate and slightly oblique. Spikes terminal; bracts orbicular to reniform. Posterior calyx lobes ovate-elliptic, other lobes linear to subulate. Corolla white; lower lip 3-lobed, lobes ovate-oblong; upper lip narrow, 2-lobed. Staminal filaments glabrous. Style pilose. Capsule ellipsoid.

Flowers & Fruits: October to February.

Specimen Cited: Murti, *Goutam & AP Das 0283*. dated 16. 12. 2006.

Local Distribution: Throughout Forest.

General Distribution: India, Bhutan, Bangladesh, Indo-China, Vietnam, Himalaya, tropic Africa.

PHLOGACANTHUS Nees in Wall., Pl. Asiat. Rar. 3: 76, 99. 1832.

Phlogacanthus thyrsiformis (Roxb. *ex* Hardw.) Mabberley, Bot. Hist. Hortus Malabaricus 189. 1980. *Justicia thyrsiformis* Hardw., Asiat. Res. 6: 349. 1799. *Phlogacanthus thyrsiflorus* Nees, Pl. Asiat. Rar. 3: 99. 1832; Clarke in Hook. *f*., Fl. Brit. India 4: 512. 1884; Ohashi in Hara, Fl. E. Himal. 1: 303. 1966; Hara *et al.,* Enn. Fl. Pl. Nep. 3:143.1982; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1284. 1991. *Justicia thyrsoides* Roxb. *ex* Nees, Prodr. 11: 321. 1847. *Phlogacanthus thyrsiflorus* (Hardw.) Mabberley in Bot. Hist. Hortus Malabaricus 83. 1980.

Local name: Jaglibasak.

Large shrubs, up to 4m. Lamina elliptic-oblong to oblong, 8–16 × 4–5 cm, acuminate to long acuminate, base attenuate, undulate. Inflorescences in terminal thyrses; bracts small. Calyx lobes linear-lanceolate, unequal. Corolla orange; tube slightly curved; lower lip deeply 3 lobed, lobes ovate; upper lip 2 cleft. Stamens much exserted; filaments glabrous; staminodes 2. Ovary glabrous. Capsule glabrous, 8-seeded.

Flowers & Fruits: January to March.

Specimen Cited: Murti, *Goutam & AP Das 0361*. dated 17. 12. 2006: *Khunia, Goutam & AP Das 0064*. dated 26. 06. 2006: *Gorumara, Goutam & AP Das 0759*. dated 11. 07. 2007: *Dhupjhora, Goutam & AP Das 0565*. dated 21. 03. 2007.

Local Distribution: Throughout the forested areas; abundant.

General Distribution: India, Bhutan, Myanmar, Nepal.

RUNGIA Nees in Wall., Pl. Asiat. Rar. 3: 77, 109. 1832.

Rungia pectinata (L.) Nees in Candolle, Prodr. 11: 470. 1847; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1291. 2001. Guha Bakshi, Fl. Mur. Dist. 244. 1984. *Justicia pectinata* L., Torner, Cent. II: Pl. 3. 1756; Amoen. Acad. 4: 299. 1760. *Dicliptera pectinata* (L.) Juss., Ann. Mus. Hist. Nat. 9: 169. 1807. *Dianthera parviflora* Roxb. *ex* Nees, Prodr. 11: 471. 1847. *Rungia parviflora* Nees, Pl. Asiat. Rar. 3: 110. 1832. *Rungia parviflora* (Retz.) Nees var. *pectinata* (L.) Clarke in Hook. *f.*, Fl. Brit. Ind. 4: 550. 1985. Prain, Beng. Plants 2: 613. 1903.

Annual, prostrate herbs, rooting at nodes, up to 50 cm. Lamina oblong-elliptic, 1–4 × 0.5–1.5 cm, glabrous, acute, entire, base cuneate. Spikes axillary and terminal, 1 sided, solitary to compound; bracts dimorphic; sterile bracts green, elliptic; fertile bracts circular to obovate, pubescent, broadly hyaline. Calyx colorless, pubescent; lobes linear-lanceolate, narrowly hyaline, mucronulate. Corolla blue; lower lip 3-lobed, lobes triangular; upper lip ovate. Staminal filaments glabrous. Ovary glabrous. Capsule ellipsoid. Seeds orbicular.

Flowers & Fruits: September to May

Specimen Cited: Murti, *Goutam & AP Das 0281*. dated 16. 12. 2006.

Local Distribution: Throughout study areas.

General Distribution: India, Bhutan, Sri Lanka, Bangladesh, Myanmar, Nepal, Thailand, Vietnam and Malaysia.

THUNBERGIA Retz., Physiogr. Sälsk. Handl. 1(3): 163. 1780, *nom. cons*.

Key to the species

1a. Petiole round; lamina oblong-ovate; flowers solitary; stem slender ..... *T. fragrans*

1b. Petiole grooved; lamina triangular-ovate; flowers in pendulous

panicle; stem thick ……..... *T. grandiflora*

Thunbergia fragrans Roxb., Pl. Coromandel 1: 47. 1795; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1247. 2001. *Roxburghia rostrata* Russell *ex* Nees, Prodr. 11: 57. 1847. *Thunbergia volubilis* Pers., Syn. Pl. 2: 179. 1806.

Large vines, herbaceous. Stems 4-angled, sulcate. Petiole hirsute; lamina oblong-ovate, broadly ovate to oblong-lanceolate, 5–15 × 2–6 cm, subglabrous, palmately 3–5-veined, acute to acuminate, irregularly sinuate to shallowly coarsely dentate, base rounded to cuneate or cordate. Flowers axillary, solitary; bracteoles ovate. Calyx dentate. Corolla red; tube basally cylindric; lobes obovate. Stamens included; filaments glabrous; anther thecae divergent. Ovary glabrous; style exserted; stigma funnel-shaped. Capsule glabrous.

Flowers & Fruits: September to April.

Specimen Cited: Khunia, *Goutam & AP Das 0036*. dated 25. 06. 2006.

Local Distribution: Takomari forest.

General Distribution: India, Bhutan, China, Sri Lanka, Indonesia, Laos, Philippines, Cambodia, Thailand, Vietnam.

Thunbergia grandiflora (Roxb. *ex* Rottler) Roxb., Bot. Reg. 6: 495. 1820; Wood in Grierson *et* Long, Fl. Bhut. 2(3): 1248. 2001. *Flemingia grandiflora* Roxb. *ex* Rottler, Neue Schriften Ges. Naturf. Freunde Berlin 4: 202. 1803. *Thunbergia chinensis* Merrill, Philipp. J. Sci. 21(5): 510. 1922. *Thunbergia cordifolia* Nees, Prodr. 11: 35. 1847.

Large, woody vines up to 15 m. Stems 4-angled. Petiole grooved; lamina ovate to triangular-ovate, 5–15 × 3–9 cm, papery, palmately 3–7-veined, acuminate to acute, undulate, base subcordate to truncate. Flowers solitary, paired in leaf axils or arranged in terminal racemes with 2–4 flowers; bracts subulate. Calyx unlobed. Corolla bluish; limb subactinomorphic; lobes ovate. Staminal filaments 6–8 mm; anther thecae pubescent. Style glabrous; stigma with 2 subequal lobes. Seeds ovate.

Flowers & Fruits: September to April.

Specimen Cited: Murti, *Goutam & AP Das 0249*. dated 16. 12. 2006: *Dhupjhora, Goutam & AP Das 0586*. dated 22. 03. 2007.

Local Distribution: Dhupjhora.

General Distribution: India, Bhutan, China, Myanmar, Thailand, Vietnam.

Bignoniaceae Juss., Gen. P1l. 137. 1789 (‘Bignoniae’); *nom. cons.*

Key to the genera

1a. Leaflets 2 to 6; lamina triangular-ovate 2

1b. Leaflets 9 to 19; lamina elliptic-oblong to obovate-oblong ..... *Spathodea*

2a. corolla yellow, bilabiate ……..…..... *Stereospermum*

2b. Corolla purple-red; tube fleshy; upper lip 2 lobed, lower lip 3 lobed ….... *Oroxylum*

STEREOSPERMUM Chamisso, Linnaea 7: 720. 1833.

Stereospermum colais (Buch.-Ham. *ex* Dillwyn) Mabberley, Taxon 27: 553. 1978. *Bignonia colais* Buch.-Ham. *ex* Dillwyn, Rev. Hort. Malab. 28. 1839. *Stereospermum tetragonum* DC., Prodr. 9: 210. 1845; Gamble, Fl. Pres. Madras 998(701). 1924. *Stereospermum chelonoides* sensu Wight, Ic. t. 1341. 1845, non (L. *f*.) DC.1838; Clarke in Hook. *f.*, Fl. Brit. India 4: 383. 1884.

Large trees, bark transversally rugose, grey. Leaves 30-35 cm long, 1pinnate; lamina 10-12 x 4-4.5 cm, 4-6 pairs, ovate, entire of serrate, caudateacuminate, obtuse at base, slightly unequal-sided, petiolulate; nerves 8-10 pairs. Flowers in terminal panicles, many together; calyx 6-7 mm long, campanulate, shallowly lobed, lobes obtuse; corolla yellow, 2-2.5 cm long, ca. 1.5 cm broad, bilabiate, lobes subequal, crisped; stamens 5, included, filaments pubescent at base; ovary sessile, oblong, 2-celled, ovules many, 1seriate, style slender, stigmas 2, spoon shaped. Capsule 30-35 x 0.5-0.7 cm, subtetragonous, spirally splitting; seeds 7-8 mm long, with membranous wing on both sides.

Flowers & Fruits: February to October.

Specimen Cited: Murti, *Goutam & AP Das 0924*, dated 10. 02. 2010.

Local Distribution: Murti, Dhupjhora, Gorumara, Bichabhanga, Budhuram, Khunia.

General Distribution: Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam.

OROXYLUM Ventenat, Decas Gen. Nov. 8. 1808.

Oroxylum indicum (L.) Benth. *ex* Kurz, Forest Fl. Burma 2: 237. 1877; Aitken in Grierson *et* Long, Fl. Bhut. 2(3): 1241. 2001. *Bignonia indica* L., Sp. Pl. 2: 625. 1753. *Bignonia tuberculata* Roxb. *ex* Candolle, Prodr. 9: 177. 1845. *Bignonia pentandra* Lour., Fl. Cochinch. 379. 1790. *Spathodea indica* (L.) Pers., Syn. Pl. 2: 173. 1807.

Trees up to 10 m. Leaves 2 to 4 pinnately compound, 60 – 130 cm; lamina triangular-ovate, 5 – 12 × 3 – 9 cm, glabrous, becoming blue after drying, short acuminate, entire, base subrounded or cordate, oblique. Inflorescences 60 – 140 cm. Flowers usually open at night. Calyx purple, campanulate. Corolla purple-red; tube fleshy; upper lip 2 lobed, lower lip 3 lobed, lobes slightly reflexed. Stamens inserted at middle of corolla tube; anthers ellipsoid, slightly divergent. Disc large, fleshy, 5 lobed. Style 5 – 7 cm. Capsule woody, flattened. Seeds rounded.

Flowers & Fruits: September to December.

Specimen Cited: Murti, *Goutam & AP Das 0299*, dated 10. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara, Bichabhanga, Budhuram, Khunia.

General Distribution: India: tropical and sub-tropical; Bhutan, China, Nepal, Indonesia, Cambodia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

SPATHODEA Beauv., Fl. Oware 1: 46, t. 27. 1805.

Spathodea campanulata Beauv., Fl. Oware 1: 47. 1805. *Spathodea nilotica* Seemon, J. Bot. 3: 333. 1865. *Spathodea tulipifera* (Schuman) G. Don, Gen. Hist. 4: 223. 1838. *Bignonia tulipifera* Schuman, Beskr. Guin. Pl. 273. 1827.

Trees, up to 18 m. Leaves imparipinnate, opposite, estipulate; rachis grooved above, swollen at base; leaflets 9-19, opposite; lamina 5 – 14 x 3 – 7.5 cm, elliptic-oblong to obovate-oblong, acuminate, margin entire, base round to oblique. Flowers bisexual, bright red in terminal racemes. Calyx spathaceous, recurved. Corolla tube bright reddish-orange; lobes 5, deltoid; Stamens subequal, unequally inserted at the base of swollen portion of the tube; staminodium small. Ovary superior, ovate-oblong, pubescent; style slender; stigma 2-lipped, lips flattened. Fruit a capsule, woody, 2-valved; seeds many, winged.

*Flowers & Fruits:*November to May.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0176*, dated 08. 02. 2009.

Local Distribution: Planted in Villages.

General Distribution: Throughout India; Native in Tropical Africa.

Lamiaceae Lindl., Nat. Syst. ed. 2. 275. 1836 (*nom. alt. cum* Labiatae *nom. cons*.

Key to the genera

1a. Inflorescences verticillasters 2 to many flowered 2

1b. Inflorescences terminal or axillary, racemose, cymose or thyrses 9

2a. Style arising above base of ovary; corolla 1 lipped ..... ***Ajuga***

2b. Style inserted at base of ovary; corolla 2 lipped 3

3a. Stamens ascending under upper corolla lip or spreading or projected 4

3b. Stamens declinate, lying along or included in lower lip of corolla 7

4a. Anthers not globose; corolla tube mostly exserted 5

4b. Anthers globose; corolla tube always included ..... ***Pogostemon***

5a. Upper lip of corolla mostly short ..... ***Anisomeles***

5b. Upper lip of corolla larger and convex or galeate 6

6a. Style lobes unequal in length, posterior much shorter than anterior ..... ***Leucas***

6b. Style lobes subequal or equal in length ..... ***Leonurus***

7a. Lower lobe of corolla saccate, abruptly reflexed ..... ***Hyptis***

7b. Lower lobe of corolla navicular or plane or slightly concave 8

8a. Lower lobe of corolla longer than other lobes, narrow at base ..... ***Isodon***

8b. Lower lobe of corolla equal or shorter as other lobes, not narrowed at base ..... ***Ocimum***

9a. Corolla actinomorphic; stamens subequal 10

9b. Corolla zygomorphic or slightly oblique; stamens didynamous 11

10a. Inflorescences axillary cymes; calyx tube always shorter than fruit ..... ***Callicarpa***

10b. Inflorescences terminal panicles; calyx inclosing fruit ..... ***Tectona***

11a. Flower bud conspicuously swollen at tip 12

11b. Flower buds not swollen at tip 13

12a. Calyx truncate at anthesis ..... ***Rotheca***

12b. Calyx dentate at anthesis ..... ***Clerodendrum***

13a. Leaves palmately compound ..... ***Vitex***

13b. Leaves simple 14

14a. Corolla funnelform; stigma lobes very unequal ..... ***Gmelina***

14b. Corolla tubular; stigma lobes equal ..... ***Premna***

AJUGA L., Sp. Pl. 2: 561. 1753.

Ajuga macrosperma Wall. *ex* Benth., Pl. Asiat. Rar. 1: 58. 1830; Clement in Grierson *et* Long, Fl. Bhut. 2(2): 944. 1999. *Bulga macrosperma* (Wall. *ex* Benth.) Kuntze, Revis. Gen. Pl. 2: 512. 1891.

Erect herbs, up to 40 cm, pilose to subglabrous when old, young parts densely white villous. Lamina ovate-lanceolate to elliptic-ovate, 4 – 12 × 2 – 5 cm, villous to strigose, obtuse to acute, undulate to irregularly undulate-crenate, ciliate, base cuneate-decurrent. Verticillasters 6 – 12 flowered, in axillary and apically forming spikes; ovate-lanceolate. Calyx funnelform, teeth ovate. Corolla blue to purple, tubular, obliquely spreading; upper lip oblong, straight; middle lobe of lower lip narrowly cordate, emarginate at apex.

*Flowers & Fruits:*January to May.

Specimen Cited: Indong, *Goutam & AP Das 0408*, dated 22.07.2009.

Local Distribution: Gorumara, Dhupjhora; rare.

General Distribution: India, Bhutan, Nepal,Laos, Myanmar, Thailand, Vietnam.

ANISOMELES R.Br., Prodr. 503. 1810.

Anisomeles indica (L.) Kuntze, Revis. Gen. Pl. 2: 512. 1891. *Nepeta indica* L., Sp. Pl. 571. 1753. *Anisomelis indica* L., Sp. Pl. 1: 571. 1753; Bora *et* Kumar, Flor. Div. Assam. 267. 2003. *Anisomelis ovata* R.Br. in Aiton, Hort. Kew 3: 364. 1811; Hook. *f*., Fl. Brit. Ind. 4: 672. 1885; Prain, Beng. Pl. 2: 853. 1903. *Monarda zeylanica* Burm. *f*., Fl. Indica 12. 1768. *Marrubium indicum* (L.) Burm. *f*., Fl. Indica 127. 1768. *Ajuga glabrata* Benth. *ex* Wall., Numer. List 2041. 1829. *Ajuga disticha* (L.) Roxb., Hort. Bengal. 44. 1814. *Ballota disticha* L., Mant. Pl. 1: 83. 1767.

Erect, branched, herbs up to 2 m. Lamina broadly ovate, 4 – 9 × 2.5 – 6 cm, abaxially densely white minutely tomentose, acute to short acuminate, irregularly dentate, base broadly truncate cuneate. Flowers in spikes. Calyx hirsute; teeth purple-red, triangular-lanceolate. Corolla purplish; tube funnelform; upper lip oblong; lower lip subhorizontally spreading; middle lobe obcordate; lateral lobes ovate. Ovary glabrous. Nutlets ovoid.

Flowers & Fruits: September to December.

Specimen Cited: Murti, *Goutam & AP Das 0283*, dated 10. 02. 2009.

Local Distribution: Murti, Dhupjhora, Gorumara.

General Distribution: India, Bhutan, Bangladesh, Laos, Malaysia, Cambodia, Myanmar, Philippines, Thailand, Vietnam.

HYPTIS Jacq., Collectanea 1: 101. 1787, *nom. cons*.

Hyptis suaveolens (L.) Poiteau, Ann. Mus. Hist. Nat. 7: 472. 1806; Clement in Griersonet Long, Fl. Bhut. 2(2): 990. 1999. *Ballota suaveolens* L., Syst. Nat. ed. 10 2: 1100. 1759. *Schaueria graveolens* (Bl.) Hasskarl, Flora 25(2 Beibl.): 25. 1842. *Mesosphaerum suaveolens* (L.) Kuntze, Revis. Gen. Pl. 2: 525. 1891. *Marrubium indicum* Blanco, Fl. Filip. 477. 1837. *Bystropogon graveolens* Bl., Bijdr. 824. 1826.

Local name: Bontulsi.

Annual, branched, robust herbs, aromatic. Lamina ovate to broadly ovate, 1.5 – 11 × 1.4 – 9 cm, adaxially olive green, abaxially pilose, subacute to obtuse, serrulate,base rounded to shallow cordate, oblique. Cymes 2 to 5 flowered, in racemes or panicles. Calyx throat tufted villous, veins very elevated; teeth broadly triangular. Corolla blue; upper lip lobes reflexed; middle lobe of lower lip shorter. Nutlets dark Br..

*Flowers & Fruits:*August to June.

Specimen Cited: Khunia, *Goutam & AP Das 0318*, dated 21.07.2009.

Local Distribution: Khunia, Murti, Bichhabhanga.

General Distribution: India; native in tropical America, widespread tropical weed.

ISODON (Schrad. *ex* Benth.) Spach, Hist. Nat. Veg. Phan. 9: 162. 1840.

Isodon rugosus (Wall *ex* Benth) Codd, Taxon 17: 239. 1968; Clement in Grierson *et* Long, Fl. Bhut. 2(2): 997. 1999. *Plectranthus rugosus* Wall. *ex* Benth., Pl. Asiat. Rar. 2: 17. 1830. *Rabdosia rugosa* (Wall. *ex* Benth.) Hara, J. Jap. Bot. 47: 199. 1972. *Ocimum densiflorum* Roth, Nov. Pl. Sp. 275. 1821. *Isodon plectranthoides* Schrader *ex* Benth., Labiat. Gen. Spec. 43. 1832.

Erect shrubs, much branched, up to 2 m; densely stellate tomentose. Stem leaves opposite; lamina ovate to elliptic, 2 – 4 × 0.5 – 2 cm, papery, densely stellate tomentose, obtuse, crenulate, base broadly cuneate to rounded. Cymes axillary, basal cymes long branched to 20 to more flowered, apical cymes 3–5 flowered. Calyx campanulate; teeth broadly triangular, subequal, minute. Corolla white, tinged rose. Stamens included. Nutlets dark Br., triquetrous, oblong.

*Flowers & Fruits:*July to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0482*, dated 23.07.2009.

Local Distribution: Gorumara, Dhupjhor.

General Distribution: India, Bhutan, Bangladesh, Nepal, Pakistan, Afghanistan.

LEONURUS L., Sp. Pl. 2: 584. 1753.

Leonurus sibiricus L., Sp. Pl. 584. 1753. *Phlomis sibirica* (L.) Medik., Bot. Beob. 124. 1784. *Leonurus sibiricus* var. *grandiflorus* Benth., Prodr. 12: 502. 1849. *Leonurus occidentalis* Colla, Mem. Reale Accad. Sci. Torino 33: 154. 1829.

Local name: Raktadron.

Erecr annuals, up to 1.2 m. Lower stem leaves early deciduous. Lamina ovate, 5 – 7 ×2 – 4 cm, sparsely strigose, lobes narrowly oblong-rhombic, 3 lobulate, base broadly cuneate. Verticillasters many flowered, 3 palmatisect; bracteoles reflexed, shorter than calyx tube, strigose. Flowers sessile. Calyx tubular-campanulate. Corolla red, rarely white. Filaments sparsely scaly. Nutlets brown, oblong, triquetrous.

*Flowers & Fruits:*July to September.

Specimen Cited: Murti, *Goutam & AP Das 0580*, dated 25.07.2009.

Local Distribution: Near Murti Jaldhaka junction.

General Distribution: India, China, Bangladesh, Nepal, Bhutan, Mongolia, Russia.

LEUCAS R. Br., Prodr. 504. 1810.

Key to the species

1a. Verticillasters loosely globose, few flowered; calyx teeth narrowly triangular ..... *L. indica*

1b. Verticillasters compactly globose, many flowered; calyx teeth broadly triangular ..... *L. aspera*

Leucas indica (L.) R. Br. *ex* Vatke in Oesterr. Bot. Zeits. 25: 95. 1875; Clement in Grierson *et* Long, Fl. Bhut. 2(2): 963. 1999. *Leonurus indicus* L., Syst. ed 10: 1101. 1760. *Leucas linifolia* (Roth) Spreng., Syst. 2: 743. 1825; Hook. *f*., Fl. Brit. Ind. 4: 690. 1885; Prain, Beng. Pl. 2: 856. 1903. *Leucas indica* (L.) Robert Br. *ex* Sm., Cycl. 20: 5. 1812. *Phlomis indica* L., Sp. Pl. 586. 1753. *Spermacoce denticulata* Walpers, Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 19 (Suppl. 1): 353. 1843. *Leucas zeylanica* var. *linearis* Cramer, Revised Handb. Fl. Ceylon 3: 184. 1981.

Local name: Madhuful.

Annual herbs, up to 30 cm. Lamina linear, 2.5 – 5 × 1 – 1.3 cm, obtuse, margin sparsely crenate to subentire. Verticillasters loosely globose, few flowered, densely hispid; bracts linear, as long as calyx. Calyx tubular; mouth oblique, erect; teeth straight, narrowly triangular. Corolla white, slightly longer than calyx tube. Nutlets Br., oblong.

*Flowers & Fruits:*Through out the Year.

Specimen Cited: Garden, *Goutam & AP Das 0292*, dated 10. 02. 2009.

Local Distribution: Throughout the study areas.

General Distribution: Pantropical hemisphere.

Leucas aspera (Willd.) Link, Enum. Hort. Berol. Alt. 2: 113. 1822; Clement in Grierson *et* Long, Fl. Bhut. 2(2): 963. 1999. *Phlomis aspera* Willd., Enum. Pl. 621. 1809. *Leucas dimidiata* Benth., Prodr. 12: 532. 1848. *Leucas obliqua* Buch.-Ham. *ex* Dillwyn, Rev. Hortus Malab. 57. 1839. *Phlomis obliqua* Buch.-Ham. *ex* Hook. *f.,* Fl. Brit. India 4: 690. 1885.

Local name: Madhuful.

Annual herbs, up to 40 cm. Lamina linear to oblong-linear, 2.5 – 6 × 1 – 1.5 cm, obtuse, margin sparsely crenate to subentire. Verticillasters compactly globose, many flowered, densely hispid; bracts linear, as long as calyx, margin hispid ciliate. Calyx tubular; mouth oblique, erect; teeth straight, broadly triangular. Corolla white, slightly longer than calyx tube. Nutlets Br., oblong, triquetrous.

*Flowers & Fruits:*Through out the Year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0138*, dated 07. 02. 2009.

Local Distribution: Dhupjhora.

General Distribution: India, Indonesia, Malaysia, Philippines, Thailand.

OCIMUM L., Sp. Pl. 2: 597. 1753.

Key to the species

1a. Posterior filaments dentate at base ..... *O. basilicum*

1b. Posterior filaments puberulent at base..... *O. tenuiflorum*

Ocimum basilicum L., Sp. Pl. 1: 597. 1753; Hook. *f*., Fl. Brit. Ind. 4: 608.1885; Prain, Beng. Pl. 2: 842. 1903; Clement in Griersonet Long, Fl. Bhut. 2(2): 1001. 1999. *Ocimum album* L., Mant. Pl. 1: 85. 1767. *Ocimum ciliare* B.Heyne *ex* Hook. *f*., Fl. Brit. India 4: 608. 1885. *Ocimum caryophyllatum* Roxb., Fl. Ind. ed. 1832 3: 16. 1832. *Ocimum basilicum* var. *album* (L.) Benth., Pl. Asiat. Rar. 2: 13. 1830.

Local name: Tulsi

Erect, annual herbs, up to 80 cm. Lamina ovate to oblong, 2.5 – 5 × 1 – 2.5 cm, subobtuse to acute, irregularly dentate or subentire, base attenuate. Thyrses 10 – 20 cm; bracts sessile, oblanceolate, base attenuate, ciliate, acute. Calyx campanulate, concave, mucronate. Corolla white, limb puberulent outside. Stamens free, slightly exserted, posterior 2 dentate, base puberulent. Nutlets dark Brown, ovoid.

*Flowers & Fruits:*July to December.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0321*, dated 21.07.2009.

Local Distribution: Dhupjhora, Khunia.

General Distribution:India; Tropical Asia, Africa.

Ocimum tenuiflorum L., Sp. Pl. 2: 597. 1753; Clement in Griersonet Long, Fl. Bhut. 2(2): 1002. 1999. *Ocimum sanctum* L., Mant. Pl. 1: 85. 1767. *Ocimum subserratum* Heyne *ex* Hook. *f*., Fl. Brit. India 4: 609. 1885. *Ocimum sanctum* var. *hirsutum* (Benth.) Hook. *f*., Fl. Brit. India 4: 609. 1885. *Ocimum scutellarioides* Willd. *ex* Benth., Linnaea 11: 344. 1837. *Ocimum inodorum* Burm. *f*., Fl. Indica 130. 1768. O*cimum hirsutum* Benth., Pl. Asiat. Rar. 2: 14. 1830.

*Local name:*KaloTulsi.

Erect, subshrubs, up to 1 m, much branched. Lamina oblong, 2.5 – 5.5 ×1 – 3 cm, obtuse, shallowly undulate-serrate, base cuneate to rounded. Verticillasters 6 flowered, in terminal thyrses or panicles; bracts sessile, cordate. Calyx campanulate, villous; middle tooth of upper lip broadly oblate; lateral teeth broadly triangular, shorter than lower lip teeth. Corolla white to reddish purple, slightly exserted. Stamens slightly exserted, free; posterior filaments puberulent at base. Nutlets Br., ovoid.

*Flowers & Fruits:*February to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0560*, dated 24.07.2009.

Local Distribution: Khunia, Murti, Dhupjhora, Budhuram.

General Distribution: Throughout India; Malaysia, Myanmar, Philippines, Thailand, Cambodia, Indonesia, Laos, Vietnam; Africa, SWAsia, Australia.

POGOSTEMON Desf., Mém. Mus. Hist. Nat. 2: 154. 1815.

Pogostemon amaranthoides Benth. in Candolle, Prodr. 12: 153. 1848; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 634. 1885; Ohashi in Hara, Fl. E. Himal. 280. 1966; Clement in Grierson *et* Long, Fl. Bhut. 2(2): 985. 1999.

Herbs; stems erect or sprawling, pubescent – tomentose in young. Leaves ovate – lanceolate, acute – acuminate, base cuneate-attenuate, numerous glands on lower surface. Cayx obovoid; corolla white. Nutlets trigonous.

Flowers & Fruits: September to October.

Specimen Cited: Budhuram, *Goutam & AP Das 0603*, dated 12.08.2009.

Local Distribution: Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, China; pantropical.

CALLICARPA Linnaeus, Sp. Pl. 1: 111. 1753.

Callicarpa arborea Roxb., Fl. Ind. 1: 405. 1820; Long in Grierson *et* Long, Fl. Bhut. 2(2): 919. 1999. *Callicarpa arborea* Roxb. *ex* Clarke in Hook. *f*., Fl. Brit. Ind. 4: 567. 1885; Ohashi in Hara, Fl. E. Himal. 1: 268. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 145. 1982; Grierson *et.* Long, Fl. Bhut. 2(2): 919. 1999. *Premna arborea* (Roxb.) Roth, Nov. Pl. Sp. 287. 1821. *Aganon umbellata* Raf., Sylva Tellur. 161. 1838. *Callicarpa magna* Schauer, Prodr. 11: 641. 1847.

Trees, up to 8 m; branchlets, inflorescences, and petioles densely tomentose, hairs stellate. Leaf blade elliptic to elliptic-ovate, 15 – 35 × 7 – 12 cm, leathery, abaxially densely yellow-Br. stellate tomentose, adaxially dark green and shiny, base cuneate to rounded, margin entire. Cymes 6 – 10 cm across; peduncle 4 angled, longer than petioles. Calyx cup-shaped, truncate, outside densely gray stellate tomentose. Corolla purple. Stamens much longer than corolla. Ovary densely stellate tomentose. Fruit purple-Br..

Flowers & Fruits: April to November.

Specimen Cited: Forest, *Goutam & AP Das 0295*, dated 10. 02. 2009.

Local Distribution: Forests.

General Distribution: India, Bhutan, China, Myanmar, Malaysia.

CLERODENDRUM L., Sp. Pl. 2: 637. 1753.

Key to the species

1a. Leaves whorled with 4 – 5 per node ..... *C. indicum*

1b. Leaves opposite at node 2

2a. Petiole up to 5 cm; flowers in terminal thyrses with dens flowers ..... *C. infortunatum*

2b. Petiole up to 18 cm; flowers in terminal lax thyrses with few flowers ..... *C. japonicum*

Clerodendrum indicum (L.) Kuntze, Rev. Gen. Pl. 2: 586. 1891; Long in Grierson *et* Long, Fl. Bhut. 2(2): 931. 1999. *Siphonanthus indicus* L., Sp. Pl. 1: 109. 1753. *Clerodendrum siphonanthud* R. Br., in Aitton *f*., Hort. Kew. 4: 65. 1812; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 593. 1885. *Clerodendrum verticillatum* Don, Prodr. Fl. Nepal. 102. 1825. *Clerodendrum indicum* f. *semiserratum* (Wall.) Moldenke, Phytologia 22(3): 214. 1971.

Subshrubs to shrubs, up to 4 m. Branchlets purple to purplish, channeled, smooth. Leaves whorled with 4 – 5 per node, subsessile; leaf blade narrowly lanceolate to oblong-lanceolate, 10 – 20 × 1 – 2 cm, membranous, glabrous, base attenuate, margin entire, apex short acuminate; midvein prominent. Inflorescences terminal leafy thyrses; cymes red, many flowered; bracts linear-lanceolate to lanceolate. Calyx densely minute round glandular; lobes ovate-lanceolate, apex acute. Corolla white, becoming cream colored; tube funnelform, curved; lobes spreading, lanceolate to elliptic -oblong, apex obtuse. Stamens long exserted. Ovary glabrous. Fruiting calyx crimson, leathery. Drupes dark blue.

Flower & Fruits: June to February.

Specimen Cited: Khunia, *Goutam & AP Das 0316*, dated 10. 02. 2009.

Local Distribution: Khunia, Gorumara, Dhupjhora.

General Distribution: India, Bhutan, Bangladesh, Sri Lanka, Myanmar, Nepal, S. China and Malaysia.

Clerodendrum infortunatum L., Sp. Pl. 637. 1753. *Clerodendrum viscosum* Ventenat, Jord. Malm. *f*. 1803; Debet al., Fl. Ass. 3: 487. 1939; Long in Grierson *et* Long, Fl. Bhut. 2(2): 934. 1999; Prain, Beng. Pl. 2: 82. 1903. *Clerodendrum calycinum* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 36(2): 222. 1863. *Clerodendrum viscosum* Ventenat, Jard. Malmaison t. 25. 1803.

Local name: Vant.

Shrubs, up to 2 m. Branchlets 4 angled, pubescent. Leaves opposite; petiole up to 5 cm, densely pubescent; lamina subcordate, 4 – 14 × 3 – 12 cm, sparsely pubescent, base cordate, margin sparsely serrulate to dentate, acute to obtuse. Inflorescences terminal thyrses with dens flowers; bracts and bractlets reddish or green. Calyx red, deeply 5 lobed, pubescent; lobes ovate-lanceolate to ovate. Corolla red; lobes oblong. Stamens and style longer than corolla tube. Fruiting calyx much longer than fruit, becoming reflexed. Drupes green when young, subglobose.

Flower & Fruits: January to September.

Specimen Cited: Forest, *Goutam & AP Das 0398*, dated 22.07.2009.

Local Distribution: Throughout forest and open shrubland.

General Distribution: India, Bhutan, China, Sri Lanka, Myanmar, Australia.

Clerodendrum japonicum (Thunb.) Sweet, Hort. Brit. 822. 1826; Long in Grierson *et* Long, Fl. Bhut. 2(2): 934. 1999. *Volkameria japonica* Thunb., Syst. Nat. ed. 14: 578. 1784. *Volkameria dentata* Roxb., Fl. Ind. ed. 3: 61. 1832. *Clerodendrum coccineum* Lam, Verben. Malay. Archip. 296. 1919. *Volkameria japonica* Thunb., Nova Acta Regiae Soc. Sci. Upsal. 3: 203. 1780.

Local name: Bara Vant.

Shrubs, up to 4 m. Branchlets 4 angled, pubescent, nodes sometimes villous. Petiole up to 18 cm, densely yellow-Br. pubescent; lamina subcordate, 8 – 35 × 6 – 25 cm, sparsely pubescent, base cordate, margin sparsely serrulate to dentate, apex acuminate to acute. Inflorescences terminal thyrses; bracts and bractlets usually reddish. Calyx red, deeply 5 lobed, pubescent, outside glandular; lobes ovate-lanceolate to ovate. Corolla red; lobes oblong. Stamens and style longer than corolla tube. Fruiting calyx much longer than fruit, becoming reflexed. Drupes green when young, blue-black at maturity, subglobose.

Flowers & Fruits: May to November.

Specimen Cited: Forest, *Goutam & AP Das 0430*, dated 22.07.2009.*Status*:

Local Distribution: Throughout forest and open shrubland.

General Distribution: India, Bhutan, Bangladesh, Indonesia, Laos, Malaysia, Vietnam.

ROTHECA Raf., Fl. Tellur. 4: 69. 1838.

Rotheca serrata (L.) Steane & Mabb., Novon 8: 206. 1998. *Clerodendrum serratum* (L.) Moon, Cat. Ceylon Pl. 46. 1824; Hara, Enn. Fl. Pl. Nep. 3: 146. 1982; Grierson *et* Long, Fl. Bhut. 2(2): 933. 1999. *Volkameria serrata* L., Mant. Pl. 90. 1767. *Volkameria serrata* L., Mant. Pl. 1: 90. 1767. *Volkameria herbacea* Roxb., Hort. Bengal. 46. 1814. *Clerodendrum grandifolium* Salisb., Prodr. Stirp. Chap. Allerton 108. 1796.

Shrubs, up to 3 m. Branchlets densely yellow pubescent, becoming dark Br. to gray-yellow and glabrous. Leaves opposite or in threes; leaf subsessile; leaf blade obovate-oblong to elliptic- ovate, 6 – 22 × 3 – 7 cm, papery, pubescent, margin serrulate, apex acuminate to acute; veins abaxially prominent. Inflorescences terminal thyrses, densely yellow-Br. pubescent, cymes sometimes monochasial; bracts sessile, ovate to broadly ovate, pubescent; bractlets lanceolate. Calyx truncate, pubescent. Corolla white, bluish; lobes oblong. Stamens long exserted, base pubescent. Ovary glabrous. Style long exserted. Drupes green when young, becoming black, subglobose.

Flowers & Fruits: July to February.

Specimen Cited: Medlajhora, *Goutam & AP Das 0463*, dated 23.07.2009.

Local Distribution: Medlajhora marginal forest, road sides; less common.

General Distribution: India, Bhutan, China, Sri Lanka, Bangladesh, Myanmar.

GMELINA L., Sp. Pl. 2: 626. 1753.

Gmelina arborea Roxburgh, Hort. Bengal. 46. 1814; Pl. Corom. 3: 4. t. 246. 1815; Clarke in Hooker *f*., Fl. Brit. Ind. 4: 581. 1885; H. Ohashi in Hara, Fl. E. Himal. 2: 113. 1971; Hara *et al*., Enn. Fl. Pl. Nep. 3: 147. 1982; Long in Grierson *et* Long, Fl. Bhut. 2(2): 928. 1999. *Gmelina sinuata* Link, Enum. Hort. Berol. Alt. 2: 128. 1822. *Gmelina arborea* var. *canescens* Haines, Forest Fl. Chota Nagpur 82. 1910.

*Local name:*Gamari

Trees, up to 15 m; bark grayish Br.; branchlets, petioles and inflorescences densely yellow-Br. tomentose. Branchlets slightly 4 angled when young, becoming terete, lenticellate, leaf scars prominent. Petiole terete; leaf blade broadly ovate, 8 – 20 × 5 – 15 cm, papery, base broadly cuneate to subcordate, apex acuminate; veins abaxially prominent. Inflorescences terminal, narrow thyrses. Calyx with several black discoid gland patches; teeth 5, sharply triangular. Corolla yellow, 2-lipped, sparsely glandular. Ovary glabrous, glandular. Stigma unequally 2 cleft. Drupes yellow when ripe and black when dry, obovoid-ellipsoid.

Flowers & Fruits: February to June.

Specimen Cited: Murti, *Goutam & AP Das 0524*, dated 23.07.2009.

Local Distribution: Murti, Dhupjhora.

General Distribution: India, Bhutan, Nepal, Sri Lanka and Philippines.

TECTONA L.f., Suppl. Pl. 151. 1781 (publ. 1782), *nom. cons*.

Tectona grandis L. *f*., Suppl. Pl. 151. 1782; C.B. Clarke in Hook. *f*., Fl. Brit. Ind. 4: 570. 1885; Grierson *et* Long, Fl. Bhut. 2(2): 921. 1999. *Tectona theca* Lour., Fl. Cochinch. 137. 1790. *Theka grandis* (L. *f*.) de Lam., Tabl. Encycl. 2: 111. 1797. *Jatus grandis* (L. *f*.) Kuntze, Revis. Gen. Pl. 2: 508. 1891.

*Local name:*Segun.

Trees, up to 40 m. Branchlets gray to grayish Br., 4 angled, yellowish to grayish Br. stellate tomentose. Petiole robust, 3 cm; leaf blade ovate-elliptic to ovate, 15 – 50 × 8 – 25 cm, papery, abaxially densely grayish Br. to yellowish Br., minutely stellate tomentose, puberulent along veins, base cuneate and de-current, margin entire, apex acuminate to obtuse, veins 7 to 12 pairs. Panicles 30 - 40 cm. Flowers fragrant. Calyx tube with white stellate hairs. Corolla white; tube outside puberulent glandular; lobes obtuse. Ovary strigose. Style 3 mm. Fruit globose, minutely tomentose.

Flowers & Fruits: June to December.

Specimen Cited: Forest, *Goutam & AP Das 0682*, dated 14. 02. 2008.

Local Distribution: Pantation forests.

General Distribution: Indo- Malaysia.

VITEX L., Sp. Pl. 2: 638. 1753.

Vitex negundo L., Sp. Pl. 638. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 583. 1885; Ohashi in Hara, Fl. E. Himal. 1: 270. 1966; Long in Grierson *et* Long, Fl. Bhut. 2(2): 926. 1999. *Agnus-castus negundo* (L.) Carriθre, Rev. Hort. 42: 415. 1871. *Vitex nogondo* L., Hortus Maurit. 258. 1837.

*Local name:*Nishinda.

Shrubs to small trees. Branchlets densely gray tomentose. Leaves 3 – 5 foliolate; central leaflet distinctly petiolulate, 4 – 13 × 1 – 4 cm, leaflets lanceolate, oblong-lanceolate, base cuneate, margin entire. Inflorescences 10 – 27 cm; peduncle densely gray tomentose. Calyx campanulate, 5 dentate, gray tomentose. Corolla 2 lipped. Stamens exserted. Ovary subglabrous.

Flower & Fruits: April to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0513*, dated 23.07.2009.

Local Distribution: Panted in Villages.

General Distribution: India, Bhutan, China, Sri Lanka, Afganistan, Myanmar, Malaysia.

PREMNA L., Mant. Pl. 154. 1771, *nom. cons*.

Key to the species

1a. Trees; leaves opposite, ovate, cordate ..... *P. bengalensis*

1b. Subshrubs; leaves rosulate; obovate-oblong to spatulate ..... *P. herbacea*

Premna bengalensis Clarke in Hook. *f*., Fl. Brit. India 4: 577 1885; Long in Grierson *et* Long, Fl. Bhut. 2(2): 925. 1999; Prain, Beng. Pl. 2: 83. 1903.

Local Name: Gineri.

Small trees, up to 8 m. Branchlets dark Br., striate, pubescent when young, subglabrescent. Leaves simple, opposite, estipulate; lamina ovate-oblong to ovate, subrounded or cordate, 5 – 12 × 3 – 5 cm, papery, abaxially densely yellow pilose, base cuneate, rounded, apex acuminate; veins 5 – 7 pairs, reticulate veins obscure. Flowers bisexual, in terminal corymbose cymes; bracts linear, deciduous. Calyx slightly 2 lipped, 5 dentate, outside minutely hirsute, inside glabrous. Corolla dusty yellow, slightly 2 lipped, 5 lobed, outside puberulent, villous in throat. Stamens equal or longer than style, exserted; anthers black. Drupe black, tuberculate, glabrous.

Flowers & Fruits: March to June.

Specimen Cited: Murti, *Goutam & AP Das 0453*, dated 22.07.2009.

Local Distribution: Murti, Gorumara, Bichhabhanga.

General Distribution: India: Cambodia, Indonesia, Laos, Myanmar, Philippines, Vietnam.

Premna herbacea Roxb., Fl. Ind. ed. 1832, 3: 80. 1832; Long in Grierson *et* Long, Fl. Bhut. 2(2): 925. 1999. *Gumira herbacea* (Roxb.) Kuntze, Revis. Gen. Pl. 2: 507. 1891. *Premna obovata* Merrill, J. Arnold Arbor. 32: 77. 1951

Subshrubs up to 5 cm. Rhizomes woody. Branches glabrous. Leaves rosulate; lamina obovate-oblong to spatulate, 3 – 10 × 2 – 7 cm, sparsely pubescent and yellow glandular, base cuneate, margin serrate to sparsely crenulate, apex rounded. Inflorescences paniculate capitate corymbs; peduncle densely puberulent; bracts linear to lanceolate. Calyx cup-shaped, outside pubescent and yellow glandular. Corolla purple, white in bloom, slightly 2 lipped, 4 lobed, outside puberulent. Ovary 2 locular.

Flowers & Fruits: June to August.

Specimen Cited: Khunia, *Goutam & AP Das 0338*, dated 21.07.2009.

Local Distribution: Khunia.

General Distribution: India, Bhutan, Nepal, Cambodia, Laos, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Australia.

Verbenaceae Juss., Ann. Mus. Hist. Nat. Paris 7: 64. 1806; *nom. cons*.

Key to the genera:

1a. Inflorescences centripetal 2

1b. Inflorescences centrifugal ..... ***Duranta***

2a. Shrubs; fruit a drupe; stem spiny ..... ***Lantana***

2b. Herbs; fruit a capsule; stem not spiny ..... ***Phyla***

LANTANA Linnaeus, Sp. Pl. 2: 626. 1753.

Lantana camara L., Sp. Pl. 2: 627. 1753; Long in Grierson *et* Long, Fl. Bhut. 2(2): 914. 1999. *Camara vulgaris* Benth., Bot. Voy. Sulphur 154. 1846. *Lantana urticifolia* Miller, Gard. Dict. ed. 8: 5. 1768. *Lantana undulate* Raf., Sylva Tellur. 82. 1838. *Lantana Mexicana* Turner, Flor. Kingd. 181. 1876.

Shrubs with long weak branches, armed, stout recurved prickles, pubescent. Petiole 2 cm, pubescent; leaf blade ovate to oblong, 4 – 8 x 1.5 – 4 cm, papery, wrinkled, very rough, with short stiff hairs, aromatic when crushed, base rounded to subcordate, margin crenate; lateral veins 5 pairs, very prominent, elevated. Capitula terminal, 2 cm across. Flowers yellow, red and orange. Ovary glabrous. Drupes deep purple, globose.

Flowers & Fruits: Throughout the year.

Specimen Cited: Murti, *Goutam & AP Das 0352*. dated 17. 12. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: Tropical India; tropical and subtro-pical America, often naturalized in other tropical and subtropical regions.

PHYLA Lour., Fl. Cochinch. 1: 66. 1790.

Phyla nudiflora (L.) Greene in Pittonia 4: 46. 1899; Long in Grierson *et* Long, Fl. Bhut. 2(2): 916. 1999; Guha Bakshi, Fl. Mur. Dist. 250. 1984. *Verbena nodiflora* L., Sp. Pl. 1: 20. 1753. *Lippia nodoflora* (L.) Michaux, Fl. Bor. Amer. 2: 15. 1803; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 563. 1885. Haines, Bot. Bihar & Orissa pt. IV: 706.1922; Mooney, Suppl. Bot. Bihar & Orissa 120: 1950. *Verbena lanata* Willd. *ex* Walpers, Repert. Bot. Syst. 4: 48. 1845. *Lippia sarmentosa* (Willd.) Sprengel, Syst. Veg. 2: 752. 1825. *Phyla chinensis* Lour., Fl. Cochinch. 66. 1790.

Perennial herbs. Branched, creeping, rooting at distal nodes, minutely strigose. Leaves subsessile; leaf blade spatulate, 1 – 4 x 1 – 1.5 cm, papery, pubescent, base cuneate, margin distally sharply

serrate, veins inconspicuously 4 paired. Inflorescences cylindric to ovate capitula, 1 – 2 cm. Corolla pinkish purple, glabrous.

Flower & Fruits: January to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0562*. dated 21. 03. 2007.

Local Distribution: Murti, Dhupjhora, Bichhabhanga, Budhuram.

General Distribution: Pantropical.

DURANTA L., Sp. Pl. 2: 637. 1753.

Duranta erecta L., Sp. Pl. 2: 637. 1753; Long in Grierson *et* Long, Fl. Bhut. 2(2): 918. 1999. *Duranta spinosa* Miller, Gard. Dict. ed. 8: 3. 1768. *Duranta inermis* L., Sp. Pl. 637. 1753. *Duranta dentata* Pers., Syn. Pl. 2: 142. 1806. *Duranta repens* L., Sp. Pl. 2: 637. 1753.

Local name: Bera gachh.

Large shrubs, often climbing. Branches spiny, pubescent when young. Petiole 1 cm, pubescent; leaf blade ovate to lanceolate, 2 – 6 x 1 – 3 cm, papery, base cuneate, margin entire to distally crenate, veins 6 pairs. Calyx pubescent on both surfaces. Corolla tube 7 mm. Stamens included. Ovary glabrous. Drupes shorter than calyx, shiny, glabrous.

Flowers & Fruits: May to October.

Specimen Cited: Murti, *Goutam & AP Das 0430*. dated 17. 12. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: India: cultivated through out; North and South America.

Order: **Solanales** Juss. *ex* Berchtoldet J. Presl (1820).

Convolvulaceae Juss., Gen. P1. 132. 1789 (‘Convolvuli’); *nom. cons*.

Key to the genera:

1a. Plants parasitic, leafless, with haustoria ..... ***Cuscuta***

1b. Plants not parasitic, with well-developed leaves, haustoria absent 2

2a. Pollen finely spiny 3

2b. Pollen never finely spiny 4

3a. Fruit dehiscing ..... ***Ipomoea***

3b. Fruit indehiscent ..... ***Argyreia***

4a. Fruit indehiscent; seeds 1 ..... ***Poranopsis***

4b. Fruit dehiscent; seeds usually 4 5

5a. Styles 2 ..... ***Evolvulus***

5b. Style 1 ..... ***Merremia***

ARGYREIA Lour., Fl. Cochinch. 1: 95, 134. 1790.

Argyreia roxburghii (Wall.) Arnott *ex* Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6: 419. 1834; Hooker *f.*, Fl. Brit. Ind. 4: 185. 1883; Ohashi in Hara, Fl. E. Himal. 1:207. 1966; Hara *et* al., Enn. Fl. Pl. Nep. 3: 105. 1982; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 841. 1999. *Convolvulus roxburghii* Wall., Numer. List n. 1415. 1829.

Large climbers. Stems terete, villous. Lamina broadly ovate to circular, 15 – 18 x 12 – 18, pubescent, acuminate to caudate, entire, base cordate. Inflorescences axillary cymose. Sepals unequal. Corolla red-purple, funnel form. Ovary glabrous. Berry enclosed by enlarged calyx, dark purple, ovoidglobose.

Flowers & Fruits: February to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0743*. dated 12. 09. 2007.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: Tropical and sub-tropical parts of the world.

EVOLVULUS L., Sp. Pl. ed. 2. 391. 1762.

Evolvulus nummularius (L.) L., Sp. Pl. (ed. 2) 1: 391. 1762; Guha Bakshi, Fl. Mur. Dist. 208. 1984. *Convolvulus nummularius* L., Sp. Pl. 1: 157. 1753. *Evolvulus veronicaeifolius* Kunth, Nov. Gen. Sp. (quarto ed.) 3: 117, t. 215, 117. 1818. *Volvulopsis nummularium* (L.) Roberty, Candollea 14: 28. 1952. *Evolvulus repens* Parodi, Contrib. fl. Parag. 1: 29. 1877.

Perennial, small herbs. Stems several, rooting at nodes, prostrate, up to 40 cm, slender. Leaves distichous; lamina nearly circular, 1.5 – 2.3 x 1.4 – 2 cm, glabrous, rounded or emarginated, base cordate to rounded. Flowers 1 to 2 per leaf axil. Sepals persistent, oblong-ovate to oblong, ciliate. Corolla broadly campanulate; 5 lobed. Stamens inserted at middle of corolla tube; anthers oblong. Ovary globose. Style lobes linear; stigmas minutely capitate. Capsule ovoid. Seeds ovoid-trigonous.

Flowers & Fruits: March to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0722*. dated 12. 09. 2007.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: India, Tropical Africa, Madagascar, Malaya Peninsula, Mexico and West Indies.

IPOMOEA L., Sp. Pl. 1: 159. 1753.

Key to the species: 1a. Shrub with milky juice ..... *I. fisulosa*

1b. Annual herbs or twiner 2

2a. Plants of marshy places or aquatic; stems fistulose ..... *I. aquatica*

2b. Plants fully terrestrial; stem not fistulose ..... *I. hederifolia*

Ipomoea aquatic Forsskal, Fl. Aegypt. Arab. 44. 1775; Clark in Hook. *f.*, Fl. Brit. Ind. 4: 210. 1883; Majumder, Bull. Bot. Soc. Bengal 19: 13. 1965; Guha Bakshi, Fl. Mur. Dist. 210. 1984. Bora *et* Kumar in Flor. Div. Ass. 229. 2003. *Ipomoea reptants* Poiret in Lam., Encycl., Suppl. 3(2): 460.1814; Prain Beng. Pl. 2: 547. 1903. *Ipomoea repens* Roth, Nov. Pl. Sp. 110. 1821. *Ipomoea natans* Dinteret Suess, Mitt. Bot. Staatssamml. Mónchen 4: 112. 1952.

Local name: Kolmi Saak.

Annual herbs, terrestrial or floating. Stems terete, thick, hollow, rooting at nodes. Petiole glabrous; lamina variable, ovate to ovate-lanceolate, 5 – 18 x 2 – 9 cm, acute or acuminate, entire or undulate, base cordate, sagittate to hastate, occasionally truncate. Inflorescences 1 to 3 flowered. Sepals sub equal, glabrous; outer 2 ovate-oblong, mucronulate; inner 3 ovate-elliptic. Corolla pink, with a darker center. Stamens unequal. Ovary conical, glabrous. Stigma 2 lobed. Capsule ovoid to globose.

Flowers & Fruits: August to February.

Specimen Cited: Gorumara, *Goutam & AP Das 0722*. dated 12. 09. 2007.

Local Distribution: Gorumara, Murti, Dhupjhora.

General Distribution: Throughout the India; Tropical Asia, Australia and Africa.

Ipomoea fisulosa Mart *ex* Choisy in de Candolle, Prodr. 9: 349. 1845. *Ipomoea carnea* Jacq., Enum. Syst. Pl. 13. 1760; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 851. 1999. *Ipomoea fruticosa* Kuntze, Revis. Gen. Pl. 2: 444. 1891. *Ipomoea crassicaulis* (Bentham) B.L. Robinson, Proc. Amer. Acad. Arts 51(10): 530. 1916. *Ipomoea carnea* f. *albiflora* Moldenke, Phytologia 2: 224. 1947. *Batatas crassicaulis* Benth., Bot. Voy. Sulphur 134. 1845.

Local name: Dhalkolmi.

Shrubs with milky juice, stem erect or asending; young parts puberulent by age, glabrous. Lamina ovate-oblong, acuminate at apex, cordate at base; midrib below with 2 small glands at the base of the petiole. Inflorescences axillary and terminal; pedicels longer than the calyx; bracts minute, ovate, caduceus. Capsule pale-brown, finely pubescent at base, ovoid, mucronate, 4-celled, 4-valved. Seeds 4 or less, black sericeous.

Flowers & Fruits: August to March.

Specimen Cited: Gorumara, *Goutam & AP Das 0743*. dated 12. 09. 2007.

Local Distribution: Gorumara, Murti, Dhupjhora.

General Distribution: India; Native to America; naturalized in tropical areas.

Ipomoea hederifolia L., Syst. Nat. (ed. 10) 925. 1759. *Ipomoea hederifolia* L., Sp.Pl. ed. 1. 159. 1753; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 850.1991. *Ipomoea phoenicea* Roxb., Fl. Indica (ed. Carey) 2: 92. 1824. *Quamoclit sanguinea* (Vahl) G. Don, Gen. Hist. 4: 259. 1838. *Quamoclit phoenicea* (Roxb.) Choisy, Convolv. Orient. 51. 1833. *Ipomoea luteola* Jacq., Collectanea 2: 266. 1788. *Ipomoea angulata* Lam., Tabl. Encycl. 1: 464. 1791. *Ipomoea coccinea* var. *hederifolia* (L.) Gray, Syn. Fl. N. Amer. 2(1): 209. 1878.

Annual twiner, up to 4 m, glabrous. Leaves alternate; lamina ovate to sub-orbicular, 3 – 12 x 2 – 8 cm, acuminate and mucronulate, base cordate, glabrous. Cymes terminal and axillary. Pedicels erect. Sepals oblong-rectangular, erect at anthesis, narrowly linear, herbaceous, inserted just below tip. Corolla scarlet, narrowly infundibular, glabrous; tube 3 cm, very slender. Stamens and style exserted. Capsule globose. Seeds 4, black.

Flowers & Fruits: July to December.

Specimen Cited: Murti, *Goutam & AP Das 0248*. dated 16. 12. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: Tropical World.

MERREMIA Dennstedt *ex* Endlicher, Gen. Pl. 1: 1403. 1841, *nom. cons*.

Key to the species:

1a. Leaves palmately 3–5 lobed ..... *M. vitifolia*

1b. Leaves entire or irregularly coarsely crenate 2

2a. Leaves linear to ovate-oblong, base truncate ..... *M. hirta*

2b. Leaves ovate-cordate, base cordate to broadly cordate ..... *M. hederacea*

Merremia hirta (L.) Merril, Philipp. J. Sci. 7(4): 244-245. 1912; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 854. 1999. *Ipomoea linifolia* Bl., Bijdr. Fl. Ned. Ind. 13: 721. 1825. *Convolvulus hirtus* L., Sp. Pl. 1: 159. 1753. *Convolvulus caespitosus* Roxb., Fl. Ind., ed. 1832 1: 483-484. 1832. *Skinneria caespitose* (Roxb.) Choisy, Mum. Soc. Phys. Gen. 6: 487. 1833.

Local name: Vitachhara.

Twining herbs. Stems rooting at nodes. lamina linear to ovate-obLong, Fl. Bhut. 2 – 6 x 0.5 – 3 cm, obtuse, acute or mucronulate, entire, base truncate, rounded. Inflorescences 1 to 4 flowered. Sepals elliptic to elliptic-oblong, unequal. Corolla whitish, broadly funnelform. Stamens included. Ovary glabrous. Capsule broadly ovoid to globose. Seeds brownish black, trigonous-ellipsoid.

Flowers & Fruits: July to January.

Specimen Cited: Khunia, *Goutam & AP Das 0136*. dated 02. 07. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; N Australia.

Merremia hederacea (Burm *f.*) Hallier *f.*, Bot. Jahrb. Syst. 18(1-2): 118. 1893; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 854. 1999. *Evolvulus hederaceus* Burm. *f.*, Fl. Indica 77, pl. 30, f. 2: 77. 1768. *Convolvulus lapathifolius* Spreng., Syst. Veg. 1: 604. 1825. *Convolvulus flavus* Willd., Sp. Pl. 1(2): 852-853. 1797.

Twining herbs; rooting at nodes. Lamina cordate-ovate, 2 – 7.5 x 1 – 5 cm, 3-lobed, entire to irregularly crenate, base cordate to broadly cordate. Inflorescences few to many flowered, umbelliform. Sepals broadly obovate to spatulate-oblong, reflexed in fruit, unequal. Corolla yellow, campanulate. Stamens as long as corolla. Ovary globose, glabrous; stigma globose. Capsule depressed globose to broadly conical. Seeds trigonous-globose.

Flowers & Fruits: June to November.

Specimen Cited: Khunia, *Goutam & AP Das 0049*. dated 26. 06. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: India, Bhutan, China, Nepal, Bangladesh, Sri Lanka, Pakistan, Cambodia, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Africa, N Australia, Pacific Islands.

Merremia vitifolia (Burm. *f.*) Hallier, Bot. Jahrb. Syst. 16(4-5): 552. 1893; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 852. 1999. *Convolvulus vitifolius* Burm. *f.*, Fl. Indica 45. 1768. *Convolvulus vitifolius* Burm. *f.*, Fl. Indica 45-46, pl. 18, f. 1: 45. 1768. *Ipomoea vitifolia* (Burm. *f.*) Blume, Bijdr. Fl. Ned. Ind. 13: 709. 1825. *Convolvulus angularis* Burm. *f.*, Fl. Indica 46. 1768.

Local name: Vitachhara.

Twining herbs. Lamina circular in outline, 5-15 x 4-15 cm, acuminate to obtuse, palmately 3-5 lobed, lobes broadly triangular or ovate-lanceolate, base cordate. Inflorescences 1 to 3 flowered. Sepals oblong to ovate-oblong, leathery, obtuse to acute. Corolla yellow; limb 5 angled. Anthers spirally twisted. Ovary glabrous. Capsule straw colored, globose. Seeds black-brown, trigonousovoid, glabrous.

Flowers & Fruits: Throughout the year.

Specimen Cited: Khunia, *Goutam & AP Das 0082*. dated 27. 06. 2006.

Local Distribution: Gorumara, Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: Tropical hemisphere.

PORANOPSIS Roberty, Candollea 14: 26. 1952.

Poranopsis paniculata (Roxb.) Roberty, Candollea 14: 26. 1953. *Porana paniculata* Roxb., Pl. Coromandel 3: 31, pl. 235. 31, 1819; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 857. 1999.

Large climbers. Lamina cordate-circular, 7 – 16 x 5 – 15 cm, smooth to rugulose, base cordate. Flowers in axillary cymes. Sepals lanceolate-linear, concave, equal. Fruiting calyx reddish, loosely clasping; outer 3 sepals elliptic-oblong to narrowly ovate, margin free. Corolla white to cream, narrowly funnelform; 5 lobed. Stamens included, equal. Ovary glabrous. Style obsolete; stigma subsessile. Fruit brownish with darker lines, globose-ellipsoid. Seeds dark brown, globose-ellipsoid.

Flowers & Fruits: October to April.

Specimen Cited: Murti, *Goutam & AP Das 0352*. dated 17. 12. 2006.

Local Distribution: Murti, Dhupjhora, Khunia, Bichhabhanga, Budhuram.

General Distribution: India, Bhutan, Nepal, Pakistan, Myanmar.

CUSCUTA L., Sp. Pl. 1: 124. 1753.

Key to the species:

1a. Stem thick; flowers in racemes or panicles; style 1 ..... *C. reflexa*

1b. Stem thin; flowers in compact cymose; style 2 ..... *C. chinensis*

Cuscuta reflexa Roxb., Pl. Corom. 2: 3,t. 104. 1798; Hook. *f*., Fl. Brit. Ind. 4: 225. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(2): 863. 1999. *Monogynella reflexa* (Roxb.) Holub, Folia Geobot. Phytotax. 12(4): 429. 1977. *Cuscuta hookeri* Sweet, Hort. Brit. 290. 1826.

Local name: Swarnalata.

Stems yellow to yellowish green, stout. Inflorescences lateral, few to many flowered, in racemes or panicles; bracts and bractoles scalelike. Calyx cupular; sepals 5, broadly ovate, equal. Corolla white to creamy, fragrant; lobes early deciduous, often reflexed, triangular-ovate. Stamens inserted at throat; filaments shorter than anthers; anthers elliptic-ovate. Ovary ovate-conical. Style 1; stigma divergent. Capsule conical-globose.

Flowers & Fruits: February to October.

Specimen Cited: Murti, *Goutam & AP Das 0248*. dated 16. 12. 2006.

Local Distribution: Murti, Dhupjhora, Budhuram.

General Distribution: India throughout; Bhutan, Nepal, Sri Lanka, Pakistan, Malaysia. Afghanistan, Indonesia, Malaysia, Myanmar, Thailand.

Cuscuta chinensis Lam., Encycl. 2(1): 229. 1786. *Cuscuta carinata* R. Br., Prodr. 491. 1810. *Cuscuta chinensis* var. *carinata* (R. Br.) Engelman, Trans. Acad. Sci. St. Louis 1(3): 480. 1859. *Cuscuta fimbriata* Bunge *ex* Engelman, Trans. Acad. Sci. St. Louis 1: 480. 1859.

Local name: Swarnalata.

Stems yellow, thin. Inflorescences lateral, compact cymose, few to many flowered; bracts and bracteoles scalelike. Calyx cupular; sepals triangular, obtuse. Corolla white; lobes persistent triangular-ovate, reflexed. Stamens inserted at throat; scales oblong. Ovary subglobose. Styles 2, equal or unequal; stigma globose. Capsule enclosed, globose. Seeds 2–4, pale brown, ovoid.

Flowers & Fruits: March to November.

Specimen Cited: Khunia, *Goutam & AP Das 0001*. dated 25. 06. 2006.

Local Distribution: Murti, Khunia, Bichhabhanga, Budhuram.

General Distribution: India throughout; Bhutan, Afghanistan, Sri Lanka, Indonesia, Japan, Kazakhstan, Korea, Mongolia, Russia; Africa, SW Asia, Australia.

Solanaceae Juss., Gen. Pl. 124. 1789 ('Solaneae'); *nom. cons*.

Key to the Genera:

1a. Berries completely enclosed within the enlarged calyx ..... ***Physalis***

1b. Berries not enclosed within the enlarged calyx 2

2a. Inflorescence many flowered 3

2b. 1 to 3 flowers per axil 4

3a. Plants spiny; leaves lobed ..... ***Solanum***

3b. Plants without spine; leaves unlobed ..... ***Nicotiana***

4a. Calyx 5-lobed; fruit prickly or papillate, 4-valved or irregularly dehiscent ..... ***Datura***

4b. Calyx 5-parted; fruit unarmed, lacking papillae, 2-valved, dehiscent ..... ***Petunia***

DATURA L., Sp. Pl. 1: 179. 1753.

Key to the species:

1a. Corolla sometimes doubled or tripled; seeds slightly reniform ..... *D. metel*

1b. Corolla usually single funnel form; seeds ovate ..... *D. stramonium*

Datura metel L., Sp. Pl. 179. 1753; Hook. *f*., Fl. Brit. Ind. 4: 243. 1883; Ohashi in Hara, Fl. E. Himal. 1: 283. 1966; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1067. 2001. *Datura nigra* Hasskarl, Cat. Hort. Bot. Bogor. 142. 1844. *Datura fruticosa* Horn., Hort. Bot. Hafn. 1: 212. 1813. *Datura alba* Mueller, Fragm. 6: 144. 1868.

Local name: Dhutro.

Erect, branched, annual undershrubs, up to 2m. Leaves petiolate, lamina ovate to rhomboid or elliptic, 5–20 x 4–l5 cm, membranous, acuminate, sinuate-dentate, base cuneate. Flowers solitary, axillary, erect. Calyx tubular. Corolla purplish, funnelform, sometimes doubled or tripled; lobes elongate. Capsule ovoid, pericarp very sharply spiny. Seed black, slightly reniform. *Flowers & Fruits*: March to December.

Specimen Cited: Murti, *Goutam & AP Das 0352*. dated 17. 12. 2006.

Local Distribution: Dhupjhora, Murti, Bichhabhanga.

General Distribution: Native of the Americas, long introduced and naturalized in Asia.

Datura stramonium L., Sp. Pl. 179.1753; Clark in Hook. *f*., Fl. Brit. Ind. 4: 242. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1067. 2001. *Datura laevis* L. *f*., Suppl. Pl. 146. 1782. *Stramonium spinosum* Lam., Fl. Franɳ. 256. 1779. *Datura parviflora* Salisb., Prodr. Stirp. Chap. Allerton 131. 1796.

Local name: Dhutro.

Subshrubs, sometimes robust, up to 3 m. Lamina broadly ovate, 8 – 16 x 4 – 12 cm, membranous, acuminate, irregularly dentate, base asymmetric, cuneate. Flowers erect. Calyx tubular, 5-angular. Corolla white, greenish at base, sometimes purple distally, funnelform; lobes 6 – 10 cm, mucronate at apex. Filaments 2.8 – 3.3 cm. Capsules erect, globose to ovoid, with copious prickles, rarely smooth, dehiscent by 4 equal valves. Seeds black, ovate.

Flower & Fruits: April to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0687*. dated 11. 09. 2007.

Local Distribution: Dhupjhora, Murti.

General Distribution: Temperate region of world. native of Mexico, now worldwide.

NICOTIANA L., Sp. Pl. 1: 180. 1753.

Nicotiana plumbaginifolia Viviani, Planch, Pl. Hort. Dinegro, 26. t. 5, 1802 & Elench. Pl. 26, pl. 1, 5 26 1802; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 246. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1074. 2001; Prain, Beng. Pl. 2: 559. 1903; Guha Bakshi, Fl. Mur. Dist. 218. 1984. *Nicotiana pusilla* L., Syst. Nat. (ed. 10) 2: 933. 1759. *Nicotiana cavanillesii* Dunal, Prodr. 13(1): 572. 1852. *Nicotiana plantaginea* Dunal, Prodr. 13(1): 559. 1852.

Local name: Ban tamak.

Annual herb with 0.7-1 m height. Lamina radical, sessile, obovate or spathulate, obtuse or rounded at apex; upper becoming smaller and passing into bracts, sessile, elliptic, elliptic lanceolate, oblong, acute or acuminate at apex. Flowers in lax racemes. Pedicels 7-9 mm long. Capsule 0.7- 1 cm long, oval, glabrous, 2 or 4 valved. Seeds dark brown.

Flower & Fruits: March to November.

Specimen Cited: Murti, *Goutam & AP Das 0306*. dated 16. 12. 2006: *Goutam & AP Das 0546. dated 19. 12. 2006*.

Local Distribution: Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India (Assam, West Bengal); Native to Mexico and West Indies.

PETUNIA Juss., Ann. Mus. Natl. Hist. Nat. 2: 214. 1803.

Petunia x ***hybrida*** Hortulanorum *ex* Vilmorin, Fl. Pleine Terre 1: 615-616. 1863. *Petunia violacea* var. *hybrida* Hook. *f*., Bot. Mag. 64: pl. 3556. 1837. *Petunia hybrida* (Hook. *f*.) Vilmorin, Fl. Pleine Terre ed. 1. 615. 1863; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1076. 2001. *Petunia violacea* var. *hybrida* Hook. *f*., Bot. Mag. 64: t. 3556. 1837.

Local name: Petuinia.

Annual, herbs up to 60 cm, glandular hairy. Leaves short petiolate to subsessile; lamina ovate, 3 – 8 x 1.5 – 4 cm, acute, entire, base cuneate. Calyx deeply parted; lobes linear, obtuse. Corolla white and yellow, sometimes fragrant, funnelform, limb spreading. Style slightly exceeding stamens. Capsules conical. Seeds subglobose.

Flowers & Fruits: March to August.

Specimen Cited: Murti, *Goutam & AP Das 0288*. dated 16. 12. 2006.

Local Distribution: Dhupjhora, Murti.

General Distribution: Cultivated Worldwide.

PHYSALIS L., Sp. Pl. 1: 182. 1753.

Physalis minima L., Sp. Pl. 183-184. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 238. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1045. 2001; Prain, Beng. Pl. 2: 750. 1903; Guha Bakshi, Fl. Mur. Dist. 219. 1984. *Physalis parviflora* Lag, Gen. Sp. Pl. 11. 1816. *Physalis parviflora* R. Br., Prodr. 447. 1810. *Physalis lanceifolia* Nees, Linnaea 6(3): 473-474. 1831.

Local name: Tapari.

Erect or decumbent, annual herbs, up to 1m. Lamina ovate to ovate-lanceolate, 2 – 3 x 1 – 1.5 cm, acuminate, base cuneate, often oblique,. Flowers yellow, solitary, on long slender deflexed pedicels. Calyx campanulate. Corolla often with small spot at the base within. Anthers light yellow. Berries completely enclosed within the enlarged membranous 5-10 ribbed calyx; seeds discoid or reniform.

Flower & Fruits: April to January.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0573*. dated 21. 03. 2007.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Pantropic.

SOLANUM L., Sp. Pl. 1: 184. 1753.

Key to the species:

1a. Corolla yellow; flowers 5–9 merous ..... *S. pimpinellifolium*

1b. Corolla usually white, blue, or violet; flowers 4 to 5 merous 2

2a. Plants with stellate hairs 3

2b. Plants glabrous, stellate hairs usually absent 5

3a. Inflorescences mostly 1–3-branched 4

3b. Inflorescences unbranched ..... *S. melongena*

4a. Leaves usually pinnate-parted ..... *S. sisymbriifolium*

4b. Leaves subentire or variously lobed ..... *S. rudepannum*

5a. Shrubs; leaves borne on woody stems ..... *S. viarum*

5b. Herbs; leaves borne on herbaceous shoots 6

6a. Fruit yellowish orange to reddish; plants villous ..... . *S. villosum*

6b. Fruit black; plants glabrescent to puberulent ..... *S. americanum*

Solanum viarum Dunal in Candolle, Prodr. 13(1): 240. 1852; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1058. 2001. *Solanum khasianum* Clarke in Hook. *f*., Fl. Brit. Ind. 4: 234. 1833.

Local name: Kantabegun.

Erect, subshrubs, up to 1m, armed. Leaves unequal paired; armed with erect, flat, straight prickles; lamina broadly ovate, 6 – 15 x 6 – 12 cm, lobed, lobes blunt at apex, base truncate to short hastate. Inflorescences extra-axillary, subfasciculate, 1–5 flowered racemes. Flowers andromonoecious, only basal ones fertile. Calyx campanulate. Corolla white. Anthers lanceolate, acuminate. Ovary puberulent. Style glabrous. Berry pale yellow, globose. Seeds brown.

Flowers & Fruits: June to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0722*. dated 12. 09. 2007.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: widespread in tropical Asia and Africa.

Solanum rudepannum Dunal, Prodr. 13(1): 264-265. 1852. *Solanum torvum* Swartz, Prodr. 47. 1788; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 234. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1055. 2001. *Solanum torvum* var. *ochraceo-ferrugineum* Dunal, Prodr. 13(1): 260-261. 1852. *Solanum diversifolium* Schltdle, Linnaea 19: 297-298. 1847. *Solanum auctosepalum* Rusby, Descr. S. Amer. Pl. 114. 1920.

Local name: Gotbegun, Titbegun.

Large shrubs, up to 3 m, sparingly armed. Leaves solitary to paired; lamina ovate to elliptic, 6 – 16 x 4 – 10 cm, acute, sinuate or usually 5–7-lobed, base cordate to cuneate. Inflorescences extraaxillary, many-flowered racemose panicles. Flowers andromonoecious. Calyx cup-shaped; lobes ovate-lanceolate. Corolla white, rotate; lobes ovate-lanceolate. Fruiting pedicel 1–2 cm. Berry yellow, smooth, glabrous. Seeds discoid.

Flower & Fruits: November to August.

Specimen Cited: Gorumara, *Goutam & AP Das 0743*. dated 12. 09. 2007.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: Tropical India, China, Malaya, Philippines and Tropical America.

Solanum americanum Miller, Gard. Dict. (ed. 8) no. 5 no. 5. 1768. *Solanum nigrum* L., Sp. Pl. 1: 186. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 4: 229. 1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1052. 2001; Guha Bakshi, Fl. Mur. Dist. 221. 1984. *Solanum nodiflorum* Jacq., Icon. Pl. Rar. 2: 11, pl. 326, 11. 1786. *Solanum nigrum* var. *minor* Hook. *f*., Trans. Linn. Soc. London 20: 201. 1847.

Annual herbs, green, mostly erect, up to 100 cm. Lamina ovate, 4 – 8 x 2 – 4 cm, membranous, apex acute, entire or sparingly dentate, base truncate to cuneate. Inflorescences extra-axillary. Calyx cup-shaped; lobes ovate, ciliate. Corolla white; lobes ovate-oblong. Filaments short. Berry shiny black, occasionally ripening green, globose. Seeds discoid.

Flower & Fruits: November to March

Specimen Cited: Khunia, *Goutam & AP Das 0182*. dated 03. 07. 2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, S. E. Asia, Tropical Africa, Australia and America.

Solanum villosum Miller, Gard. Dict. (ed. 8) no. 2. 1768; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1052. 2001. *Solanum miniatum* Bernh. *ex* Willd., Enum. Pl. 1: 236. 1809.

Annual, erect, herbs up to 100 cm. Lamina ovate, 4 – 10 X 3 – 7 cm, pubescent, obtuse, entire or coarsely dentate, base cuneate, decurrent. Inflorescences extra-axillary umbels. Calyx cup-shaped; lobes subdeltate, pubescent abaxially, ciliate. Corolla white; lobes ovate-oblong, ciliate, spreading. Filaments 1.5 mm; anthers oblong. Style 5 mm. Fruiting pedicel strongly deflexed. Berry dull black, globose. Seeds discoid.

Flower & Fruits: March to November.

Specimen Cited: Murti, *Goutam & AP Das 0528*. dated 19. 12. 2006.

Local Distribution: Dhupjhora, Murti, Khunia, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Japan; SW Asia, Europe.

Solanum sisymbriifolium Lam., Tab. Encyl. 2: 25. 1794. *Solanum sisymbriifolium* f. *ililacinum* Kuntze, Revis. Gen. Pl. 3(3): 227. 1898.

Annual herbs, up to 1m, copiously armed. Leaves simple or sometimes pinnate; lamina oblong to ovate, 5 – 12 x 2.5 – 5 cm; lobes pinnately lobed or dentate, apex acute. Inflorescences axillary and extra-axillary scorpioid racemes. Calyx cup-shaped; lobes ovate-lanceolate. Corolla white, stellate; lobes ovate. Anthers lanceolate. Ovary puberulent. Fruiting calyx enlarged, longer than fruit, densely prickly, enveloping most berry. Berry bright red, subglobose. Seeds reniform.

Flowers & Fruits: February to August.

Specimen Cited: Murti, *Goutam & AP Das 0289*. dated 16. 12. 2006.

Local Distribution: Dhupjhora, Murti, Budhuram, Bichhabhanga.

General Distribution: India, native to South America; naturalized in Africa, Australia.

Solanum melongena L., Sp. Pl. 1: 186. 1753; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1058. 2001.

Local Name: Begun.

Woody, branched shrubs, up to 60 cm, sparingly armed. Lamina ovate to oblong-ovate, 6 – 18 x 5 – 11 cm, obtuse, sinuate-lobed, base oblique. Inflorescences mostly solitary flowers. Flowers andromonoecious. Calyx stellate tomentose; lobes lanceolate. Corolla purplish; lobes deltate. Berry purple, pink, with a thick, spongy, whitish mesocarp and septal region. Seeds lenticular, yellowish.

Flowers & Fruits: January to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0566*. dated 21. 03. 2007.

Local Distribution: Dhupjhora, Murti, Budhuram.

General Distribution: Widely cultivated for its edible fruits.

Solanum pimpinellifolium L., Cent. Pl. I 1: 8. 1755. *Lycopersicon pimpinellifolium* (L.) Miller, Gard. Dict. (ed. 8) no. 4. 1768. *Lycopersicon esculentum* Miller, Gard. Dict. (ed.8) n.2. 1768; Hook. *f*., Fl. Brit. Ind. 4:237.1883; Mill in Grierson *et* Long, Fl. Bhut. 2(3): 1063. 2001. *Solanum lycopersicum* L., Sp. Pl. 185.1753.

Local name: Chhoto tomato.

Annual, sprawling, herbs up to 1.3 m, odorous. Lamina mostly pinnately compound to divided, 10 – 40 cm, obtuse, base oblique, cuneate; leaflets mostly unequal, ovate to oblong, entire to irregularly dentate. Racemes 3–7 flowered. Calyx rotate-campanulate, lobes lanceolate. Corolla lobes narrowly oblong, yellow. Berry red to orange-yellow, subglobose, fleshy, juicy, shiny. Seeds straw colored.

Flowers & Fruits: May to November.

Specimen Cited: Murti, *Goutam & AP Das 0039*. dated 25. 06. 2006.

Local Distribution: Dhupjhora, Murti, Budhuram, Bichhabhanga.

General Distribution: A native to Mexico and South America; cultivated elsewhere; sometime escapes.

Order 54: Asterales Link (1829)

Asteraceae Link, Handb. 1: 731. 1829 (‘Asteroideae’); *nom. nov*. vs. Corymbi- ferae A. L. de Jussieu, 1789; *nom. alt.* vs. Compositae)

Key to the genera:

1a. Capitula with only male florets or with only female florets 2

1b. Capitula all alike, homogamous or heterogamous 4

2a. Plants monoecious, with male and female capitula on same plant 9

2b. Plants dioecious, with male and female capitula on different plants 3

3a. phyllaries with distinct pale or brownish scarious margin ..... ***Artemisia***

3b. Phyllaries whitish brown or yellowish especially in distal part ..... ***Gnaphalium***

4a. Capitula homogamous and all florets ligulate, latex present 19

4b. Capitula heterogamous, or if homogamous then corollas zygomorphic, latex absent 5

5a. Capitula homogamous; corollas pseudoligulate, 5-lobed and zygomorphic 20

5b. Capitula heterogamous; corollas 3–5-lobed, actinomorphic 6

6a. Leaves opposite or at least below synflorescence opposite 21

6b. Leaves all alternate 7

7a. Receptacle paleate 23

7b. Receptacle epaleate 8

8a. Phyllaries uniseriate; involucre cylindric 9

8b. Phyllaries 2- to several seriate, involucres saucer-shaped to subglobose 25

9a. Capitula small and not showy; all florets unisexual ..... ***Xanthium***

9b. Capitula colorful and attractive; some or all florets bisexual 10

10a. Leaves and phyllaries with obvious oil glands ..... ***Tagetes***

10b. Leaves and phyllaries lacking oil glands 11

11a. Only ray florets fertile, ray achenes much longer than sterile disk florets ..... ***Parthenium***

11b. Disk florets fertile; ray florets present and fertile or sterile or absent 12

12a. Pappus of plumose setae or fimbriate 13

12b. Pappus absent, or awned 14

13a. Pappus of plumose setae ..... ***Tridax***

13b. Pappus absent or of fimbriate ..... ***Galinsoga***

14a. Achenes compressed 15

14b. Achenes all plump or 3–5-angled in ray florets 17

15a. Pappus of retrorsely barbed awns; leaves opposite or upper alternate ..... ***Bidens***

15b. Pappus absent, or persistent, of 2 bristly cusps or scales; leaves opposite 16

16a. Achenes markedly dimorphic, lacerate winged margin, others wingless ..... ***Synedrella***

16b. Achenes all alike, wingless, not lacerate ..... ***Eleutheranthera***

17a. Achenes enclosed by inner phyllaries or outer paleae ..... ***Enydra***

17b. Achenes not enclosed by inner phyllaries 18

18a. Paleae narrow, long, flat; 2 seriate ray florets not enclosed by paleae . ..... ***Eclipta***

18b. Paleae concave or folded, enclosing florets ..... ***Acmella***

19a. Pappus white, fine cottony outer bristles intermixed with thicker inner ones ..... ***Sonchus***

19b. Pappus grayish and yellowish, equal in diametre and stiffness ..... ***Youngia***

20a. Capitula densely clustered, subtended by 3 leaflike bracts ..... ***Elephantopus***

20b. Capitula in lax panicles with more than 4 florets ..... ***Vernonia***

21a. Phyllaries and florets 4 per capitulum ..... ***Mikania***

21b. Phyllaries and florets not of equal number 22

22a. Phyllaries all deciduous leaving a naked receptacle ..... ***Chromolaena***

22b. At least some basal phyllaries persistent ..... ***Ageratum***

23a. All florets with pappus ..... ***Blumea***

23b. Pappus absent ..... ***Sphaeranthus***

24a. Involucre not calyculate ..... ***Emilia***

24b. Involucre calyculate ..... ***Crassocephalum***

25a. Herbs prostrate; involucres patelliform ..... ***Grangea***

25b. Herbs erect; involucres hemispheric ..... ***Erigeron***

ACMELLA Rich. in C. H. Pers., Syn. Pl. 2: 472. 1807.

Key to the species :

1a. Petiole 1–2 cm; lamina ovate to ovate-lanceolate, apex acute …… *A. paniculata*

1b. Petiole 5 – 8 mm; lamina lanceolate, apex acuminate or caudate …….. *A. calva*

Acmella paniculata (Wall. *ex* Candolle) Jansen, Syst. Bot. Monogr. 8: 67. 1985; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1605. 2001. *Spilanthes paniculata* Wallich *ex* Candolle, Prodr. 5: 625. 1836. *Spilanthes acmella* var. *paniculata* (Wall. *ex* Candolle) Clarke, Comp. Ind. (1876) 139. 1876.

Annual ascending herbs. Stems branched. Petiole 1–2 cm; lamina ovate to ovate-lanceolate, 2 – 5 x 1 – 3 cm, 3 veined, base cuneate, crenately serrate, acute. Capitula discoid, solitary, terminal; phyllaries 9 – 11, 2 seriate, ovate-lanceolate. Florets 100 – 200; corollas tubular, minute, 4 to 5 lobed. Achenes obovoid, 3 angled; pappus of 2 subequal bristles.

Flowers & Fruits: June to November.

Specimen Cited: Khunia, *Goutam & AP Das 0806*, dated 04.07.2009.

Local Distribution: Khunia, Murti, Budhuram, Bichhabhanga, abundant.

General Distribution: India, Bhutan, China, Bangladesh, Nepal, Sri Lanka, Indonesia, Laos, Malaysia, Myanmar, Philippines, Vietnam, Thailand.

Acmella calva (Candolle) Jansen, Syst. Bot. Monogr. 8: 41. 1985; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1605. 2001. *Spilanthes calva* Candolle in Wight, Contr. Bot. Ind. 19. 1834; Ohashi in Hara, Fl. E. Himal. 2: 141. 1971; Hara *et al*., Enn. Fl. Pl. Nep. 3: 45. 1982; Fl. Ind. 12: 409. 1995. *Spilanthes acmella* var. *calva* (Candolle) Clarke, Comp. Ind. 138. 1876; Clarke in Hook. *f.*, Fl. Brit. Ind. 3: 307. 1881

Perennial, creeping or prostrate herbs. Stems up to 60 cm, rooting at nodes. Petiole 5 – 8 mm; lamina lanceolate, 3 – 8 × 1– 3 cm, base cuneate, peaked serrate, acuminate or caudate. Capitula ovoid-conical; phyllaries 7 – 9, 2 seriate, subequal, ovate-oblong, ciliate; receptacle columnar-conical. Corollas yellow; ray florets female, lamina short, obovate, shallowly 3-lobed; disk florets bisexual, tubular, 4 to 5 toothed. Achenes Br., oblong; pappus 2.

Flowers & Fruits: July to November.

Specimen Cited: Khunia, *Goutam & AP Das 0206*, dated 04.07.2006.

Local Distribution: Khunia, Murti, Budhuram, Bichhabhanga, abundant.

General Distribution: India, Bhutan, Nepal, Sri Lanka, China, Myanmar, Indonesia, Malaysia.

AGERATINA Spach, Hist. Nat. Veg. Phan. 10: 286. 1841.

Ageratina adenophora (Spreng.) King & Robins., Phytologia 19: 211. 1970. *Eupatorium adenophorum* Spreng., Syst. Veg. 3: 420. 1826; Uniyal in Hajra *et al*., Fl. India 12: 350. 1995. *Eupatorium glandulosum* Kunth, Nov. Gen. Sp. 4: 122, t. 346. 1820; Matthew, Rec. Bot. Surv. India 20:135. 1969.

Subshrubs, glandular hairy; stems violet-blue. Leaves opposite, 7-8 x 3-4 cm, ovate, acute, serrate; petiole ca. 2 cm long. Heads 7-8 mm across, packed, in terminal corymbose panicle; bracts 3 -seriate, lanceolate, strongly 3-ribbed; outer florets bisexual, 4-5 mm long; corolla white, tube narrow, campanulate above, 5-lobed, hispid; inner florets female. Achenes curved, ellipsoid, 5angled, brown, smooth; pappus 5-10, white, barbed.

Flowering & Fruiting: February to June.

Specimen Cited: Murti, *Goutam & AP Das* 0442, dated 18. 12. 2006.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara.

General Distribution: Pantropical.

AGERATUM L., Sp. Pl. 2: 839. 1753.

Key to the species:

1a.Leaf base cordate to truncate ..... *A. houstonianum*

1b. Leaf base obtuse to broadly cuneate ..... *A. conyzoides*

Ageratum houstonianum Miller, Gard. Dict. ed. 8, Ageratum no. 2. 1768; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1627. 2001. *Ageratum mexicanum* Sims, Bot. Mag. T. 2524. 1825. *Ageratum conyzoides* var. *mexicanum* (Sims) Candolle, Prodr. 5: 108. 1836. *Carelia houstoniana* (Miller) Kuntze, Revis. Gen. Pl. 1: 325. 1891. 325. 1891. *Ageratum cordifolium* Roxburgh, 415. 1832.

Local name: Uchuntijhar.

Annual, erect herbs. Stems robust, simple or branched from middle, stems and branches reddish, or green toward apex, densely spreading long tomentose. Leaves alternate; median leaves ovate, elliptic

to oblong, 3 – 7 × 2 – 5 cm; upper leaves gradually smaller, oblong, base obtuse to broadly cuneate, crenate-serrate, acute. Capitula small, 4 – 12, in dense terminal corymbs; involucre campanulate; phyllaries 2 seriate, oblong to lanceolate-oblong; corollas limb purplish, 5 lobed. Achenes black.

Flowers & Fruits: Throughout of year.

Specimen Cited: Murti, *Goutam & AP Das* 0442, dated 18. 12. 2006.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Bichhabhanga, Budhuram; abundant.

General Distribution: native to tropical America; widespread weed throughout Africa, India, Malay Peninsula, Myanmar, Nepal, and the South China Sea islands

Ageratum conyzoides L., Sp. Pl. 2: 839. 1753; Clarke in Hook. *f*., Fl. Brit. India 3: 243. 1881; Ohashi in Hara, Fl. E. Himal. 1: 330. 1966; Hajra *et al*., Fl. Ind. 12: 348. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1627. 2001. *Ageratum arsenei* Robinson, Contr. Gray Herb. 64 3. 1922.

Local name: Uchunti jhar.

Annual, erect herbs, purple-red branched from middle or lower part, up to 80 cm. Leaves broadly ovate or triangular-ovate; median stem leaves 2 – 6 × 2 – 4 cm; upper and axillary leaves smaller; both surfaces sparsely to densely white pubescent, base cordate to truncate, crenateserrate, rounded or acute. Synflorescence corymbose. Capitula 6 – 14 or more; involucres campanulate; phyllaries 2 to 3 seriate, narrowly lanceolate; corollas tubular; limb purplish; lobes pubescent. Achenes black.

Flowers & Fruits: June to November.

Specimen Cited: Khunia, *Goutam & AP Das0138;*dated: 02.07.2006

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Bichhabhanga, Budhuram; abundant.

General Distribution: India, Myanmar, Nepal; Africa, South China Sea islands; native to tropical America.

ARTEMISIA L., Sp. Pl. 2: 845. 1753.

Artemisia indica Willd., Sp. Pl. ed. 4, 3(3): 1846. 1803; Hara *et al*., Enn. Fl. Pl. Nep. 3: 12. 1982; Hajra *et al*.,Fl. Ind. 12: 27. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1559. 2001. *Artemisia indica* var. *Indica* Willd., Sp. Pl., ed. 4. 3: 1846. 1803.

Local name: Nagnishinda.

Perennial herbs or small subshrubs, up to 180 cm tall, much branched. Leaves shortly petiolate; lamina tomentose. Leaves ovate to oblong-ovate, 6 – 15 x 3 – 7 cm, pinnatipartite; distal lobes larger; segments 3 to 4 pairs; uppermost leaves pinnatipartite; leaflike bracts 3 lobed or entire. Capitula sessile. Involucre oblong-ovoid to broadly ovoid; phyllaries puberulent to glabrous. Florets 16 – 20. Marginal female florets 4 – 10; corolla tubular, 2 toothed. Disk florets 8 – 12, bisexual, basally glandular. Achenes brown, oblong or obovoid.

Flowers & Fruits: August to October.

Specimen Cited: Khunia, *Goutam & AP Das0838;*dated: 02.07.2009

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara.

General Distribution: India: tropical and subtropical; S.E. Asia, North America including Central America, Oceania.

BIDENS L., Sp. Pl. 831. 1753.

Bidens pilosa L., Sp. Pl. ed. 2: 832. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 3: 309. 1881; Ohashi in Hara, Fl. E. Himal. 1: 333. 1966; Hara *et al*., Enn. Fl. Pl. Nep. 3: 15. 1982; Fl. Ind. 12: 372. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1619. 2001. *Bidens alba* (L.) Candolle, Prodr. 5: 605. 1836. *Coreopsis alba* L., Sp. Pl. 2: 908. 1753.

Annual erect or suberect herbs, up to 90 cm. Lamina ovate to lanceolate, 30 – 90 × 12 – 25 mm, 3 – 7 lobes, bases truncate to cuneate, serrate or entire, acute to attenuate. Synflorescence of solitary capitula or lax corymbs. Capitula radiate or discoid; calycular bracts spatulate to linear; phyllaries 8 or 10, lanceolate to oblanceolate. Ray florets absent or 5; lamina whitish. Disk florets 20 – 60; corollas yellowish. Outer achenes red-Br., 2-grooved; inner achenes blackish, 4 angled, 2-grooved.

Flowers & Fruits: June to March.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0853*, dated 14. 02. 2010.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Bichhabhanga, abundant.

General Distribution: Tropical and subtropical regions.

BLUMEA Candolle in Guillemin, Arch. Bot. (Paris) 2: 514. 1833.

Blumea lacera (Burm. *f.*) Candolle in Wight, Contr. Bot. India, 14. 1834; Hook. *f*, Fl. Brit. Ind. 3: 263. 1881; Guha Bakshi, Fl. Mur. Dist. 161. 1984; Hajra *et al*., Fl. Ind. 13: 128. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1504. 2001. *Conyza lacera* Burm. *f*., Fl. Ind. 180. t. 59. f. 1. 1768. *Blumea hieraciifolia* Hook. *f. et* Thom., Fl. Brit. Ind. 3(8): 267. 1881. *Blumea lacera* var. *cinerascens* (Candolle) Hook. *f*., Fl. Brit. Ind. 3(8): 263. 1881. *Blumea hieraciifolia* Hook. *f. et* Thomson in Hook. *f*., Fl. Brit. Ind. 3(8): 267. 1881. *Blumea villosa* Schultz-Bipontinus *ex* Hook. *f*., Fl. Brit. Ind. 3(8): 263. 1881.

Local name: Kukur mota.

Annual or biennial, erect, branched, herbs, up to 100 cm. Leaves sessile and petiolate, elliptic to oblong, 10 – 15 × 4 – 5 cm, base attenuate, doubly serrate and sometimes slightly lyrately lobed, obtuse. Capitula in axillary and terminal dense panicles. Involucres campanulate; phyllaries in 2 to 3 series. Receptacle convex, glabrous. Marginal florets 2 – 5 lobed. Central florets yellowish. Achenes oblong. Pappus white.

Flowers & Fruits: March to June.

Exscicattus: Murti, *Goutam & AP Das 0321*, dated 17.12.2006.

Local Distribution: Murti, Khunia, Gorumara, Budhuram, Bichhabhanga, abundant.

General Distribution: India, Bhutan, Japan, Malaysia, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Pacific islands.

CHROMOLAENA Candolle, Prodr. 5: 133. 1836.

Chromolaena odorata (L.) King *et* Harold Robinson, Phytologia 20: 204. 1970; Grierson *et* Springate in Griersonet Long, Fl. Bhutan 2(3): 1628. 2001. *Eupatorium odoratum* Linnaeus, Syst. Nat. ed. 10: 1205. 1759; Clarke in Hook. *f.*, Fl. Brit. India 3: 244. 1881; Uniyal in Hajra *et al*., Fl. India 12: 354.1995.

Local name: Assamlata.

Perennial, procumbent herbs. Stems erect, up to 2.5 m. Leaves opposite; lamina ovate, triangular, or ovate-triangular, 5 – 10 × 2 – 5 cm, basally 3 veined, base truncate to shallowly cordate, coarsely and

irregularly crenate to serrate, acute. Synflorescence of numerous capitula in corymbs or compound corymbs. Capitula 20 – 24 flowered; involucre cylindric; phyllaries 3 to 4 seriate; corollas white. Achenes black-Br..

Flowers & Fruits: April to December.

Specimen Cited: Khunia, *Goutam & AP Das* 0105, dated 27.06.2006.

Local Distribution: Khunia, Murti, Dhupjhora, abundant.

General Distribution: Native to America; naturalized in tropical countries.

CRASSOCEPHALUM Moench, Methodus 516. 1794. (*nom. rej*. vs. *Gynura* Cassini 1825, *nom. cons*.

Crassocephalum crepidioides (Benth.) Moore in J. Bot. 50: 211.1912; Hara *et al*, Enn. Fl. Pl. Nep. 3: 22. 1982; Hajra *et al.*,Fl. Ind. 13: 201. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1597. 2001. *Gynura crepidioides* Benth. in Hook. *f*., Fl. Niger. 438.1849.

Annual, erect, herbs, up to 120 cm. Lamina elliptic to oblong-elliptic, 8 – 12 × 4 – 5 cm, membranous, base cuneate, irregularly serrate or double-serrate, sometimes pinnately lobed at base, acuminate. Capitula numerous in terminal corymbiform cymes. Involucres cylindric; phyllaries uniseriate, linear-lanceolate. Florets tubular, bisexual; corolla red-brownish. Style papillose. Achenes brownish, narrowly oblong.

Flowers & Fruits: April to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0338*, dated 21.07.2009.

Local Distribution: Gorumara, Khunia, Murti, Dhupjhora, abundant.

General Distribution: India, native to Africa; pantropical weed of Africa, S and SE Asia, Australia, Central and South America, and Pacific islands.

CYANTHILLIUM Bl., Bijdr. Fl. Ned. Ind. 15: 889. 1826.

Cyanthillium cinereum (L.) Robinson, Proc. Biol. Soc. Wash. 103: 252. 1990; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1488. 2001. *Vernonia cinerea* (L.) Less in Linnaea 4:291. 1829; Hook. *f*., Fl. Brit. Ind 3: 233. 1881; Guha Bakshi, Fl. Mur. Dist. 175. 1984. Hajra *et al*, Fl. Ind. 13: 367. 1995. *Conyza cinerea* L., Sp. Pl. 2: 862. 1753.

Annual or perennial, erect, branched above,herbs, up to 100 cm. Lower and middle leaves petiole, lamina rhombic-ovate, rhombic-oblong, 3 – 6 × 1.5 – 3 cm, base cuneately attenuate into winged petiole, remotely mucronate-serrate to repand, acute; upper leaves progressively smaller. Synflorescences terminal. Capitula many. Involucre campanulate; phyllaries 4 seriate. Receptacle flat. Florets 19 – 28; corolla reddish purple, tubular; lobes linear-lanceolate. Achenes cylindric. Pappus white.

Flowers & Fruits: January to January.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0674*, dated 24.03.2009.

Local Distribution: Dhupjhora, Khunia, Murti, Bichhabhanga, very common.

General Distribution: India, Indonesia, Japan, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Arabia, Australia, Pacific islands; introduced to the Americas.

ECLIPTA L., Mant. Pl. 157, 286. 1771.

Eclipta prostrata (L.) L., Mant. Pl. 2: 286. 1771; Hajra *et al*.,Fl. Ind. 12: 381. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1623. 2001. *Verbesina prostrata* L., Sp. Pl. 2: 902. 1753. *Eclipta alba* (L.) Hasskarl, Pl. Jav. Rav. 528. 1848; Clarke in Hook. *f*., Fl. Brit. Ind. 3: 304. 1881. *Verbesina alba* L., Sp. Pl. 2: 902.1753.

Local name : Kesut.

Annual erect, ascending or prostrate, herbs, up to 60 cm. Leaves lanceolate, 3 – 10 × 0.5 – 2 cm, papery, base narrowed, sessile to shortly petiolate, serrulate, gradually acuminate. Capitula terminal and axillary; peduncle slender; involucre globose-campanulate; phyllaries 5 to 6, in 2 seriate, oblong, acute. Ray florets 2 seriate. Disk florets many; corolla 4-lobed. Achenes ribbed.

Flowers & Fruits: Throughout the year.

Specimen Cited: Budhuram, *Goutam & AP Das 0773*, dated 12. 11. 2009.

Local Distribution: Budhuram, Khunia, Murti, Gorumara, Dhupjhora, Bichhabhanga, Common.

General Distribution: North America, Central America; South America; introduced in Europe, Asia, Africa, Pacific islands, Australia.

ELEPHANTOPUS L., Sp. Pl. 814. 1753 et Gen. Pl. ed. 5. 5355. 1754.

Elephantopus scaber L., Sp. Pl. 2: 814. 1753; Clarke in Hook. *f*., Fl. Brit. India 3: 242. 1881; Hajra *et al*., Fl. Ind. 13: 333. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1489. 2001. *Scabiosa cochinchinensis* Lour., Fl. Cochinch. 1: 68. 1790. *Elephantopus scaber* var. *albiflorus* Kuntze, Revis. Gen. Pl. 1 335. 1891.

Perennial, procumbent or ascending herbs, up to 40 cm. Stems erect, dichotomously branched. Basal leaves persistent by anthesis, rosulate, spatulate or oblanceolate, 8 – 16 × 2 – 4 cm, base gradually attenuate, crenate-serrate, shortly acute; cauline leaves few and small. Synflorescence densely aggregated in compound heads, surrounded by leaflike bracts; bracts broadly ovate, acuminate. Capitula many. Phyllaries oblong-lanceolate, acuminate and spinescent. Florets 4, herbaceous, purplish or pink. Achenes oblong-linear.

Flowers & Fruits: June to November.

Specimen Cited: Gorumara, *Goutam & AP Das 0709*, dated 30. 09. 2009.

Local Distribution: Gorumara, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga, very common.

General Distribution: widely distributed in tropical areas of Africa, America, and Asia.

ELEUTHERANTHERA Poiteau, Bull. Sci. Soc. Philom. Paris 3(no. 66): 137. 1802. ***Eleutheranthera ruderalis*** (Sw.) Sch.-Bip., Bot. Zeitung (Berlin) 24: 165. 1866; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1606. 2001. *Melampodium ruderalis* Sw.**,** Fl. Ind. Occid. 3: 1372. 1806. *Gymnopsis microcephala* Gardner**,** London Jour. Bot. 7 292. 1848.

Annual, erect herbs, up to 30 cm. Petiole 1– 2 cm; lamina ovate, 3 – 7 x 2 – 3 cm, 3 veined from near base, both surfaces pubescent and glandular, base obtuse, acute to acuminate, margin entire or crenulate-dentate, acute to acuminate. Synflorescence terminal. Capitula discoid; phyllaries 2 seriate. Florets 2 – 6; anthers black; style branches lanceolate. Achenes Br., 3 angled; pappus an apical peg.

Flowers & Fruits: June to November.

Specimen Cited: Murti,*Goutam & AP Das 0819*, dated 17. 12. 2009.

Local Distribution: Khunia, Murti, Gorumara; abundant.

General Distribution: Widespread in Central and South America but also found in W Africa and Australia.

EMILIA Cassini, Bull. Sci. Soc. Philom. Paris 1817: 68. 1817.

Emilia sonchifolia (L.) Candolle *ex* Candolle, "Wight, Contr. Bot. India" 24. 1834; Prain, Beng. Pl. 1: 444.1903; Hajra *et. al.,* Fl. Ind. 13: 212. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1598. 2001; Guha Bakshi, Fl. Mur. Dist. 166. 1984. *Cacalia sonchifolia* L., Sp. Pl.: 835. 1753; Hook. *f*., Fl. Brit. Ind. 3: 336. 1881.

Annual, erect or ascending herbs, up to 40 cm. Leaves thick, lower leaves crowded, abaxially dark green, often becoming purple, 5 – 12 x 2.5 – 6 cm; terminal lobe large, broadly ovate-triangular, irregularly dentate, obtuse; lateral lobes usually paired, oblong-lanceolate, bluntly dentate, obtuse or acute. Median stem leaves lax, sessile, smaller, ovate-lanceolate; upper leaves few, linear. Capitula pendulous before anthesis, erect later, usually 2 – 5, in terminal lax corymbs. Involucres cylindric; phyllaries 8 or 9, oblong-linear to linear. Florets pink or purplish. Achenes cylindric.

Flowers & Fruits: June to October.

Specimen Cited: Gorumara, *Goutam & AP Das 0744*, dated 30. 09. 2009.

Local Distribution: Dhupjhora Budhuram, Gorumara, Bichhabhanga, Murti, Khunia.

General Distribution: India: eastern states throughout; China, Asia and Africa.

ENYDRA Lour., Fl. Cochinch. 2: 510. 1790.

Enydra fluctuans Lour., Fl. Cochinch. 511. 1790; Clarke in Hook. *f.*, Fl. Brit. India3: 304. 1881; Hajraet al.,Fl. Ind.12: 384. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1614. 2001.

Local name: Helencha; Hincha.

Annual or biennial, cylindric, slightly fleshy, prostrate herbs, up to 80 cm. Leaves subsessile, oblong to linear-oblong, 3 – 6 cm × 5 – 12 mm, both surfaces glabrous, base amplexicaul, sparsely serrate, obtuse or acute. Capitula terminal and axillary; involucre of 4 phyllaries, ovate-oblong. Ray florets 3 to 4 lobed. Disk florets 5 lobed; stamens 5. Achenes obovoid-cylindric.

Flowers & Fruits: November to April.

Specimen Cited: Gorumara,*Goutam & AP Das 0714*, dated 30. 09. 2009.

Local Distribution: Dhupjhora Budhuram, Gorumara, very common in riverine wetland.

General Distribution: Tropical regions of Asia and Africa.

ERIGERON L., Sp. Pl. 2: 863. 1753.

Erigeron canadensis L., Sp. Pl. 2: 863. 1753; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1546. 2001. *Conyza canadensis* (L.) Cronquist, Bull. Torrey Bot. Club. 70: 632. 1943.

Annual, semierect, branched herbs, up to 80 cm. Lower leaves petiolate, lamina oblanceolate, 6 – 10 × 1 – 1.5 cm, base attenuate, sparsely serrate to entire, acute to shortly acuminate; mid and upper leaves subsessile or sessile, lamina linear-lanceolate to linear, smaller, margin entire. Capitula in terminal, large paniculiform synflorescences; peduncles slender. Involucre subcylindric; phyllaries 2 to 3 seriate. Ray florets 20 – 40, white; disk florets 8 – 30, yellowish. Achenes linear-lanceoloid, compressed.

Flowers & Fruits: May to september.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0852*, dated 14. 02. 2010.

Local Distribution: Khunia, Murti, Bichhabhanga, Common.

General Distribution: native to North America.

GALINSOGA Ruiz *et* Pav. Fl. Peruv. Prodr. 110, plate 24. 1794.

Galinsoga parviflora Cavanilles, Icon. 3: 41. 1795; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1610. 2001.

Suberect or erect herbs up to 40 cm. Lamina 10 – 150 × 5 – 70 mm. Peduncles 10 – 20 mm; involucres campanulate; phyllaries persistent; outer paleae persistent, distal inner phyllaries deciduous, elliptic to obovate, 3 lobed, acute. Ray florets 5; corollas usually dull white. Disk florets 20 – 45. Pappus absent or of 5; disk achenes glabrous or strigose; pappus absent or of 16.

Flowers & Fruits: July to October.

Flowers & Fruits: June to December.

Specimen Cited: Budhuram,*Goutam & AP Das 0772*, dated 12. 11. 2009.

Local Distribution: Gorumara, Khunia, rare.

General Distribution: native to South America.

GNAPHALIUM L., Sp. Pl. 2: 850. 1753.

Key to the species:

1a. Corollas of all florets usually purplish ..... *G. luteo-album* ssp. *affine*

1b. Corollas of all florets usually purplish ..... *G. purpureum*

Gnaphalium luteo-album L. ssp. *affine* (Don) Koster in Blumea 4(3): 484.1941; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1522. 2001. *Gnaphalium affine* Don, Prodr. Fl. Nep. 173. 1825. *Gnaphalium luteo-album* var. *multiceps* Candolle, Prodr. 6: 222. 1838; Hook. *f*., Fl. Brit. Ind. 3: 288. 1881.

Biennial herbs; stems up to 40 cm, densely white woolly tomentose. Leaves thin; lower leaves smaller than median cauline leaves; cauline leaves spatulate, 2 – 5 x 4 - 10 cm, apex rounded, mucronulate, base angular, narrowed, sessile, decurrent, margins entire, white woolly on surfaces. Heads numerous, densely aggregated in terminal corymbs. Involucre globose-campanulate, bracts 3-seriate, pale yellow, outer ones shorter, broadly ovate, inner ones oblong, apex obtuse. Outer florets many. Achenes oblong, compressed, papillose. Pappus white, bristles deciduous separately.

Flowers & Fruits: December to May.

Specimen Cited: Gorumara, *Goutam & AP Das 0712*, dated 30. 09. 2009.

Local Distribution: Gorumara, Khunia, Murti.

General Distribution: Tropical India; Bhutan, China, Myanmar, Thailand and Japan.

Gnaphalium purpureum L., Sp. Pl. 2: 854. 1753; Hook. *f*., Fl. Brit. Ind 3: 289. 1881; Hajra *et. al*., Fl. Ind. 13: 92. 1995. *Gamochaeta purpurea* (L.) Cabrera, Bol. Soc. Argent. Bot. 9: 377. 1961; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1523. 2001. *Gnaphalium littorale* Banks *et* Solander *ex* Hooker *f*., 310. 1846. *Gamochaeta rosacea* (Johnston) Anderberg, Opera Bot. 104: 157. 1991.

Annual or biennial, erect to decumbentascending, unbranched or rarely branched herbs. Leaves basal and cauline, basal and proximal cauline in rosettes, withered but persistent at anthesis; lamina oblanceolate to spatulate, 1.5 – 6 cm x 5 – 15 mm, upper ones smaller. Capitula continuous and interrupted arrays, bracteate. Involucre turbinate-cylindric; phyllaries 4 to 5 seriate. Bisexual florets 3 or 4. Corollas of all florets usually purplish. Achenes oblong. Pappus connate.

Flowers & Fruits: June to November.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0855*, dated 14. 02. 2010.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga, abundant.

General Distribution: Pantropical in Asia.

GRANGEA Adanson, Fam. 2: 121. 1763.

Grangea maderaspatana (L.) Poir. in Lam., Encycl. Suppl. 2: 825. 1812; Hook. *f*., Fl. Brit. Ind 3: 247.1881; Prain, Beng. Pl. 1: 442.1903; Grierson *et* Long, Fl. Bhut. 2(3): 1529. 2001. *Artemisia maderaspatana* L., Sp. Pl. 2: 849. 1753.

Annual, slender, procumbent, branched, herbs, up to 30 cm. Leaves usually obovate to oblanceolate, 3 – 8 × 1.5 – 3 cm; basal sessile, lamina dissected-lobed, 6 – 10 × 2 – 5 cm, base usually auriculate, terminal lobe obovate to suborbicular, coarsely dentate, lateral lobes 2 – 5 paired; upper gradually smaller. Capitula terminal, solitary. Involucre hemispheric; phyllaries 2 to 3 seriate. Receptacles hemispheric. Marginal female florets yellow, 2 to 6 seriate, corolla filiform; disk florets shortly cylindric campanulate. Achenes compressed.

Flowers & Fruits: May to August.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0546*;dated 21.03.2009.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bangladesh, Bhutan; Pantropical Asia and Africa.

LAPHANGIUM (Hillard *et*. Burtt) Tzvelev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 98(6): 105. 1994.

Laphangium affine (Don) Tzvelev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 98(6): 105. 1994. *Gnaphalium affine* Don, Prodr. Fl. Nepal. 173 1825. *Gnaphalium luteo-album* Linnaeus var. *multiceps* Candolle, Prodr. 6: 222.1838; Hooker *f.*, Fl. Brit. Ind 3: 288. 1881. *Gnaphalium luteo-album* L., Sp. Pl. 2: 851. 1753; Hook. *f*., Fl. Brit. Ind 3: 288. 1881. *Pseudognaphalium affine* (Don) Anderberg, Opera Bot. 104: 146. 1991; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1522. 2001.

Biennial erect herbs, up to 40 cm. Stems densely white lanate tomentose. Leaves thin; lower leaves smaller than median cauline leaves; cauline leaves spatulate, 2 – 7 × 4 – 10 cm, white lanate on both surfaces, base angular, entire, rounded, mucronulate. Capitula numerous, densely aggregated in terminal corymbs. Involucre globose-campanulate; phyllaries 3 seriate, pale yellow, broadly ovate, obtuse. Outer florets many. Central florets 5 – 10. Achenes oblong, compressed. Pappus white.

Flowers & Fruits: June to November.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0572;*dated: 21.03.2009.

Local Distribution: Murti, Gorumara, Budhuram, Bichhabhanga, abundant.

General Distribution: India, Mauritius, Philippines, Indo-Chin, New Guinea, Australia, Africa and Europe.

MIKANIA Willd., Sp. Pl. ed. 4, 3: 1742. 1803, *nom. cons*.

Mikania micrantha Kunth in H B K., Nov. Gen. Sp. 4: 134. 1820; Hajra *et al*, Fl. Ind. 12: 357. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1625. 2001.

Branched, slender, large vines. Leaves opposite; petiole 1–6 cm; lamina ovate, 5 – 15 × 4 – 9 cm, both surfaces glabrate, base cordate, entire to coarsely dentate, shortly acuminate. Synflorescence a corymbose panicle, capitula clustered on subcymose branches; phyllaries oblong; corollas white, tube narrow, limb broadly campanulate, inside papillate. Achenes 4 ribbed, with many scattered glands; pappus setae pale white.

Flowers & Fruits: June to December.

Specimen Cited: Gorumara, *Goutam & AP Das 0711*, dated 30. 09. 2009.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Tropical America. Nepal, Myanmar, Malaysia, China, Philippines, Taiwan and Tropical Africa.

PARTHENIUM L., Sp. Pl. 988. 1753; Gen. Pl. ed. 5, 426. 1754.

Parthenium hysterophorus L., Sp. Pl. 2: 988. 1753; Hajra *et. al*., Fl. Ind. 12: 403. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1622. 2001.

Annual erect herbs, much branched, up to 120 cm. Lamina ovate to elliptic, 3 – 15 x 1 – 5 cm, pinnately 2 lobed, ultimate lobes lanceolate to linear, both surfaces with gland-dotted. Synflorescences of open panicles. Capitula obscurely radiate; outer phyllaries 5, elliptic – lanceolate, inner 5, ovate to orbicular. Female florets 5; corolla limbs reniform or orbicular to oblong. Disk florets 15 – 40. Achenes obovoid; pappuslike enations erect, deltate to ovate.

Flowers & Fruits: April to December.

Specimen Cited: Bichhabhanga, *Goutam & AP Das 0741*, dated 30. 09. 2009.

Local Distribution: Bichhabhanga.

General Distribution: Through out India; native to tropical America; a widely introduced weed in the tropics.

SONCHUS L., Sp. Pl. 2: 793. 1753.

Sonchus asper (L.) Hill, Herb. Brit. 1: 47. 1769; Hook. *f*., Fl. Brit. Ind. 3: 414. 1881; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1479. 2001. *Sonchus oleraceus* L. var. *asper* L., Sp. Pl. 2: 794. 1753.

Annual semi erect or procumbent herbs, up to 50 cm. Stem usually unbranched below synflorescence. Leaves extremely variable, Lamina obovate, spatulate to elliptic, 7 – 12 × 2 – 5 cm, undivided or irregularly pinnatisect, base attenuate, densely spinulosely dentate, acute to acuminate. Capitula with many florets; peduncle slender. Involucre campanulate. Phyllaries abaxially glabrous, acute; outer phyllaries narrowly lanceolate. Corolla 1 cm. Achene strongly compressed.

Flowers & Fruits: Throughout the year.

Specimen Cited: Murti,*Goutam & AP Das 0823*, dated 17. 12. 2009.

Local Distribution: Khunia, Murti, Gorumara.

General Distribution: Pantropical in Asia.

SYNEDRELLA Gaertn., Fruct. Sem. Pl. 2: 456, plate 171, fig. 7. 1791.

Synedrella nodiflora (L.) Gaertn., Fruct. Sem. Pl. 2: 456. 1791; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1607. 2001. *Verbesina nodiflora* L., Cent. Pl. 1: 28. 1755. *Blainvillea latifolia* (L. *f*.) Candolle, Contributions to the Botany of India 17. 1834. *Eclipta latifolia* L. *f*., 378. 1782.

Annuals, suberect to ascending, branched herbs, up to 70 cm. Leaves cauline, opposite, petiolate; lamina ovate to elliptic, 3 – 9 × 2 – 4 cm, both surfaces scabrid, usually 3 veined, base cuneate to rounded, toothed. Capitula radiate, sessile in axillary glomerules or capitula solitary; involucres cylindric to campanulate; phyllaries persistent; receptacle convex. Ray florets 2 – 9, 1 to 2 seriate, female, fertile; corollas yellowish. Disk florets 4 – 15, bisexual, fertile; corollas yellowish, 4-lobed.

Flowers & Fruits: through out the year.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0854*, dated 14. 02. 2010.

Local Distribution: Dhupjhora, Khunia, Budhuram, Bichhabhanga, moderate.

General Distribution: Pantropical weed of South American origin.

TRIDAX L., Sp. Pl. 900. 1753; Gen. Pl. ed. 5, 382. 1754.

Tridax procumbens (L.) L., Sp. Pl. 2: 900. 1753; Hook. *f*., Fl. Brit. India 3: 311. 1881; Gamble, Fl. Pres. Madras 711(500). 1921; Chowdhery in Hajra *et al.,* Fl. India 12: 418. 1995; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1611. 2001. *Balbisia elongate* Willd., Sp. Pl. 3: 2214. 1803. *Balbisia canescens* Richard, Syn. Pl. 2: 470. 1807.

Annual to perennial, procumbent herbs up to 40 cm, stems terete, hispid. Stems procumbent, branched at base. Leaves few, shortly petiolate; lamina ovate to ovate-lanceolate, 3 – 5 cm, base cuneate, deeply irregularly serrate, pinnatisect, acute to acuminate. Capitula solitary; involucre subcampanulate; phyllaries few seriate. Ray florets 4, white. Disk florets yellow, limb 5 lobed, lobes reflexed. Achenes brown, oblong.

Flowers & Fruits: November to March.

Specimen Cited: Gorumara, *Goutam & AP Das 0711*, dated 30. 09. 2009.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: native to tropical America; now a pantropical weed.

WEDELIA Jacq., Enum. Syst. Pl. 8, 28. 1760.

Wedelia trilobata (L.) Hitchc., Rep. Missouri Bot. Gard. 4: 99. 1898; Sivar. *et* Pradeep, Indian J. For. 11: 161. 1988; Chowdhery in Hajra *et al*., Fl. India 12: 426. 1995. *Silphium trilobatum* L., Syst. (ed. 10) 1232. 1759.

Herbs, rooting at nodes; stems glabrous or pubescent near nodal region. Leaves 3-7 cm long, elliptic-obovate, usually with 3 angular lobes with toothed margins, acute at apex, basally cuneate, glabrous to sparingly pubescent. Heads radiate, solitary 2-2.5 cm across; peduncles strigose, 4-15 cm long; ray florets 5-8; corolla bright yellow, tube short; ovary trigonous; stigma bilobed; disc florets many; anthers black, syngenecious. Achenes blackish, warty, crowned by the persistent pappus cup.

Flowering & Fruiting: June to September.

Specimen Cited: Gorumara, *Goutam & AP Das 0711*, dated 30. 09. 2009.

Local Distribution: Gorumara.

General Distribution: Pantropical.

XANTHIUM L., Sp. Pl. 987. 1753.

Xanthium strumarium L., Sp. Pl. 2: 987. 1753; *Xanthium indicum* Koen. *ex* Roxb., Fl. Ind. 3: 601. 1832; Guha Bakshi, Fl. Mur. Dist. 176. 1984. Hajra *et al*., Fl. Ind 12: 427. 1995, Grierson *et* Springate

in Grierson *et* Long, Fl. Bhutan 2(3): 1620. 2001. *Xanthium strumarium* L., Sp. Pl. 2: 987. 1753,p. p.; Hook. *f*. in Hook. *f*., Fl. Brit. Ind 3: 303. 1881; Haines, Bot. Bihar & Orissa pt. IV: 478. 1922.

Local name: Okra.

Annual, erect, much branched herbs, up to 100 cm. Median cauline leaves ovate-deltate, 9 – 25 cm, papery, densely scabrid on both surfaces, base shallowly cordate to broadly cuneate, irregularly dentate, 3-lobed, apex acute. Capitula monoecious. Male capitula in terminal umbels; phyllaries 1 seriate; outer paleae oblong-lanceolate, inner paleae lanceolate; corolla white, tubular. Female capitula axillary. Fruits sessile, oblong, ellipsoid.

Flowers & Fruits: August to April.

Specimen Cited: Murti, *Goutam & AP Das0427;*dated:17.12.2006.

Local Distribution: Khunia, Murti, Bichhabhanga, Common.

General Distribution: Pantropical.

YOUNGIA Cassini, Ann. Sci. Nat. (Paris) 23: 88. 1831.

Youngia japonica (L.) Candolle, Prodr. 7: 194. 1838; Grierson *et* Springate in Grierson *et* Long, Fl. Bhutan 2(3): 1457. 2001. *Prenanthes japonica* L., Mant. Pl. 1: 107. 1767. *Youngia formosana* (Hayata) H. Hara, 53. 1938. *Youngia ambigua* Candolle, Prodr. (Candolle) 7(1): 193. 1838.

Annual, erect, branched herbs, up to 120 cm. Leaves oblanceolate, lamina 15 – 25 × 4 – 6 cm; base attenuate, sinuate-dentate; lateral lobes few to many, ovate to rhombic-elliptic, gradually smaller toward leaf base; terminal lobe ovate to ovate-lanceolate, rounded to acute. Synflorescence corymbiform, usually with many to numerous capitula. Capitula with 15 – 20 florets. Involucre cylindric. Phyllaries ovate to triangular, apex acute. Anther tube dark green. Style branches yellow. Achene purplish Br.. Pappus white.

Flowers & Fruits: April to October.

Specimen Cited: Dhupjhora, *Goutam & AP Das 0634,* dated 22. 03. 2009.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Japan, Korea, Malaysia, Philippines.

Order 59: Apiales Nakai (1930)

Apiaceae Lindley, Nat. Syst. ed. 2. 21. 1836 (*nom. alt*. vs.Umbelliferae); *nom. cons*.

Key to the Genera

1a. Stem creeping or ascending; lamina reniform to rounded-cordate …..... ***Centella***

1b. Stem usually erect, not creeping; leaves not reniform 2

2a. Leaves simple, usually palmately divide to shallowly lobed ..... ***Eryngium***

2b. Leaves compound 4

3a. Calyx teeth minute; fruit ellipsoid, furrowed ..... ***Oenanthe***

3b. Calyx teeth obsolete; fruit sub-globose, furrow absent, ridges thick ..... ***Seseli***

CENTELLA L., Sp. Pl., ed. 2, 2. 1393. 1763.

Centella asiatica (L.) Urb., Mart. Fl. Brass. 11: 287. 1879; Datta *et* Majumder, Bull. Bot. Soc. Beng. 20(2): 93. 1966. Guha Bakshi, Fl. Mur. Dist. 149. 1984. *Hydrocotyle asiatica* L. Sp. Pl. 1: 234. 1753; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 669. 1879; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 446. 1999; Prain, Beng. Pl. 1: 391. 1903.

Local name: Thankuni

Fleshy, weak, creeping herbs with numerous roots from lower nodes. Lamina orbicular, reniform, peduncle short. Erect small, ovate embracing the flower. Umbel simple, 3-6 pink flowered, axillary. Fruit not vittate, pericarps not thickened. Seeds compressed laterally.

Flowers & Fruits: July to February.

Specimen Cited: Murti, *Goutam & AP Das 0387*, dated 17.12.2006.

Local Distribution: Dhupjhora, Khunia, Murti, Gorumara, Budhuram, Bichhabhanga.

General Distribution: India, Bhutan, China, Nepal, Pakistan, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Thailand, Vietnam.

ERYNGIUM L., Sp. Pl. 1: 232. 1753.

Eryngium foetidum L., Sp. Pl. 1: 232. 1753; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 447. 1999.

Local name: Bilati dhoniya.

Herbs, up to 30 cm from a basal rosette. Stem green. Basal leaves numerous; petiole short or obsolete; lamina lanceolate to oblanceolate, 5 – 30 x 2 – 4 cm, obtuse, crenate to finely spinuloseserrate, base cuneate to decurrent. Upper leaves sessile. Inflorescence divaricately trifurcate; heads numerous. Flower heads cylindrical; margin 1–3 spinulose-serrate. Calyx teeth ovatelanceolate, acute, equaling petals. Petals white to pale yellow. Styles erect, exceeding calyx teeth. Fruit ovoid-globose.

Flowers & Fruits: April to December.

Specimen Cited: Murti, *Goutam & AP Das 0174. dated 03. 07. 2006.*

Local Distribution: Gorumara, Murti, Dhupjhora.

General Distribution: Tropical India; native to Central America; now a widespread weed in tropical and subtropical regions.

OENANTHE L., Sp. Pl. 1: 254. 1753.

Oenanthe javanica (Bl.) Candolle, Prodr. 4: 138. 1830; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 486. 1999. *Sium javanicum* Bl., Bijdr. 15: 881. 1826. *Oenanthe bengalensis* Benth. *et* Hook., Gen. Pl. 1: 906: 1862; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 696. 1879; Prain, Beng. Pl. 1: 394. 1903.

Herbs, growing in wet places, especially on the shade of other plants. Lamina 1-3 pinnate, secondary, pinnae-lanceolate ovate, deeply pinnatifid, pale green. Flowers often polygamous. Calyx teeth minute. Fruit ellipsoid, nearly terete, furrowed, forrow1-vittate, carpophore 0.

Flowers & Fruits: January to April.

Specimen Cited: Gorumara, *Goutam & AP Das 0749*, dated 21.09.2009.

Local Distribution: Gorumara, Dhupjhora, Common in riverine wetland.

General Distribution: India, China, Nepal, Pakistan, Malaysia, Myanmar, Japan, Thailand, Vietnam and Java.

SESELI L. Sp. Pl. 1: 259. 1753

Seseli diffusum (Roxb. *ex* Sm.) Santapou *et* Wagh, Bull. Bot. Surv. Ind. 5(2): 108. 1963. *Ligusticum diffusum* Roxb. *ex* Sm., Rees Cyclop 21: 11. 1812. *Cnidium diffusum* Candolle, Prodr. 4: 153. 1830. *Seseli indicum* Wight *et* Arn., Prodr. 371. 1874; Clarke in Hook. *f*., Fl. Brit. Ind. 2: 693. 1879; Prain, Beng. Plants 1: 393. 1903.

Local name: Ban Jowan

Erect or diffuse, annual herb with pubescent branches from the root. Lamina oblong, lanceolate, petiolate, 2-pinnate or pinnae, pinnatisect 2-3 pairs; cauline similar but smaller and more crisped, all hairy, especially beneath with short white hairs. Flowers pink or white in compound umbles. Fruit sub-globose, glabrous or hispid; ridges thick.

Flowers & Fruits: January to April.

Specimen Cited: Dhupjhora,*Goutam & AP Das 0857*, dated 14. 02. 2010.

Local Distribution: Dhupjhora, Common in riverine wetland.

General Distribution: India (Throughout the plains) and Bangladesh.

Araliaceae Juss., Gen. P1. 217. 1789 (‘Araliae’).

HYDROCOTYLE L., Sp. Pl. 1: 234. 1753.

Hydrocotyle sibthorpioides Lam., Encycl. Meith. 3:153. 1789; Ohashi in Hara, Fl. E. Himal. 1:230.1966; Hara *et al*., Enn. Fl. Pl. Nep. 2:187. 1979; Watson in Grierson *et* Long, Fl. Bhut. 2(2): 444. 1999. *Hydrocotyle rotundifolia* Roxb. *ex* Candolle, Prodr. 4:64. 1830; Hook. *f*., Fl. Brit. Ind. 2:668. 1879.

Local name: Chhotomanimuni.

Strongly aromatic herbs. Stem weak, slender, filiform, creeping. Lamina reniform-rounded, 0.5 – 1.5 × 0.8 – 2 cm; membranous, entire or shallowly 5–7-lobed, lobes rounded, base cordate. Umbel solitary at the nodes, each umbel 5–8 flowered. Petals greenish white. Styles spreading. Fruit broadly globose, greenish yellow when young, covered with purplish stains when mature.

Flowers & Fruits: April to September.

Specimen Cited: Gorumara,*Goutam & AP Das 0713*, dated 30. 09. 2009.

Local Distribution: Throughout the forests.

General Distribution: India, Bhutan, Nepal, China, Indonesia, Japan, Korea, Philippines, Thailand, Vietnam; tropical Africa.

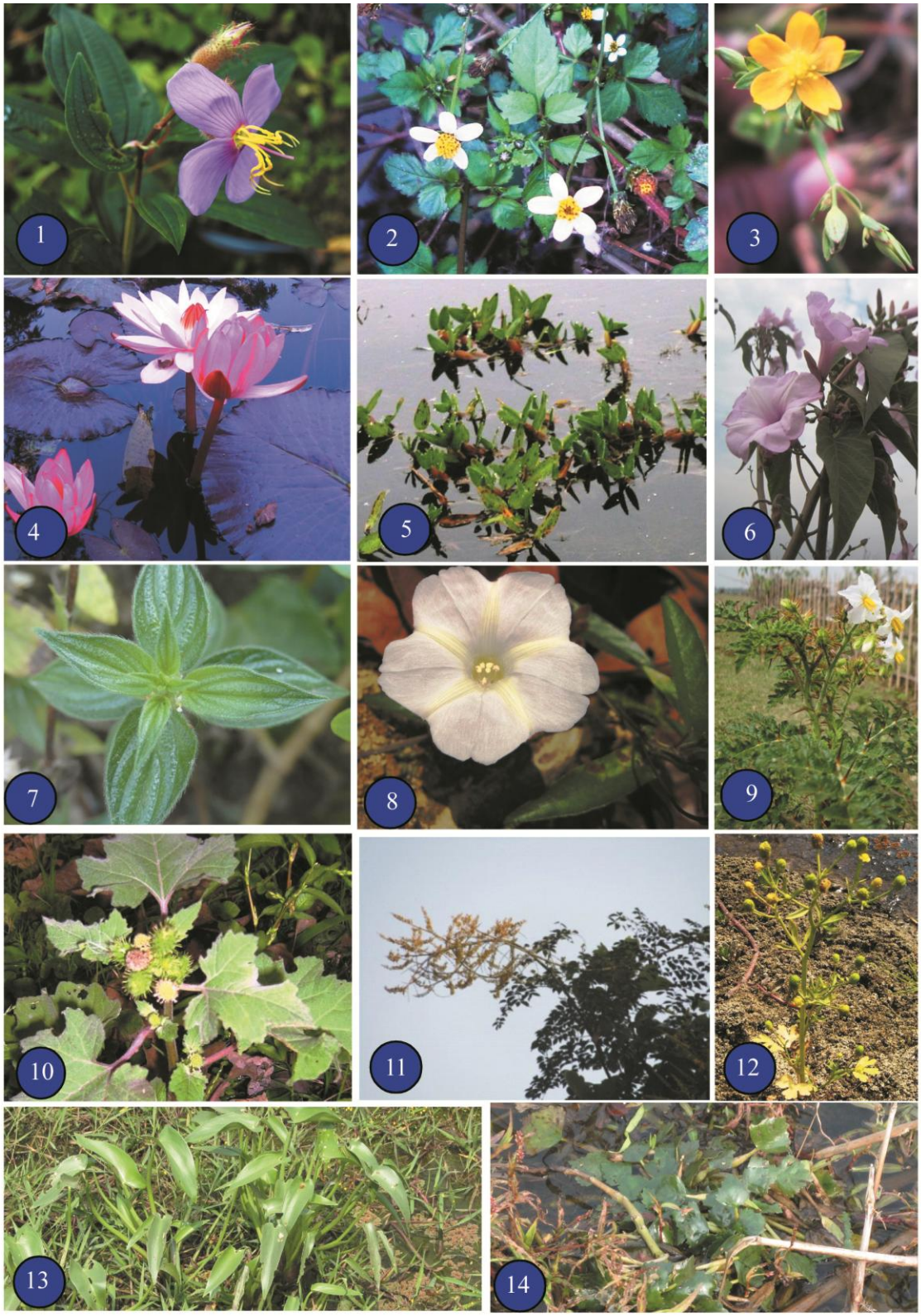

PLATE 1: Figure 1 - 14: 1. *Melastoma malabathricum*; 2. *Bidens pilosa*; 3. *Hypericum japonicum*; 4. *Nympheae rubra*; 5. *Hygroryza aristata*; 6. *Ipomoea fisulosa*; 7. *Pouzolzia zeylanica*; 8. *Merremia hirta*; 9. *Solanum sisymbriifolium*; 10. *Xanthium strumarium*; 11. *Caesalpinia cucullata*; 12. *Ranunculus sceleratus*; 13. *Monochoria hastata*; 14. *Trapa natans* var. *bispinosa*

PLATE 2: Figure 15 - 29: 15. *Dendrocnide sinuata*; 16. *Duchesnea indica*; 17. *Oxalis debilis* var. *corymbosa*; 18. *Terminalia bellirica*; 19. *Rumex dentatus*; 20. *Croton bonplandianus*; 21. *Ludwigia adscendens*; 22. *Rotala rotundifolia*; 23. *Floscopa scandens*; 24. *Centella asiatica*; 25. *Persicaria hydropiper*; 26. *Alternanthera paronychioides*; 27. *Eleutheranthera ruderalis*; 28. *Barleria strigosa*; 29. *Ocimum basilicum*

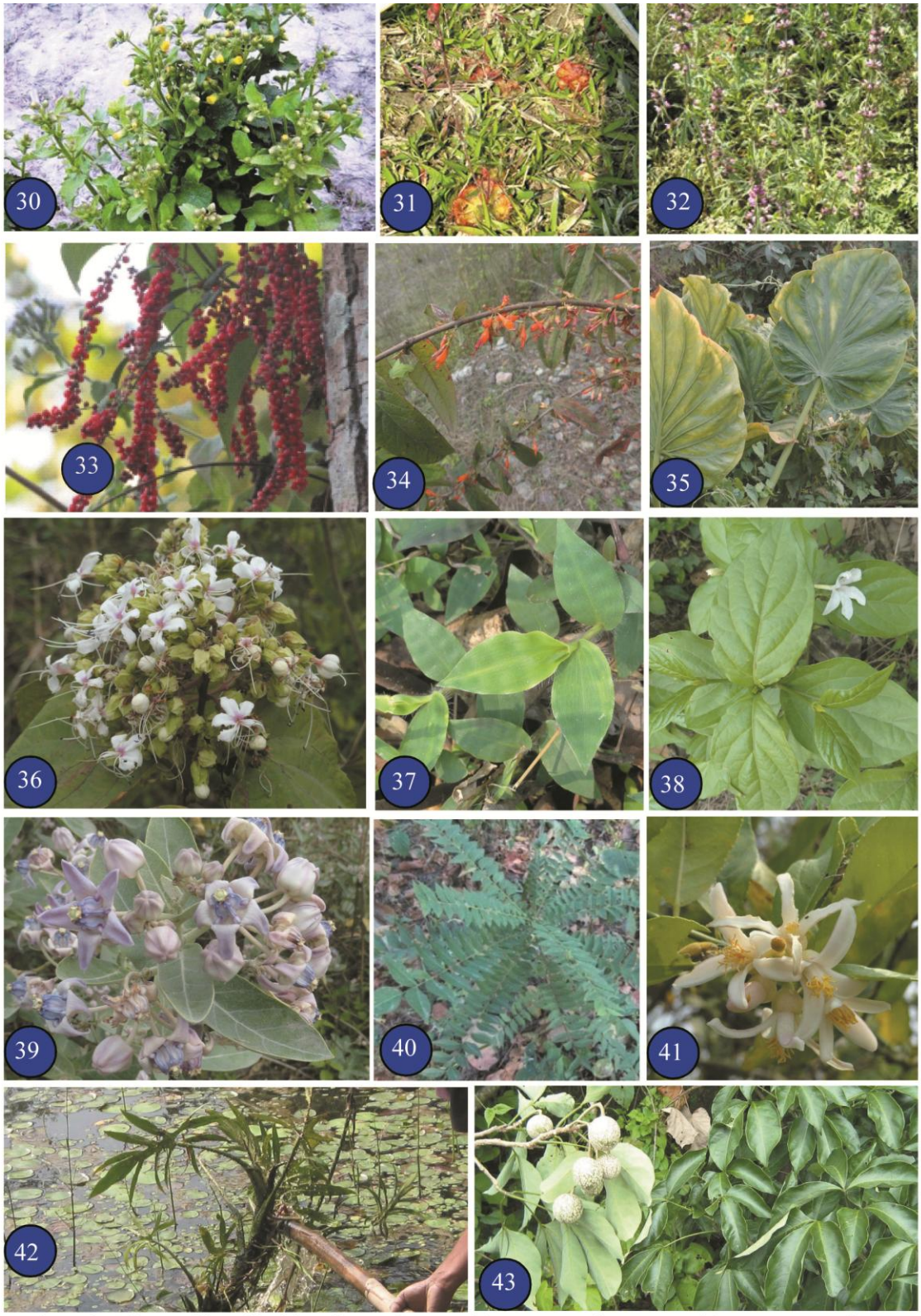

PLATE 3: Figure 30 - 43: 30. *Blumea lacera*; 31. *Drosera burmanni*; 32. *Leonurus sibiricus*; 33. *Deeringia amaranthoides*; 34. *Woodfordia fruticosa*; 35. *Xanthosoma brasiliense*; 36. *Clerodendrum infortunatum*; 37. *Oplismenus burmannii*; 38. *Coffea bengalensis*; 39. *Calotropis gigantea*; 40. *Clausena excavate*; 41. *Citrus limon*; 42. *Lasia spinosa*; 43. *Crateva religiosa*

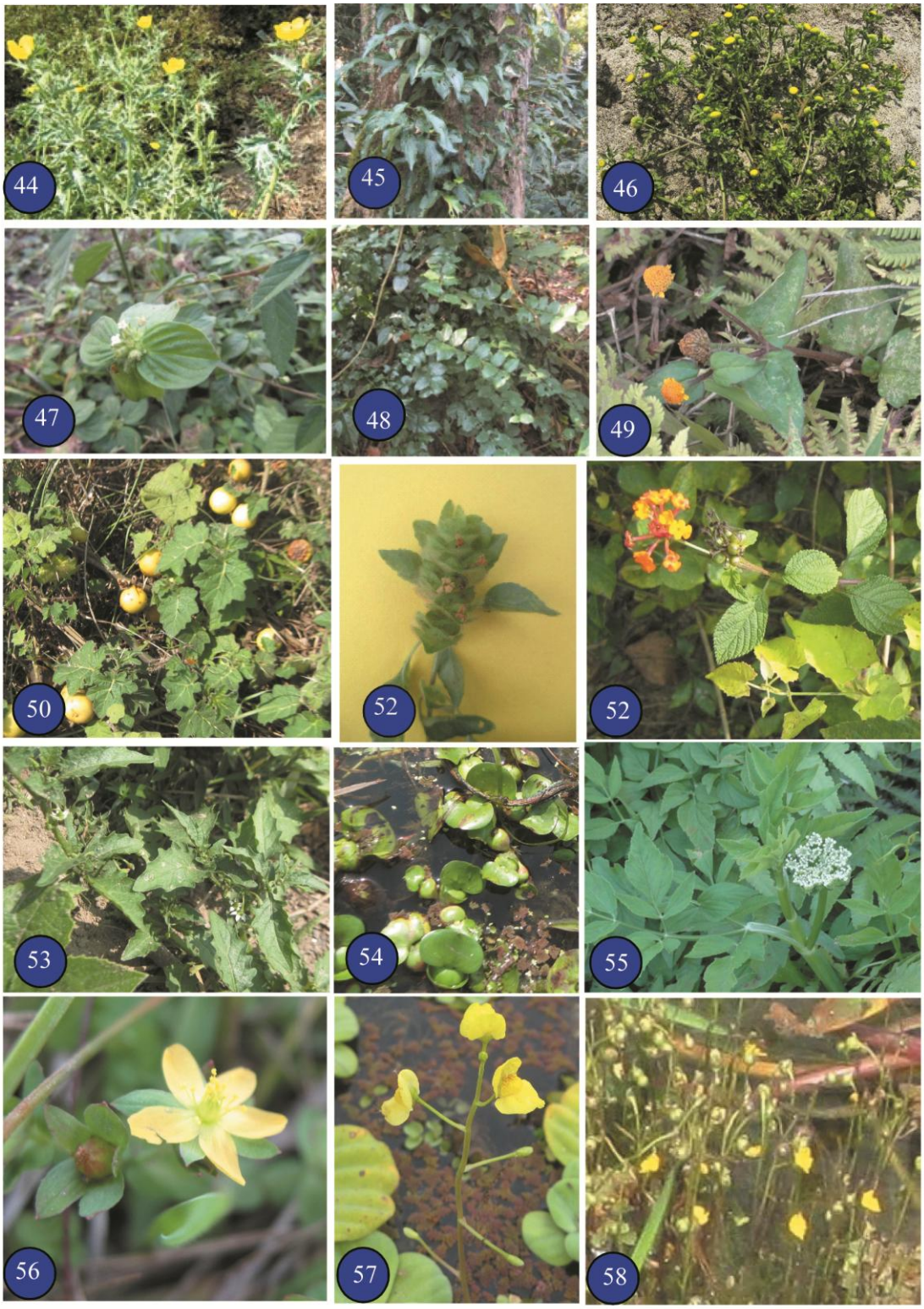

PLATE 4: Figure 44 - 58: 44. *Argemone mexicana*; 45. *Piper sylvaticum*; 46. *Grangea maderaspatana*; 47. *Dentella repens*; 48. *Catunaregam spinosa*; 49. *Acmella calva*; 50. *Solanum viarum*; 51. *Sagittaria guayanensis*; 52. *Phaulopsis imbricate*; 53. *Solanum villosum*; 54. *Eichhornia crassipes*; 55. *Oenanthe javanica*; 56. *Hypericum japonicum*; 57. *Utricularia aurea*; 58. *Utricularia gibba*

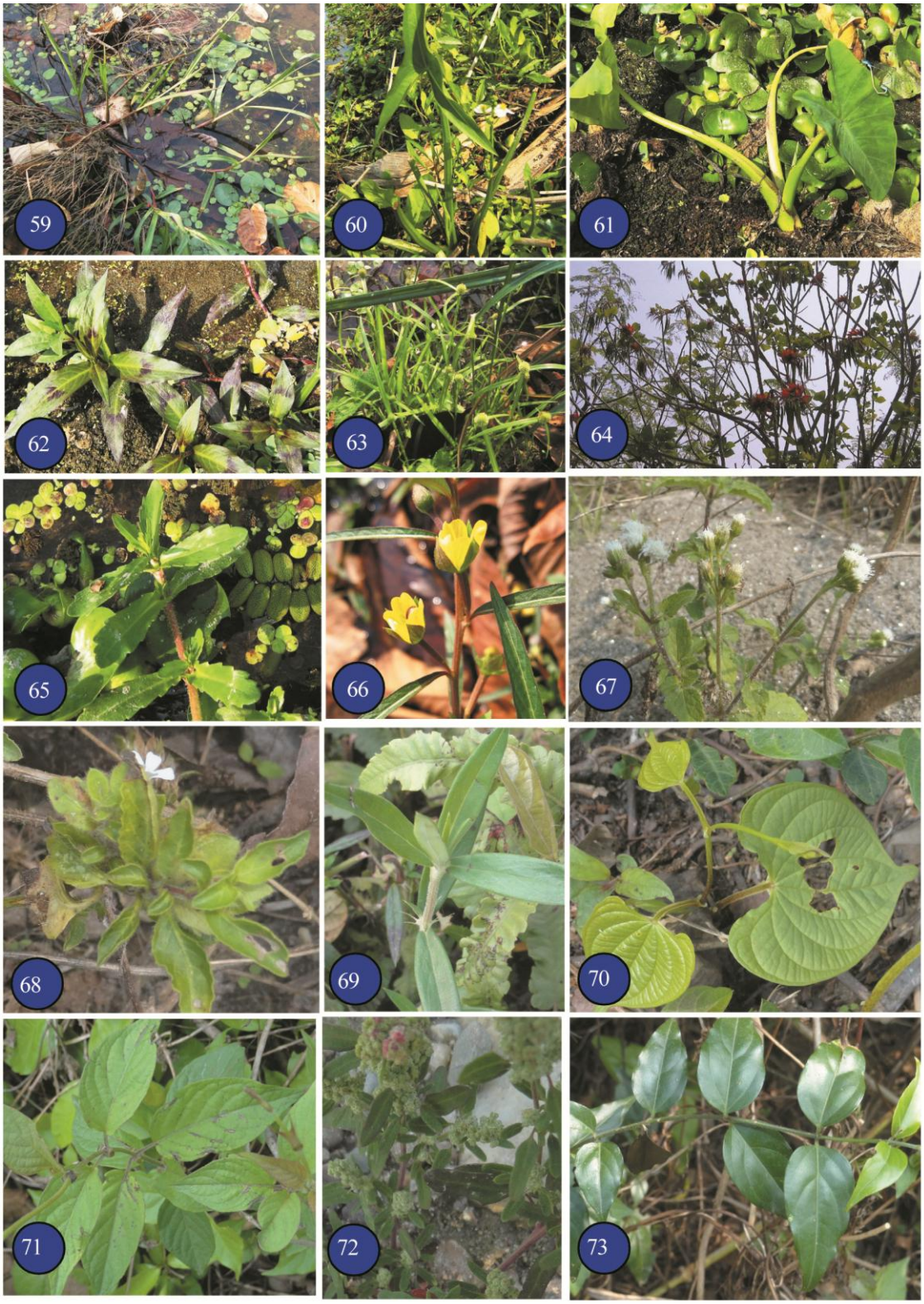

PLATE 5: Figure 59 - 73: 59. *Echinochloa colona*; 60. *Sagittaria sagittifolia*; 61. *Colocasia esculenta*; 62. *Polygonum pubescens*; 63. *Kyllinga nemoralis*; 64. *Erythrina stricta*; 65. *Enydra fluctuans*; 66. *Ludwigia octovalvis*; 67. *Ageratum conyzoides*; 68. *Phaulopsis imbricata*; 69. *Oldenlandia verticillata*; 70. *Dioscorea esculenta*; 71. *Paederia foetida*; 72. *Chenopodium album*; 73. *Jasminum dispermum*

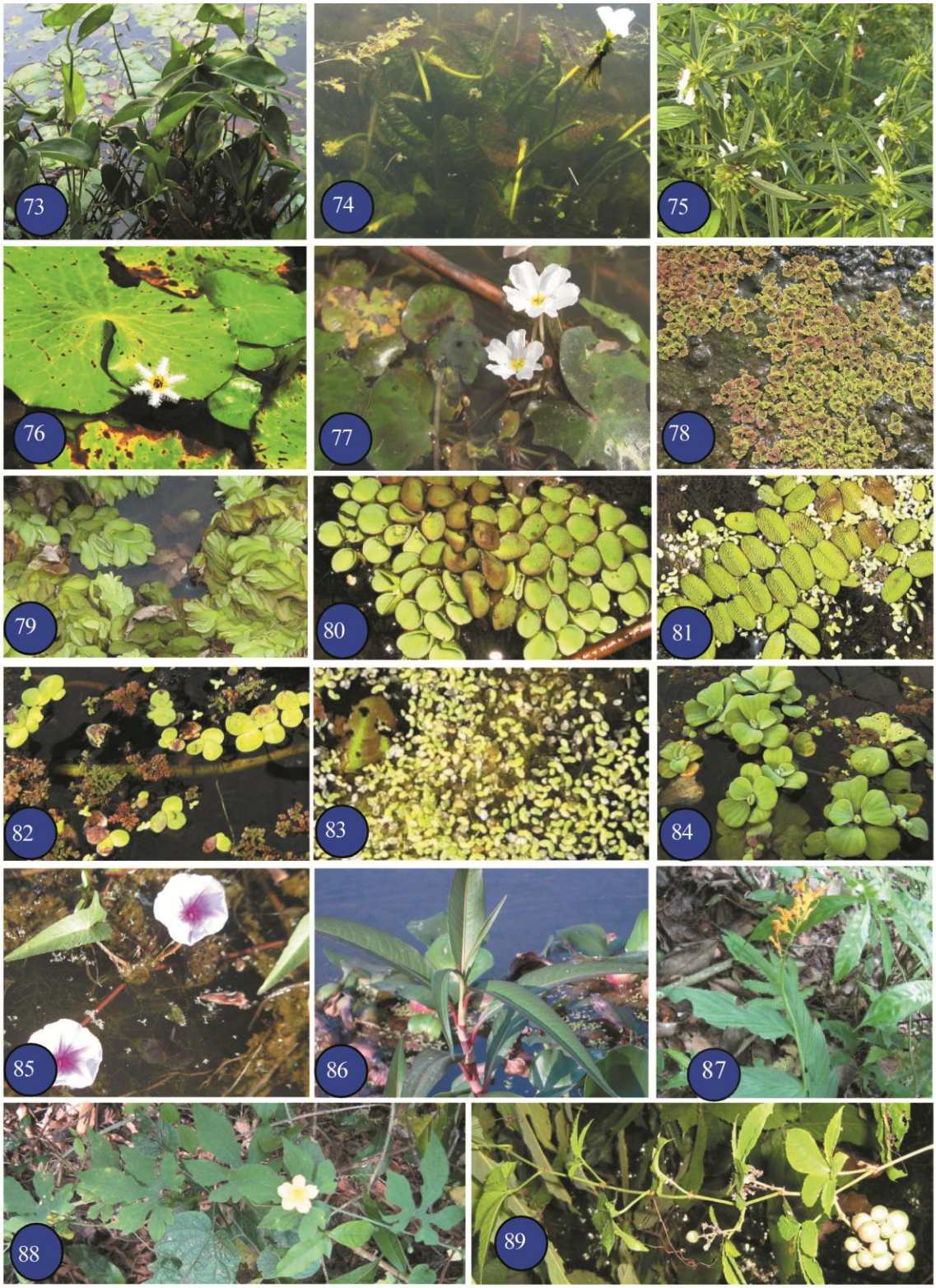

PLATE 6: Figure 73 - 90: 73. *Monochoria vaginalis*; 74. *Ottelia alismoides*; 75. *Leucas indica*; 76. *Nymphoides indica*; 77. *Nymphoides hydrophylla*; 78. *Azolla pinnata* subsp. *africana*; 79. *Salvinia adnata*; 80. *Salvinia cucullata*; 81. *Salvinia natans*; 82. *Spirodela polyrrhiza*; 83. *Lemna aequinoctialis*; 84. *Pistia stratiotes*; 85. *Ipomoea aquatica*; 86. *Persicaria barbata*; 87. *Globba racemosa*; 88. *Momordica charantia*; 89. *Tetrastigma serrulatum*

Chapter 7

ANALYSIS OF THE FLORA

ANALYSIS OF THE FLORA

Gorumara National Park (GNP) is a virgin broadleaf forest but the vegetation is very much disturbed. The Park belongs to the Bio-Geographical zone 7B (Lower Gangetic Plain) as recognized by Rodgers and Panwar (1988). Total area of this bottle shaped National Park is only 79.99 sq km. The National Park is located in the flood plains of Jaldhaka and Murti rivers and other medium and small rivers and rivulets which have created pockets of grassland. As it is not possible to control the movement of big wild animals like Rhinos, Gaurs and Elephants within the legally demarcated boundary of the National Park, it is seen that the ecological boundary extends up to the Sibchu, Khumani and Jaldhaka blocks of Jalpaiguri and Kalimpong Forest Divisions respectively. In the South too it extends into the Bichabhanga, Lataguri and Ramsai areas of Jalpaiguri Forest Division. The ecological boundary in the eastern fringe extends well beyond Gairkata, Central Diana upto Moraghat blocks of Jalpaiguri forest division whereas in the western part it assumes an area beyond Sursuti, Lataguri blocks of Jalpaiguri forest division up to the Apalchand and Kathambari forests of Baikunthapur forest division.

The GNP has immense significance in view of it being situated in the middle of the elephant migratory route between the rivers Teesta and Torsa in North Bengal. Gorumara can become one part of the Managed Elephant ranges for containing and sustaining the wild elephant population of North Bengal. Especially, the Tondu, Selka, Gorumara, Panjhora and Indong blocks serve as a major habitat of elephant population and with more scientific management of these are as follows by development of fodder, cover and water resources, the Elephant depredation problem can be substantially reduced. The same is true for the ever increasing population of gaurs in the area. However, inspire of having a good habitat for large carnivores, with plenty of food, water and covered the area is not having much tigers which it once had, though still today it is quite rise in Leopard population. In view of the ever dwindling number of great Indian one horn rhinoceros, any area harbouring a natural population of this animal assumes immense significance, even if the population is small, yet with increasing population of one horn rhinoceroses in west Bengal, other than its much larger counterpart, Jaldapara National Park (JNP). Besides rhinos, GNP serves as an important corridor for sustaining the population of wild elephants in North Bengal, between Teesta and Torsa rivers. A large number of Indian Bison also utilize this national park along with other herbivore species. Though the presence of Royal Bengal Tiger is debatable but the national park can boast of a good population of leopards and few other small carnivores. The area also has a great significance in the forested landscape of the Jalpaiguri district along with its forest and riverine ecosystem. GNP has approximately 48 species of carnivores and herbivores, approximately 193 species of birds, 22 species of reptiles, 7 species of turtles, 27 species of fishes and other macro and micro fauna.

The complete flora and the vegetation structure of GNP are not known. So, an attempt was initiated in 2006 to record the flora of this area that has enough potential for conservation.

7.1. Recorded Flora: After the comprehensive floristic survey, it is noted that the Gorumara National Park is housing enormously rich flora. A total of 670 species of spermatophytes has been recorded from the intensive survey since the year 2006. Of these, angiosperms are represented by 666 species

under 431 genera belonging to 104 families (Table 7.1). In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP during the present exploration. The reason for sustentation of enormous richness in floral diversity within the forest is basically due to the Natural Habitation areas and suitable climate of Terai and Duars foothills. The area receives annual precipitation of 200 – 400 cm, the major amount of which is received mainly during the monsoon months. However, little amount of rain is received almost in all other months. This type of distribution of precipitation helpful to maintains a very good broadleaf floristic wealth. The analysis of the flora revealed that there are numerous tropical, subtropical and even temperate elements those are common with the East Himalayan region. The beels, nalahas, other low-laying areas, scrubs, forests etc. provided enormous variety of habitats and that is reflected in the richness of its flora.

The detailed analysis of the total spermatophytic flora of the forest distribution and variation in dicots have much dominance over the monocots.

An analysis of the flora of GNP further revealed the existence of numerous important plant species which are directly or indirectly beneficial for the human sustenance. Many of the species have been recorded for having varied potential as food, medicines, etc. for humanity, besides an extraordinarily rich repository of various plant resources including the large number of valuable and durable timber-yielding trees.

7.2. Numerical Distribution of Taxa

The present floristic work on GNP deals with the recorded 108 Spermatophytic families, out of which 78 are dicotyledonous and the remaining 26 are monocotyledonous; 484 species under 319 genera are recorded from 78 dicotyledons families and 182 species belonging to 112 genera in 26 monocot families. Only 4 species of gymnosperm belonging to 4 genera from 4 families were recorded (Table 7.1).

Table 7.1. Numerical representation of different floristic elements in GNP

Categories	Families	Genera	Species
Magnoliopsida	78	319	484
Liliopsida	26	112	182
Gymnosperms	4	4	4
Total	**108**	**435**	**670**

The Tables 7.2 to 7.5 provided accounts of family-wise numerical distribution of Taxa recorded from the GNP.

Table 7.2. Alphabetically **f**amily-wise numerical representation of Angiospermic taxa: A. Dicotyledons for the flora of GNP

Families	No. of genera	No. of species
Acanthaceae	16	25
Amaranthaceae	9	16
Anacardiaceae	3	4
Annonaceae	5	7
Apiaceae	4	4
Apocynaceae	18	18
Araliaceae	3	3
Aristolochiaceae	1	2
Asteraceae	21	23
Balsaminaceae	1	2
Bignoniaceae	3	3
Bixaceae	1	1

Families	No. of genera	No. of species
Boraginaceae	2	2
Brassicaceae	3	3
Cannabaceae	1	1
Capparaceae	3	4
Caricaceae	1	1
Caryophyllaceae	3	5
Celastraceae	1	1
Chloranthaceae	1	1
Clusiaceae	1	1
Combretaceae	2	7
Convolvulaceae	6	11
Cornaceae	1	1
Crassulaceae	1	1
Cucurbitaceae	7	12
Dilleniaceae	2	3
Dipterocarpaceae	1	1
Droseraceae	1	1
Ebenaceae	1	1
Elaeocarpaceae	1	1
Elatinaceae	1	1
Euphorbiaceae	10	13
Fabaceae	37	62
Hypericaceae	1	1
Icacinaceae	1	1
Lamiaceae	15	20
Lauraceae	4	15
Lecythidaceae	2	2
Lythraceae	5	10
Magnoliaceae	1	3
Malvaceae	19	26
Melastomataceae	2	2
Meliaceae	7	8
Menispermaceae	4	5
Molluginaceae	1	2
Moraceae	4	13
Moringaceae	1	1
Myrtaceae	3	6
Nyctaginaceae	4	5
Nymphaeaceae	1	4
Onagraceae	1	4
Oxalidaceae	2	4
Papaveraceae	2	2
Passifloraceae	1	1
Phyllanthaceae	4	9
Piperaceae	2	6
Plumbaginaceae	1	1
Polygalaceae	2	2

Families	No. of genera	No. of species
Polygonaceae	3	10
Portulacaceae	1	2
Primulaceae	2	2
Ranunculaceae	2	2
Rhamnaceae	3	5
Rosaceae	1	1
Rubiaceae	9	13
Rutaceae	6	8
Salicaceae	1	1
Sapindaceae	2	2
Sapotaceae	1	1
Solanaceae	5	12
Tamaricaceae	1	1
Theaceae	1	1
Ulmaceae	1	1
Urticaceae	7	9
Verbenaceae	5	5
Violaceae	1	1
Vitaceae	5	12
Total (76 Families)	**308**	**461**

Table 7.3. Family-wise numerical representation of Angiospermic taxa: B. Monocotyledons for the flora of GNP

Families	No. of genera	No. of species
Poaceae	29	45
Cyperaceae	10	29
Araceae	14	20
Orchidaceae	15	17
Commelinaceae	6	13
Zingiberaceae	5	10
Hydrocharitaceae	6	7
Alismataceae	3	6
Arecaceae	5	5
Dioscoreaceae	1	5
Pontederiaceae	2	3
Potamogetonaceae	1	3
Amaryllidaceae	1	2
Eriocaulaceae	1	2
Hypoxidaceae	2	2
Musaceae	1	2
Smilacaceae	1	2
Acoraceae	1	1
Burmanniaceae	1	1
Cannaceae	1	1
Ceratophyllaceae	1	1
Costaceae	1	1

Families	No. of genera	No. of species
Juncaceae	1	1
Marantaceae	1	1
Typhaceae	1	1
Xyridaceae	1	1
Total (26 Families)	**112**	**182**

Table 7.4. Family-wise numerical representation of Pinophyta for the flora of GNP

Family	Genera	Species
Araucariaceae	1	1
Cupressaceae	1	1
Cycadaceae	1	1
Gnetaceae	1	1
Total	**4**	**4**

7.3. High Representation

So far, the most comprehensive floristic work for the Indian subcontinent was published by Sir J.D. Hooker (1872 – 1897) in his *The Flora of British India*. Recently *The Flora of Eastern Himalaya*, Parts I - III by Hara (1966, 1971) and Ohashi (1975*),* and *Flora of Bhutan,* vols. 1 – 3, by Grierson & Long (1983, 1984, 1987, 1991, 1999, 2000), Noltie (1994, 2000) and Pears and Cribb (2002) also presented detailed floristic works on this region. The first flora, i.e. *The Flora of British India* covers the plants collected from Indian subcontinent, Eastern Himalaya to Pakistan, Bangladesh, Myanmar, Malaysia, etc. *The Flora of Eastern Himalaya* has engrossed the plant collection from the hilly parts of North Bengal, Sikkim, Eastern Nepal and Bhutan regions in the Eastern Himalaya covering an altitudinal range of 300 m to 4400 m. *Flora of Bhutan* covered the *Terai* and *Duars* of North Bengal. In case of Dicotyledonous flora, In *Flora of Eastern Himalaya* (FEH), the Fabaceae is represented with highest number of species, which is followed by Asteraceae, Lamiaceae, Rubiaceae, etc. The *Flora of Bhutan* (FB) recorded Asteraceae as the most represented and is followed by Fabaceae, Rubiaceae, Lamiaceae, etc. The present survey recorded 62 species for the Fabaceae and then followed by Malvaceae,Acanthaceae, Asteraceae, Lamiaceae, Rubiaceae, etc. A comparative account of top 10 families in these three works are given in the Table 7.6.

Table 7.5: Comparative study of top 10 dicots Families after the survey of GNP with FEH and FB

Name of the plants	FEH		FB		GNP	
	Genus	Species	Genus	Species	Genus	Species
Fabaceae	71	184	85	277	37	62
Asteraceae	70	166	126	370	21	23
Acanthaceae	19	46	27	83	16	25
Malvaceae	8	18	12	34	19	26
Amaranthaceae	9	16	11	21	9	16
Lamiaceae	39	88	43	117	15	20
Rubiaceae	31	66	55	153	9	13
Moraceae	6	15	7	52	4	13
Solanaceae	7	25	22	50	5	12
Apocynaceae	12	13	22	45	18	18

In case of Monocotyledonous flora, in the *Flora of Eastern Himalaya* (FEH), Orchidaceae is highest represented, which is followed by Poaceae, Cyperaceae, Araceae and Commelinaceae. In *Flora of Bhutan* (FB), Orchidaceae is the largest family and that is followed by Poaceae, Cyperaceae, Araceae and Commelinaceae. In the present survey recorded highest number of 45 species for Poaceae and is

followed by Cyperaceae, Araceae, Orchidaceae and then Commelinaceae. A comparison of top 5 monocotyledonous families in these three works are given in the Table 7.6.

Table 7.6. Comparative study of top five monocot families after the survey of GNP flora

Name of the plants	FEH		FB		GNP	
	Genus	Species	Genus	Species	Genus	Species
Poaceae	78	183	125	381	29	45
Cyperaceae	10	114	73	181	10	29
Araceae	14	37	17	44	14	20
Commelinaceae	9	16	11	31	6	13
Orchidaceae	61	188	132	579	15	17

7.3.1. Present work: The present work in GNP, the Fabaceae appeared as the largest with 37 genera and 62 species and it is followed by Poaceae, Cyperaceae, Malvaceae, Acanthaceae, Asteraceae, Araceae, Lamiaceae, Apocynaceae and Rubiaceae, is presented in Table 7.7 with further details.

Table 7.7. Top ten families in the flora of GNP

Families	No. of genera	No. of species
Fabaceae	37	62
Poaceae	29	45
Cyperaceae	10	29
Malvaceae	19	26
Acanthaceae	16	25
Asteraceae	21	23
Araceae	14	20
Lamiaceae	15	20
Apocynaceae	18	18
Orchidaceae	15	17

The present survey is restricted to a small fragment of the Duars Forests. So, the number of families, genera, species and their highest relative position also varied. A comparative account of top ten families in these four works are given in the Table 7.8.

Table 7.8. Comparison of top ten families of GNP with three monumental publications

SN	FBI	FEH	FB	GNP
1	Orchidaceae	Orchidaceae	Orchidaceae	Fabaceae
2	Asteraceae	Fabaceae	Poaceae	Poaceae
3	Poaceae	Poaceae	Cyperaceae	Cyperaceae
4	Rosaceae	Asteraceae	Asteraceae	Malvaceae
5	Cyperaceae	Cyperaceae	Fabaceae	Acanthaceae
6	Geraniaceae	Rosaceae	Scrophulariaceae	Asteraceae
7	Ericaceae	Scrophulariaceae	Rosaceae	Araceae
8	Liliaceae	Lamiaceae	Rubiaceae	Lamiaceae
9	Lamiaceae	Ranunculaceae	Lamiaceae	Apocynaceae
10	Apiaceae	Urticaceae	Ranunculaceae	Orchidaceae

The study area is comparatively too small and is housing only 670 species of vascular plants as has been recorded through the intensive survey since the year 2006. Of these, angiosperms are represented by 666 species under 431 genera belonging to 104 families. In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP. The largest genus is *Cyperus* of Cyperaceae

with 9 species and is followed by *Ficus* of Moraceae, *Litsea* of Lauraceae, *Solanum* of *Solanaceae, Eleocharis* of *Cyperaceae, Persicaria* of *Polygonaceae, Phyllanthus of Phyllanthaceae, Dioscorea* of Dioscoreaceae etc. The best represented 10 genera in the GNP flora has been presented in Table 7.9.

Table 7.9: The highest represented ten genera in GNP flora

Family	Genus	Species
Cyperaceae	*Cyperus*	9
Moraceae	*Ficus*	8
Lauraceae	*Litsea*	8
Solanaceae	*Solanum*	7
Cyperaceae	*Eleocharis*	6
Polygonaceae	*Persicaria*	6
Phyllanthaceae	*Phyllanthus*	6
Dioscoreaceae	*Dioscorea*	5
Polygonaceae	*Commelina*	5
Piperaceae	*Piper*	5

7.4. Rare and threatened plants of Gorumara National Park

The Gorumara National Park is one of the important conservatories for rare and threatened species of plants in the area. During the study, some of the threatened species of India, under Red Data Books of Indian Plants (Nayar and Shastri 1987, 1988, 1990) has also recorded many plants from this area. These plants seem to be widely distributed inside the conservatories. The rarity of or threat to a majority of those could be due to several natural causes, but it could also be due to severe anthropogenic factors like habitat destruction through timber extraction, grazing, fishing, tourisms, etc. Unskilled and unscientific harvest of large number of species by local plant-traders for several identical purposes are attributing directly or indirectly in the population structure or even the loss of species from their natural habitat.

The knowledge of plants being used in medicine is high in the Indian Himalayan region, Terai and Duars regions. There are major gaps in the knowledge of biological resources and the means by which biological diversity is being maintained (Heywood and Baste 1995; Biswas 2015). *Dioscorea deltoidea* is an endangered species found in this area. Two species, *Shorea robusta* and *Toona ciliata* has been recognized as 'Lower Risk/ Least Concern' under ver 2.3 in the Red List of IUCN [http://www.iucnredlist.org/], Indian Red Data Book [Nayar & Sastry, 1987, 1988] and Red List of Botanical Survey of India [http://bsi.gov.in/content/259_1_ InventorisationofEndangeredPlantSpecies. Aspx].

7.5. Exotic Elements

Earlier, Das (2002) has recorded 114 species of naturalized and semi-naturalized taxa from the sub-tropical and temperate hills of Darjeeling. Again, Himalayas and its foothill region is rich with a total of 190 invasive alien species under 112 genera, belonging to 47 families (Chandra Sekar 2012). Out of 190 invasive alien species, dicotyledons flora is represented by 40 families, 95 genera and 170 species and monocotyledons by 7 families, 17 genera and 20 species. Scattered research work on the exotic and alien species of India has been carried out by Maheswari 1962; Matthew 1969; Maiti and Guha Bakshi 1981; Das and Chanda, 1986; Khuroo *et al*. 2007, 2008, 2010, 2012; Negi and Hajra 2007; Singh *et al*. 2010. Nayar (1977) has discussed the changing pattern of vegetation due to some exotic and invasive species. Liu *et al.* (2005, 2006, 2008) has worked in detail on the exotics in China that has also included the Himalayan region. A preliminary list of exotic and introduce plants of India has been compiled by Pandey (2000) and Reddy (2008). Out of the 670 species of recorded flora, 89 species has been recognized as exotics. Out of these 63 are found in naturalized condition (Table. 7.10). The taxonomic distribution of these exotic plants are given bellow:

7.4. Rare and threatened plants of Gorumara National Park

The Gorumara National Park is one of the important conservatories for rare and threatened species of plants in the area. During the study, some of the threatened species of India, under Red Data Books of Indian Plants (Nayar and Shastri 1987, 1988, 1990) has also recorded many plants from this area. These plants seem to be widely distributed inside the conservatories. The rarity of or threat to a majority of those could be due to several natural causes, but it could also be due to severe anthropogenic factors like habitat destruction through timber extraction, grazing, fishing, tourisms, etc. Unskilled and unscientific harvest of large number of species by local plant-traders for several identical purposes are attributing directly or indirectly in the population structure or even the loss of species from their natural habitat.

The knowledge of plants being used in medicine is high in the Indian Himalayan region, Terai and Duars regions. There are major gaps in the knowledge of biological resources and the means by which biological diversity is being maintained (Heywood and Baste 1995; Biswas 2015). *Dioscorea deltoidea* is an endangered species found in this area. Two species, *Shorea robusta* and *Toona ciliata* has been recognized as 'Lower Risk/ Least Concern' under ver 2.3 in the Red List of IUCN [http://www.iucnredlist.org/], Indian Red Data Book [Nayar & Sastry, 1987, 1988] and Red List of Botanical Survey of India [http://bsi.gov.in/content/259_1_InventorisationofEndangeredPlantSpecies. Aspx].

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Table 7.10. Taxonomic distribution and status of exotic plants in the flora of GNP

Plants	County from introduced	Status
Ageratum conyzoides	South America	Naturalized
Ageratum houstonianum	Mexico	Naturalized
Alternanthera paronychioides	Brazil	Naturalized
Annona reticulata	West Indies	Cultivated
Annona squamosa	Tropical America, West Indies	Cultivated

Plants	County from introduced	Status
Argemone mexicana	Mexico	Naturalized
Bougainvillea glabra	Brazil	Cultivated
Bougainvillea spectablis	Brazil	Cultivated
Bidens pilosa	America	Naturalized
Cajanus scarabaeoides	Africa	Semi-naturalized
Carica papaya	Central America	Semi-naturalized
Senna alata	South America	Naturalized
Senna tora	Tropical America	Naturalized
Cassia javanica subsp. *nodosa*	Sumatra, Java	Semi-naturalized
Catharanthus roseus	West Indies, Madagascar	Naturalized
Dysphania ambrosioides	Mexico	Naturalized
Chromolaena odorata	Jamaica	Naturalized
Cinnamomum verum	Sri Lanka	Cultivated
Cissampelos pareira	Neo-tropical	Naturalized
Cleome rutidosperma	West Africa	Naturalized
Clitoria ternatea	Tropical America	Semi-naturalized
Corchorus aestuans	Tropical America	Naturalized
Crassocephalum crepidioides	Tropical America	Naturalized
Croton bonplandianus	Paraguay	Naturalized
Datura metel	Tropical America	Naturalized
Delonix regia	Madagascar	Semi-naturalized
Digitaria ciliaris	Tropical America	Naturalized
Eclipta prostrata	South America	Naturalized
Eichhornia crassipes	Tropical America	Naturalized
Emilia sonchifolia	Africa, Asia	Naturalized
Eragrostis tenella	Africa, Asia	Naturalized
Erigeron canadensis	North America	Naturalized
Euphorbia hirta	Tropical America	Naturalized
Evolvulus nummularius	West Indies	Naturalized
Fumaria indica	North temperate region	Naturalized
Galinsoga parviflora	Tropical America	Naturalized
Gnaphalium purpurium	Tropical America	Naturalized
Hibiscus rosa-sinensis	China	Cultivated
Hibiscus sabdariffa	America	Semi-naturalized
Hyptis suaveolens	South America	Naturalized
Ipomoea carnea ssp. *fistulosa*	South America	Naturalized
Jatropha curcas	Tropical America	Naturalized
Lagerstroemia indica	China	Cultivated
Lantana camara	West Indies, Jamaica	Naturalized
Lippia javanica	Tropical America	Naturalized
Litchi chinensis	China	Semi-naturalized
Malvaviscus arboreus	Mexico	Cultivated
Manilkara zapota	Central America	Cultivated
Mecardonia procumbens	Tropical America	Naturalized
Mikania micrantha	Tropical America	Naturalized
Mimosa invisa	Tropical America	Naturalized
Mimosa pudica	Brazil	Naturalized
Nicotiana plumbaginifolia	Tropical America	Naturalized
Oxalis corniculata	South Europe, North America	Naturalized
Oxalis latifolia	Brazil	Naturalized
Parthenium hysterophorus	West Indies, Central & North America	Naturalized
Peperomia pellucida	Central America	Naturalized
Persicaria hydropiper	Temperate region	Naturalized
Petunia violacea	South America	Cultivated

Plants	County from introduced	Status
Physalis minima	South America	Naturalized
Portulaca oleracea	Europe, North Africa	Naturalized
Psidium guajava	Tropical South America	Semi-naturalized
Pupalia lappacea	Afro-Asia	Naturalized
Ricinus communis	Africa	Naturalized
Scoparia dulcis	South America	Naturalized
Senna occidentalis	South America	Naturalized
Senna sophera	America	Naturalized
Sida cordata	Tropical America	Naturalized
Solanum pimpinellifolium	Tropical America	Naturalized
Solanum sisymbriifolium	Brazil	Naturalized
Spathodea campanulata	Tropical Africa	Semi-naturalized
Stachytarpheta indica	South America	Naturalized
Stellaria media	Europe	Naturalized
Synedrella nodiflora	Tropical America	Naturalized
Tamarindus indica	Tropical Africa	Naturalized
Tridax procumbens	South America	Naturalized
Vicia sativa	West Africa, Europe	Naturalized
Wedelia calendulacea	Austro-Asia	Naturalized
Xanthium strumarium	South America	Naturalized

Mainly cultivated species are planted in Beat Office grounds and village areas. Some exotic species found also in the core forests and these are naturalized. Out of the recorded 4 Gymnosperms 3 species has been detected as exotic elements. Only 2 monocotyledons species found there as naturalized exotic elements (Fig. 7.1).

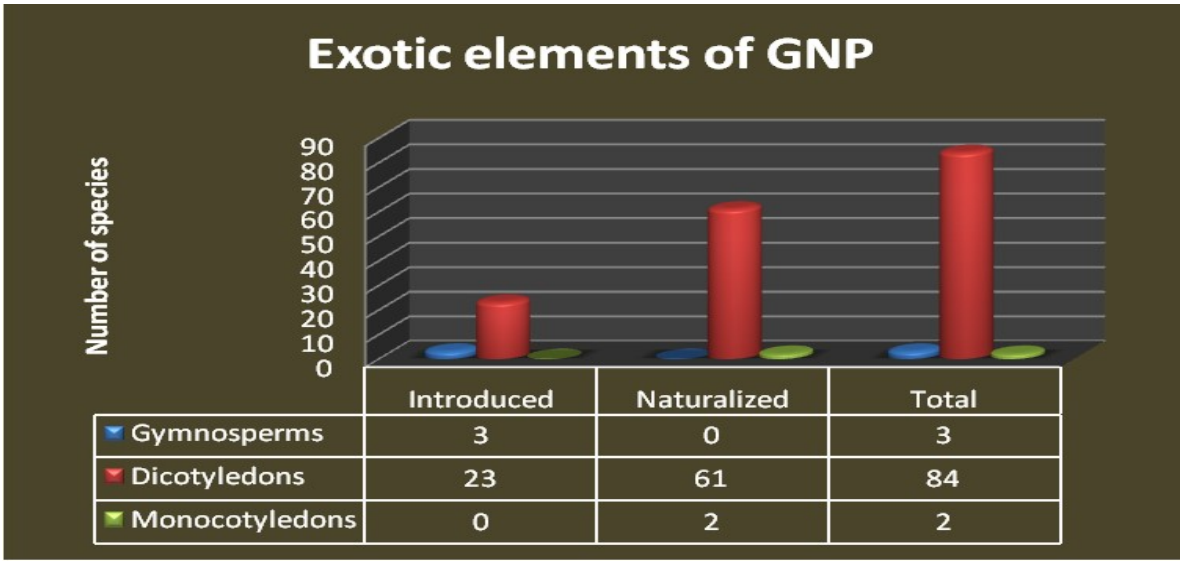

Fig. 7.1. Graphical presentation of Exotic elements in the flora of GNP

7.6. Flowering calendar

Flowering calendar of the temperate flora of Darjeeling Hills (1500 – 2400 m) was previously prepared by Das and Chanda (1987) and for the Sambalpur District flora by Panda *et al.* (1992). The flowering seasons of different species in Terai and Duars flora is little known till date. The flowering seasons of majority of the floristic elements of GNP has been recorded by Biswas (2015) and the present study shows a clear picture of flowering and fruiting periods of GNP flora during the survey work and has been presented in the Table 7.12.

Table 7.12: Flowering Calendar of GNP Flora [1 – 12 denotes the months of the year]

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Abrus pulchellus									*	*	*	
Acacia catechu					*	*						
Acacia pennata						*	*					
Acampe papillosa			*	*	*	*						
Achyrospermum wallichianum	*	*	*	*	*	*	*	*	*	*		
Acmella calva			*	*	*	*	*	*	*	*	*	*
Acmella uliginosa	*	*	*	*	*	*	*	*	*	*	*	*
Adenanthera pavonina					*	*						
Aegle marmelos				*	*	*						
Aerides multiflora			*	*	*	*						
Aesculus assamica	*	*	*	*	*	*						
Ageratina adenophora	*	*	*	*	*							*
Ageratum conyzoides	*	*	*	*	*	*	*	*	*	*	*	*
Ageratum houstonianum			*	*	*	*	*	*	*			
Alangium chinense					*	*						
Alpinia calcarata							*	*	*			
Alstonia scholaris		*	*	*								
Alternanthera ficoidea								*	*	*	*	
Alternanthera philoxeroides			*	*	*	*	*	*				
Alternanthera sessilis			*	*	*	*	*	*				
Amaranthus blitum subsp. *oleraceus*			*	*	*	*	*	*				
Amaranthus spinosus					*	*	*	*	*			
Amaranthus viridis				*	*	*	*	*	*	*		
Amischotolype hookeri					*	*	*	*	*			
Ammannia baccifera										*	*	*
Annona reticulata					*	*	*	*	*	*	*	
Neolamarckia cadamba				*	*	*	*	*	*			
Annona squamosa					*	*	*	*	*	*	*	
Ardisia solanacea				*	*	*						
Areca catechu	*	*	*								*	*
Argyreia roxburghii		*	*	*	*	*	*	*	*			
Aristolochia indica					*	*	*					
Aristolochia tagala			*	*	*							
Artabotrys hexapetalus						*	*	*	*	*	*	*
Artemisia indica						*	*	*				
Artocarpus heterophyllus		*	*	*	*	*	*					
Artocarpus lacucha			*	*	*							
Asystasia macrocarpa		*	*	*								
Axonopus compressus									*	*	*	
Barleria strigosa									*	*	*	*
Bauhinia acuminata			*	*	*	*						
Bauhinia purpurea		*	*	*								
Bauhinia variegata		*	*	*								
Bidens pilosa			*	*	*	*	*	*	*	*	*	*
Biophytum sensitivum							*	*	*			
Spilanthes acmella	*	*	*							*	*	*
Blumea lacera		*	*	*								
Bombax ceiba	*	*	*							*	*	*
Bridelia retusa									*	*	*	*
Bryophyllum pinnatum			*	*	*							
Burmannia coelestis							*	*				
Butomopsis latifolia								*	*	*		
Caesalpinia bonduc	*	*	*	*	*						*	*
Caesalpinia cucullata											*	*
Calamus tenuis		*	*	*	*							
Callicarpa arborea				*	*	*						
Calotropis gigantea	*	*	*	*								
Cannabis sativa	*	*	*	*							*	*
Cassia javanica	*	*	*	*	*	*	*					*
Centella asiatica			*	*	*							
Cheilocostus speciosus		*	*	*	*	*	*	*	*			
Chenopodium album	*	*	*	*	*	*	*	*				
Dysphania ambrosioides					*	*	*	*	*			
Chloranthus erectus				*	*	*	*	*	*			

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Chonemorpha fragrans				*	*	*						
Chromolaena odorata						*	*	*	*	*	*	*
Cinnamomum tamala	*	*	*	*	*							
Cinnamomum verum			*	*	*							
Cinnamomum bejolghota	*	*	*	*	*							
Citrus limon		*	*	*	*							
Citrus maxima	*	*	*	*	*	*	*	*	*	*		*
Clerodendrum indicum										*	*	*
Clerodendrum infortunatum	*	*	*	*						*	*	*
Clerodendrum japonicum						*	*	*				
Coffea benghalensis		*	*									
Colocasia esculenta						*	*	*				
Colocasia fallax						*	*	*				
Combretum decandrum	*	*										
Commelina benghalensis						*	*	*	*	*		
Commelina diffusa			*	*	*	*	*	*	*			
Commelina longifolia					*	*	*	*				
Commelina paludosa						*	*	*	*	*		
Commelina sufruticosa			*	*	*	*	*	*	*			
Crassocephalum crepidioides	*	*	*				*	*	*	*	*	*
Crateva religiosa		*	*									
Crinum amoenum						*	*	*	*	*		
Crotalaria alata				*	*	*	*					
Crotalaria cytisoides		*	*	*	*	*	*					
Crotalaria pallida	*	*	*	*	*							*
Croton bonplandianus						*	*	*	*	*	*	
Croton caudatus	*	*	*									*
Cryptolepis buchananii			*	*	*	*	*	*	*			
Cyanotis axillaris					*	*	*	*	*			
Cyanotis cristata						*	*	*	*	*		
Cyanotis vaga						*	*	*	*	*		
Cynodon dectylon	*	*	*	*								
Cynoglossum lanceolatum										*	*	*
Cyperus compressus					*	*	*	*	*			
Cyperus cyperoides	*								*	*	*	*
Cyperus distans							*	*	*	*	*	*
Cyperus haspan								*	*	*	*	
Cyperus iria				*	*	*	*	*	*			
Cyperus pangorei									*	*	*	*
Cyperus pilosus	*					*	*	*	*	*	*	*
Cyperus rotundus							*	*	*	*	*	
Cyperus stoloniferus					*	*	*	*	*			
Dactyloctenium aegyptium							*	*	*	*	*	*
Dalbergia stipulacea									*	*	*	
Dalbergia pinnata										*		
Dalbergia sissoo										*	*	*
Datura metel				*	*	*	*	*				
Datura stramonium				*	*	*	*	*				

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Deeringia amaranthoides	*	*						*	*	*	*	*
Delonix regia	*	*	*						*	*	*	*
Dendrobium aphyllum			*	*	*	*						
Dendrocnide sinuata				*	*	*	*	*				
Dentella repens											*	*
Desmodium gangeticum									*	*		
Desmodium heterocarpon						*	*					
Desmodium laxiflorum									*	*		
Desmodium styracifolium			*	*	*							
Desmodium triflorum									*	*	*	*
Dicliptera bupleuroides	*	*	*	*	*				*	*	*	*
Dillenia indica						*	*					
Dillenia pentagyna			*	*								
Dioscorea bulbifera						*	*	*	*	*	*	
Dioscorea esculenta								*	*	*	*	
Dioscorea pentaphylla							*	*	*	*		
Dioscorea pubera						*	*	*	*	*	*	*
Drosera barmanni	*	*	*									
Drymaria cordata subsp. *diandra*					*	*						
Duchesnia indica		*	*	*								
Echinochloa crus-galli					*	*	*	*	*			
Eclipta prostrata							*	*	*	*		
Eichhornia crassipes							*	*	*	*		
Elaeocarpus rugosus		*	*	*	*							
Elephantopus scaber									*	*	*	*
Eleusine indica				*	*	*	*					
Emilia sonchifolia	*	*	*	*	*	*	*	*	*	*	*	*
Enydra fluctuans						*	*	*	*	*	*	*
Evolvulus nummularius	*	*										*
Ficus benghalensis	*	*	*	*	*	*	*	*	*	*	*	*
Ficus elastica	*	*	*	*	*	*	*	*				
Ficus hederacea	*	*	*	*	*	*	*	*				
Ficus heterophylla								*	*	*	*	*
Ficus hispida	*	*	*	*	*	*	*	*	*	*		
Ficus racemosa		*	*	*	*							
Ficus religiosa	*	*	*	*	*	*	*	*	*	*	*	
Ficus semicordata	*	*	*	*								
Fimbristylis aestivalis								*	*	*		
Fimbristylis tetragona							*	*	*	*		
Floscopa scandens	*	*								*	*	*
Flueggea virosa				*	*	*						
Glinus lotoides									*	*	*	
Glinus oppositifolius					*	*	*	*				
Globba clarkei						*	*					
Globba racemosa					*	*	*	*				
Gmelina arborea		*	*	*								

Continue to next

Deeringia amaranthoides	*	*						*	*	*	*	*
Delonix regia	*	*	*						*	*	*	*
Dendrobium aphyllum			*	*	*	*						
Dendrocnide sinuata				*	*	*	*	*				
Dentella repens											*	*
Desmodium gangeticum									*	*		
Desmodium heterocarpon						*	*					
Desmodium laxiflorum									*	*		
Desmodium styracifolium			*	*	*							
Desmodium triflorum									*	*	*	*
Dicliptera bupleuroides	*	*	*	*	*				*	*	*	*
Dillenia indica						*	*					
Dillenia pentagyna			*	*								
Dioscorea bulbifera						*	*	*	*	*	*	
Dioscorea esculenta								*	*	*	*	
Dioscorea pentaphylla							*	*	*	*		
Dioscorea pubera						*	*	*	*	*	*	*
Drosera barmanni	*	*	*									
Drymaria cordata subsp. *diandra*					*	*						
Duchesnia indica		*	*	*								
Echinochloa crus-galli					*	*	*	*	*			
Eclipta prostrata							*	*	*	*		
Eichhornia crassipes							*	*	*	*		
Elaeocarpus rugosus		*	*	*	*							
Elephantopus scaber									*	*	*	*
Eleusine indica				*	*	*	*					
Emilia sonchifolia	*	*	*	*	*	*	*	*	*	*	*	*
Enydra fluctuans						*	*	*	*	*	*	*
Evolvulus nummularius	*	*										*
Ficus benghalensis	*	*	*	*	*	*	*	*	*	*	*	*
Ficus elastica	*	*	*	*	*	*	*	*				
Ficus hederacea	*	*	*	*	*	*	*	*				
Ficus heterophylla								*	*	*	*	*
Ficus hispida	*	*	*	*	*	*	*	*	*	*		
Ficus racemosa		*	*	*	*							
Ficus religiosa	*	*	*	*	*	*	*	*	*	*	*	
Ficus semicordata	*	*	*	*								
Fimbristylis aestivalis								*	*	*		
Fimbristylis tetragona							*	*	*	*		
Floscopa scandens	*	*								*	*	*
Flueggea virosa				*	*	*						
Glinus lotoides									*	*	*	
Glinus oppositifolius					*	*	*	*				
Globba clarkei						*	*					
Globba racemosa					*	*	*	*				
Gmelina arborea		*	*	*								

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Gnaphalium purpureum			*	*	*	*	*	*	*	*	*	*
Grangea maderaspatana				*	*							
Heliotropium indicum	*	*	*									
Holarrhena pubescens				*	*	*						
Hoya parasitica							*	*	*	*	*	
Hydrocotyle sibthorpioides		*	*	*								
Hygrophila phlomoides	*	*	*	*						*	*	*
Hygrophila polysperma	*	*	*	*						*	*	*
Hypericum japonicum			*	*	*	*	*					
Ichnocarpus frutescens						*	*	*	*	*	*	*
Impatiens balsamina							*	*	*	*		
Impatiens trilobata									*	*	*	
Ipomoea aquatica							*	*	*			
Ipomoea hederifolia										*	*	*
Ipomoea indica		*	*	*								
Ixora acuminata						*	*	*	*	*	*	*
Jasminum dispermum			*	*	*	*	*					
Jasminum laurifolium				*	*	*						
Juncus prismatocarpus		*	*	*								
Juncus trichophyllus			*	*	*							
Justicia adhatoda	*	*	*	*								
Justicia gendarussa	*	*	*	*	*	*	*					
Justicia japonica								*	*	*	*	
Kyllinga nemoralis				*	*	*	*					
Lagerstroemia indica		*	*	*	*	*	*	*	*	*		
Lagerstroemia parviflora				*	*	*	*					
Lagerstroemia speciosa				*	*	*	*	*				
Lannea coromandelica	*	*	*	*	*							
Lantana camara	*	*	*	*	*	*	*	*	*	*	*	*
Laphangium affine	*	*							*	*	*	*
Lasia spinosa			*	*								
Leea aequata				*	*	*						
Leea asiatica					*	*	*					
Leea guineensis				*	*	*						
Leea indica				*	*	*	*	*				
Leea macrophylla								*	*	*	*	
Lepidagathis incurva	*	*	*	*							*	*
Leucaena leucocephala	*	*	*	*				*	*	*	*	*
Leucas aspera	*	*	*								*	*
Limnophila heterophylla							*	*	*	*	*	
Limnophila racemosa						*	*	*	*	*		
Lindernia antipoda							*	*	*	*	*	
Lindernia crustacea	*								*	*	*	*
Lindernia ruellioides									*	*	*	
Lippia alba	*	*	*	*	*							
Litsea cubeba	*	*	*	*	*	*						

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litsea glutinosa					*	*						
Litsea monopetala	*	*	*	*	*	*	*				*	*
Ludwigia adscendens								*	*	*		
Ludwigia octovalvis	*	*	*									
Ludwigia perennis	*									*	*	*
Maesa indica			*	*	*							
Maesa macrophylla	*	*	*									
Mallotus philippensis										*	*	*
Mangifera indica			*	*	*	*						
Mangifera sylvatica			*	*	*	*						
Marsdenia tinctoria								*	*	*		
Mazus pumilus			*	*	*							
Melastoma malabathricum				*	*							
Melochia corchorifolia							*	*	*	*		
Merremia umbellata				*	*	*						
Merremia vitifolia		*	*	*								
Meyna spinosa				*	*	*						
Mikania micrantha	*	*	*					*	*	*	*	*
Mimosa invisa									*	*	*	*
Mimosa pudica	*	*	*									
Monochoria hastata								*	*	*		
Monochoria vaginalis								*	*	*	*	
Morinda angustifolia			*	*	*							
Morus indica			*	*	*							
Murdannia nudiflora					*	*	*	*				
Naravelia zeylanica	*										*	*
Natsiatum herpeticum	*										*	*
Nelsonia canescens	*	*	*	*	*							
Nymphoides hydrophylla	*	*	*	*								
Nymphoides indica	*	*	*									
Nymphaea nouchali						*	*	*	*	*	*	*
Nymphaea pubescens						*	*	*	*	*	*	*
Nymphaea rubra						*	*	*	*	*	*	*
Oenanthe javanica				*	*	*	*	*	*	*		
Oplismenus burmannii							*	*	*	*	*	
Oplismenus compositus								*	*	*	*	
Oroxylum indicum					*	*	*	*	*	*		
Osbeckia nepalensis						*	*	*				
Ottelia alismoides		*	*	*	*	*	*					
Oxalis corniculata						*	*					
Oxalis debilis var. corymbosa	*								*	*	*	*
Oxalis latifolia									*	*	*	*
Persicaria barbata									*	*	*	*
Persicaria chinensis					*	*	*	*	*	*		
Persicaria hydropiper				*	*	*	*	*	*			
Persicaria orientalis				*	*	*	*					

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Persicaria strigosa						*	*	*				
Phaulopsis imbricata	*	*								*	*	*
Phlogacanthus thyrsiformis		*	*	*								
Phyla nodiflora								*	*	*	*	
Piper betle						*	*	*				
Piper hamiltonii				*	*	*	*	*				
Piper nigrum	*	*	*	*								
Piper longum			*	*	*							
Piper sylvaticum							*	*	*	*	*	
Pistia stratiotes							*	*	*			
Pogostemon andersonii					*	*						
Polyalthia longifolia			*	*	*	*	*	*	*			
Polycarpon prostratum					*	*						
Polygala chinensis					*	*	*	*	*			
Polygonum microcephalum					*	*	*	*	*	*	*	*
Polygonum perfoliatum			*	*	*							
Polygonum plebeium							*	*	*	*		
Polygonum pubescens							*	*	*	*		
Portulaca oleracea					*	*	*	*				
Potamogeton crispus							*	*	*	*		
Potamogeton nodosus							*	*	*	*		
Pothos scandens					*	*	*	*				
Pouzolzia hirta					*	*	*	*	*	*	*	
Pouzolzia zeylanica				*	*	*						
Premna mollissima									*	*		
Pseudognaphalium luteoalbum			*	*	*	*	*	*	*	*	*	*
Pueraria sikkimensis	*	*	*									
Rauvolfia serpentina	*	*	*	*	*	*						
Rorippa indica											*	*
Rotala densiflora		*	*	*								
Rotala rotundifolia		*	*	*								
Rubus ellipticus		*	*	*								
Rumex dentatus		*	*	*								
Rumex maritimus		*	*	*								
Rungia pectinata	*	*	*	*	*						*	*
Saccharum spontaneum		*	*	*								
Salomonia oblongifolia							*	*				
Schefflera bengalensis	*	*	*							*	*	*
Senna alata	*									*	*	*
Senna fistula					*	*						
Senna occidentalis						*	*	*	*			
Senna siamea						*	*	*	*			
Senna sophera						*	*	*	*			
Senna tora	*	*									*	*
Sida acuta	*	*	*									
Sida cordata			*	*	*							

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Sida cordifolia							*	*	*			
Sida rhombifolia						*	*	*	*	*	*	
Smilax perfoliata			*	*	*	*	*	*	*	*	*	
Solanum americanum									*	*	*	
Solanum anguivii										*	*	*
Solanum indicum	*	*										*
Solanum pimpinellifolium										*	*	*
Solanum torvum			*	*	*	*	*	*	*	*	*	*
Solanum viarum										*	*	*
Sonchus asper										*	*	*
Spathodia campanulata		*	*	*	*	*	*	*	*	*		
Spermacoce alata										*	*	*
Spermacoce ocymoides	*	*	*	*								
Spirodela polyrrhiza											*	*
Spondias pinnata	*	*	*							*	*	*
Sporobolus diander	*	*									*	*
Stachytarpheta indica		*	*	*								
Stellaria media	*	*										*
Synedrella nodiflora					*	*	*	*	*	*		
Syzygium cumini	*	*	*									
Syzygium jambos		*	*	*	*	*						
Syzygium operculatum		*	*	*	*	*	*	*	*	*		
Syzygium tetragonum	*	*	*									
Tabernaemontana divericata	*	*	*	*	*	*	*	*	*	*	*	*
Tectona grandis								*	*			
Terminalia arjuna	*	*								*	*	*
Terminalia bellirica					*	*	*	*	*	*		
Terminalia chebula											*	*
Terminalia myriocarpa					*	*	*					
Tetracera sarmentosa							*	*	*			
Tetrastigma campylocarpum				*	*	*	*	*				
Tetrastigma planicaule										*	*	
Thunbergia fragrans							*	*	*	*		
Thunbergia grandiflora					*	*	*	*				
Tinospora cordifolia				*	*	*						
Toddalia asiatica				*	*	*						
Trevesia palmata			*	*	*							
Triadica cochinchinensis		*	*	*								
Trichosanthes cordata										*	*	*
Trichosanthes lepiniana										*	*	*
Tridax procumbens									*	*		
Triumfetta rhomboidea		*	*	*								
Typha elephantina										*	*	*
Typhonium trilobatum										*	*	*
Uraria picta									*	*		
Uvaria hamiltonii					*	*	*					

Continue to next

Species name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Vallaris solanacea			*	*	*	*						
Vallisneria natans	*	*								*	*	*
Papilionanthe teres		*	*									
Ventilago denticulata		*	*	*								
Vitex negundo		*	*									
Vitex peduncularis					*	*						
Wrightia arborea				*	*	*	*					
Wrightia sikkimensis				*	*							
Xanthium strumarium				*	*	*	*					
Xanthosoma brasiliense				*	*	*	*	*				
Xyris pauciflora					*	*	*					
Youngia japonica	*	*									*	*
Ziziphus jujuba		*	*	*								
Ziziphus oenopolia		*	*									
Ziziphus rugosa					*	*						

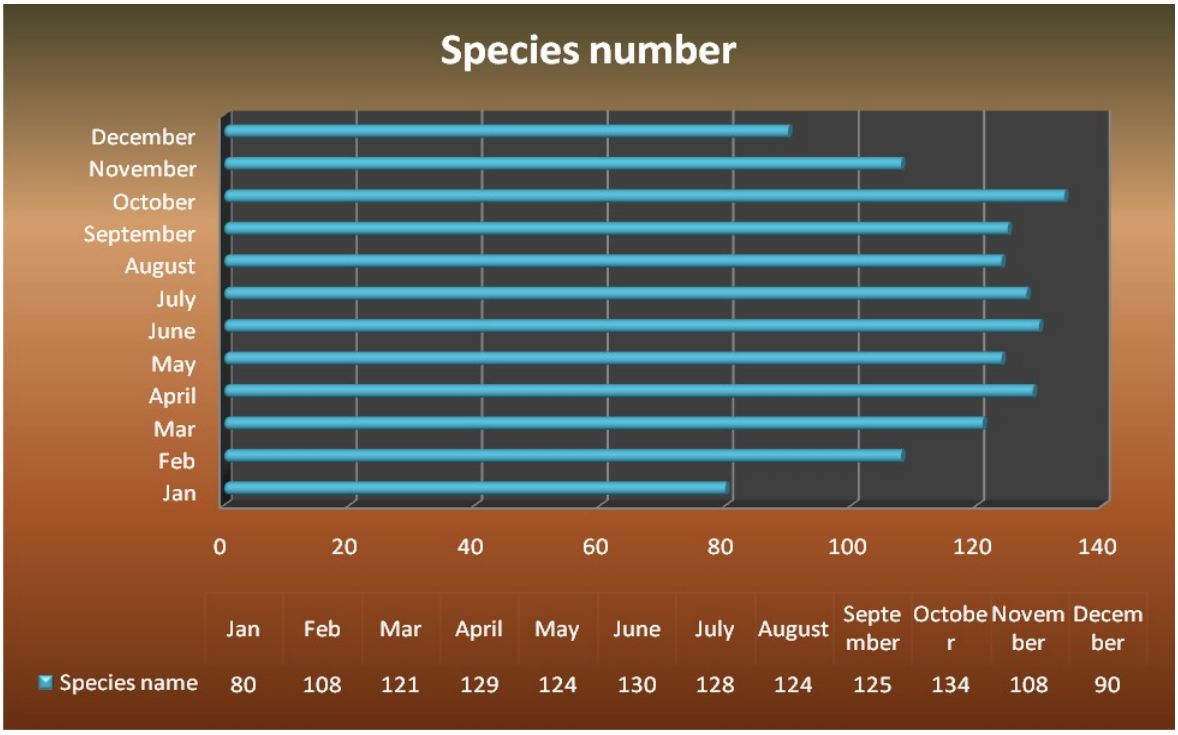

Fig. 7.2. Species showing maximum duration of flowering

Acmella uliginosa, Ageratum conyzoides, Emilia sonchifolia, Ficus benghalensis, Lantana camara, Tabernaemontana divericata etc are blooming round the year (Table 7.16) then followed by *Acmella paniculata, Citrus maxima, Ficus religiosa, Achyrospermum wallichianum, Acmella calva, Bidens pilosa, Ficus hispida, Gnaphalium purpureum, Pseudognaphalium luteoalbum, Solanum torvum* etc blooming for 10 to 11 months, sometimes may be round the year (Fig. 7.2).

April, May, June and July and later September to October may be called as nature's flower festival in GNP flora, because maximum flowering species (9 %) of the total studied flowering species in each month) found to bloom during these two periods every year. December to January appears to be the resting month, as very less number species go for flowering in winter (Fig. 7.3).

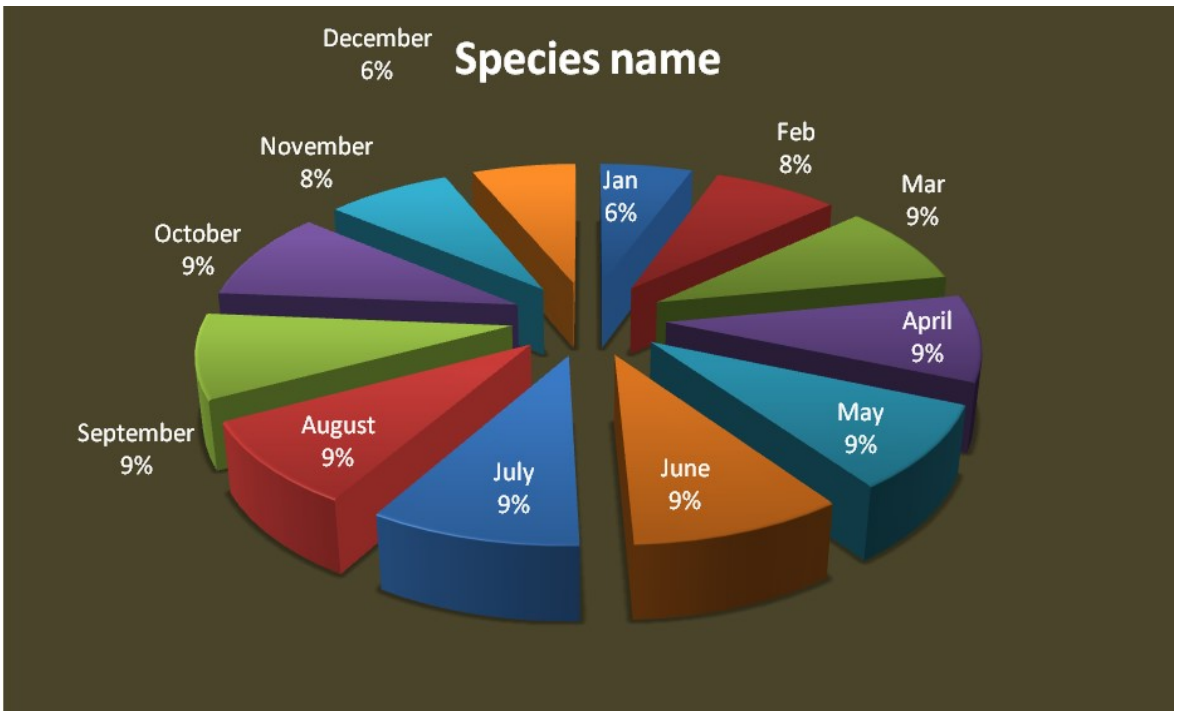

Fig. 7.3. Yearly flowering distribution of GNP flora

Table 7.13. 16 Species showing maximum duration of flowering and fruiting of GNP Flora [1 – 12 denotes the months of the year]

Species	No. of months
Acmella uliginosa	12
Ageratum conyzoides	12
Emilia sonchifolia	12
Ficus benghalensis	12
Lantana camara	12
Tabernaemontana divericata	12
Citrus maxima	11
Ficus religiosa	11
Achyrospermum wallichianum	10
Acmella calva	10
Bidens pilosa	10
Ficus hispida	10
Gnaphalium purpureum	10
Pseudognaphalium luteoalbum	10
Solanum torvum	10

7.7. Anthropogenic activities:

Some Beats like Murti, Bichha Bhanga, Bhudhuram are very much disturbed by the local villagers and poachers. The villagers are collecting commercially important and daily used materials from the forests. If this practice is continued for few more years, then the local valuable and medicinally and economically important plant species of the forests will be vanished from the National Park very soon. They are damaging vegetation when collecting fuel wood and fodder for their cattle and other domestic animals. The population of Aquatic rotifers, Mollusca, Zoo planktons and phytoplanktons

are also being seriously affected by them due to fishery related activities in the water bodies like Indong, Gorati, Medlajhora, Dhupjhora etc within the core areas. At the same time, the basic stock of food for the aquatic-birds, both native and migratory birds, are being affected. Poor knowledge of NTFP collection by local villagers is also the cause of damage of diversity and food crisis for aquatic and other birds. Ecotourism is seriously disturbing the local floral and faunal communities and also the overall environment of the area.

7.8. *Ex-situ* conservation:

There is no any facility for the *ex-situ* conservation of plants in the study area except for some species of Bamboos and *Phyllanthus emblica* as Elephants fodders and fruits for Birds. Foresters try to stop this practices by planting naturally growing species like *Terminalia* spp*, Mangifera* spp*, Artocarpus* spp. etc. In the Murti River Beds, plantation forest area is also increasing and the species under use for the purpose are mainly *Phyllanthus emblica, Salix tetrasperma, Lagerstroemia speciosa, Terminalia arjuna, Terminalia bellirica, Syzygium cumini, Putranjiva roxburghii, Cassia javanica* ssp. *nodosa, Delonix regia, Lagerstroemia indica, Litchi chinensis, Spathodea campanulata* etc. It appears that for a conservatory devoted mainly for the bird conservation enough thought need to be given for the selection of species for plantation. Plants provide food, shelter and suitable structures for nesting round the year for larger number of bird species, local as well as migratory, may be properly recognized and should be used for plantations.

Chapter 8

PHYTOSOCIOLOGY

PHYTOSOCIOLOGICAL ANALYSIS

Phytosociological studies were conducted in six Beats, as well as in the Roadside Forested jone. While the nested quadrate method was applied randomly for the vegetation with three sizes of quadrates [20 m x 20 m; 5 m x 5 m; and 1 m x 1m]. 155 nested quadrates, i.e. 155 large [20 x 20 m], 310 medium [5 x 5 m] and 775 small [1 x 1m] quadrates were used to sample the canopy, under-storey and the ground-cover vegetation, respectively.

The sampling was done in three different seasons of the year: (i) Pre-monsoon [March to April], Monsoon [May to July] and Post-monsoon [September to November]. The data obtained were computed to determine different phytosociological parameters, namely Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI). And, finally, using these processed data different diversity and richness Index were calculated for better understanding of the vegetation.

8.1. Seasonal Variations of Flora

Occurrence of floral species varies across the seasons. Pre-monsoon, monsoon and post-monsoon studies enlighten this argument, showing difference of occurring species in respect of density, frequency, abundance and IVI [Annexure – I-XLII].

8.1.1. Premonsoon ground covers of Murti Beat (Annex. I)

Commelina sufruticosa (95.54) emerged with highest frequency in premonsoon ground covers in Murti Beat and followed by *Cyperus compressus*(93.33)*, Diplazium esculentum* (72.22)*, Molineria capitulate* (72.22)*, Cryptolepis dubia* (70.00), *Pronephreum nudatum* (68.89)*, Axonopus compressus* (64.44), *Piper sylvaticum* (63.33)*, Tetrastigma serrulatum* (60.00) and *Oplismenus burmannii* (57.78). Similarly highest abandance presented *Centella asiatica* (6.47) then followed by *Dryopteris sikkimensis*(4.37), *Clerodendrum infortunatum* (3.88), *Natsiatum herpeticum* (3.70), *Oplismenus burmannii* (3.63) etc. However highest density recorded against *Oplismenus burmannii* (2.10) followed by *Natsiatum herpeticum* (1.52), *Pronephreum nudatum* (1.52), *Diplazium esculentum* (1.49), *Mikania micrantha* (1.42), *Dryopteris sikkimensis* (1.31), *Coffea benghalensis* (1.31) etc. Highest IVI during pre-monsoon season has been recorded by *Oplismenus burmannii* (15.04)*, Centella asiatica* (12.97)*, Natsiatum herpeticum* (12.27)*, Pronephreum nudatum* (12.11) *Diplazium esculentum* (12.03)*, Dryopteris sikkimensis* (11.78)*, Mikania micrantha* (11.45) etc (Table 8.1 – 8.4).

Table 8.1. Top ten Frequency and relative frequency of Premonsoon Ground cover of Murti

Name of the plants	F	RF
Commelina sufruticosa	95.56	6.27
Cyperus compressus	93.33	6.12
Diplazium esculentum	72.22	4.74
Molineria capitulata	72.22	4.74
Cryptolepis dubia	70.00	4.59
Pronephreum nudatum	68.89	4.52
Axonopus compressus	64.44	4.23
Piper sylvaticum	63.33	4.15
Tetrastigma serrulatum	60.00	3.94
Oplismenus burmannii	57.78	3.79

Table 8.2. Top ten Abandance and relative abandance of Premonsoon Ground cover of Murti

Name of the plants	A	RA
Centella asiatica	6.47	8.58
Dryopteris sikkimensis	4.37	5.80
Clerodendrum infortunatum	3.88	5.15
Natsiatum herpeticum	3.70	4.91
Oplismenus burmannii	3.63	4.82
Pupalia lappacea	3.56	4.71
Coffea benghalensis	3.11	4.12
Mikania micrantha	3.05	4.04
Ageratum conyzoides	3.05	4.05
Synedrella nodiflora	2.96	3.92

Table 8.3. Top ten Density and relative density of Premonsoon Ground cover of Murti

Name of the plants	D	RD
Oplismenus burmannii	2.10	6.43
Natsiatum herpeticum	1.52	4.66
Pronephreum nudatum	1.52	4.66
Diplazium esculentum	1.49	4.56
Mikania micrantha	1.42	4.35
Dryopteris sikkimensis	1.31	4.01
Coffea benghalensis	1.31	4.01
Persicaria chinensis	1.29	3.94
Chloranthus erectus	1.29	3.94
Ageratum conyzoides	1.26	3.84

Table 8.4. Top ten IVI of Premonsoon Ground covers of Murti

Name of the plants	RF	RA	RD	IVI
Oplismenus burmannii	3.79	4.82	6.43	15.04
Centella asiatica	1.09	8.58	3.3	12.97
Natsiatum herpeticum	2.7	4.91	4.66	12.27
Pronephreum nudatum	4.52	2.93	4.66	12.11
Diplazium esculentum	4.74	2.73	4.56	12.03
Dryopteris sikkimensis	1.97	5.8	4.01	11.78
Mikania micrantha	3.06	4.04	4.35	11.45
Cyperus compressus	6.12	1.55	3.33	11
Commelina sufruticosa	6.27	1.46	3.23	10.96
Coffea benghalensis	2.77	4.12	4.01	10.9

Pupalia lappacea, Rungia pectinata, Achyrospermum wallichianum, Elatostema monandrum and *Acacia pennata* shows maximum Shannon – Weiner Index (SDI).

8.1.2. Premonsoon ground covers of Dhupjhora Beat (Annex. II)

Ichnocarpus frutescens (92.86) emerged with highest frequency in premonsoon ground covers in Dhupjhora Beat and followed by *Achyrospermum wallichianum* (84.29), *Mikania micrantha* (84.29), *Lepidagathis incurva* (81.43), *Oplismenus burmannii* (80.00) etc. Similarly highest abandance

presented *Axonopus compressus* (6.12) then followed by *Ageratum conyzoides* (3.69), *Dryopteris sikkimensis* (3.66), *Coffea benghalensis* (3.50), *Molineria capitulata* (3.49), *Chloranthus erectus* (3.24) etc. However highest density recorded against *Axonopus compressus* (3.59) followed by *Ichnocarpus frutescens* (2.81), *Dryopteris sikkimensis* (2.77), *Achyrospermum wallichianum* (2.60), *Lepidagathis incurve* (2.47) etc. Highest IVI during pre-monsoon season has been recorded by *Axonopus compressus* (3.40), *Ichnocarpus frutescens* (5.39), *Dryopteris sikkimensis* (4.39), *Achyrospermum wallichianum* (4.89) etc (Table 8.5 – 8.8).

Table 8.5. Top ten Frequency and relative frequency of Premonsoon Ground cover of Dhupjhora

Name of the plants	F	RF
Ichnocarpus frutescens	92.86	5.39
Achyrospermum wallichianum	84.29	4.89
Mikania micrantha	84.29	4.89
Lepidagathis incurva	81.43	4.72
Oplismenus burmannii	80.00	4.64
Acmella calva	75.71	4.39
Dryopteris sikkimensis	75.71	4.39
Elatostema monandrum	72.86	4.23
Spermacoce latifolia	72.86	4.23
Pupalia lappacea	70.00	4.06

Table 8.6. Top ten abandance and relative abandance of Premonsoon Ground cover of Dhupjhora

Name of the plants	A	RA
Axonopus compressus	6.12	8.06
Ageratum conyzoides	3.69	4.85
Dryopteris sikkimensis	3.66	4.82
Coffea benghalensis	3.50	4.61
Molineria capitulata	3.49	4.59
Chloranthus erectus	3.24	4.26
Achyrospermum wallichianum	3.08	4.06
Lepidagathis incurva	3.04	3.99
Cyperus compressus	3.03	3.99
Ichnocarpus frutescens	3.03	3.99

Table 8.7. Top ten diversity and relative diversity of Premonsoon Ground cover of Dhupjhora

Name of the plants	D	RD
Axonopus compressus	3.59	7.79
Ichnocarpus frutescens	2.81	6.11
Dryopteris sikkimensis	2.77	6.02
Achyrospermum wallichianum	2.60	5.65
Lepidagathis incurva	2.47	5.37
Elatostema monandrum	2.16	4.69
Molineria capitulata	2.04	4.44
Acmella calva	1.97	4.28
Diplazium esculentum	1.96	4.25
Ageratum conyzoides	1.84	4.00

Table 8.8. Top ten IVI of Premonsoon Ground covers of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Axonopus compressus	3.40	8.06	7.79	19.24
Ichnocarpus frutescens	5.39	3.99	6.11	15.49
Dryopteris sikkimensis	4.39	4.82	6.02	15.23
Achyrospermum wallichianum	4.89	4.06	5.65	14.60
Lepidagathis incurva	4.72	3.99	5.37	14.09
Elatostema monandrum	4.23	3.90	4.69	12.81
Molineria capitulata	3.40	4.59	4.44	12.42
Acmella calva	4.39	3.43	4.28	12.10
Diplazium esculentum	3.81	3.92	4.25	11.98
Ageratum conyzoides	2.90	4.85	4.00	11.75

Achyranthes bidentata, Alternantheara philoxeroides, Clerodendrum infortunatum, Coffea benghalensis, Floscopa scandens, Persicaria chinensis and *Pronephreum nudatum* shows maximum SDI.

8.1.3. Premonsoon ground covers of Gorumara Beat (Annex. III)

Axonopus compressus (97.33) emerged with highest frequency in premonsoon ground covers in Gorumara Beat and followed by *Ageratum conyzoides* (96.00)*, Lepidagathis incurva* (96.00)*, Mimosa pudica* (90.67)*, Natsiatum herpeticum* (89.33) etc. Similarly highest abandance presented *Elatostema monandrum* (5.17) then followed by *Diplazium esculentum* (4.61), *Ichnocarpus frutescens* (3.03), *Axonopus compressus* (2.84), *Achyrospermum wallichianum* (2.67), *Lepidagathis incurva* (2.60) etc. However highest density recorded against *Elatostema monandrum* (2.89) followed by *Axonopus compressus* (2.76), *Diplazium esculentum* (2.52), *Lepidagathis incurva* (2.49), *Ageratum conyzoides* (2.47) etc. Highest IVI during pre-monsoon season has been recorded by *Elatostema monandrum* (21.44)*, Diplazium esculentum* (19.24)*, Axonopus compressus* (19.13)*, Lepidagathis incurva* (17.84) etc (Table 8.9 – 8.12).

Table 8.9. Top ten Frequency and relative frequency of Premonsoon Ground cover of Gorumara

Name of the plants	F	RF	IVI
Axonopus compressus	97.33	5.94	19.13
Ageratum conyzoides	96.00	5.86	17.72
Lepidagathis incurva	96.00	5.86	17.84
Mimosa pudica	90.67	5.53	12.03
Natsiatum herpeticum	89.33	5.45	14.50
Chloranthus erectus	81.33	4.96	11.64
Ichnocarpus frutescens	81.33	4.96	17.71
Oplismenus burmannii	78.67	4.80	12.35
Acmella calva	77.33	4.72	11.56
Piper sylvaticum	77.33	4.72	11.13

Table 8.10. Top ten Abandance and relative abandance of Premonsoon Ground cover of Gorumara

Name of the plants	A	RA	IVI
Elatostema monandrum	5.17	9.87	21.44
Diplazium esculentum	4.61	8.80	19.24
Ichnocarpus frutescens	3.03	5.79	17.71
Axonopus compressus	2.84	5.42	19.13

Continue to next

Name of the plants	A	RA	IVI
Achyrospermum wallichianum	2.67	5.09	7.27
Lepidagathis incurva	2.60	4.96	17.84
Ageratum conyzoides	2.57	4.91	17.72
Dryopteris sikkimensis	2.40	4.58	13.66
Sauropus quadrangularis	2.11	4.02	8.52
Natsiatum herpeticum	2.04	3.91	14.50

Table 8.11. Top ten Diversity and relative diversity of Premonsoon Ground cover of Gorumara

Name of the plants	D	RD
Elatostema monandrum	2.89	8.15
Axonopus compressus	2.76	7.78
Diplazium esculentum	2.52	7.10
Lepidagathis incurva	2.49	7.02
Ageratum conyzoides	2.47	6.95
Ichnocarpus frutescens	2.47	6.95
Natsiatum herpeticum	1.83	5.15
Dryopteris sikkimensis	1.69	4.77
Spermacoce latifolia	1.51	4.24
Oplismenus burmannii	1.44	4.06

Table 8.12. Ten species with maximum IVI of Premonsoon Ground cover of Gorumara

Name of the plants	RF	RA	RD	IVI
Elatostema monandrum	3.42	9.87	8.15	21.44
Diplazium esculentum	3.34	8.80	7.10	19.24
Axonopus compressus	5.94	5.42	7.78	19.13
Lepidagathis incurva	5.86	4.96	7.02	17.84
Ageratum conyzoides	5.86	4.91	6.95	17.72
Ichnocarpus frutescens	4.96	5.79	6.95	17.71
Natsiatum herpeticum	5.45	3.91	5.15	14.50
Dryopteris sikkimensis	4.31	4.58	4.77	13.66
Spermacoce latifolia	4.64	3.79	4.24	12.67
Oplismenus burmannii	4.80	3.50	4.06	12.35

Achyrospermum wallichianum, Oxalis corniculata, Rungia pectinata, Commelina diffusa and *Sauropus quadrangularis* showing maximum SDI.

8.1.4. Premonsoon ground covers of Khunia Beat (Annex. IV)

Pupalia lappacea (96.00) emerged with highest frequency in premonsoon ground covers in Khunia Beat and followed by *Ageratum conyzoides* (94.00), *Axonopus compressus* (92.00), *Diplazium esculentum* (92.00), *Ichnocarpus frutescens* (92.00) etc. Similarly highest abandance presented *Ichnocarpus frutescens* (3.46) then followed by *Pronephreum nudatum* (3.00), *Rungia pectinata* (3.00), *Acmella calva* (2.49), *Pupalia lappacea* (2.48), *Axonopus compressus* (2.39) etc. However highest density recorded against *Ichnocarpus frutescens* (3.18) followed by *Pupalia lappacea* (2.38), *Axonopus compressus* (2.20), *Acmella calva* (1.94), *Oplismenus compositus* (1.94) etc. Highest IVI during pre-monsoon season has been recorded by *Ichnocarpus frutescens* (20.19), *Pupalia lappacea* (16.34), *Axonopus compressus* (15.46), *Acmella calva* (14.20) etc (Table 8.13 – 8.16).

Table 8.13. Top ten Frequency and relative frequency of Premonsoon Ground cover of Khunia

Name of the plants	F	RF
Pupalia lappacea	96.00	5.06
Ageratum conyzoides	94.00	4.95
Axonopus compressus	92.00	4.85
Diplazium esculentum	92.00	4.85
Ichnocarpus frutescens	92.00	4.85
Chromolaena odorata	90.00	4.74
Piper sylvaticum	90.00	4.74
Oplismenus compositus	86.00	4.53
Clerodendrum infortunatum	84.00	4.43
Cyperus compressus	84.00	4.43

Table 8.14. Top ten Abandance and relative abandance of Premonsoon Ground cover of Khunia

Name of the plants	A	RA
Ichnocarpus frutescens	3.46	6.62
Pronephreum nudatum	3.00	5.74
Rungia pectinata	3.00	5.74
Acmella calva	2.49	4.76
Pupalia lappacea	2.48	4.75
Axonopus compressus	2.39	4.58
Oplismenus compositus	2.26	4.32
Achyrospermum wallichianum	2.08	3.98
Dryopteris sikkimensis	2.03	3.88
Diplazium esculentum	1.98	3.79

Table 8.15. Top ten Diversity and relative diversity of Premonsoon Ground cover of Khunia

Name of the plants	D	RD
Ichnocarpus frutescens	3.18	8.73
Pupalia lappacea	2.38	6.53
Axonopus compressus	2.20	6.04
Acmella calva	1.94	5.32
Oplismenus compositus	1.94	5.32
Diplazium esculentum	1.82	4.99
Ageratum conyzoides	1.78	4.88
Piper sylvaticum	1.78	4.88
Chromolaena odorata	1.72	4.72
Achyrospermum wallichianum	1.62	4.45

Table 8.16. Ten species with maximum IVI of Premonsoon Ground cover of Khunia

Name of the plants	RF	RA	RD	IVI
Ichnocarpus frutescens	4.85	6.62	8.73	20.19
Pupalia lappacea	5.06	4.75	6.53	16.34
Axonopus compressus	4.85	4.58	6.04	15.46
Acmella calva	4.11	4.76	5.32	14.20
Oplismenus compositus	4.53	4.32	5.32	14.17

Continue to next

Name of the plants	RF	RA	RD	IVI
Diplazium esculentum	4.85	3.79	4.99	13.63
Ageratum conyzoides	4.95	3.63	4.88	13.46
Piper sylvaticum	4.74	3.79	4.88	13.41
Chromolaena odorata	4.74	3.66	4.72	13.12
Achyrospermum wallichianum	4.11	3.98	4.45	12.53

Acacia pennata, Asystasia macrocarpa, Chloranthus erectus, Commelina sufruticosa, Elatostema monandrum, Floscopa scandens, Natsiatum herpeticum, Persicaria chinensis and *Phlogacanthus thyrsiformis* showing maximum SDI.

8.1.5. Premonsoon ground covers of Bichhabhanga Beat (Annex. V)

Elatostema monandrum (98.00) emerged with highest frequency in premonsoon ground covers in Bichhabhanga Beat and followed by *Acmella calva* (96.00), *Achyrospermum wallichianum* (94.00), *Piper sylvaticum* (94.00), *Diplazium esculentum* (90.00) etc. Similarly highest abandance presented *Globba racemosa* (11.92) then followed by *Ageratum conyzoides* (5.40), *Elatostema monandrum* (4.02), *Dryopteris sikkimensis* (3.25), *Acmella calva* (3.19), *Clerodendrum infortunatum* (3.13) etc. However highest density recorded against *Elatostema monandrum* (3.94) followed by *Ageratum conyzoides* (3.78), *Acmella calva* (3.06), *Globba racemosa* (2.86), *Dryopteris sikkimensis* (2.34) etc. Highest IVI during pre-monsoon season has been recorded by *Globba racemosa* (24.50), *Elatostema monandrum* (20.43), *Ageratum conyzoides* (20.35), *Acmella calva* (17.09) etc. (Table 8.17 – 8.20).

Table 8.17. Top ten Frequency and relative frequency of Premonsoon Ground cover of Bichhabhanga

Name of the plants	F	RF
Elatostema monandrum	98.00	5.56
Acmella calva	96.00	5.45
Achyrospermum wallichianum	94.00	5.33
Piper sylvaticum	94.00	5.33
Diplazium esculentum	90.00	5.11
Mikania micrantha	84.00	4.77
Spermacoce latifolia	82.00	4.65
Synedrella nodiflora	82.00	4.65
Persicaria chinensis	76.00	4.31
Rungia pectinata	76.00	4.31

Table 8.18. Top ten Abandance and relative abandance of Premonsoon Ground cover of Bichhabhanga

Name of the plants	A	RA
Globba racemosa	11.92	16.34
Ageratum conyzoides	5.40	7.41
Elatostema monandrum	4.02	5.51
Dryopteris sikkimensis	3.25	4.46
Acmella calva	3.19	4.37
Clerodendrum infortunatum	3.13	4.29
Blumea lacera	3.03	4.15
Cyperus compressus	3.00	4.11
Spermacoce latifolia	2.10	2.88
Commelina sufruticosa	2.08	2.86

Table 8.19. Top ten Diversity and relative diversity of Premonsoon Ground cover of Bichhabhanga

Name of the plants	D	RD
Elatostema monandrum	3.94	9.35
Ageratum conyzoides	3.78	8.97
Acmella calva	3.06	7.26
Globba racemosa	2.86	6.79
Dryopteris sikkimensis	2.34	5.56
Blumea lacera	2.24	5.32
Clerodendrum infortunatum	1.94	4.61
Piper sylvaticum	1.94	4.61
Achyrospermum wallichianum	1.78	4.23
Diplazium esculentum	1.74	4.13

Table 8.20. Top ten IVI of Premonsoon Ground cover of Bichhbhanga

Name of the plants	RF	RA	RD	IVI
Globba racemosa	1.36	16.34	6.79	24.50
Elatostema monandrum	5.56	5.51	9.35	20.43
Ageratum conyzoides	3.97	7.41	8.97	20.35
Acmella calva	5.45	4.37	7.26	17.09
Dryopteris sikkimensis	4.09	4.46	5.56	14.10
Blumea lacera	4.20	4.15	5.32	13.67
Clerodendrum infortunatum	3.52	4.29	4.61	12.42
Achyrospermum wallichianum	5.33	2.60	4.23	12.16
Diplazium esculentum	5.11	2.65	4.13	11.89
Persicaria chinensis	4.31	2.74	3.61	10.67

Achyranthes bidentata, Anisomeles indica, Axonopus compressus, Commelina sufruticosa, Cyperus compressus, Dicliptera bupleuroides, Elephantopus scaber, Euphorbia hirta, Ichnocarpus frutescens, Oplismenus burmannii and *Pupalia lappacea* showing maximum SDI.

8.1.6. Premonsoon ground covers of Budhuram Beat (Annex. VI)

Ageratum conyzoides (97.78) emerged with highest frequency in premonsoon ground covers in Budhuram Beat and followed by *Achyrospermum wallichianum* (91.11), *Axonopus compressus* (91.11), *Pronephreum nudatum* (91.11), *Chromolaena odorata* (88.89) etc. Similarly highest abandance presented *Molineria capitulata* (6.00) then followed by *Chloranthus erectus (*5.62), *Mikania micrantha* (4.15), *Ageratum conyzoides* (4.05), *Axonopus compressus* (3.98), *Dicliptera bupleuroides* (3.78) etc. However highest density recorded against *Chloranthus erectus (*4.87) followed by *Ageratum conyzoides* (3.96), *Axonopus compressus* (3.62), *Mikania micrantha* (3.04), *Pronephreum nudatum* (2.98) etc. Highest IVI during pre-monsoon season has been recorded by *Chloranthus erectus (*23.15), *Ageratum conyzoides* (19.71), *Axonopus compressus* (18.52), *Mikania micrantha* (16.49) etc (Table 8.21 – 8.24).

Table 8.21. Top ten Frequency and relative frequency of Premonsoon Ground cover of Budhuram

Name of the plants	F	RF
Ageratum conyzoides	97.78	5.74
Achyrospermum wallichianum	91.11	5.35
Axonopus compressus	91.11	5.35
Pronephreum nudatum	91.11	5.35
Chromolaena odorata	88.89	5.22

Name of the plants	F	RF
Chloranthus erectus	86.67	5.09
Coffea benghalensis	86.67	5.09
Diplazium esculentum	86.67	5.09
Pupalia lappacea	82.22	4.83
Tetrastigma serrulatum	82.22	4.83

Table 8.22. Top ten Abandance and relative abandance of Premonsoon Ground cover of Budhuram

Name of the plants	A	RA
Molineria capitulata	6.00	8.26
Chloranthus erectus	5.62	7.73
Mikania micrantha	4.15	5.71
Ageratum conyzoides	4.05	5.57
Axonopus compressus	3.98	5.47
Dicliptera bupleuroides	3.78	5.20
Natsiatum herpeticum	3.68	5.06
Spermacoce latifolia	3.38	4.65
Pronephreum nudatum	3.27	4.50
Achyrospermum wallichianum	3.20	4.40

Table 8.23. Top ten Diversity and relative diversity of Premonsoon Ground cover of Budhuram

Name of the plants	D	RD
Chloranthus erectus	4.87	10.34
Ageratum conyzoides	3.96	8.40
Axonopus compressus	3.62	7.69
Mikania micrantha	3.04	6.47
Pronephreum nudatum	2.98	6.32
Achyrospermum wallichianum	2.91	6.18
Dryopteris sikkimensis	2.42	5.14
Piper sylvaticum	2.33	4.96
Natsiatum herpeticum	2.04	4.34
Oplismenus burmannii	1.98	4.20

Table 8.24. Top ten Frequency and relative frequency of Premonsoon Ground cover of Budhuram

Name of the plants	RF	RA	RD	IVI
Chloranthus erectus	5.09	7.73	10.34	23.15
Ageratum conyzoides	5.74	5.57	8.40	19.71
Axonopus compressus	5.35	5.47	7.69	18.52
Mikania micrantha	4.31	5.71	6.47	16.49
Pronephreum nudatum	5.35	4.50	6.32	16.17
Achyrospermum wallichianum	5.35	4.40	6.18	15.93
Dryopteris sikkimensis	4.70	4.17	5.14	14.01
Piper sylvaticum	4.70	4.01	4.96	13.67
Natsiatum herpeticum	3.26	5.06	4.34	12.67
Oplismenus burmannii	4.31	3.71	4.20	12.22

Anisomeles indica, Centella asiatica, Dicliptera bupleuroides, Hypericum japonicum, Molineria capitulate, Rungia pectinata and *Synedrella nodiflora* showing maximum SDI.

Fig. 8.1. showing diversity and species richness of the pre monsoon vegetation of Gorumara National Park. Magalef index showing high R^2 Value.

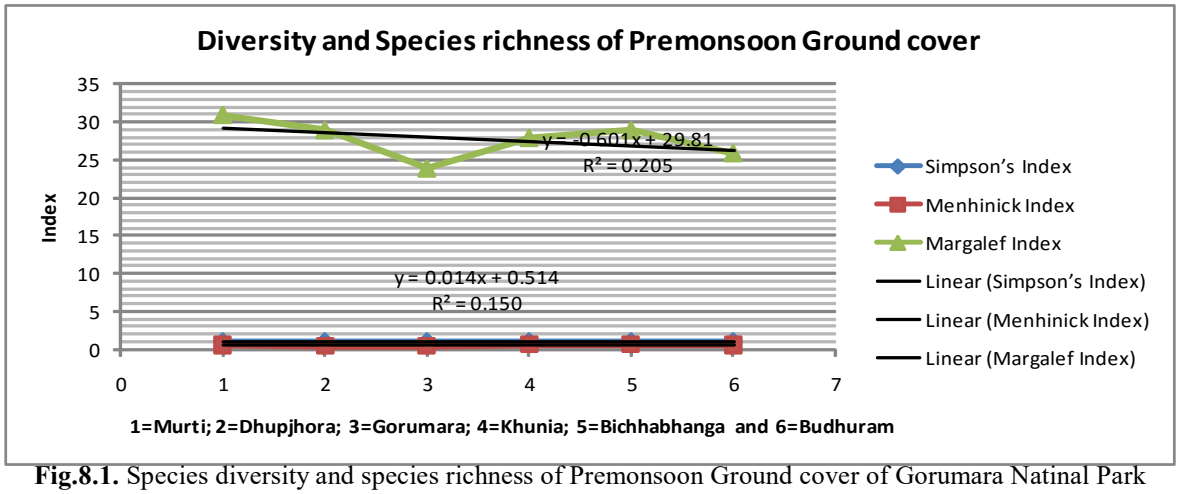

Fig.8.1. Species diversity and species richness of Premonsoon Ground cover of Gorumara Natinal Park

8.1.7. Monsoon ground covers of Murti Beat (Annex. VII)

Axonopus compressus (98.89) emerged with highest frequency in monsoon ground covers in Murti Beat and followed by *Commelina sufruticosa* (95.56), *Mikania micrantha* (95.56), *Oplismenus burmannii* (94.44), *Oxalis corniculata* (94.44) etc. Similarly highest abandance presented *Duchesnea indica* (6.23) then followed by *Acmella calva* (4.99), *Pupalia lappacea* (4.92), *Clerodendrum infortunatum* (4.56), *Dryopteris sikkimensis* (4.37), *Chloranthus erectus* (4.12) etc. However highest density recorded against *Acmella calva* (3.77) followed by *Mikania micrantha* (3.76), *Oplismenus burmannii* (3.50), *Chloranthus erectus* (2.98), *Natsiatum herpeticum* (2.97) etc. Highest IVI during pre-monsoon season has been recorded by*Acmella calva* (15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *Chloranthus erectus* (13.02) etc (Table 8.25 – 8.28).

Table 8.25. Top ten Frequency and relative frequency of Monsoon Ground cover of Murti

Name of the plants	F	RF
Axonopus compressus	98.89	4.47
Commelina sufruticosa	95.56	4.32
Mikania micrantha	95.56	4.32
Oplismenus burmannii	94.44	4.27
Oxalis corniculata	94.44	4.27
Cyperus compressus	93.33	4.22
Piper sylvaticum	86.67	3.92
Coffea benghalensis	84.44	3.82
Pronephreum nudatum	83.33	3.77
Spermacoce alata	83.33	3.77

Table 8.26. Top ten Abandance and relative abundance of Monsoon Ground cover of Murti

Name of the plants	A	RA
Duchesnea indica	6.23	6.84
Acmella calva	4.99	5.48
Pupalia lappacea	4.92	5.41

Name of the plants	A	RA
Clerodendrum infortunatum	4.56	5.01
Dryopteris sikkimensis	4.37	4.80
Chloranthus erectus	4.12	4.53
Mikania micrantha	3.93	4.32
Natsiatum herpeticum	3.93	4.31
Persicaria chinensis	3.81	4.19
Oplismenus burmannii	3.71	4.07

Table 8.27. Top ten Density and relative density of Monsoon Ground cover of Murti

Name of the plants	D	RD
Acmella calva	3.77	6.61
Mikania micrantha	3.76	6.59
Oplismenus burmannii	3.50	6.14
Chloranthus erectus	2.98	5.22
Natsiatum herpeticum	2.97	5.20
Persicaria chinensis	2.88	5.05
Duchesnea indica	2.42	4.25
Coffea benghalensis	2.40	4.21
Diplazium esculentum	2.38	4.17
Pupalia lappacea	2.08	3.64

Table 8.28. Top ten IVI of Monsoon Ground cover of Murti

Name of the plants	RF	RA	RD	IVI
Acmella calva	3.42	5.48	6.61	15.50
Mikania micrantha	4.32	4.32	6.59	15.23
Oplismenus burmannii	4.27	4.07	6.14	14.48
Chloranthus erectus	3.27	4.53	5.22	13.02
Natsiatum herpeticum	3.42	4.31	5.20	12.94
Duchesnea indica	1.76	6.84	4.25	12.85
Persicaria chinensis	3.42	4.19	5.05	12.65
Coffea benghalensis	3.82	3.12	4.21	11.15
Diplazium esculentum	3.27	3.62	4.17	11.06
Pupalia lappacea	1.91	5.41	3.64	10.96

Acacia pennata, Achyrospermum wallichianum , *Clerodendrum infortunatum* , *Clerodendrum infortunatum* , *Cryptolepis dubia* , *Drymaria cordata, Elatostema monandrum, Floscopa scandens, Ichnocarpus frutescens, Molineria capitulate, Phlogacanthus thyrsiformis* , *Rungia pectinata, Synedrella nodiflora* and *Tetrastigma serrulatum* showing maximum SDI.

8.1.8. Monsoon ground covers of Dhupjhora Beat (Annex. VIII)

Achyrospermum wallichianum (97.14) emerged with highest frequency in monsoon ground covers in Dhupjhora Beat and followed by *Ichnocarpus frutescens* (97.14)*, Elatostema monandrum* (95.71)*, Mikania micrantha* (95.71)*, Cyperus cyperoides* (92.86) etc (Table 8.36). Similarly highest abandance presented *Mikania micrantha* (4.73) then followed by *Natsiatum herpeticum* (3.74), *Piper sylvaticum* (3.69), *Drymaria cordata* (3.58), *Chloranthus erectus* (3.54), *Chromolaena odorata* (3.54) etc (Table 8.37). However highest density recorded against *Mikania micrantha* (4.53) followed by *Ichnocarpus frutescens* (3.30), *Achyrospermum wallichianum* (3.13), *Piper sylvaticum* (3.11), *Chloranthus erectus* (3.09) etc (Table 8.38). Highest IVI during pre-monsoon season has been recorded by *Mikania*

micrantha (17.06), *Achyrospermum wallichianum* (13.13), *Piper sylvaticum* (13.05), *Oplismenus burmannii* (12.16) etc (Table 8.29 – 8.32).

Table 8.29. Top ten Frequency and relative frequency of Monsoon Ground cover of Dhupjhora

Name of the plants	F	RF
Achyrospermum wallichianum	97.14	4.38
Ichnocarpus frutescens	97.14	4.38
Elatostema monandrum	95.71	4.31
Mikania micrantha	95.71	4.31
Cyperus cyperoides	92.86	4.18
Cyanthillium cinereum	91.43	4.12
Chloranthus erectus	87.14	3.93
Chromolaena odorata	87.14	3.93
Oplismenus burmannii	84.29	3.80
Piper sylvaticum	84.29	3.80

Table 8.30. Top ten Abandance and relative abandance of Monsoon Ground cover of Dhupjhora

Name of the plants	A	RA
Mikania micrantha	4.73	5.17
Natsiatum herpeticum	3.74	4.09
Piper sylvaticum	3.69	4.04
Drymaria cordata	3.58	3.92
Chloranthus erectus	3.54	3.87
Chromolaena odorata	3.54	3.87
Ichnocarpus frutescens	3.40	3.71
Oplismenus burmannii	3.34	3.65
Cyperus cyperoides	3.32	3.63
Achyrospermum wallichianum	3.22	3.52

Table 8.31. Top ten density and relative density of Monsoon Ground cover of Dhupjhora

Name of the plants	D	RD
Mikania micrantha	4.53	7.58
Ichnocarpus frutescens	3.30	5.52
Achyrospermum wallichianum	3.13	5.24
Piper sylvaticum	3.11	5.21
Chloranthus erectus	3.09	5.16
Chromolaena odorata	3.09	5.16
Cyperus cyperoides	3.09	5.16
Natsiatum herpeticum	3.04	5.09
Oplismenus burmannii	2.81	4.71
Pronephreum nudatum	2.39	3.99

Table 8.32. Top ten IVI of Monsoon Ground cover of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Mikania micrantha	4.31	5.17	7.58	17.06
Achyrospermum wallichianum	4.38	3.52	5.24	13.13
Piper sylvaticum	3.80	4.04	5.21	13.05
Oplismenus burmannii	3.80	3.65	4.71	12.16
Elatostema monandrum	4.31	2.32	3.39	10.02
Commelina sufruticosa	2.70	3.51	3.23	9.44

Name of the plants	RF	RA	RD	IVI
Diplazium esculentum	2.90	3.13	3.08	9.11
Acmella calva	3.60	2.23	2.73	8.55
Clerodendrum infortunatum	3.28	2.44	2.73	8.45
Phlogacanthus thyrsiformis	2.64	2.61	2.34	7.59

Achyrospermum wallichianum, *Axonopus compressus, Boehmeria glomerulifera, Coffea benghalensis, Cryptolepis dubia*, *Cyanthillium cinereum*, *Drymaria cordata, Duchesnea indica, Molineria capitulate, Persicaria chinensis, Rungia pectinata, Spermacoce alata*, *Synedrella nodiflora*, *Tetrastigma serrulatum* and *Youngia japonica* showing highest SDI.

8.1.9. Monsoon ground covers of Gorumara Beat (Annex. IX)

Ageratum conyzoides (94.67) emerged with highest frequency in monsoon ground covers in Gorumara Beat and followed by *Achyrospermum wallichianum* (90.67), *Axonopus compressus* (90.67), *Mikania micrantha* (90.67), *Chromolaena odorata* (89.33) etc. Similarly highest abandance presented *Acacia pennata* (1.90) then followed by *Achyranthes bidentata* (1.21), *Achyrospermum wallichianum* (2.91), *Acmella calva* (1.19), *Ageratum conyzoides* (1.61), *Axonopus compressus* (3.18) etc. However highest density recorded against *Axonopus compressus* (2.88) followed by *Achyrospermum wallichianum* (2.64), *Spermacoce alata* (2.05), *Mikania micrantha* (1.96), *Piper sylvaticum* (1.85) etc. Highest IVI during pre-monsoon season has been recorded by *Axonopus compressus* (17.20), *Achyrospermum wallichianum* (16.14), *Spermacoce alata* (13.56), *Mikania micrantha* (13.16) etc (Table 8.33 – 8.36).

Table 8.33. Top ten Frequency and relative frequency of Monsoon Ground cover of Gorumara

Name of the plants	F	RF
Ageratum conyzoides	94.67	4.77
Achyrospermum wallichianum	90.67	4.57
Axonopus compressus	90.67	4.57
Mikania micrantha	90.67	4.57
Chromolaena odorata	89.33	4.50
Oplismenus burmannii	89.33	4.50
Pronephreum nudatum	85.33	4.30
Chloranthus erectus	81.33	4.10
Ichnocarpus frutescens	81.33	4.10
Floscopa scandens	78.67	3.97

Table 8.34. Top ten abandance and relative abandance of Monsoon Ground cover of Gorumara

Name of the plants	A	RA
Acacia pennata	1.90	3.16
Achyranthes bidentata	1.21	2.01
Achyrospermum wallichianum	2.91	4.83
Acmella calva	1.19	1.97
Ageratum conyzoides	1.61	2.66
Axonopus compressus	3.18	5.27
Boehmeria glomerulifera	2.67	4.42
Chloranthus erectus	2.02	3.35
Chromolaena odorata	1.43	2.38
Clerodendrum infortunatum	1.92	3.19

Table 8.35. Top ten density and relative density of Monsoon Ground cover of Gorumara

Name of the plants	D	RD
Axonopus compressus	2.88	7.36
Achyrospermum wallichianum	2.64	6.74
Spermacoce alata	2.05	5.25
Mikania micrantha	1.96	5.01
Piper sylvaticum	1.85	4.73
Dryopteris sikkimensis	1.83	4.67
Oplismenus burmannii	1.83	4.67
Diplazium esculentum	1.81	4.63
Ichnocarpus frutescens	1.71	4.36
Chloranthus erectus	1.64	4.19

Table 8.36. Top ten Frequency and relative frequency of Monsoon Ground cover of Gorumara

Name of the plants	RF	RA	RD	IVI
Axonopus compressus	4.57	5.27	7.36	17.20
Achyrospermum wallichianum	4.57	4.83	6.74	16.14
Spermacoce alata	3.83	4.48	5.25	13.56
Mikania micrantha	4.57	3.59	5.01	13.16
Diplazium esculentum	2.62	5.78	4.63	13.04
Dryopteris sikkimensis	3.02	5.05	4.67	12.74
Piper sylvaticum	3.97	3.91	4.73	12.61
Oplismenus burmannii	4.50	3.39	4.67	12.56
Ichnocarpus frutescens	4.10	3.48	4.36	11.94
Chloranthus erectus	4.10	3.35	4.19	11.63

Acacia pennata, Boehmeria glomerulifera, Molineria capitulate, Oxalis corniculata, Rungia pectinata and *Youngia japonica* showing maximum SDI.

8.1.10. Monsoon ground covers of Khunia Beat (Annex. X)

Coffea benghalensis (96.00) emerged with highest frequency in monsoon ground covers in Khunia Beat and followed by *Ageratum conyzoides* (94.00), *Achyrospermum wallichianum* (92.00), *Axonopus compressus* (92.00), *Elatostema monandrum* (92.00) etc. Similarly highest abandance presented *Achyrospermum wallichianum* (5.52) then followed by *Axonopus compressus* (3.83), *Rungia pectinata* (3.36), *Acmella calva* (3.18), *Oxalis corniculata* (3.00), *Ichnocarpus frutescens* (2.98) etc. However highest density recorded against *Achyrospermum wallichianum* (5.08) followed by *Axonopus compressus* (3.52), *Ichnocarpus frutescens* (2.68), *Pronephreum nudatum* (2.68), *Elatostema monandrum* (2.58) etc. Highest IVI during pre-monsoon season has been recorded by *Achyrospermum wallichianum* (22.30), *Axonopus compressus* (16.85), *Ichnocarpus frutescens* (13.91), *Pronephreum nudatum* (13.91) etc (Table 8.37 – 8.40).

Table 8.37. Top ten Frequency and relative frequency of Monsoon Ground cover of Khunia

Name of the plants	F	RF
Coffea benghalensis	96.00	4.76
Ageratum conyzoides	94.00	4.66
Achyrospermum wallichianum	92.00	4.56
Axonopus compressus	92.00	4.56
Elatostema monandrum	92.00	4.56
Ichnocarpus frutescens	90.00	4.46
Pronephreum nudatum	90.00	4.46
Oplismenus burmannii	86.00	4.26
Piper sylvaticum	86.00	4.26
Cyperus cyperoides	84.00	4.16

Table 8.38. Top ten abandance and relative abandance of Monsoon Ground cover of Khunia

Name of the plants	A	RA
Achyrospermum wallichianum	5.52	7.66
Axonopus compressus	3.83	5.31
Rungia pectinata	3.36	4.66
Acmella calva	3.18	4.41
Oxalis corniculata	3.00	4.16
Ichnocarpus frutescens	2.98	4.13
Pronephreum nudatum	2.98	4.13
Piper sylvaticum	2.95	4.10
Elatostema monandrum	2.80	3.89
Ageratum conyzoides	2.68	3.72

Table 8.39. Top ten density and relative density of Monsoon Ground cover of Khunia

Name of the plants	D	RD
Achyrospermum wallichianum	5.08	10.09
Axonopus compressus	3.52	6.99
Ichnocarpus frutescens	2.68	5.32
Pronephreum nudatum	2.68	5.32
Elatostema monandrum	2.58	5.12
Piper sylvaticum	2.54	5.04
Ageratum conyzoides	2.52	5.00
Coffea benghalensis	2.50	4.96
Acmella calva	2.48	4.92
Mikania micrantha	1.96	3.89

Table 8.40. Top ten IVI of Monsoon Ground cover of Khunia

Name of the plants	RF	RA	RD	IVI
Achyrospermum wallichianum	4.56	7.66	10.09	22.30
Axonopus compressus	4.56	5.31	6.99	16.85
Ichnocarpus frutescens	4.46	4.13	5.32	13.91
Pronephreum nudatum	4.46	4.13	5.32	13.91
Elatostema monandrum	4.56	3.89	5.12	13.57
Piper sylvaticum	4.26	4.10	5.04	13.40
Ageratum conyzoides	4.66	3.72	5.00	13.38
Coffea benghalensis	4.76	3.61	4.96	13.33
Acmella calva	3.87	4.41	4.92	13.20
Mikania micrantha	3.87	3.48	3.89	11.24

Acacia pennata, Amerimnon stipulatum, *Clerodendrum infortunatum*, *Floscopa scandens, Nelsonia canescens, Oxalis corniculata, Phlogacanthus thyrsiformis*, *Pupalia lappacea, Rungia pectinata, Synedrella nodiflora* and *Tetrastigma serrulatum* presented maximum SDI.

8.1.11. Monsoon ground covers of Bichhabhanga Beat (Annex. XI)

Ageratum conyzoides (96.00) emerged with highest frequency in monsoon ground covers in Bichhabhanga Beat and followed by *Ichnocarpus frutescens* (96.00)*, Oplismenus burmannii* (96.00)*, Coffea benghalensis* (94.00)*, Cyperus cyperoides* (94.00) etc. Similarly highest abandance presented *Achyrospermum wallichianum* (19.50) then followed by *Dryopteris sikkimensis* (3.53), *Elatostema monandrum* (3.45), *Piper sylvaticum* (3.24), *Axonopus compressus* (3.20), *Coffea benghalensis* (2.57) etc. However highest density recorded against *Achyrospermum wallichianum* (4.68) followed by

Elatostema monandrum (3.24), *Piper sylvaticum* (2.92), *Ageratum conyzoides* (2.74), *Mikania micrantha* (2.74) etc. Highest IVI during pre-monsoon season has been recorded by *Achyrospermum wallichianum* (30.48), *Elatostema monandrum* (13.69), *Piper sylvaticum* (12.71), *Ageratum conyzoides* (12.22) etc (Table 8.41 – 8.44).

Table 8.41. Top ten Frequency and relative frequency of Monsoon Ground cover of Bichhabhanga

Name of the plants	F	RF
Ageratum conyzoides	96.00	4.15
Ichnocarpus frutescens	96.00	4.15
Oplismenus burmannii	96.00	4.15
Coffea benghalensis	94.00	4.06
Cyperus cyperoides	94.00	4.06
Elatostema monandrum	94.00	4.06
Mikania micrantha	94.00	4.06
Acmella calva	92.00	3.97
Rungia pectinata	92.00	3.97
Diplazium esculentum	90.00	3.89

Table 8.42. Top ten abandance and relative abandance of Monsoon Ground cover of Bichhabhanga

Name of the plants	A	RA
Achyrospermum wallichianum	19.50	20.86
Dryopteris sikkimensis	3.53	3.77
Elatostema monandrum	3.45	3.69
Piper sylvaticum	3.24	3.47
Axonopus compressus	3.20	3.42
Coffea benghalensis	2.57	2.75
Floscopa scandens	2.43	2.60
Pronephreum nudatum	2.34	2.51
Diplazium esculentum	2.18	2.33
Spermacoce alata	2.12	2.27

Table 8.43. Top ten density and relative density of Monsoon Ground cover of Bichhabhanga

Name of the plants	D	RD
Achyrospermum wallichianum	4.68	8.58
Elatostema monandrum	3.24	5.94
Piper sylvaticum	2.92	5.36
Ageratum conyzoides	2.74	5.03
Mikania micrantha	2.74	5.03
Oplismenus burmannii	2.58	4.73
Dryopteris sikkimensis	2.54	4.66
Coffea benghalensis	2.42	4.44
Axonopus compressus	2.24	4.11
Diplazium esculentum	1.96	3.60

Table 8.44. Top ten IVI of Monsoon Ground cover of Bichhabhanga

Name of the plants	RF	RA	RD	IVI
Achyrospermum wallichianum	1.04	20.86	8.58	30.48
Elatostema monandrum	4.06	3.69	5.94	13.69
Piper sylvaticum	3.89	3.47	5.36	12.71
Ageratum conyzoides	4.15	3.05	5.03	12.22
Mikania micrantha	4.06	3.12	5.03	12.20
Oplismenus burmannii	4.15	2.88	4.73	11.75
Dryopteris sikkimensis	3.11	3.77	4.66	11.54
Coffea benghalensis	4.06	2.75	4.44	11.25
Axonopus compressus	3.02	3.42	4.11	10.55
Diplazium esculentum	3.89	2.33	3.60	9.81

Achyranthes bidentata, Boehmeria glomerulifera, Clerodendrum infortunatum , *Commelina sufruticosa, Cyanthillium cinereum*, *Drymaria cordata, Duchesnea indica, Floscopa scandens, Molineria capitulate, Oxalis corniculata, Phlogacanthus thyrsiformis* , *Pupalia lappacea, Rungia pectinata, Synedrella nodiflora* and *Youngia japonica* showing maximum SDI.

8.1.12. Monsoon ground covers of Budhuram Beat (Annex. XII)

Achyrospermum wallichianum (100.00) emerged with highest frequency in monsoon ground covers in Budhuram Beat and followed by *Ageratum conyzoides* (97.78)*, Ichnocarpus frutescens* (95.56)*, Elatostema monandrum* (93.33)*, Axonopus compressus* (91.11) etc. Similarly highest abandance presented *Oplismenus compositus* (6.45) then followed by *Molineria capitulata* (6.00), *Elatostema monandrum* (5.14), *Clerodendrum infortunatum* (5.13), *Floscopa scandens* (4.83), *Chloranthus erectus* (4.79) etc. However highest density recorded against *Oplismenus compositus* (5.44) followed by *Chloranthus erectus* (4.16), *Mikania micrantha* (3.38), *Piper sylvaticum* (3.04), *Natsiatum herpeticum* (2.49) etc. Highest IVI during pre-monsoon season has been recorded by *Oplismenus compositus* (18.86)*, Elatostema monandrum* (17.03)*, Chloranthus erectus* (15.35)*, Pronephreum nudatum* (14.52) etc (Table 8.45 – 8.48).

Table 8.45. Top ten Frequency and relative frequency of Monsoon Ground cover of Budhuram

Name of the plants	F	RF
Achyrospermum wallichianum	100.00	4.83
Ageratum conyzoides	97.78	4.72
Ichnocarpus frutescens	95.56	4.61
Elatostema monandrum	93.33	4.51
Axonopus compressus	91.11	4.40
Piper sylvaticum	91.11	4.40
Pronephreum nudatum	91.11	4.40
Chromolaena odorata	88.89	4.29
Chloranthus erectus	86.67	4.18
Coffea benghalensis	86.67	4.18

Table 8.46. Top ten abandance and relative abandance of Monsoon Ground cover of Budhuram

Name of the plants	A	RA
Oplismenus compositus	6.45	6.12
Molineria capitulata	6.00	5.70
Elatostema monandrum	5.14	4.88
Clerodendrum infortunatum	5.13	4.87
Floscopa scandens	4.83	4.59

Name of the plants	A	RA
Chloranthus erectus	4.79	4.55
Mikania micrantha	4.61	4.37
Natsiatum herpeticum	4.48	4.25
Spermacoce alata	4.24	4.02
Pronephreum nudatum	4.22	4.01

Table 8.47. Top ten density and relative density of Monsoon Ground cover of Budhuram

Name of the plants	D	RD
Oplismenus compositus	5.44	8.66
Chloranthus erectus	4.16	6.61
Mikania micrantha	3.38	5.37
Piper sylvaticum	3.04	4.84
Natsiatum herpeticum	2.49	3.96
Chromolaena odorata	1.49	2.37
Phlogacanthus thyrsiformis	1.42	2.26
Cyanthillium cinereum	1.36	2.16
Floscopa scandens	1.29	2.05
Ichnocarpus frutescens	1.27	2.02

Table 8.48. Top ten IVI of Monsoon Ground cover of Budhuram

Name of the plants	RF	RA	RD	IVI
Oplismenus compositus	4.08	6.12	8.66	18.86
Elatostema monandrum	4.51	4.88	7.64	17.03
Chloranthus erectus	4.18	4.55	6.61	15.35
Pronephreum nudatum	4.40	4.01	6.12	14.52
Achyrospermum wallichianum	4.83	3.44	5.76	14.03
Mikania micrantha	3.54	4.37	5.37	13.29
Piper sylvaticum	4.40	3.17	4.84	12.42
Dryopteris sikkimensis	3.86	3.53	4.74	12.14
Axonopus compressus	4.40	2.87	4.38	11.66
Natsiatum herpeticum	2.68	4.25	3.96	10.90

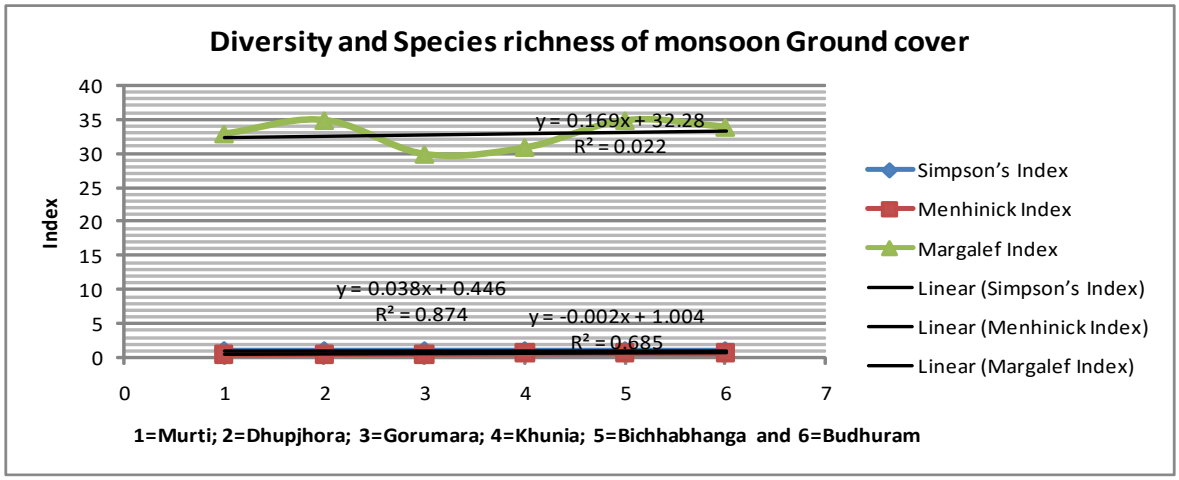

Fig.8.2. Species diversity and species richness of monsoon Ground cover of Gorumara Natinal Park

Acacia pennata, Achyranthes bidentata, Acmella calva, Boehmeria glomerulifera, Clerodendrum infortunatum, *Commelina sufruticosa, Cyanthillium cinereum*, *Duchesnea indica, Floscopa scandens, Ichnocarpus frutescens, Molineria capitulate, Persicaria chinensis, Pupalia lappacea, Rungia pectinata, Synedrella nodiflora, Tetrastigma serrulatum* and *Youngia japonica* presenting maximum SDI.

Fig. 8.2. showing diversity and species richness of the monsoon vegetation of Gorumara National Park. Simpson's index showing high R^2 Value.

8.1.13. Postmonsoon ground covers of Murti Beat (Annex. XIII)

Axonopus compressus (98.89) emerged with highest frequency in Postmonsoon ground covers in Murti Beat and followed by *Commelina diffusa* (95.56), *Mikania micrantha* (95.56), *Chloranthus erectus* (94.44), *Oplismenus burmannii* (94.44) etc. Similarly highest abandance presented *Youngia japonica* (6.23) then followed by *Acmella calva* (4.99), *Pupalia lappacea* (4.92), *Clerodendrum infortunatum* (4.56), *Dryopteris sikkimensis* (4.37), *Chloranthus erectus* (4.12) etc. However highest density recorded against *Acmella calva* (3.77) followed by *Mikania micrantha* (3.76), *Oplismenus burmannii* (3.50), *Chloranthus erectus (*2.98), *Natsiatum herpeticum* (2.97) etc. Highest IVI during pre-monsoon season has been recorded by *Acmella calva* (15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *Chloranthus erectus (*13.02) etc (Table 8.49 – 8.52).

Table 8.49. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Murti

Name of the plants	F	RF
Axonopus compressus	98.89	4.47
Commelina diffusa	95.56	4.32
Mikania micrantha	95.56	4.32
Chloranthus erectus	94.44	4.27
Oplismenus burmannii	94.44	4.27
Cyperus compressus	93.33	4.22
Piper sylvaticum	86.67	3.92
Coffea benghalensis	84.44	3.82
Pronephreum nudatum	83.33	3.77
Spermacoce latifolia	83.33	3.77

Table 8.50. Top ten abandance and relative abandance of Postmonsoon Ground cover of Murti

Name of the plants	A	RA
Youngia japonica	6.23	6.84
Acmella calva	4.99	5.48
Pupalia lappacea	4.92	5.41
Clerodendrum infortunatum	4.56	5.01
Dryopteris sikkimensis	4.37	4.80
Chloranthus erectus	4.12	4.53
Mikania micrantha	3.93	4.32
Natsiatum herpeticum	3.93	4.31
Persicaria chinensis	3.81	4.19
Oplismenus burmannii	3.71	4.07

Table 8.51. Top ten density and relative density of Postmonsoon Ground cover of Murti

Name of the plants	D	RD
Acmella calva	3.77	6.61
Mikania micrantha	3.76	6.59
Oplismenus burmannii	3.50	6.14
Chloranthus erectus	2.98	5.22
Natsiatum herpeticum	2.97	5.20
Persicaria chinensis	2.88	5.05
Youngia japonica	2.42	4.25
Coffea benghalensis	2.40	4.21
Diplazium esculentum	2.38	4.17
Pupalia lappacea	2.08	3.64

Table 8.52. Top ten IVI of Postmonsoon Ground cover of Murti

Name of the plants	RF	RA	RD	IVI
Acmella calva	3.42	5.48	6.61	15.50
Mikania micrantha	4.32	4.32	6.59	15.23
Oplismenus burmannii	4.27	4.07	6.14	14.48
Chloranthus erectus	3.27	4.53	5.22	13.02
Natsiatum herpeticum	3.42	4.31	5.20	12.94
Youngia japonica	1.76	6.84	4.25	12.85
Persicaria chinensis	3.42	4.19	5.05	12.65
Coffea benghalensis	3.82	3.12	4.21	11.15
Diplazium esculentum	3.27	3.62	4.17	11.06
Pupalia lappacea	1.91	5.41	3.64	10.96

Acacia pennata , Achyrospermum wallichianum , Chromolaena odorata , Clerodendrum infortunatum , *Cryptolepis dubia , Elatostema monandrum, Floscopa scandens, Ichnocarpus frutescens, Molineria capitulate, Phlogacanthus thyrsiformis , Rungia pectinata, Sauropus quadrangularis , Synedrella nodiflora* and *Tetrastigma serrulatum* has presenting highest SDI.

8.1.14. Postmonsoon ground covers of Dhupjhora Beat (Annex. XIV)

Ichnocarpus frutescens (97.14) emerged with highest frequency in postmonsoon ground covers in Dhupjhora Beat and followed by *Elatostema monandrum* (95.71)*, Cyperus compressus* (92.86)*, Mikania micrantha* (92.86)*, Sauropus quadrangularis* (91.43) etc. Similarly highest abandance presented *Axonopus compressus* (7.09) then followed by *Acmella calva* (6.39), *Chloranthus erectus* (6.33), *Ageratum conyzoides* (6.29), *Cyperus compressus* (5.65), *Oplismenus burmannii* (5.29) etc. However highest density recorded against *Chloranthus erectus* (5.51) followed by *Cyperus compressus* (5.24), *Ageratum conyzoides* (5.21), *Acmella calva* (5.11), *Mikania micrantha* (4.53) etc. Highest IVI during pre-monsoon season has been recorded by *Chloranthus erectus* (15.78)*, Ageratum conyzoides* (15.19)*, Cyperus compressus* (15.15)*, Acmella calva* (15.03) etc (Table 8.53 – 8.56).

Table 8.53. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Dhupjhora

Name of the plants	F	RF
Ichnocarpus frutescens	97.14	4.38
Elatostema monandrum	95.71	4.32
Cyperus compressus	92.86	4.19
Mikania micrantha	92.86	4.19
Sauropus quadrangularis	91.43	4.13
Chloranthus erectus	87.14	3.93
Chromolaena odorata	87.14	3.93
Oplismenus burmannii	84.29	3.80
Piper sylvaticum	84.29	3.80
Ageratum conyzoides	82.86	3.74

Table 8.54. Top ten abandance and relative abandance of Postmonsoon Ground cover of Dhupjhora

Name of the plants	A	RA
Axonopus compressus	7.09	5.79
Acmella calva	6.39	5.22
Chloranthus erectus	6.33	5.17
Ageratum conyzoides	6.29	5.14
Cyperus compressus	5.65	4.61
Oplismenus burmannii	5.29	4.32
Mikania micrantha	4.88	3.98
Synedrella nodiflora	4.83	3.95
Dryopteris sikkimensis	4.52	3.69
Diplazium esculentum	4.23	3.45

Table 8.55. Top ten density and relative density of Postmonsoon Ground cover of Dhupjhora

Name of the plants	D	RD
Chloranthus erectus	5.51	6.68
Cyperus compressus	5.24	6.35
Ageratum conyzoides	5.21	6.32
Acmella calva	5.11	6.20
Mikania micrantha	4.53	5.49
Oplismenus burmannii	4.46	5.40
Elatostema monandrum	3.87	4.69
Ichnocarpus frutescens	3.77	4.57
Dryopteris sikkimensis	3.61	4.38
Axonopus compressus	3.54	4.29

Table 8.56. Top ten IVI of Postmonsoon Ground cover of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Chloranthus erectus	3.93	5.17	6.68	15.78
Ageratum conyzoides	3.74	5.14	6.32	15.19
Cyperus compressus	4.19	4.61	6.35	15.15
Acmella calva	3.61	5.22	6.20	15.03
Mikania micrantha	4.19	3.98	5.49	13.66
Oplismenus burmannii	3.80	4.32	5.40	13.52
Axonopus compressus	2.26	5.79	4.29	12.33
Elatostema monandrum	4.32	3.30	4.69	12.31
Ichnocarpus frutescens	4.38	3.17	4.57	12.12
Dryopteris sikkimensis	3.61	3.69	4.38	11.68

Achyranthes bidentata, Alternantheara philoxeroides, Clerodendrum infortunatum , Coffea benghalensis, Cryptolepis dubia , Floscopa scandens, Lepidagathis incurva , Mimosa pudica, Molineria capitulate, Oxalis corniculata, Persicaria chinensis, Pupalia lappacea, Rumex dentatus, Rungia pectinata, Sauropus quadrangularis , Spermacoce latifolia, Synedrella nodiflora and *Tetrastigma serrulatum* presenting highest SDI.

8.1.15. Postmonsoon ground covers of Gorumara Beat (Annex. XV)

Axonopus compressus (97.33) emerged with highest frequency in postmonsoon ground covers in Gorumara Beat and followed by *Achyrospermum wallichianum* (96.00), *Ageratum conyzoides* (96.00), *Dryopteris sikkimensis* (94.67), *Elatostema monandrum* (90.67) etc. Similarly highest abandance

presented *Diplazium esculentum* (7.33) then followed by *Elatostema monandrum* (5.68), *Achyrospermum wallichianum* (5.11), *Axonopus compressus* (4.44), *Dryopteris sikkimensis* (4.39), *Ichnocarpus frutescens* (3.54) etc. However highest density recorded against *Elatostema monandrum* (5.15) followed by *Achyrospermum wallichianum* (4.91), *Axonopus compressus* (4.32), *Dryopteris sikkimensis* (4.16), *Diplazium esculentum* (3.81) etc. Highest IVI during pre-monsoon season has been recorded by *Elatostema monandrum* (20.10), *Achyrospermum wallichianum* (19.28), *Diplazium esculentum* (17.86), *Axonopus compressus* (17.54) etc (Table 8.57 – 8.60).

Table 8.57. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Gorumara

Name of the plants	F	RF
Axonopus compressus	97.33	4.87
Achyrospermum wallichianum	96.00	4.80
Ageratum conyzoides	96.00	4.80
Dryopteris sikkimensis	94.67	4.74
Elatostema monandrum	90.67	4.54
Mikania micrantha	90.67	4.54
Oplismenus compositus	89.33	4.47
Chloranthus erectus	81.33	4.07
Ichnocarpus frutescens	81.33	4.07
Piper sylvaticum	78.67	3.94

Table 8.58. Top ten Abandance and relative abandance of Postmonsoon Ground cover of Gorumara

Name of the plants	A	RA
Diplazium esculentum	7.33	8.74
Elatostema monandrum	5.68	6.77
Achyrospermum wallichianum	5.11	6.09
Axonopus compressus	4.44	5.29
Dryopteris sikkimensis	4.39	5.24
Ichnocarpus frutescens	3.54	4.22
Piper sylvaticum	3.32	3.96
Persicaria chinensis	3.25	3.87
Oplismenus compositus	3.18	3.79
Acacia pennata	3.10	3.69

Table 8.59. Top ten Density and relative Density of Postmonsoon Ground cover of Gorumara

Name of the plants	D	RD
Elatostema monandrum	5.15	8.79
Achyrospermum wallichianum	4.91	8.38
Axonopus compressus	4.32	7.38
Dryopteris sikkimensis	4.16	7.11
Diplazium esculentum	3.81	6.51
Ageratum conyzoides	2.88	4.92
Ichnocarpus frutescens	2.88	4.92
Oplismenus compositus	2.84	4.85
Piper sylvaticum	2.61	4.46
Chloranthus erectus	2.48	4.24

Table 8.60. Top ten IVI of Postmonsoon Ground cover of Gorumara

Table 8.60. Top ten IVI of Postmonsoon Ground cover of Gorumara

Name of the plants	RF	RA	RD	IVI
Elatostema monandrum	4.54	6.77	8.79	20.10
Achyrospermum wallichianum	4.80	6.09	8.38	19.28
Diplazium esculentum	2.60	8.74	6.51	17.86
Axonopus compressus	4.87	5.29	7.38	17.54
Dryopteris sikkimensis	4.74	5.24	7.11	17.08
Ageratum conyzoides	4.80	3.58	4.92	13.30
Ichnocarpus frutescens	4.07	4.22	4.92	13.21
Oplismenus compositus	4.47	3.79	4.85	13.11
Piper sylvaticum	3.94	3.96	4.46	12.36
Chloranthus erectus	4.07	3.64	4.24	11.94

Acacia pennata , Achyranthes bidentata, Asystasia macrocarpa, Chromolaena odorata , Clerodendrum infortunatum , Commelina sufruticosa, Floscopa scandens, Molineria capitulate, Natsiatum herpeticum, Nelsonia canescens, Phlogacanthus thyrsiformis , Pronephreum nudatum, Pupalia lappacea, Rungia pectinata and *Sauropus quadrangularis* presenting SDI 1.

8.1.16. Postmonsoon ground covers of Khunia Beat (Annex. XVI)

Coffea benghalensis (96.00) emerged with highest frequency in postmonsoon ground covers in Khunia Beat and followed by *Ageratum conyzoides* (94.00), *Achyrospermum wallichianum* (92.00), *Axonopus compressus* (92.00), *Elatostema monandrum* (92.00) etc. Similarly highest abandance presented *Achyrospermum wallichianum* (5.52) then followed by *Axonopus compressus* (3.83), *Rungia pectinata* (3.36), *Acmella calva* (3.18), *Phyllanthus reticulatus* (3.00), *Ichnocarpus frutescens* (2.98) etc. However highest density recorded against *Achyrospermum wallichianum* (5.08) followed by *Axonopus compressus* (3.52), *Ichnocarpus frutescens* (2.68), *Pronephreum nudatum* (2.68), *Elatostema monandrum* (2.58) etc. Highest IVI during pre-monsoon season has been recorded by *Achyrospermum wallichianum* (20.18), *Axonopus compressus* (15.21), *Ichnocarpus frutescens* (12.52), *Pronephreum nudatum* (12.52) etc (Table 8.61 – 8.64).

Table 8.61. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Khunia

Name of the plants	F	RF
Coffea benghalensis	96.00	4.16
Ageratum conyzoides	94.00	4.07
Achyrospermum wallichianum	92.00	3.99
Axonopus compressus	92.00	3.99
Elatostema monandrum	92.00	3.99
Ichnocarpus frutescens	90.00	3.90
Pronephreum nudatum	90.00	3.90
Oplismenus burmannii	86.00	3.73
Piper sylvaticum	86.00	3.73
Cyperus compressus	84.00	3.64

Table 8.62. Top ten Abandance and relative abandance of Postmonsoon Ground cover of Khunia

Name of the plants	A	RA
Achyrospermum wallichianum	5.52	6.84
Axonopus compressus	3.83	4.74
Rungia pectinata	3.36	4.16
Acmella calva	3.18	3.94

Name of the plants	A	RA
Phyllanthus reticulatus	3.00	3.71
Ichnocarpus frutescens	2.98	3.69
Pronephreum nudatum	2.98	3.69
Piper sylvaticum	2.95	3.66
Elatostema monandrum	2.80	3.47
Ageratum conyzoides	2.68	3.32

Table 8.63. Top ten Density and relative density of Postmonsoon Ground cover of Khunia

Name of the plants	D	RD
Achyrospermum wallichianum	5.08	9.36
Axonopus compressus	3.52	6.48
Ichnocarpus frutescens	2.68	4.94
Pronephreum nudatum	2.68	4.94
Elatostema monandrum	2.58	4.75
Piper sylvaticum	2.54	4.68
Ageratum conyzoides	2.52	4.64
Coffea benghalensis	2.50	4.60
Acmella calva	2.48	4.57
Mikania micrantha	1.96	3.61

Table 8.64. Top ten IVI of Postmonsoon Ground cover of Khunia

Name of the plants	RF	RA	RD	IVI
Achyrospermum wallichianum	3.99	6.84	9.36	20.18
Axonopus compressus	3.99	4.74	6.48	15.21
Ichnocarpus frutescens	3.90	3.69	4.94	12.52
Pronephreum nudatum	3.90	3.69	4.94	12.52
Elatostema monandrum	3.99	3.47	4.75	12.21
Piper sylvaticum	3.73	3.66	4.68	12.06
Ageratum conyzoides	4.07	3.32	4.64	12.03
Mikania micrantha	3.38	3.11	3.61	10.10
Spermacoce latifolia	3.55	2.93	3.57	10.06
Dryopteris sikkimensis	3.64	2.62	3.28	9.54

Ageratum conyzoides, Anisomeles indica, Blumea lacera, Clerodendrum infortunatum, Commelina sufruticosa, Dicliptera bupleuroides, Elephantopus scaber, Euphorbia hirta, Floscopa scandens, Globba racemosa, Maesa indica, Phlogacanthus thyrsiformis, Phyllanthus reticulates, Prunella vulgaris, Pupalia lappacea, Rungia pectinata, Synedrella nodiflora and *Youngia japonica* showing maximum SDI.

8.1.17. Postmonsoon ground covers of Bichhabhanga Beat (Annex. XVII)

Elatostema monandrum (98.00) emerged with highest frequency in postmonsoon ground covers in Bichhabhanga Beat and followed by *Ageratum conyzoides* (96.00), *Ichnocarpus frutescens* (96.00), *Oplismenus burmannii* (96.00), *Coffea benghalensis* (94.00) etc. Similarly highest abandance presented *Achyrospermum wallichianum* (20.42) then followed by *Elatostema monandrum* (6.43), *Axonopus compressus* (6.20), *Chloranthus erectus (*6.10), *Ageratum conyzoides* (5.52), *Mikania micrantha* (4.98) etc. However highest density recorded against *Elatostema monandrum* (6.30) followed by *Ageratum conyzoides* (5.30), *Achyrospermum wallichianum* (4.90), *Mikania micrantha* (4.68),

Axonopus compressus (4.34) etc. Highest IVI during pre-monsoon season has been recorded by *Achyrospermum wallichianum* (27.49), *Elatostema monandrum* (19.71), *Ageratum conyzoides* (17.27), *Mikania micrantha* (15.74) etc (Table 8.65 – 8.68).

Table 8.65. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Bichhabhanga

Name of the plants	F	RF
Elatostema monandrum	98.00	4.22
Ageratum conyzoides	96.00	4.13
Ichnocarpus frutescens	96.00	4.13
Oplismenus burmannii	96.00	4.13
Coffea benghalensis	94.00	4.04
Cyperus compressus	94.00	4.04
Mikania micrantha	94.00	4.04
Acmella calva	92.00	3.96
Rungia pectinata	92.00	3.96
Diplazium esculentum	90.00	3.87

Table 8.66. Top ten Abandance and relative abandance of Postmonsoon Ground cover of Bichhabhanga

Name of the plants	A	RA
Achyrospermum wallichianum	20.42	19.08
Elatostema monandrum	6.43	6.01
Axonopus compressus	6.20	5.79
Chloranthus erectus	6.10	5.70
Ageratum conyzoides	5.52	5.16
Mikania micrantha	4.98	4.65
Dryopteris sikkimensis	3.53	3.30
Commelina sufruticosa	3.43	3.20
Piper sylvaticum	3.24	3.03
Molineria capitulata	2.78	2.60

Table 8.67. Top ten Density and relative density of Postmonsoon Ground cover of Bichhabhanga

Name of the plants	D	RD
Elatostema monandrum	6.30	9.48
Ageratum conyzoides	5.30	7.98
Achyrospermum wallichianum	4.90	7.38
Mikania micrantha	4.68	7.04
Axonopus compressus	4.34	6.53
Chloranthus erectus	3.78	5.69
Piper sylvaticum	2.92	4.39
Oplismenus burmannii	2.58	3.88
Dryopteris sikkimensis	2.54	3.82
Coffea benghalensis	2.42	3.64

Table 8.68. Top ten IVI of Postmonsoon Ground cover of Bichhabhanga

Name of the plants	RF	RA	RD	IVI
Achyrospermum wallichianum	1.03	19.08	7.38	27.49
Elatostema monandrum	4.22	6.01	9.48	19.71
Ageratum conyzoides	4.13	5.16	7.98	17.27
Mikania micrantha	4.04	4.65	7.04	15.74

Name of the plants	RF	RA	RD	IVI
Axonopus compressus	3.01	5.79	6.53	15.34
Chloranthus erectus	2.67	5.70	5.69	14.05
Piper sylvaticum	3.87	3.03	4.39	11.30
Oplismenus burmannii	4.13	2.51	3.88	10.53
Dryopteris sikkimensis	3.10	3.30	3.82	10.22
Coffea benghalensis	4.04	2.41	3.64	10.09

Acmella calva, Anisomeles indica, Blumea lacera, Boerhavia coccinea, Chromolaena odorata, Coffea benghalensis, Commelina sufruticosa, Floscopa scandens, Molineria capitulate, Oxalis corniculata, Persicaria chinensis, Phlogacanthus thyrsiformis, Prunella vulgaris, Pupalia lappacea, Rumex dentatus, Rungia pectinata, Saccharum spontaneum, Synedrella nodiflora and *Tetrastigma serrulatum* showing maximum SDI.

8.1.18. Postmonsoon ground covers of Bubhuram Beat (Annex. XVIII)

Achyrospermum wallichianum (100.00) emerged with highest frequency in postmonsoon ground covers in Budhuram Beat and followed by *Ageratum conyzoides* (97.78), *Ichnocarpus frutescens* (95.56), *Elatostema monandrum* (93.33), *Oplismenus burmannii* (93.33) etc. Similarly highest abandance presented *Chloranthus erectus* (9.44) then followed by *Axonopus compressus* (8.56), *Ageratum conyzoides* (7.82), *Oplismenus burmannii* (6.29), *Molineria capitulata* (6.00), *Mikania micrantha* (5.73) etc. However highest density recorded against *Chloranthus erectus* (8.18) followed by *Axonopus compressus* (7.80), *Ageratum conyzoides* (7.64), *Oplismenus burmannii* (5.87), *Elatostema monandrum* (5.22) etc. Highest IVI during pre-monsoon season has been recorded by *Chloranthus erectus* (22.18), *Axonopus compressus* (21.20), *Ageratum conyzoides* (20.72), *Oplismenus burmannii* (17.01) etc (Table 8.69 – 8.72).

Table 8.69. Top ten Frequency and relative frequency of Postmonsoon Ground cover of Budhuram

Name of the plants	F	RF
Achyrospermum wallichianum	100.00	4.81
Ageratum conyzoides	97.78	4.70
Ichnocarpus frutescens	95.56	4.59
Elatostema monandrum	93.33	4.49
Oplismenus burmannii	93.33	4.49
Axonopus compressus	91.11	4.38
Piper sylvaticum	91.11	4.38
Pronephreum nudatum	91.11	4.38
Chromolaena odorata	88.89	4.27
Chloranthus erectus	86.67	4.17

Table 8.70. Top ten Abandance and relative abandance of Postmonsoon Ground cover of Budhuram

Name of the plants	A	RA
Chloranthus erectus	9.44	7.69
Axonopus compressus	8.56	6.98
Ageratum conyzoides	7.82	6.37
Oplismenus burmannii	6.29	5.12
Molineria capitulata	6.00	4.89
Mikania micrantha	5.73	4.67
Elatostema monandrum	5.60	4.56
Achyrospermum wallichianum	5.13	4.18
Floscopa scandens	4.83	3.94
Natsiatum herpeticum	4.48	3.65

Table 8.71. Top ten Density and relative density of Postmonsoon Ground cover of Budhuram

Name of the plants	D	RD
Chloranthus erectus	8.18	10.32
Axonopus compressus	7.80	9.84
Ageratum conyzoides	7.64	9.65
Oplismenus burmannii	5.87	7.40
Elatostema monandrum	5.22	6.59
Mikania micrantha	4.20	5.30
Pronephreum nudatum	3.84	4.85
Achyrospermum wallichianum	3.62	4.57
Piper sylvaticum	3.04	3.84
Dryopteris sikkimensis	2.98	3.76

Table 8.72. Top ten IVI of Postmonsoon Ground cover of Budhuram

Name of the plants	RF	RA	RD	IVI
Chloranthus erectus	4.17	7.69	10.32	22.18
Axonopus compressus	4.38	6.98	9.84	21.20
Ageratum conyzoides	4.70	6.37	9.65	20.72
Oplismenus burmannii	4.49	5.12	7.40	17.01
Elatostema monandrum	4.49	4.56	6.59	15.64
Mikania micrantha	3.53	4.67	5.30	13.49
Pronephreum nudatum	4.38	3.44	4.85	12.67
Achyrospermum wallichianum	4.81	2.95	4.57	12.33
Piper sylvaticum	4.38	2.72	3.84	10.95
Dryopteris sikkimensis	3.85	3.03	3.76	10.64

Achyrospermum wallichianum, Acmella calva, Anisomeles indica, Centella asiatica, Chromolaena odorata, Commelina sufruticosa, Cynodon dactylon, Dicliptera bupleuroides, Floscopa scandens, Hypericum japonicum, Ichnocarpus frutescens, Lepidagathis incurva , Molineria capitulate, Persicaria chinensis, Prunella vulgaris, Pupalia lappacea, Rungia pectinata, Synedrella nodiflora and *Tetrastigma serrulatum* presenting maximum SDI.

Fig. 8.3. showing diversity and species richness of the post monsoon vegetation of Gorumara National Park. Menhinick index showing high R^2 Value.

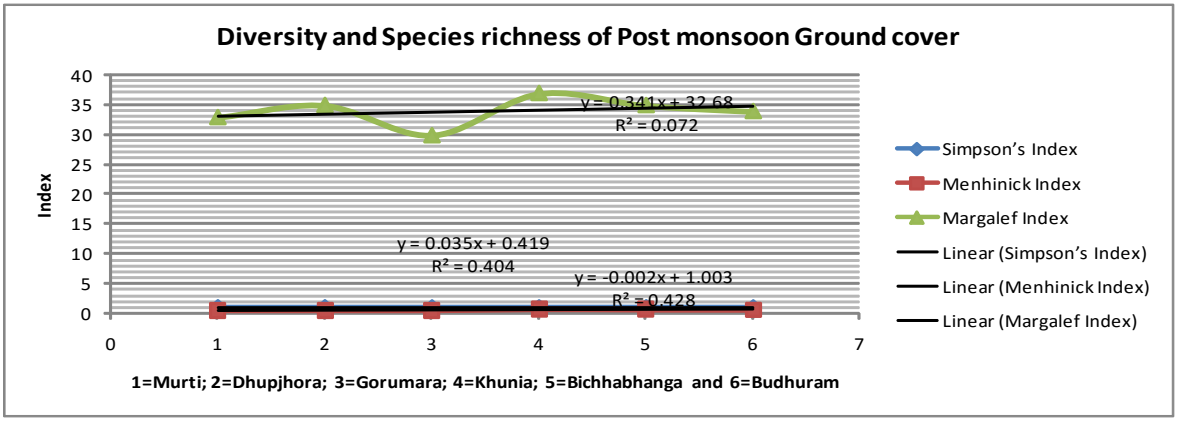

Fig.8.3. Species diversity and species richness of Post monsoon Ground cover of Gorumara Natinal Park

8.2.1. Premonsoon Shrub layer of Murti Beat (Annex. XIX)

Ichnocarpus frutescens (100.00) emerged with highest frequency in premonsoon shrub layer in Murti Beat and followed by *Mikania micrantha* (100.00), *Chromolaena odorata* (97.22), *Maesa indica* (97.22), *Litsea glutinosa* (94.44), *Tetrastigma serrulatum* (94.44), *Natsiatum herpeticum* (91.67), *Bridelia retusa* (86.11), *Phlogacanthus thyrsiformis* (86.11) and *Toddalia asiatica* (86.11). Similarly highest abandance presented *Alpinia nigra* (17.75) then followed by *Morinda angustifolia* (6.57), *Maesa indica* (5.54), *Litsea glutinosa* (5.41), *Caesalpinia cucullata* (4.50), *Natsiatum herpeticum* (3.76), *Croton caudatus* (3.73), *Chromolaena odorata* (3.63), *Aglaia spectabilis* (3.62) and *Argyreia roxburghii* (3.23). However highest density recorded against *Maesa indica* (5.39) followed by *Litsea glutinosa* (5.11), *Chromolaena odorata* (3.53), *Natsiatum herpeticum* (3.44), *Ichnocarpus frutescens* (3.17), *Croton caudatus* (2.69), *Argyreia roxburghii* (2.33), *Mikania micrantha* (2.11), *Alpinia nigra* (1.97) and *Pueraria phaseoloides* (1.50). Highest IVI during pre-monsoon season has been recorded by *Maesa indica* (17.15), *Alpinia nigra* (16.66), *Litsea glutinosa* (16.47), *Chromolaena odorata* (12.65), *Natsiatum herpeticum* (12.37), *Ichnocarpus frutescens* (11.82) etc (Table 8.73 – 8.76).

Table 8.73. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Murti

Name of the plants	F	RF
Ichnocarpus frutescens	100.00	4.22
Mikania micrantha	100.00	4.22
Chromolaena odorata	97.22	4.10
Maesa indica	97.22	4.10
Litsea glutinosa	94.44	3.99
Tetrastigma serrulatum	94.44	3.99
Natsiatum herpeticum	91.67	3.87
Bridelia retusa	86.11	3.63
Phlogacanthus thyrsiformis	86.11	3.63
Toddalia asiatica	86.11	3.63

Table 8.74. Top ten Abandance and relative abandance of Premonsoon Shrub layer of Murti

Name of the plants	A	RA
Alpinia nigra	17.75	12.89
Morinda angustifolia	6.57	4.77
Maesa indica	5.54	4.03
Litsea glutinosa	5.41	3.93
Caesalpinia cucullata	4.50	3.27
Natsiatum herpeticum	3.76	2.73
Croton caudatus	3.73	2.71
Chromolaena odorata	3.63	2.64
Aglaia spectabilis	3.62	2.63
Argyreia roxburghii	3.23	2.35

Table 8.75. Top ten Density and relative density of Premonsoon Shrub layer of Murti

Name of the plants	D	RD
Maesa indica	5.39	9.02
Litsea glutinosa	5.11	8.56
Chromolaena odorata	3.53	5.91
Natsiatum herpeticum	3.44	5.77
Ichnocarpus frutescens	3.17	5.30

Name of the plants	D	RD
Croton caudatus	2.69	4.51
Argyreia roxburghii	2.33	3.91
Mikania micrantha	2.11	3.53
Alpinia nigra	1.97	3.30
Pueraria phaseoloides	1.50	2.51

Table 8.76. Top ten IVI of Premonsoon Shrub layer of Murti

Name of the plants	RF	RA	RD	IVI
Maesa indica	4.10	4.03	9.02	17.15
Alpinia nigra	0.47	12.89	3.30	16.66
Litsea glutinosa	3.99	3.93	8.56	16.47
Chromolaena odorata	4.10	2.64	5.91	12.65
Natsiatum herpeticum	3.87	2.73	5.77	12.37
Ichnocarpus frutescens	4.22	2.30	5.30	11.82
Croton caudatus	3.05	2.71	4.51	10.27
Argyreia roxburghii	3.05	2.35	3.91	9.30
Mikania micrantha	4.22	1.53	3.53	9.29
Morinda angustifolia	0.82	4.77	2.14	7.73

Abrus pulchellus, *Actinodaphne obovata*, *Actinodaphne sikkimensis*, *Aglaia spectabilis* , *Alstonia scholaris*, *Angiopteris evecta, Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata , Celastrus paniculatus* , *Cinnamomum bejolghota* , *Coffea benghalensis, Deeringia amaranthoides, Dillenia indica, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Dioscorea pentaphylla, Glycosmis pentaphylla, Mallotus philippensis, Mallotus polycarpus*, *Merremia vitifolia , Morinda angustifolia, Parabaena sagittata* , *Pericampylus glaucus, Phlogacanthus thyrsiformis* , *Pterocarpus acerifolius* , *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Sorindeia madagascariensis* , *Stephania glabra, Streblus asper, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* , *Toddalia asiatica, Toddalia asiatica* and *Wrightia arborea* presenting maximum SDI.

8.2.2. Premonsoon Shrub layer of Dhupjhora Beat (Annex. XX)

Chromolaena odorata (96.43) emerged with highest frequency in premonsoon shrub layer in Dhupjhora Beat and followed by *Argyreia roxburghii* (89.29), *Mikania micrantha* (85.71), *Ichnocarpus frutescens* (82.14), *Croton caudatus* (78.57) etc. Similarly highest abandance presented (6.12) then followed by *Alpinia nigra* (9.50), *Ichnocarpus frutescens* (7.13), *Pueraria phaseoloides* (5.95), *Phlogacanthus thyrsiformis* (5.57), *Argyreia roxburghii* (5.28) etc. However highest density recorded against *Mikania micrantha* (4.25) followed by *Alpinia nigra* (4.07), *Pueraria phaseoloides* (4.04), *Maesa indica* (3.46), *Tetrastigma serrulatum* (3.46) etc. Highest IVI during pre-monsoon season has been recorded by *Ichnocarpus frutescens* (18.58), *Chromolaena odorata* (16.39), *Argyreia roxburghii* (15.89), *Alpinia nigra* (15.59) etc (Table 8.77 – 8.80).

Table 8.77. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Dhupjhora

Name of the plants	F	RF
Chromolaena odorata	96.43	5.34
Argyreia roxburghii	89.29	4.94
Mikania micrantha	85.71	4.74

Name of the plants	F	RF
Ichnocarpus frutescens	82.14	4.55
Croton caudatus	78.57	4.35
Merremia vitifolia	78.57	4.35
Actinodaphne sikkimensis	75.00	4.15
Maesa indica	75.00	4.15
Tetrastigma serrulatum	75.00	4.15
Morinda angustifolia	67.86	3.75

Table 8.78. Top ten abandance and relative abandance of Premonsoon Shrub layer of Dhupjhora

Name of the plants	A	RA
Alpinia nigra	9.50	7.23
Ichnocarpus frutescens	7.13	5.43
Pueraria phaseoloides	5.95	4.53
Phlogacanthus thyrsiformis	5.57	4.24
Argyreia roxburghii	5.28	4.02
Chromolaena odorata	5.07	3.86
Mikania micrantha	4.96	3.78
Maesa indica	4.62	3.52
Tetrastigma serrulatum	4.62	3.52
Aristolochia indica	4.57	3.48

Table 8.79. Top ten diversity and relative diversity of Premonsoon Shrub layer of Dhupjhora

Name of the plants	D	RD
Mikania micrantha	4.25	6.24
Alpinia nigra	4.07	5.98
Pueraria phaseoloides	4.04	5.93
Maesa indica	3.46	5.09
Tetrastigma serrulatum	3.46	5.09
Croton caudatus	3.43	5.04
Merremia vitifolia	3.39	4.98
Actinodaphne sikkimensis	2.43	3.57
Morinda angustifolia	2.18	3.20
Dioscorea pentaphylla	1.54	2.26

Table 8.80. Top ten IVI of Premonsoon Shrub layer of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Ichnocarpus frutescens	4.55	5.43	8.60	18.58
Chromolaena odorata	5.34	3.86	7.19	16.39
Argyreia roxburghii	4.94	4.02	6.93	15.89
Alpinia nigra	2.37	7.23	5.98	15.59
Mikania micrantha	4.74	3.78	6.24	14.76
Pueraria phaseoloides	3.75	4.53	5.93	14.21
Maesa indica	4.15	3.52	5.09	12.76
Tetrastigma serrulatum	4.15	3.52	5.09	12.76
Croton caudatus	4.35	3.32	5.04	12.71
Merremia vitifolia	4.35	3.29	4.98	12.62

Abrus pulchellus, *Actinodaphne obovata*, *Alstonia scholaris*, *Aristolochia indica*, *Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata, Cinnamomum bejolghota*, *Cryptolepis dubia, Deeringia amaranthoides, Dillenia indica, Dioscorea pentaphylla, Impatiens trilobata, Litsea glutinosa, Natsiatum herpeticum, Parabaena sagittata* , *Pericampylus glaucus, Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Sorindeia madagascariensis*, *Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora*, *Toddalia asiatica, Wrightia arborea* and *Zizyphus mauritiana* showing maximum SDI.

8.2.3. Premonsoon Shrub layer of Gorumara Beat (Annex. XXI)

Argyreia roxburghii (96.67) emerged with highest frequency in premonsoon shrub layer in Gorumara Beat and followed by *Ichnocarpus frutescens* (93.33)*, Mikania micrantha* (86.67)*, Croton caudatus* (83.33)*, Chromolaena odorata* (80.00) etc. Similarly highest abandance presented (6.12) then followed by *Parabaena sagittata* (8.38), *Sloanea sterculiacea* (7.50), *Argyreia roxburghii* (5.41), *Chromolaena odorata* (4.79), *Ichnocarpus frutescens* (4.79) etc. However highest density recorded against *Argyreia roxburghii* (5.23) followed by *Ichnocarpus frutescens* (4.47), *Parabaena sagittata* (4.47), *Croton caudatus* (3.23), *Dillenia indica* (2.27) etc. Highest IVI during pre-monsoon season has been recorded by *Argyreia roxburghii* (21.60)*, Parabaena sagittata* (19.75)*, Ichnocarpus frutescens* (19.32)*, Chromolaena odorata* (17.18) etc (Table 8.81 – 8.84).

Table 8.81. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Gorumara

Name of the plants	F	RF
Argyreia roxburghii	96.67	6.59
Ichnocarpus frutescens	93.33	6.36
Mikania micrantha	86.67	5.91
Croton caudatus	83.33	5.68
Chromolaena odorata	80.00	5.45
Cinnamomum bejolghota	80.00	5.45
Tetrastigma serrulatum	73.33	5.00
Dillenia indica	70.00	4.77
Merremia vitifolia	70.00	4.77
Natsiatum herpeticum	70.00	4.77
Tetrastigma planicauli	70.00	4.77

Table 8.82. Top ten Abandance and relative abandance of Premonsoon Shrub layer of Gorumara

Name of the plants	A	RA
Parabaena sagittata	8.38	7.37
Sloanea sterculiacea	7.50	6.60
Argyreia roxburghii	5.41	4.76
Chromolaena odorata	4.79	4.22
Ichnocarpus frutescens	4.79	4.21
Pueraria sikkimensis	4.67	4.11
Smilax zeylanica	4.67	4.11
Mikania micrantha	4.15	3.65
Tetrastigma serrulatum	3.95	3.48
Croton caudatus	3.88	3.41

Table 8.83. Top ten Diversity and relative diversity of Premonsoon Shrub layer of Gorumara

Name of the plants	D	RD
Argyreia roxburghii	5.23	10.25
Ichnocarpus frutescens	4.47	8.75
Parabaena sagittata	4.47	8.75

Name of the plants	D	RD
Croton caudatus	3.23	6.33
Dillenia indica	2.27	4.44
Natsiatum herpeticum	2.23	4.37
Litsea glutinosa	2.03	3.98
Merremia vitifolia	1.40	2.74
Smilax zeylanica	1.40	2.74
Actinodaphne obovata	0.50	0.98

Table 8.84. Ten species with maximum IVI of Premonsoon Shrub layer of Gorumara

Name of the plants	RF	RA	RD	IVI
Argyreia roxburghii	6.59	4.76	10.25	21.60
Parabaena sagittata	3.64	7.37	8.75	19.75
Ichnocarpus frutescens	6.36	4.21	8.75	19.32
Chromolaena odorata	5.45	4.22	7.51	17.18
Mikania micrantha	5.91	3.65	7.05	16.61
Croton caudatus	5.68	3.41	6.33	15.43
Tetrastigma serrulatum	5.00	3.48	5.68	14.16
Dillenia indica	4.77	2.85	4.44	12.06
Natsiatum herpeticum	4.77	2.81	4.37	11.95
Litsea glutinosa	3.86	3.16	3.98	11.00

Abrus pulchellus, *Actinodaphne obovata*, *Aglaia spectabilis*, *Alstonia scholaris* , *Angiopteris evecta, Aristolochia indica*, *Bauhinia purpurea*, *Caesalpinia cucullata, Celastrus paniculatus, Dioscorea pentaphylla, Morinda angustifolia, Pericampylus glaucus, Pterocarpus acerifolius*, *Pueraria phaseoloides*, *Pueraria sikkimensis* , *Sloanea sterculiacea*, *Sorindeia madagascariensis* , *Syzygium tetragona, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* showing highest SDI.

8.2.4. Premonsoon Shrub layer of Khunia Beat (Annex. XXII)

Mikania micrantha (95) emerged with highest frequency in premonsoon shrub layer in Khunia Beat and followed by *Argyreia roxburghii* (90), *Dioscorea pentaphylla* (90), *Pericampylus glaucus* (90), *Croton caudatus* (80) etc. Similarly highest abandance presented (6.12) then followed by *Alpinia nigra* (30.60), *Merremia vitifolia* (9.00), *Pericampylus glaucus* (7.75), *Argyreia roxburghii* (7.61), *Chromolaena odorata* (7.00) etc. However highest density recorded against *Croton caudatus* (4.45), followed by *Merremia vitifolia* (4.05), *Tetrastigma serrulatum* (4.05), *Litsea glutinosa* (2.10) etc. Highest IVI during pre-monsoon season has been recorded by *Alpinia nigra* (27.21), *Argyreia roxburghii* (16.90), *Mikania micrantha* (15.16), *Chromolaena odorata* (13.23) etc (Table 8.85 – 8.88).

Table 8.85. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Khunia

Name of the plants	F	RF
Mikania micrantha	95	4.81
Argyreia roxburghii	90	4.56
Dioscorea pentaphylla	90	4.56
Pericampylus glaucus	90	4.56
Croton caudatus	80	4.05
Dillenia indica	80	4.05
Dillenia indica	75	3.8
Chromolaena odorata	70	3.54
Ichnocarpus frutescens	70	3.54
Natsiatum herpeticum	70	3.54

Table 8.86. Top ten Abandance and relative abandance of Premonsoon Shrub layer of Khunia

Name of the plants	A	RA
Alpinia nigra	30.60	16.84
Merremia vitifolia	9.00	4.95
Pericampylus glaucus	7.75	4.27
Argyreia roxburghii	7.61	4.19
Chromolaena odorata	7.00	3.85
Natsiatum herpeticum	7.00	3.85
Ichnocarpus frutescens	6.86	3.77
Smilax zeylanica	6.80	3.74
Mikania micrantha	6.16	3.39
Tetrastigma campylocarpum	6.00	3.30

Table 8.87. Top ten Diversity and relative diversity of Premonsoon Shrub layer of Khunia

Name of the plants	D	RD
Croton caudatus	4.45	5.30
Merremia vitifolia	4.05	4.82
Tetrastigma serrulatum	4.05	4.82
Litsea glutinosa	2.10	2.50
Pericampylus glaucus	1.55	1.85
Tetrastigma planicauli	1.55	1.85
Parabaena sagittata	1.45	1.73
Syzygium tetragona	1.40	1.67
Morinda angustifolia	1.30	1.55
Cinnamomum bejolghota	1.20	1.43

Table 8.88. Ten species with maximum IVI of Premonsoon Shrub layer of Khunia

Name of the plants	RF	RA	RD	IVI
Alpinia nigra	1.27	16.84	9.11	27.21
Argyreia roxburghii	4.56	4.19	8.15	16.90
Mikania micrantha	4.81	3.39	6.96	15.16
Chromolaena odorata	3.54	3.85	5.83	13.23
Natsiatum herpeticum	3.54	3.85	5.83	13.23
Ichnocarpus frutescens	3.54	3.77	5.71	13.03
Croton caudatus	4.05	3.06	5.30	12.41
Merremia vitifolia	2.28	4.95	4.82	12.05
Tetrastigma serrulatum	3.54	3.18	4.82	11.55
Phlogacanthus thyrsiformis	3.04	2.52	3.27	8.83

Abrus pulchellus, *Actinodaphne obovata*, *Aglaia spectabilis*, *Alstonia scholaris* , *Aristolochia indica*, *Baliospermum solanifolium, Caesalpinia cucullata , Celastrus paniculatus*, *Cinnamomum bejolghota*, *Dillenia indica, Dioscorea esculenta, Dioscorea pentaphylla, Holarrhena pubescens, Mallotus polycarpus*, *Morinda angustifolia, Parabaena sagittata* , *Pericampylus glaucus, Pericampylus glaucus, Pterocarpus acerifolius* , *Pueraria sikkimensis* , *Sloanea sterculiacea* , *Smilax zeylanica, Streblus asper, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* , *Toddalia asiatica, Wrightia arborea* and *Zizyphus mauritiana* presenting maximum SDI.

8.2.5. Premonsoon Shrub layer of Bichhabhanga Beat (Annex. XXIII)

Bridelia retusa (105.00) emerged with highest frequency in premonsoon shrub layer in Bichhabhanga Beat and followed by *Celastrus paniculatus* (105.00), *Ichnocarpus frutescens* (100.00), *Mikania micrantha* (100.00), *Chromolaena odorata* (95.00) etc. Similarly highest abandance presented (6.12) then followed by *Morinda angustifolia* (8.08), *Alangium chinense* (6.25), *Parabaena sagittata* (5.94), *Mikania micrantha* (5.75), *Pericampylus glaucus* (5.69) etc. However highest density recorded against *Mikania micrantha* (5.75) followed by *Parabaena sagittata* (5.35), *Chromolaena odorata* (4.90), *Morinda angustifolia* (4.85), *Natsiatum herpeticum* (4.70) etc. Highest IVI during pre-monsoon season has been recorded by *Mikania micrantha* (19.52), *Parabaena sagittata* (18.59), *Morinda angustifolia* (18.40), *Chromolaena odorata* (17.38) etc (Table 8.89 – 8.92).

Table 8.89. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Bichhabhanga

Name of the plants	F	RF
Bridelia retusa	105.00	5.34
Celastrus paniculatus	105.00	5.34
Ichnocarpus frutescens	100.00	5.09
Mikania micrantha	100.00	5.09
Chromolaena odorata	95.00	4.83
Dillenia indica	90.00	4.58
Parabaena sagittata	90.00	4.58
Phlogacanthus thyrsiformis	90.00	4.58
Natsiatum herpeticum	85.00	4.33
Pericampylus glaucus	80.00	4.07

Table 8.90. Top ten Abandance and relative abandance of Premonsoon Shrub layer of Bichhabhanga

Name of the plants	A	RA
Morinda angustifolia	8.08	7.94
Alangium chinense	6.25	6.14
Parabaena sagittata	5.94	5.84
Mikania micrantha	5.75	5.65
Pericampylus glaucus	5.69	5.59
Natsiatum herpeticum	5.53	5.43
Chromolaena odorata	5.16	5.07
Merremia vitifolia	4.47	4.39
Phlogacanthus thyrsiformis	4.39	4.31
Sloanea sterculiacea	4.33	4.26

Table 8.91. Top ten Diversity and relative diversity of Premonsoon Shrub layer of Bichhabhanga

Name of the plants	D	RD
Mikania micrantha	5.75	8.78
Parabaena sagittata	5.35	8.17
Chromolaena odorata	4.90	7.48
Morinda angustifolia	4.85	7.40
Natsiatum herpeticum	4.70	7.18
Pericampylus glaucus	4.55	6.95
Phlogacanthus thyrsiformis	3.95	6.03
Ichnocarpus frutescens	3.90	5.95
Celastrus paniculatus	3.35	5.11
Merremia vitifolia	3.35	5.11

Table 8.92. Top ten IVI of Premonsoon Shrub layer of Bichhabhanga

Name of the plants	RF	RA	RD	IVI
Mikania micrantha	5.09	5.65	8.78	19.52
Parabaena sagittata	4.58	5.84	8.17	18.59
Morinda angustifolia	3.05	7.94	7.40	18.40
Chromolaena odorata	4.83	5.07	7.48	17.38
Natsiatum herpeticum	4.33	5.43	7.18	16.93
Pericampylus glaucus	4.07	5.59	6.95	16.61
Phlogacanthus thyrsiformis	4.58	4.31	6.03	14.92
Ichnocarpus frutescens	5.09	3.83	5.95	14.88
Celastrus paniculatus	5.34	3.13	5.11	13.59
Merremia vitifolia	3.82	4.39	5.11	13.32

Actinodaphne obovata, *Aglaia spectabilis*, *Alangium chinense, Alstonia scholaris*, *Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea* , *Caesalpinia cucullata , Cinnamomum bejolghota*, *Holarrhena pubescens, Litsea glutinosa, Maesa indica, Pueraria sikkimensis*, *Sloanea sterculiacea* , *Smilax zeylanica, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* showing maimum SDI.

8.2.6. Premonsoon Shrub layer of Budhuram Beat (Annex. XXIV)

Mikania micrantha (100.00) emerged with highest frequency in premonsoon shrub layer in Budhuram Beat and followed by *Chromolaena odorata* (94.44), *Ichnocarpus frutescens* (88.89), *Croton caudatus* (83.33), *Natsiatum herpeticum* (83.33) etc. Similarly highest abandance presented (6.12) then followed by *Mikania micrantha* (9.06), *Ichnocarpus frutescens* (7.75), *Tetrastigma serrulatum* (6.47), *Chromolaena odorata* (6.41), *Actinodaphne obovata* (6.38) etc. However highest density recorded against *Mikania micrantha* (9.06) followed by *Ichnocarpus frutescens* (6.89), *Chromolaena odorata* (6.06), *Tetrastigma serrulatum* (5.39), *Natsiatum herpeticum* (4.83) etc. Highest IVI during pre-monsoon season has been recorded by *Mikania micrantha* (26.15), *Ichnocarpus frutescens* (21.33), *Chromolaena odorata* (19.29), *Tetrastigma serrulatum* (17.79) etc (Table 8.93 – 8.96).

Table 8.93. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Budhuram

Name of the plants	F	RF
Mikania micrantha	100.00	5.42
Chromolaena odorata	94.44	5.12
Ichnocarpus frutescens	88.89	4.82
Croton caudatus	83.33	4.52
Natsiatum herpeticum	83.33	4.52
Tetrastigma serrulatum	83.33	4.52
Celastrus paniculatus	77.78	4.22
Litsea glutinosa	77.78	4.22
Merremia vitifolia	72.22	3.92
Argyreia roxburghii	66.67	3.61

Table 8.94. Top ten Abandance and relative abandance of Premonsoon Shrub layer of Budhuram

Name of the plants	A	RA
Mikania micrantha	9.06	7.86
Ichnocarpus frutescens	7.75	6.73
Tetrastigma serrulatum	6.47	5.61

Name of the plants	A	RA
Chromolaena odorata	6.41	5.57
Actinodaphne obovata	6.38	5.53
Natsiatum herpeticum	5.80	5.04
Sorindeia madagascariensis	5.50	4.78
Croton caudatus	5.27	4.57
Aglaia spectabilis	5.00	4.34
Merremia vitifolia	4.85	4.21

Table 8.95. Top ten Diversity and relative diversity of Premonsoon Shrub layer of Budhuram

Name of the plants	D	RD
Mikania micrantha	9.06	12.87
Ichnocarpus frutescens	6.89	9.79
Chromolaena odorata	6.06	8.60
Tetrastigma serrulatum	5.39	7.66
Natsiatum herpeticum	4.83	6.87
Croton caudatus	4.39	6.24
Merremia vitifolia	3.50	4.97
Argyreia roxburghii	2.94	4.18
Actinodaphne obovata	2.83	4.03
Litsea glutinosa	2.17	3.08

Table 8.96. Top ten Frequency and relative frequency of Premonsoon Shrub layer of Budhuram

Name of the plants	RF	RA	RD	IVI
Mikania micrantha	5.42	7.86	12.87	26.15
Ichnocarpus frutescens	4.82	6.73	9.79	21.33
Chromolaena odorata	5.12	5.57	8.60	19.29
Tetrastigma serrulatum	4.52	5.61	7.66	17.79
Natsiatum herpeticum	4.52	5.04	6.87	16.42
Croton caudatus	4.52	4.57	6.24	15.33
Merremia vitifolia	3.92	4.21	4.97	13.10
Actinodaphne obovata	2.41	5.53	4.03	11.97
Argyreia roxburghii	3.61	3.83	4.18	11.63
Litsea glutinosa	4.22	2.42	3.08	9.71

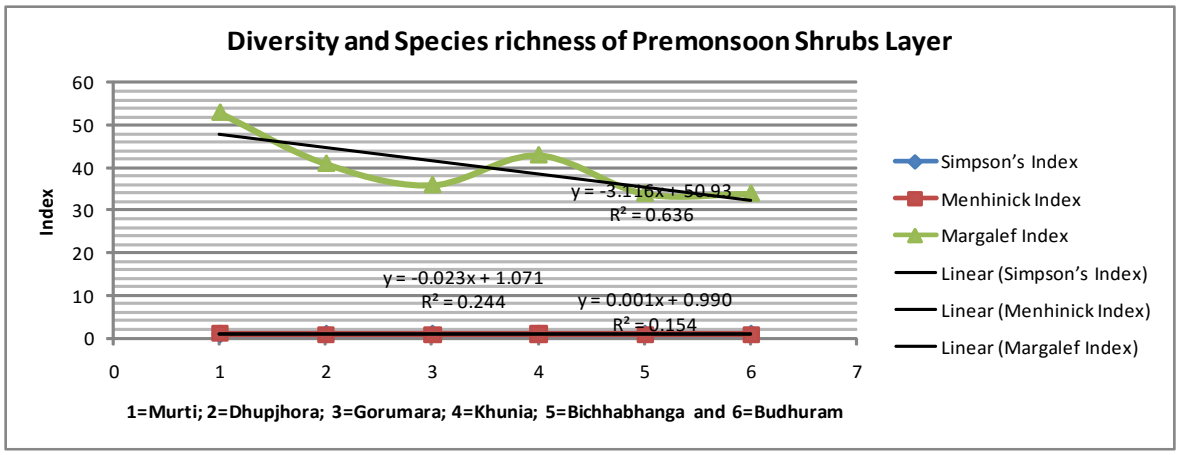

Fig.8.4. Species diversity and species richness of Premonsoon Shrubs cover of Gorumara Natinal Park

Abrus pulchellus , *Aglaia spectabilis* , *Alstonia scholaris* , *Aristolochia indica* , *Bauhinia purpurea* , *Caesalpinia cucullata , Cinnamomum bejolghota* , *Dillenia indica, Dillenia pentagyna, Dioscorea pentaphylla, Morinda angustifolia, Phlogacanthus thyrsiformis* , *Pterocarpus acerifolius* , *Pueraria sikkimensis* , *Sloanea sterculiacea* , *Sorindeia madagascariensis* , *Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* presenting highiest SDI.

Fig. 8.4. showing diversity and species richness of shrubs of the pre monsoon vegetation of Gorumara National Park. Magalef index showing high R^2 Value.

8.2.7. Monsoon Shrub layer of Murti Beat (Annex. XXV)

Argyreia roxburghii (100.00) emerged with highest frequency in monsoon shrub layer in Murti Beat and followed by *Ichnocarpus frutescens* (100.00)*, Mikania micrantha* (100.00)*, Chromolaena odorata* (97.22)*, Pueraria phaseoloides* (97.22) etc. Similarly highest abandance presented *Holarrhena pubescens* (18.25) then followed by *Argyreia roxburghii* (9.64), *Ichnocarpus frutescens* (9.53), *Mikania micrantha* (8.64), *Natsiatum herpeticum* (8.21), *Chromolaena odorata* (8.20) etc. However highest density recorded against *Argyreia roxburghii* (9.64) followed by *Ichnocarpus frutescens* (9.53), *Mikania micrantha* (8.64), *Chromolaena odorata* (7.97), *Natsiatum herpeticum* (7.53) etc. Highest IVI during pre-monsoon season has been recorded by *Argyreia roxburghii* (20.68)*, Ichnocarpus frutescens* (20.49)*, Mikania micrantha* (18.97)*, Chromolaena odorata* (17.85) etc (Table 8.97 – 8.100).

Table 8.97. Top ten Frequency and relative frequency of Monsoon Shrub layer of Murti

Name of the plants	F	RF
Argyreia roxburghii	100.00	4.20
Ichnocarpus frutescens	100.00	4.20
Mikania micrantha	100.00	4.20
Chromolaena odorata	97.22	4.08
Pueraria phaseoloides	97.22	4.08
Litsea glutinosa	94.44	3.97
Phlogacanthus thyrsiformis	94.44	3.97
Ardisia solanacea	91.67	3.85
Natsiatum herpeticum	91.67	3.85
Bridelia retusa	86.11	3.62

Table 8.98. Top ten Abandance and relative abundance of Monsoon Shrub layer of Murti

Name of the plants	A	RA
Holarrhena pubescens	18.25	11.25
Argyreia roxburghii	9.64	5.94
Ichnocarpus frutescens	9.53	5.87
Mikania micrantha	8.64	5.32
Natsiatum herpeticum	8.21	5.06
Chromolaena odorata	8.20	5.05
Morinda angustifolia	8.14	5.02
Litsea glutinosa	6.38	3.93
Pueraria phaseoloides	5.54	3.42
Cissampelos pareira	4.50	2.77

Table 8.99. Top ten Density and relative density of Monsoon Shrub layer of Murti

Name of the plants	D	RD
Argyreia roxburghii	9.64	10.54
Ichnocarpus frutescens	9.53	10.42
Mikania micrantha	8.64	9.44
Chromolaena odorata	7.97	8.72
Natsiatum herpeticum	7.53	8.23
Litsea glutinosa	6.03	6.59
Pueraria phaseoloides	5.39	5.89
Deeringia amaranthoides	3.58	3.92
Croton caudatus	2.97	3.25
Holarrhena pubescens	2.03	2.22

Table 8.100. Top ten IVI of Monsoon Shrub layer of Murti

Name of the plants	RF	RA	RD	IVI
Argyreia roxburghii	4.20	5.94	10.54	20.68
Ichnocarpus frutescens	4.20	5.87	10.42	20.49
Mikania micrantha	4.20	5.32	9.44	18.97
Chromolaena odorata	4.08	5.05	8.72	17.85
Natsiatum herpeticum	3.85	5.06	8.23	17.14
Litsea glutinosa	3.97	3.93	6.59	14.49
Holarrhena pubescens	0.47	11.25	2.22	13.93
Pueraria phaseoloides	4.08	3.42	5.89	13.39
Deeringia amaranthoides	3.62	2.56	3.92	10.10
Croton caudatus	3.15	2.44	3.25	8.84

Abrus pulchellus, *Actinodaphne obovata*, *Actinodaphne sikkimensis*, *Alangium chinense, Alstonia scholaris*, *Angiopteris evecta, Ardisia solanacea, Aristolochia indica*, *Baliospermum solanifolium, Bridelia retusa, Celastrus paniculatus* , *Cinnamomum bejolghota* , *Cissampelos pareira, Clausena excavate, Coffea benghalensis, Dillenia indica, Dioscorea pentaphylla, Glycosmis pentaphylla, Holarrhena pubescens, Impatiens trilobata, Maesa indica, Maesa indica, Mallotus philippensis, Mallotus polycarpus*, *Morinda angustifolia, Murraya paniculata, Parabaena sagittata*, *Pericampylus glaucus, Phlogacanthus thyrsiformis* , *Pterocarpus acerifolius*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Stephania glabra,* Syzygium tetragona, *Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora*, *Toddalia asiatica* and *Wrightia arborea* are showing maximum SDI.

8.2.8. Monsoon Shrub layer of Dhupjhora Beat (Annex. XXVI)

Argyreia roxburghii (100.00) emerged with highest frequency in monsoon shrub layer in Dhupjhora Beat and followed by *Chromolaena odorata* (100.00), *Ichnocarpus frutescens* (100.00), *Mikania micrantha* (100.00), *Phlogacanthus thyrsiformis* (100.00) etc. Similarly highest abandance presented *Croton caudatus* (13.21) then followed by *Mikania micrantha* (11.64), *Argyreia roxburghii* (10.32), *Alpinia nigra* (9.92), *Ichnocarpus frutescens* (9.18), *Chromolaena odorata* (8.25) etc. However highest density recorded against *Mikania micrantha* (11.64) followed by *Croton caudatus* (11.32), *Argyreia roxburghii* (10.32), *Ichnocarpus frutescens* (9.18), *Chromolaena odorata* (8.25) etc. Highest IVI during pre-monsoon season has been recorded by *Mikania micrantha* (23.75), *Croton caudatus* (23.72), *Argyreia roxburghii* (21.61), *Ichnocarpus frutescens* (19.76) etc (Table 8.101 – 8.104).

Table 8.101. Top ten Frequency and relative frequency of Monsoon Shrub layer of Dhupjhora

Name of the plants	F	RF
Argyreia roxburghii	100.00	4.90
Chromolaena odorata	100.00	4.90
Ichnocarpus frutescens	100.00	4.90
Mikania micrantha	100.00	4.90
Phlogacanthus thyrsiformis	100.00	4.90
Murraya paniculata	89.29	4.38
Croton caudatus	85.71	4.20
Gouania tiliifolia	78.57	3.85
Dillenia indica	75.00	3.68
Morinda angustifolia	75.00	3.68

Table 8.102. Top ten Abandance and relative abandance of Monsoon Shrub layer of Dhupjhora

Name of the plants	A	RA
Croton caudatus	13.21	8.34
Mikania micrantha	11.64	7.35
Argyreia roxburghii	10.32	6.52
Alpinia nigra	9.92	6.26
Ichnocarpus frutescens	9.18	5.79
Chromolaena odorata	8.25	5.21
Syzygium tetragona	7.19	4.54
Parabaena sagittata	5.39	3.40
Gouania tiliifolia	5.32	3.36
Aristolochia indica	5.29	3.34

Table 8.103. Top ten density and relative density of Monsoon Shrub layer of Dhupjhora

Name of the plants	D	RD
Mikania micrantha	11.64	11.50
Croton caudatus	11.32	11.18
Argyreia roxburghii	10.32	10.19
Ichnocarpus frutescens	9.18	9.07
Chromolaena odorata	8.25	8.15
Phlogacanthus thyrsiformis	5.07	5.01
Murraya paniculata	4.36	4.30
Alpinia nigra	4.25	4.20
Gouania tiliifolia	4.18	4.13
Syzygium tetragona	4.11	4.06

Table 8.104. Top ten IVI of Monsoon Shrub layer of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Mikania micrantha	4.90	7.35	11.50	23.75
Croton caudatus	4.20	8.34	11.18	23.72
Argyreia roxburghii	4.90	6.52	10.19	21.61
Ichnocarpus frutescens	4.90	5.79	9.07	19.76
Chromolaena odorata	4.90	5.21	8.15	18.26
Phlogacanthus thyrsiformis	4.90	3.20	5.01	13.11
Alpinia nigra	2.10	6.26	4.20	12.56
Murraya paniculata	4.38	3.08	4.30	11.76
Syzygium tetragona	2.80	4.54	4.06	11.40
Gouania tiliifolia	3.85	3.36	4.13	11.34

Abrus pulchellus , *Actinodaphne obovata* , *Alstonia scholaris* , *Aristolochia indica* , *Bauhinia purpurea* , *Bridelia retusa, Cinnamomum bejolghota* , *Cissampelos pareira, Clausena excavate, Cryptolepis dubia* , *Deeringia amaranthoides, Dillenia indica, Floscopa scandens, Litsea glutinosa, Litsea monopetala, Mallotus philippensis, Morinda angustifolia, Mucuna pruriens* , *Pericampylus glaucus, Pueraria sikkimensis* , *Sloanea sterculiacea* , *Sorindeia madagascariensis* , *Stephania glabra, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* , *Wrightia arborea* and *Zizyphus mauritiana* are showing highiest SDI.

8.2.9. Monsoon Shrub layer of Gorumara Beat (Annex. XXVII)

Argyreia roxburghii (93.33) emerged with highest frequency in monsoon shrub layer in Gorumara Beat and followed by *Ichnocarpus frutescens* (93.33), *Mikania micrantha* (90.00), *Croton caudatus* (83.33), *Chromolaena odorata* (80.00) etc. Similarly highest abandance presented *Parabaena sagittata* (14.25) then followed by *Ichnocarpus frutescens* (10.64), *Tetrastigma campylocarpum* (10.17), *Mikania micrantha* (9.89), *Argyreia roxburghii* (9.46), *Chromolaena odorata* (8.96) etc. However highest density recorded against *Ichnocarpus frutescens* (9.93) followed by *Mikania micrantha* (8.90), *Argyreia roxburghii* (8.83), *Parabaena sagittata* (7.60), *Chromolaena odorata* (7.17) etc. Highest IVI during pre-monsoon season has been recorded by *Ichnocarpus frutescens* (26.88), *Mikania micrantha* (24.76), *Argyreia roxburghii* (24.62), *Parabaena sagittata* (23.29) etc (Table 8.105 – 8.108).

Table 8.105. Top ten Frequency and relative frequency of Monsoon Shrub layer of Gorumara

Name of the plants	F	RF
Argyreia roxburghii	93.33	6.45
Ichnocarpus frutescens	93.33	6.45
Mikania micrantha	90.00	6.22
Croton caudatus	83.33	5.76
Chromolaena odorata	80.00	5.53
Cinnamomum bejolghota	80.00	5.53
Tetrastigma serrulatum	80.00	5.53
Dillenia indica	70.00	4.84
Merremia vitifolia	70.00	4.84
Natsiatum herpeticum	70.00	4.84

Table 8.106. Top ten abandance and relative abandance of Monsoon Shrub layer of Gorumara

Name of the plants	A	RA
Parabaena sagittata	14.25	9.27
Ichnocarpus frutescens	10.64	6.93
Tetrastigma campylocarpum	10.17	6.62
Mikania micrantha	9.89	6.44
Argyreia roxburghii	9.46	6.16
Chromolaena odorata	8.96	5.83
Sloanea sterculiacea	7.50	4.88
Tetrastigma serrulatum	4.75	3.09
Pueraria sikkimensis	4.67	3.04

Table 8.107. Top ten density and relative density of Monsoon Shrub layer of Gorumara

Name of the plants	D	RD
Ichnocarpus frutescens	9.93	13.50
Mikania micrantha	8.90	12.10
Argyreia roxburghii	8.83	12.01

Name of the plants	D	RD
Parabaena sagittata	7.60	10.33
Chromolaena odorata	7.17	9.74
Croton caudatus	3.83	5.21
Tetrastigma serrulatum	3.80	5.17
Dillenia indica	2.27	3.08
Litsea glutinosa	2.13	2.90
Tetrastigma campylocarpum	2.03	2.76

Table 8.108. Top ten Frequency and relative frequency of Monsoon Shrub layer of Gorumara

Name of the plants	RF	RA	RD	IVI
Ichnocarpus frutescens	6.45	6.93	13.50	26.88
Mikania micrantha	6.22	6.44	12.10	24.76
Argyreia roxburghii	6.45	6.16	12.01	24.62
Parabaena sagittata	3.69	9.27	10.33	23.29
Chromolaena odorata	5.53	5.83	9.74	21.10
Croton caudatus	5.76	2.99	5.21	13.97
Tetrastigma serrulatum	5.53	3.09	5.17	13.79
Tetrastigma campylocarpum	1.38	6.62	2.76	10.76
Dillenia indica	4.84	2.11	3.08	10.03
Litsea glutinosa	4.15	2.31	2.90	9.36

Abrus pulchellus , *Actinodaphne obovata* , *Actinodaphne sikkimensis* , *Aglaia spectabilis* , *Alangium chinense, Alstonia scholaris* , *Angiopteris evecta, Aristolochia indica* , *Bauhinia purpurea* , *Cinnamomum bejolghota* , *Clausena excavate, Dioscorea pentaphylla, Merremia vitifolia* , *Morinda angustifolia, Pericampylus glaucus, Pterocarpus acerifolius* , *Pueraria phaseoloides* , *Pueraria sikkimensis* , *Sloanea sterculiacea* , *Sorindeia madagascariensis*, *Stephania glabra, Syzygium tetragona, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* presenting maximum SDI.

8.2.10. Monsoon Shrub layer of Khunia Beat (Annex. XXVIII)

Ichnocarpus frutescens (100) emerged with highest frequency in monsoon shrub layer in Khunia Beat and followed by *Croton caudatus* (95), *Mikania micrantha* (95), *Argyreia roxburghii* (90), *Chromolaena odorata* (90) etc. Similarly highest abandance presented *Alpinia nigra* (64.80) then followed by *Chromolaena odorata* (15.94), *Argyreia roxburghii* (13.67), *Mikania micrantha* (12.32), *Natsiatum herpeticum* (11.29), *Ichnocarpus frutescens* (10.90) etc. However highest density recorded against *Alpinia nigra* (16.20) followed by *Chromolaena odorata* (14.35), *Argyreia roxburghii* (12.30), *Croton caudatus* (6.10), *Litsea glutinosa* (2.35) etc. Highest IVI during premonsoon season has been recorded by *Alpinia nigra* (40.39), *Chromolaena odorata* (22.33), *Argyreia roxburghii* (19.79), *Mikania micrantha* (19.02) etc (Table 8.109 – 8.112).

Table 8.109. Top ten Frequency and relative frequency of Monsoon Shrub layer of Khunia

Name of the plants	F	RF
Ichnocarpus frutescens	100	5.03
Croton caudatus	95	4.77
Mikania micrantha	95	4.77
Argyreia roxburghii	90	4.52
Chromolaena odorata	90	4.52

Name of the plants	F	RF
Dioscorea esculenta	90	4.52
Pericampylus glaucus	90	4.52
Dillenia indica	85	4.27
Natsiatum herpeticum	70	3.52
Tetrastigma serrulatum	70	3.52

Table 8.110. Top ten abandance and relative abandance of Monsoon Shrub layer of Khunia

Name of the plants	A	RA
Alpinia nigra	64.80	26.35
Chromolaena odorata	15.94	6.48
Argyreia roxburghii	13.67	5.56
Mikania micrantha	12.32	5.01
Natsiatum herpeticum	11.29	4.59
Ichnocarpus frutescens	10.90	4.43
Merremia vitifolia	10.78	4.38
Pericampylus glaucus	8.50	3.46
Tetrastigma serrulatum	8.00	3.25
Smilax zeylanica	6.80	2.77

Table 8.111. Top ten density and relative density of Monsoon Shrub layer of Khunia

Name of the plants	D	RD
Alpinia nigra	16.20	12.79
Chromolaena odorata	14.35	11.33
Argyreia roxburghii	12.30	9.71
Croton caudatus	6.10	4.81
Litsea glutinosa	2.35	1.85
Dillenia indica	2.10	1.66
Bridelia retusa	2.05	1.62
Cinnamomum bejolghota	1.55	1.22
Tetrastigma planicauli	1.55	1.22
Parabaena sagittata	1.45	1.14

Table 8.112. Top ten IVI of Monsoon Shrub layer of Khunia

Name of the plants	RF	RA	RD	IVI
Alpinia nigra	1.26	26.35	12.79	40.39
Chromolaena odorata	4.52	6.48	11.33	22.33
Argyreia roxburghii	4.52	5.56	9.71	19.79
Mikania micrantha	4.77	5.01	9.23	19.02
Ichnocarpus frutescens	5.03	4.43	8.60	18.06
Natsiatum herpeticum	3.52	4.59	6.24	14.34
Croton caudatus	4.77	2.61	4.81	12.20
Tetrastigma serrulatum	3.52	3.25	4.42	11.19
Merremia vitifolia	2.26	4.38	3.83	10.47
Phlogacanthus thyrsiformis	3.02	1.86	2.17	7.05

Abrus pulchellus , *Actinodaphne obovata* , *Aglaia spectabilis* , *Aglaia spectabilis*, *Alstonia scholaris*, *Aristolochia indica, Bridelia retusa, Caesalpinia cucullata*, *Cinnamomum bejolghota*, *Clausena*

excavate, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Litsea glutinosa, Mallotus polycarpus, *Morinda angustifolia, Parabaena sagittata* , *Pericampylus glaucus, Pericampylus glaucus, Phlogacanthus thyrsiformis*, *Pterocarpus acerifolius*, *Pueraria sikkimensis*, *Sloanea sterculiacea* , *Smilax zeylanica, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora*, *Wrightia arborea* and *Zizyphus mauritiana* presenting highiest SDI.

8.2.11. Monsoon Shrub layer of Bichhabhanga Beat (Annex. XXIX)

Pueraria phaseoloides (105.00) emerged with highest frequency in monsoon shrub layer in Bichhabhanga Beat and followed by *Ichnocarpus frutescens* (100.00)*, Maesa indica* (100.00)*, Mikania micrantha* (100.00)*, Chromolaena odorata* (95.00) etc. Similarly highest abandance presented *Maesa indica* (12.05) then followed by *Mikania micrantha* (11.70), *Ichnocarpus frutescens* (11.45), *Morinda angustifolia* (9.50), *Pericampylus glaucus* (8.56), *Natsiatum herpeticum* (6.82) etc. However highest density recorded against *Maesa indica* (12.05) followed by *Ichnocarpus frutescens* (11.45), *Pueraria phaseoloides* (4.45), *Tetrastigma serrulatum* (4.30), *Thunbergia grandiflora* (3.45) etc. Highest IVI during pre-monsoon season has been recorded by *Maesa indica* (25.46)*, Mikania micrantha* (24.86)*, Ichnocarpus frutescens* (24.44)*, Pericampylus glaucus* (16.80) etc (Table 8.113 – 8.116).

Table 8.113. Top ten Frequency and relative frequency of Monsoon Shrub layer of Bichhabhanga

Name of the plants	F	RF
Pueraria phaseoloides	105.00	5.19
Ichnocarpus frutescens	100.00	4.94
Maesa indica	100.00	4.94
Mikania micrantha	100.00	4.94
Chromolaena odorata	95.00	4.69
Dillenia indica	90.00	4.44
Natsiatum herpeticum	85.00	4.20
Pericampylus glaucus	80.00	3.95
Tetrastigma serrulatum	80.00	3.95
Thunbergia grandiflora	80.00	3.95

Table 8.114. Top ten abandance and relative abandance of Monsoon Shrub layer of Bichhabhanga

Name of the plants	A	RA
Maesa indica	12.05	8.32
Mikania micrantha	11.70	8.08
Ichnocarpus frutescens	11.45	7.90
Morinda angustifolia	9.50	6.56
Pericampylus glaucus	8.56	5.91
Natsiatum herpeticum	6.82	4.71
Chromolaena odorata	6.21	4.29
Alstonia scholaris	5.50	3.80
Tetrastigma serrulatum	5.38	3.71
Parabaena sagittata	5.33	3.68

Table 8.115. Top ten density and relative density of Monsoon Shrub layer of Bichhabhanga

Name of the plants	D	RD
Maesa indica	12.05	12.20
Ichnocarpus frutescens	11.45	11.59
Pueraria phaseoloides	4.45	4.51

Name of the plants	D	RD
Tetrastigma serrulatum	4.30	4.35
Thunbergia grandiflora	3.45	3.49
Merremia vitifolia	3.35	3.39
Phlogacanthus thyrsiformis	3.05	3.09
Cinnamomum bejolghota	1.20	1.22
Alstonia scholaris	0.55	0.56
Smilax zeylanica	0.55	0.56

Table 8.116. Top ten IVI of Monsoon Shrub layer of Bichhabhanga

Name of the plants	RF	RA	RD	IVI
Maesa indica	4.94	8.32	12.20	25.46
Mikania micrantha	4.94	8.08	11.85	24.86
Ichnocarpus frutescens	4.94	7.90	11.59	24.44
Pericampylus glaucus	3.95	5.91	6.94	16.80
Morinda angustifolia	2.96	6.56	5.77	15.29
Chromolaena odorata	4.69	4.29	5.97	14.95
Natsiatum herpeticum	4.20	4.71	5.87	14.78
Pueraria phaseoloides	5.19	2.93	4.51	12.62
Tetrastigma serrulatum	3.95	3.71	4.35	12.02
Thunbergia grandiflora	3.95	2.98	3.49	10.42

Abrus pulchellus, *Actinodaphne obovata*, *Aglaia spectabilis*, *Alstonia scholaris*, *Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata, Celastrus paniculatus*, *Cinnamomum bejolghota*, *Croton caudatus*, *Dioscorea esculenta, Litsea glutinosa, Parabaena sagittata*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Stephania glabra, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli* and *Wrightia arborea* presenting maximum SDI.

8.2.12. Monsoon Shrub layer of Budhuram Beat (Annex. XXX)

Chromolaena odorata (94.44) emerged with highest frequency in monsoon shrub layer in Budhuram Beat and followed by *Mikania micrantha* (94.44), *Ichnocarpus frutescens* (88.89), *Croton caudatus* (83.33), *Natsiatum herpeticum* (83.33) etc. Similarly highest abandance presented *Chromolaena odorata* (12.76) then followed by *Mikania micrantha* (12.59), *Ichnocarpus frutescens* (12.31), *Merremia vitifolia* (8.85), *Actinodaphne obovata* (7.10), *Tetrastigma serrulatum* (6.53) etc. However highest density recorded against *Chromolaena odorata* (12.06) followed by *Mikania micrantha* (11.89), *Ichnocarpus frutescens* (10.94), *Merremia vitifolia* (6.39), *Tetrastigma serrulatum* (5.44) etc. Highest IVI during pre-monsoon season has been recorded by *Chromolaena odorata* (27.80), *Mikania micrantha* (27.48), *Ichnocarpus frutescens* (25.92), *Merremia vitifolia* (17.44) etc (Table 8.117 – 8.120).

Table 8.117. Top ten Frequency and relative frequency of Monsoon Shrub layer of Budhuram

Name of the plants	F	RF
Chromolaena odorata	94.44	5.31
Mikania micrantha	94.44	5.31
Ichnocarpus frutescens	88.89	5.00
Croton caudatus	83.33	4.69
Natsiatum herpeticum	83.33	4.69
Tetrastigma serrulatum	83.33	4.69
Litsea glutinosa	77.78	4.37
Holarrhena pubescens	72.22	4.06
Merremia vitifolia	72.22	4.06
Argyreia roxburghii	66.67	3.75

Table 8.118. Top ten abandance and relative abandance of Monsoon Shrub layer of Budhuram

Name of the plants	A	RA
Chromolaena odorata	12.76	8.97
Mikania micrantha	12.59	8.85
Ichnocarpus frutescens	12.31	8.65
Merremia vitifolia	8.85	6.22
Actinodaphne obovata	7.10	4.99
Tetrastigma serrulatum	6.53	4.59
Croton caudatus	6.47	4.54
Natsiatum herpeticum	6.47	4.54
Aglaia spectabilis	5.00	3.51
Argyreia roxburghii	4.75	3.34

Table 8.119. Top ten density and relative density of Monsoon Shrub layer of Budhuram

Name of the plants	D	RD
Chromolaena odorata	12.06	13.51
Mikania micrantha	11.89	13.33
Ichnocarpus frutescens	10.94	12.27
Merremia vitifolia	6.39	7.16
Tetrastigma serrulatum	5.44	6.10
Croton caudatus	5.39	6.04
Natsiatum herpeticum	5.39	6.04
Actinodaphne obovata	3.94	4.42
Argyreia roxburghii	3.17	3.55
Bridelia retusa	2.28	2.55

Table 8.120. Top ten IVI of Monsoon Shrub layer of Budhuram

Name of the plants	RF	RA	RD	IVI
Chromolaena odorata	5.31	8.97	13.51	27.80
Mikania micrantha	5.31	8.85	13.33	27.48
Ichnocarpus frutescens	5.00	8.65	12.27	25.92
Merremia vitifolia	4.06	6.22	7.16	17.44
Tetrastigma serrulatum	4.69	4.59	6.10	15.38
Croton caudatus	4.69	4.54	6.04	15.27
Natsiatum herpeticum	4.69	4.54	6.04	15.27
Actinodaphne obovata	3.12	4.99	4.42	12.54
Argyreia roxburghii	3.75	3.34	3.55	10.64
Litsea glutinosa	4.37	1.96	2.43	8.76

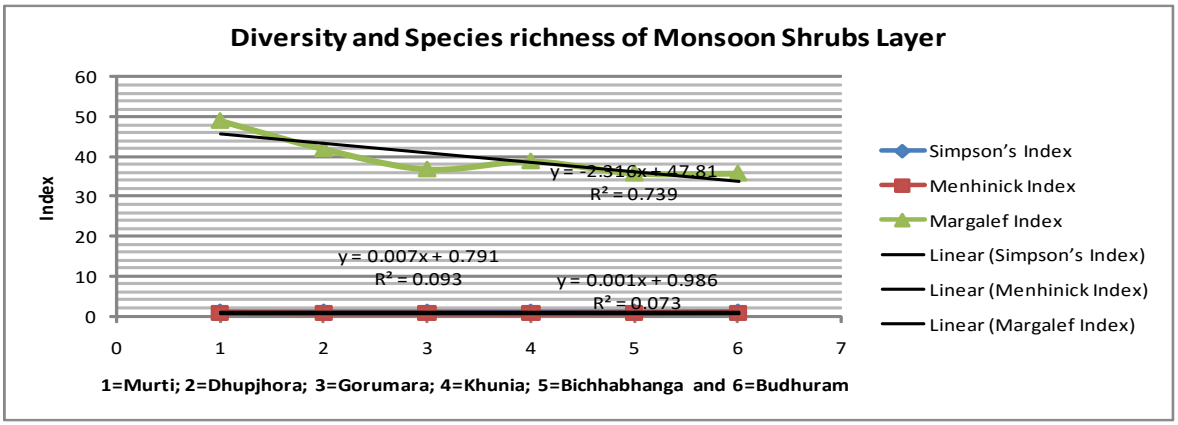

Fig.8.5. Species diversity and species richness of monsoon Shrubs cover of Gorumara Natinal Park

Abrus pulchellus , *Aglaia spectabilis* , *Alstonia scholaris* , *Aristolochia indica, Bauhinia purpurea* , *Caesalpinia cucullata, Celastrus paniculatus*, *Cinnamomum bejolghota* , *Dillenia indica, Dillenia pentagyna, Dioscorea pentaphylla, Holarrhena pubescens, Morinda angustifolia, Pericampylus glaucus, Phlogacanthus thyrsiformis* , *Pterocarpus acerifolius* , *Pueraria sikkimensis* , *Sloanea sterculiacea* , *Smilax zeylanica, Sorindeia madagascariensis* , *Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* presenting maximum SDI.

Fig. 8.5. showing diversity and species richness of Shrubs of the pre monsoon vegetation of Gorumara National Park. Magalef index showing high R^2 Value.

8.2.13. Postmonsoon Shrub layer of Murti Beat (Annex. XXXI)

Argyreia roxburghii (100.00) emerged with highest frequency in Postmonsoon shrub layer in Murti Beat and followed by *Ichnocarpus frutescens* (100.00), *Mikania micrantha* (100.00), *Chromolaena odorata* (97.22), *Litsea glutinosa* (94.44) etc. Similarly highest abandance presented *Argyreia roxburghii* (9.64) then followed by *Ichnocarpus frutescens* (9.53), *Mikania micrantha* (8.64), *Natsiatum herpeticum* (8.21), *Chromolaena odorata* (8.20), *Morinda angustifolia* (8.14) etc. However highest density recorded against *Argyreia roxburghii* (9.64) followed by *Ichnocarpus frutescens* (9.53), *Mikania micrantha* (8.64), *Chromolaena odorata* (7.97), *Natsiatum herpeticum* (7.53) etc. Highest IVI during pre-monsoon season has been recorded by *Argyreia roxburghii* (23.81), *Ichnocarpus frutescens* (23.59), *Mikania micrantha* (21.83), *Chromolaena odorata* (20.55) etc (Table 8.121 – 8.124).

Table 8.121. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Murti

Name of the plants	F	RF
Argyreia roxburghii	100.00	4.77
Ichnocarpus frutescens	100.00	4.77
Mikania micrantha	100.00	4.77
Chromolaena odorata	97.22	4.64
Litsea glutinosa	94.44	4.50
Phlogacanthus thyrsiformis	94.44	4.50
Natsiatum herpeticum	91.67	4.37
Tetrastigma serrulatum	91.67	4.37
Bridelia retusa	86.11	4.11
Tetrastigma campylocarpum	77.78	3.71

Table 8.122. Top ten abandance and relative abandance of Postmonsoon Shrub layer of Murti

Name of the plants	A	RA
Argyreia roxburghii	9.64	6.89
Ichnocarpus frutescens	9.53	6.81
Mikania micrantha	8.64	6.17
Natsiatum herpeticum	8.21	5.87
Chromolaena odorata	8.20	5.86
Morinda angustifolia	8.14	5.82
Litsea glutinosa	6.38	4.56
Caesalpinia cucullata	4.50	3.22
Aglaia spectabilis	4.15	2.97
Croton caudatus	3.96	2.83

Table 8.123. Top ten density and relative density of Postmonsoon Shrub layer of Murti

Name of the plants	D	RD
Argyreia roxburghii	9.64	12.15
Ichnocarpus frutescens	9.53	12.01
Mikania micrantha	8.64	10.89
Chromolaena odorata	7.97	10.05
Natsiatum herpeticum	7.53	9.49
Litsea glutinosa	6.03	7.60
Croton caudatus	2.97	3.75
Morinda angustifolia	1.58	2.00
Tetrastigma serrulatum	1.58	2.00
Aglaia spectabilis	1.50	1.89

Table 8.124. Top ten IVI of Postmonsoon Shrub layer of Murti

Name of the plants	RF	RA	RD	IVI
Argyreia roxburghii	4.77	6.89	12.15	23.81
Ichnocarpus frutescens	4.77	6.81	12.01	23.59
Mikania micrantha	4.77	6.17	10.89	21.83
Chromolaena odorata	4.64	5.86	10.05	20.55
Natsiatum herpeticum	4.37	5.87	9.49	19.73
Litsea glutinosa	4.50	4.56	7.60	16.66
Croton caudatus	3.58	2.83	3.75	10.16
Morinda angustifolia	0.93	5.82	2.00	8.74
Tetrastigma serrulatum	4.37	1.23	2.00	7.60
Phlogacanthus thyrsiformis	4.50	1.11	1.86	7.47

Abrus pulchellus, *Actinodaphne obovata*, *Actinodaphne sikkimensis*, *Aglaia spectabilis*, *Alstonia scholaris*, *Angiopteris evecta, Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata, Celastrus paniculatus*, *Cinnamomum bejolghota*, *Coffea benghalensis, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Dioscorea pentaphylla, Glycosmis pentaphylla, Maesa indica, Mallotus polycarpus*, *Merremia vitifolia, Morinda angustifolia, Parabaena sagittata*, *Pericampylus glaucus, Phlogacanthus thyrsiformis*, *Pterocarpus acerifolius*, *Pueraria phaseoloides*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Sorindeia madagascariensis*, *Stephania glabra, Streblus asper, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Tetrastigma serrulatum, Thunbergia grandiflora* , *Toddalia asiatica* and *Wrightia arborea* presenting maximum SDI.

8.2.14. Postmonsoon Shrub layer of Dhupjhora Beat (Annex. XXXII)

Argyreia roxburghii (100.00) emerged with highest frequency in Postmonsoon shrub layer in Dhupjhora Beat and followed by *Chromolaena odorata* (100.00), *Ichnocarpus frutescens* (100.00), *Mikania micrantha* (100.00), *Tetrastigma serrulatum* (89.29) etc. Similarly highest abandance presented *Croton caudatus* (14.18) then followed by *Argyreia roxburghii* (10.32), *Mikania micrantha* (10.32), *Chromolaena odorata* (10.25), *Shorea robusta* (9.92), *Ichnocarpus frutescens* (9.43) etc. However highest density recorded against *Croton caudatus* (11.14) followed by *Argyreia roxburghii* (10.32), *Mikania micrantha* (10.32), *Chromolaena odorata* (10.25), *Ichnocarpus frutescens* (9.43) etc. Highest IVI during pre-monsoon season has been recorded by *Croton caudatus* (22.94), *Argyreia roxburghii* (20.85), *Mikania micrantha* (20.85), *Chromolaena odorata* (20.74) etc (Table 8.125 – 8.128).

Table 8.125. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Dhupjhora

Name of the plants	F	RF
Argyreia roxburghii	100.00	4.80
Chromolaena odorata	100.00	4.80
Ichnocarpus frutescens	100.00	4.80
Mikania micrantha	100.00	4.80
Tetrastigma serrulatum	89.29	4.29
Litsea glutinosa	85.71	4.12
Morinda angustifolia	82.14	3.95
Croton caudatus	78.57	3.77
Merremia vitifolia	78.57	3.77
Dillenia indica	75.00	3.60

Table 8.126. Top ten abandance and relative abandance of Postmonsoon Shrub layer of Dhupjhora

Name of the plants	A	RA
Croton caudatus	14.18	8.58
Argyreia roxburghii	10.32	6.24
Mikania micrantha	10.32	6.24
Chromolaena odorata	10.25	6.20
Shorea robusta	9.92	6.00
Ichnocarpus frutescens	9.43	5.70
Pueraria phaseoloides	7.19	4.35
Parabaena sagittata	6.53	3.95
Phlogacanthus thyrsiformis	6.36	3.85
Tetrastigma serrulatum	5.84	3.53

Table 8.127. Top ten density and relative density of Postmonsoon Shrub layer of Dhupjhora

Name of the plants	D	RD
Croton caudatus	11.14	10.58
Argyreia roxburghii	10.32	9.80
Mikania micrantha	10.32	9.80
Chromolaena odorata	10.25	9.74
Ichnocarpus frutescens	9.43	8.96
Tetrastigma serrulatum	5.21	4.95
Parabaena sagittata	4.43	4.21
Shorea robusta	4.25	4.04
Pueraria phaseoloides	4.11	3.90
Merremia vitifolia	3.50	3.32

Table 8.128. Top ten IVI of Postmonsoon Shrub layer of Dhupjhora

Name of the plants	RF	RA	RD	IVI
Croton caudatus	3.77	8.58	10.58	22.94
Argyreia roxburghii	4.80	6.24	9.80	20.85
Mikania micrantha	4.80	6.24	9.80	20.85
Chromolaena odorata	4.80	6.20	9.74	20.74
Ichnocarpus frutescens	4.80	5.70	8.96	19.46
Tetrastigma serrulatum	4.29	3.53	4.95	12.77
Shorea robusta	2.06	6.00	4.04	12.09
Parabaena sagittata	3.26	3.95	4.21	11.41
Pueraria phaseoloides	2.74	4.35	3.90	10.99
Merremia vitifolia	3.77	2.70	3.32	9.79

Abrus pulchellus , *Actinodaphne obovata* , *Aristolochia indica* , *Aristolochia indica* , *Bauhinia purpurea* , *Bridelia retusa, Caesalpinia cucullata , Cinnamomum bejolghota* , *Cissampelos pareira, Clausena excavate, Cryptolepis dubia , Dillenia indica, Dioscorea esculenta, Dioscorea pentaphylla, Litsea monopetala, Morinda angustifolia, Pericampylus glaucus, Pueraria sikkimensis* , *Sloanea sterculiacea* , *Smilax zeylanica, Sorindeia madagascariensis* , *Stephania glabra, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora , Wrightia arborea* and *Zizyphus mauritiana* showing maximum SDI.

8.2.15. Postmonsoon Shrub layer of Gorumara Beat (Annex. XXXIII)

Argyreia roxburghii (96.67) emerged with highest frequency in Postmonsoon shrub layer in Gorumara Beat and followed by *Ichnocarpus frutescens* (93.33), *Mikania micrantha* (86.67), *Croton caudatus* (83.33), *Chromolaena odorata* (80.00) etc. Similarly highest abandance presented *Parabaena sagittata* (12.00) then followed by *Chromolaena odorata* (11.04), *Argyreia roxburghii* (9.14), *Mikania micrantha* (9.00), *Sloanea sterculiacea* (7.50), *Ichnocarpus frutescens* (7.07) etc. However highest density recorded against *Argyreia roxburghii* (8.83) followed by *Chromolaena odorata* (8.83), *Mikania micrantha* (7.80), *Ichnocarpus frutescens* (6.60), *Parabaena sagittata* (6.40) etc. Highest IVI during pre-monsoon season has been recorded by *Chromolaena odorata* (24.77), *Argyreia roxburghii* (24.59), *Mikania micrantha* (22.43), *Parabaena sagittata* (20.35) etc (Table 8.129 – 8.132).

Table 8.129. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Gorumara

Name of the plants	F	RF
Argyreia roxburghii	96.67	6.44
Ichnocarpus frutescens	93.33	6.22
Mikania micrantha	86.67	5.78
Croton caudatus	83.33	5.56
Chromolaena odorata	80.00	5.33
Cinnamomum bejolghota	80.00	5.33
Tetrastigma serrulatum	73.33	4.89
Dillenia indica	70.00	4.67
Merremia vitifolia	70.00	4.67
Natsiatum herpeticum	70.00	4.67

Table 8.130. Top ten Abandance and relative abandance of Postmonsoon Shrub layer of Gorumara

Name of the plants	A	RA
Parabaena sagittata	12.00	8.13
Chromolaena odorata	11.04	7.48
Argyreia roxburghii	9.14	6.19
Mikania micrantha	9.00	6.10
Sloanea sterculiacea	7.50	5.08
Ichnocarpus frutescens	7.07	4.79
Tetrastigma serrulatum	6.14	4.16
Tetrastigma campylocarpum	5.86	3.97
Croton caudatus	4.96	3.36
Pueraria phaseoloides	4.67	3.16

Table 8.131. Top ten Density and relative Density of Postmonsoon Shrub layer of Gorumara

Name of the plants	D	RD
Argyreia roxburghii	8.83	11.95
Chromolaena odorata	8.83	11.95
Mikania micrantha	7.80	10.55
Ichnocarpus frutescens	6.60	8.93
Parabaena sagittata	6.40	8.66
Tetrastigma serrulatum	4.50	6.09
Croton caudatus	4.13	5.59
Natsiatum herpeticum	2.73	3.70
Tetrastigma campylocarpum	2.73	3.70
Dillenia indica	2.27	3.07

Table 8.132. Top ten IVI of Postmonsoon Shrub layer of Gorumara

Name of the plants	RF	RA	RD	IVI
Chromolaena odorata	5.33	7.48	11.95	24.77
Argyreia roxburghii	6.44	6.19	11.95	24.59
Mikania micrantha	5.78	6.10	10.55	22.43
Parabaena sagittata	3.56	8.13	8.66	20.35
Ichnocarpus frutescens	6.22	4.79	8.93	19.95
Tetrastigma serrulatum	4.89	4.16	6.09	15.14
Croton caudatus	5.56	3.36	5.59	14.51
Natsiatum herpeticum	4.67	2.65	3.70	11.01
Tetrastigma campylocarpum	3.11	3.97	3.70	10.78
Dillenia indica	4.67	2.19	3.07	9.93

Abrus pulchellus, *Actinodaphne obovata*, *Aglaia spectabilis*, *Alstonia scholaris* , *Angiopteris evecta, Aristolochia indica* , *Bauhinia purpurea*, *Caesalpinia cucullata , Clausena excavate, Dioscorea pentaphylla, Holarrhena pubescens, Merremia vitifolia , Morinda angustifolia, Pericampylus glaucus, Pterocarpus acerifolius*, *Pueraria phaseoloides* , *Sloanea sterculiacea* , *Smilax zeylanica, Sorindeia madagascariensis* , *Stephania glabra, Syzygium tetragona, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* showing maximum SDI.

8.2.16. Postmonsoon Shrub layer of Khunia Beat (Annex. XXXIV)

Ichnocarpus frutescens (100.00) emerged with highest frequency in Postmonsoon shrub layer in Khunia Beat and followed by *Croton caudatus* (95.00), *Mikania micrantha* (95.00), *Argyreia roxburghii* (90.00), *Chromolaena odorata* (90.00) etc. Similarly highest abandance presented *Chromolaena odorata* (15.94) then followed by *Argyreia roxburghii* (13.67), *Mikania micrantha* (12.32), *Natsiatum herpeticum* (11.29), *Ichnocarpus frutescens* (10.90), *Merremia vitifolia* (10.78) etc. However highest density recorded against *Chromolaena odorata* (14.35) followed by *Argyreia roxburghii* (12.30), *Croton caudatus* (6.10), *Litsea glutinosa* (2.35), *Dillenia indica* (2.10) etc. Highest IVI during pre-monsoon season has been recorded by *Chromolaena odorata* (25.50), *Argyreia roxburghii* (22.48), *Mikania micrantha* (21.47), *Ichnocarpus frutescens* (20.24) etc (Table 8.133 – 8.136).

Table 8.133. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Khunia

Name of the plants	F	RF
Ichnocarpus frutescens	100.00	4.80
Croton caudatus	95.00	4.56
Mikania micrantha	95.00	4.56
Argyreia roxburghii	90.00	4.32

Name of the plants	F	RF
Chromolaena odorata	90.00	4.32
Dillenia indica	90.00	4.32
Dioscorea pentaphylla	90.00	4.32
Pericampylus glaucus	90.00	4.32
Dillenia indica	85.00	4.08
Natsiatum herpeticum	70.00	3.36

Table 8.134. Top ten Abandance and relative abandance of Postmonsoon Shrub layer of Khunia

Name of the plants	A	RA
Chromolaena odorata	15.94	8.49
Argyreia roxburghii	13.67	7.27
Mikania micrantha	12.32	6.56
Natsiatum herpeticum	11.29	6.01
Ichnocarpus frutescens	10.90	5.80
Merremia vitifolia	10.78	5.74
Pericampylus glaucus	8.50	4.52
Tetrastigma serrulatum	8.00	4.26
Smilax zeylanica	6.80	3.62
Croton caudatus	6.42	3.42

Table 8.135. Top ten Density and relative density of Postmonsoon Shrub layer of Khunia

Name of the plants	D	RD
Chromolaena odorata	14.35	12.70
Argyreia roxburghii	12.30	10.88
Croton caudatus	6.10	5.40
Litsea glutinosa	2.35	2.08
Dillenia indica	2.10	1.86
Bridelia retusa	2.05	1.81
Dillenia indica	2.05	1.81
Cinnamomum bejolghota	1.55	1.37
Tetrastigma planicauli	1.55	1.37
Parabaena sagittata	1.45	1.28

Table 8.136. Top ten IVI of Postmonsoon Shrub layer of Khunia

Name of the plants	RF	RA	RD	IVI
Chromolaena odorata	4.32	8.49	12.70	25.50
Argyreia roxburghii	4.32	7.27	10.88	22.48
Mikania micrantha	4.56	6.56	10.35	21.47
Ichnocarpus frutescens	4.80	5.80	9.65	20.24
Natsiatum herpeticum	3.36	6.01	6.99	16.36
Croton caudatus	4.56	3.42	5.40	13.37
Tetrastigma serrulatum	3.36	4.26	4.96	12.57
Merremia vitifolia	2.16	5.74	4.29	12.19
Phlogacanthus thyrsiformis	2.88	2.44	2.43	7.75
Dillenia indica	4.32	1.21	1.81	7.34

Abrus pulchellus, *Actinodaphne obovata*, *Aglaia spectabilis*, *Aristolochia indica*, *Aristolochia indica*, *Bridelia retusa, Caesalpinia cucullata, Cinnamomum bejolghota*, *Deeringia*

amaranthoides, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Dioscorea pentaphylla, Litsea glutinosa, Mallotus polycarpus, *Morinda angustifolia, Parabaena sagittata*, *Pericampylus glaucus, Premna latifolia, Pterocarpus acerifolius, Pueraria sikkimensis, Sloanea sterculiacea , Smilax zeylanica, Streblus asper, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora, Toddalia asiatica, Wrightia arborea* and *Zizyphus mauritiana* presenting mhighiest SDI.

8.2.17. Postmonsoon Shrub layer of Bichhabhanga Beat (Annex. XXXV)

Bridelia retusa (105.00) emerged with highest frequency in Postmonsoon shrub layer in Bichhbhanga Beat and followed by *Stephania glabra* (105.00), *Ichnocarpus frutescens* (100.00), *Mikania micrantha* (100.00), *Chromolaena odorata* (95.00) etc. Similarly highest abandance presented *Parabaena sagittata* (11.94) then followed by *Ichnocarpus frutescens* (9.90), *Mikania micrantha* (9.85), *Morinda angustifolia* (9.50), *Pericampylus glaucus* (8.56), *Natsiatum herpeticum* (6.82) etc. However highest density recorded against *Stephania glabra* (4.45) followed by *Phlogacanthus thyrsiformis* (4.40), *Tetrastigma serrulatum* (4.30), *Merremia vitifolia* (3.35), *Croton caudatus* (2.45) etc. Highest IVI during pre-monsoon season has been recorded by *Parabaena sagittata* (24.45), *Ichnocarpus frutescens* (22.51), *Mikania micrantha* (22.42), *Pericampylus glaucus* (17.36) etc (Table 8.137 – 8.140).

Table 8.137. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Bichhabhanga

Name of the plants	F	RF
Bridelia retusa	105.00	4.96
Stephania glabra	105.00	4.96
Ichnocarpus frutescens	100.00	4.73
Mikania micrantha	100.00	4.73
Chromolaena odorata	95.00	4.49
Dillenia indica	90.00	4.26
Parabaena sagittata	90.00	4.26
Phlogacanthus thyrsiformis	90.00	4.26
Natsiatum herpeticum	85.00	4.02
Pericampylus glaucus	80.00	3.78

Table 8.138. Top ten Abandance and relative abandance of Postmonsoon Shrub layer of Bichhabhanga

Name of the plants	A	RA
Parabaena sagittata	11.94	8.90
Ichnocarpus frutescens	9.90	7.38
Mikania micrantha	9.85	7.34
Morinda angustifolia	9.50	7.08
Pericampylus glaucus	8.56	6.38
Natsiatum herpeticum	6.82	5.08
Celastrus paniculatus	6.25	4.66
Chromolaena odorata	6.21	4.63
Tetrastigma serrulatum	5.38	4.00
Phlogacanthus thyrsiformis	4.89	3.64

Table 8.139. Top ten Density and relative density of Postmonsoon Shrub layer of Bichhabhanga

Name of the plants	D	RD
Stephania glabra	4.45	4.68
Phlogacanthus thyrsiformis	4.40	4.62
Tetrastigma serrulatum	4.30	4.52

Name of the plants	D	RD
Merremia vitifolia	3.35	3.52
Croton caudatus	2.45	2.57
Thunbergia grandiflora	2.10	2.21
Celastrus paniculatus	1.25	1.31
Alstonia scholaris	1.15	1.21
Smilax zeylanica	0.55	0.58
Ardisia solanacea	0.40	0.42

Table 8.140. Top ten IVI of Postmonsoon Shrub layer of Bichhabhanga

Name of the plants	RF	RA	RD	IVI
Parabaena sagittata	4.26	8.90	11.30	24.45
Ichnocarpus frutescens	4.73	7.38	10.40	22.51
Mikania micrantha	4.73	7.34	10.35	22.42
Pericampylus glaucus	3.78	6.38	7.20	17.36
Morinda angustifolia	2.84	7.08	5.99	15.91
Chromolaena odorata	4.49	4.63	6.20	15.32
Natsiatum herpeticum	4.02	5.08	6.10	15.20
Stephania glabra	4.96	3.16	4.68	12.80
Phlogacanthus thyrsiformis	4.26	3.64	4.62	12.52
Tetrastigma serrulatum	3.78	4.00	4.52	12.31

Actinodaphne obovata, *Actinodaphne sikkimensis*, *Aglaia spectabilis* , *Alstonia scholaris* , *Ardisia solanacea, Aristolochia indica* , *Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata, Celastrus paniculatus* , *Cinnamomum bejolghota* , *Dioscorea pentaphylla, Litsea glutinosa, Pterocarpus acerifolius*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* showing maximum SDI.

8.2.18. Postmonsoon Shrub layer of Bubhuram Beat (Annex. XXXVI)

Mikania micrantha (100.00) emerged with highest frequency in Postmonsoon shrub layer in Budhuram Beat and followed by *Chromolaena odorata* (94.44), *Ichnocarpus frutescens* (88.89), *Syzygium tetragona* (88.89), *Croton caudatus* (83.33) etc. Similarly highest abandance presented *Chromolaena odorata* (12.76) then followed by *Ichnocarpus frutescens* (12.31), *Mikania micrantha* (11.89), *Tetrastigma serrulatum* (8.93), *Merremia vitifolia* (7.54), *Natsiatum herpeticum* (7.53) etc. However highest density recorded against *Chromolaena odorata* (12.06) followed by *Mikania micrantha* (11.89), *Ichnocarpus frutescens* (10.94), *Tetrastigma serrulatum* (7.44), *Natsiatum herpeticum* (6.28) etc. Highest IVI during pre-monsoon season has been recorded by *Chromolaena odorata* (25.76), *Mikania micrantha* (25.27), *Ichnocarpus frutescens* (24.03), *Tetrastigma serrulatum* (17.86) etc (Table 8.141 – 8.144).

Table 8.141. Top ten Frequency and relative frequency of Postmonsoon Shrub layer of Budhuram

Name of the plants	F	RF
Mikania micrantha	100.00	4.99
Chromolaena odorata	94.44	4.71
Ichnocarpus frutescens	88.89	4.43
Syzygium tetragona	88.89	4.43
Croton caudatus	83.33	4.16
Natsiatum herpeticum	83.33	4.16

Name of the plants	F	RF
Tetrastigma serrulatum	83.33	4.16
Deeringia amaranthoides	77.78	3.88
Litsea glutinosa	77.78	3.88
Glycosmis pentaphylla	72.22	3.60

Table 8.142. Top ten Abandance and relative abandance of Postmonsoon Shrub layer of Budhuram

Name of the plants	A	RA
Chromolaena odorata	12.76	8.61
Ichnocarpus frutescens	12.31	8.30
Mikania micrantha	11.89	8.02
Tetrastigma serrulatum	8.93	6.02
Merremia vitifolia	7.54	5.08
Natsiatum herpeticum	7.53	5.08
Actinodaphne obovata	7.10	4.79
Sorindeia madagascariensis	7.00	4.72
Croton caudatus	6.47	4.36
Bridelia retusa	5.33	3.60

Table 8.143. Top ten Density and relative density of Postmonsoon Shrub layer of Budhuram

Name of the plants	D	RD
Chromolaena odorata	12.06	12.44
Mikania micrantha	11.89	12.27
Ichnocarpus frutescens	10.94	11.30
Tetrastigma serrulatum	7.44	7.68
Natsiatum herpeticum	6.28	6.48
Merremia vitifolia	5.44	5.62
Croton caudatus	5.39	5.56
Actinodaphne obovata	3.94	4.07
Argyreia roxburghii	3.50	3.61
Bridelia retusa	2.67	2.75

Table 8.144. Top ten IVI of Postmonsoon Shrub layer of Budhuram

Name of the plants	RF	RA	RD	IVI
Chromolaena odorata	4.71	8.61	12.44	25.76
Mikania micrantha	4.99	8.02	12.27	25.27
Ichnocarpus frutescens	4.43	8.30	11.30	24.03
Tetrastigma serrulatum	4.16	6.02	7.68	17.86
Natsiatum herpeticum	4.16	5.08	6.48	15.71
Merremia vitifolia	3.60	5.08	5.62	14.30
Croton caudatus	4.16	4.36	5.56	14.08
Actinodaphne obovata	2.77	4.79	4.07	11.63
Argyreia roxburghii	3.32	3.54	3.61	10.48
Bridelia retusa	2.49	3.60	2.75	8.84

Aglaia spectabilis, *Alstonia scholaris*, *Aristolochia indica*, *Bauhinia purpurea* , *Caesalpinia cucullata, Cinnamomum bejolghota*, *Deeringia amaranthoides, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Glycosmis pentaphylla, Litsea glutinosa, Morinda angustifolia, Neolamarckia cadamba, Pericampylus glaucus, Phlogacanthus thyrsiformis* , *Pterocarpus acerifolius*, *Pueraria sikkimensis*,

Sloanea sterculiacea, *Smilax zeylanica, Sorindeia madagascariensis, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* showing maximum SDI.

Fig. 8.6. showing diversity and species richness of Shrubs of the post monsoon vegetation of Gorumara National Park. Magalef index showing high R^2 Value.

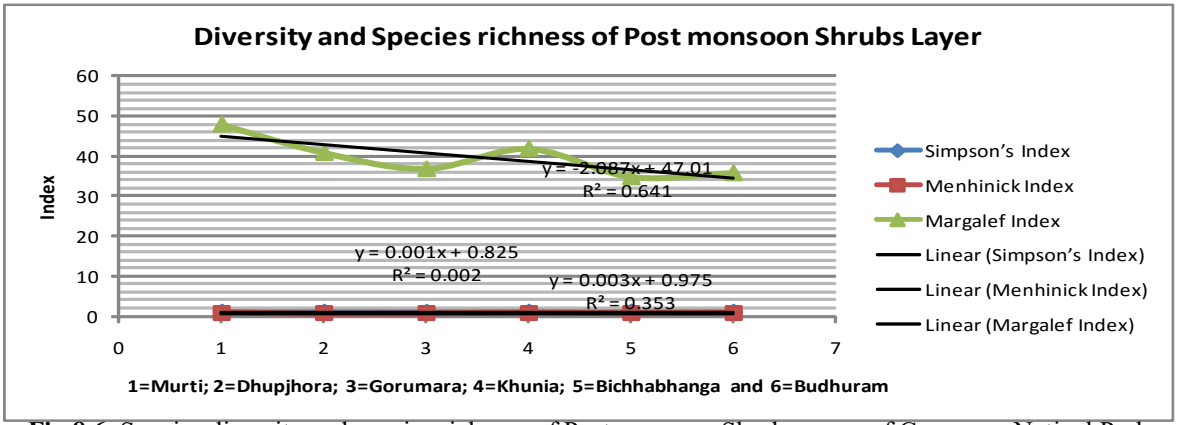

Fig.8.6. Species diversity and species richness of Post monsoon Shrubs cover of Gorumara Natinal Park

8.3.1. Canopy cover of Murti Beat (Annex. XXXVII)

Actinidaphne obovata (100.00) emerged with highest frequency in Canopy cover of Murti Beat and followed by *Albizia chinensis* (100.00), *Amoora walichii* (100.00), *Casaeria vareca* (100.00), *Litsea glutinosa* (100.00), *Shorea robusta* (100.00) etc. Similarly highest abandance presented *Shorea robusta* (21.00) then followed by *Litsea glutinosa* (13.39), *Casaeria vareca* (9.94), *Alstonia scholaris* (9.19), *Tectona grandis* (8.60), *Albizia chinensis* (8.50) etc. However highest density recorded against *Shorea robusta* (21.00) followed by *Litsea glutinosa* (13.39), *Casaeria vareca* (9.94), *Albizia chinensis* (8.50), *Alstonia scholaris* (8.17) etc. Highest IVI has been recorded by *Shorea robusta* (34.67), *Litsea glutinosa* (23.58), *Casaeria vareca* (18.56), *Albizia chinensis* (16.45) etc (Table 8.145 – 8.148).

Table 8.145. Top ten Frequency and relative frequency of Canopy cover of Murti

Name of the species	F	RF
Actinidaphne obovata	100.00	4.06
Albizia chinensis	100.00	4.06
Amoora walichii	100.00	4.06
Casaeria vareca	100.00	4.06
Litsea glutinosa	100.00	4.06
Shorea robusta	100.00	4.06
Albizia lucidior	100.00	4.06
Alangium chinensis	94.44	3.84
Alstonia scholaris	88.89	3.61
Gmelina arborea	88.89	3.61

Table 8.146. Top ten Abandance and relative abandance of Canopy cover of Murti

Name of the species	A	RA
Shorea robusta	21.00	13.65
Litsea glutinosa	13.39	8.70
Casaeria vareca	9.94	6.47
Alstonia scholaris	9.19	5.97

Name of the species	A	RA
Tectona grandis	8.60	5.59
Albizia chinensis	8.50	5.53
Albizia lucidior	6.83	4.44
Trewia nudiflora	6.83	4.44
Sizygium cumini	6.06	3.94
Amoora walichii	5.28	3.43

Table 8.147. Top ten Density and relative density of Canopy cover of Murti

Name of the species	D	RD
Shorea robusta	21.00	16.95
Litsea glutinosa	13.39	10.81
Casaeria vareca	9.94	8.03
Albizia chinensis	8.50	6.86
Alstonia scholaris	8.17	6.59
Albizia lucidior	6.83	5.52
Sizygium cumini	5.39	4.35
Amoora walichii	5.28	4.26
Trewia nudiflora	4.56	3.68
Actinidaphne obovata	4.33	3.50

Table 8.148. Top ten IVI of Canopy cover of Murti

Name of the species	RF	RA	RD	IVI
Shorea robusta	4.06	13.65	16.95	34.67
Litsea glutinosa	4.06	8.70	10.81	23.58
Casaeria vareca	4.06	6.47	8.03	18.56
Albizia chinensis	4.06	5.53	6.86	16.45
Alstonia scholaris	3.61	5.97	6.59	16.18
Albizia lucidior	4.06	4.44	5.52	14.02
Sizygium cumini	3.61	3.94	4.35	11.90
Amoora walichii	4.06	3.43	4.26	11.75
Trewia nudiflora	2.71	4.44	3.68	10.83
Actinidaphne obovata	4.06	2.82	3.50	10.38

Aglaia perviridis, Ailanthus excels, Albizia lebeck, Aphanamixis polystachya, Artocarpus chaplasa, Artocarpus heterophyllus, Bauhinia purpuria, Bombax Ceiba, Bridelia retusa, Cassia fistula, Castanopsis indica , Dalbergia sisoo, Ficus benghalensis, Gmelina arborea, Lagerstroemia hypoluca, Leea aquata, Mayna spinosa, Michelia champaca, Polyalthia simiarum, Sena siamia, Sizygium operculatum, Tectona grandis, Terminalia belirica, Terminalia myriocarpa and *Toona ciliate* showing maximum SDI.

8.3.2. Canopy cover of Dhupjhora Beat (Annex. XXXVIII)

Alangium chinensis (100.00) emerged with highest frequency in Canopy cover of Dhupjhora Beat and followed by *Albizia chinensis* (100.00), *Alstonia scholaris* (100.00), *Casaeria vareca* (100.00), *Dendrocnide sinuta* (100.00) etc (Table 8.186). Similarly highest abandance presented *Shorea robusta* (26.86) then followed by *Trewia nudiflora* (24.43), *Litsea glutinosa* (18.93), *Casaeria vareca* (16.50), *Dendrocnide sinuta* (13.07), *Albizia chinensis* (11.64) etc. However highest density recorded against *Shorea robusta* (26.86) followed by *Litsea glutinosa* (18.93), *Casaeria vareca* (16.50), *Dendrocnide sinuta* (13.07), *Albizia chinensis* (11.64) etc. Highest IVI has been recorded by *Shorea robusta* (28.69), *Litsea glutinosa* (21.77), *Casaeria vareca* (19.65), *Dendrocnide sinuta* (16.65) etc (Table 8.149 – 8.152).

Table 8.149. Top ten Frequency and relative frequency of Canopy cover of Dhupjhora

Name of the Species	F	RF
Alangium chinensis	100.00	5.24
Albizia chinensis	100.00	5.24
Alstonia scholaris	100.00	5.24
Casaeria vareca	100.00	5.24
Dendrocnide sinuta	100.00	5.24
Litsea glutinosa	100.00	5.24
Shorea robusta	100.00	5.24
Sizygium cumini	100.00	5.24
Trewia nudiflora	100.00	5.24
Actinidaphne obovata	92.86	4.87

Table 8.150. Top ten Abandance and relative abandance of Canopy cover of Dhupjhora

Name of the Species	A	RA
Shorea robusta	26.86	9.97
Trewia nudiflora	24.43	9.07
Litsea glutinosa	18.93	7.03
Casaeria vareca	16.50	6.13
Dendrocnide sinuta	13.07	4.85
Albizia chinensis	11.64	4.32
Trewia nudiflora	10.17	3.77
Alstonia scholaris	9.71	3.61
Bridelia retusa	9.60	3.56
Sizygium cumini	9.07	3.37

Table 8.151. Top ten Density and relative density of Canopy cover of Dhupjhora

Name of the Species	D	RD
Shorea robusta	26.86	13.47
Trewia nudiflora	24.43	12.25
Litsea glutinosa	18.93	9.49
Casaeria vareca	16.50	8.28
Dendrocnide sinuta	13.07	6.56
Albizia chinensis	11.64	5.84
Alstonia scholaris	9.71	4.87
Sizygium cumini	9.07	4.55
Alangium chinensis	8.43	4.23
Lagerstroemia hypoluca	6.64	3.33

Table 8.152. Top ten IVI of Canopy cover of Dhupjhora

Name of the Species	RF	RA	RD	IVI
Shorea robusta	5.24	9.97	13.47	28.69
Trewia nudiflora	5.24	9.07	12.25	26.57
Litsea glutinosa	5.24	7.03	9.49	21.77
Casaeria vareca	5.24	6.13	8.28	19.65
Dendrocnide sinuta	5.24	4.85	6.56	16.65
Albizia chinensis	5.24	4.32	5.84	15.41
Alstonia scholaris	5.24	3.61	4.87	13.72
Sizygium cumini	5.24	3.37	4.55	13.16
Alangium chinensis	5.24	3.13	4.23	12.60
Actinidaphne obovata	4.87	2.63	3.30	10.79

Aglaia perviridis, Albizia lebeck, Amoora walichii, Artocarpus chaplasa, Bauhinia purpuria, Bombax ceiba, Bridelia retusa, Cassia fistula, Dalbergia sisoo, Ficus benghalensis, Gmelina arborea, Leea guinens, Mayna spinosa, Polyalthia simiarum, Sizygium operculatum, Tectona grandis, Terminalia belirica, Terminalia myriocarpa, Toona ciliate and *Trewia nudiflora* presenting maximum SDI.

8.3.3. Canopy cover of Gorumara Beat (Annex. XXXIX)

Actinodaphne obovata (100.00) emerged with highest frequency in Canopy cover of Gorumara Beat and followed by *Mallotus philippensis* (100.00), *Shorea robusta* (100.00), *Syzygium tetragona* (93.33), *Aphanamixis polystachya* (86.67) etc. Similarly highest abandance presented *Dendrocnide sinuta* (22.09) then followed by *Shorea robusta* (21.00), *Ficus hispida* (19.57), *Dillenia pentagyna* (13.50), *Alangium chinense* (11.42), *Syzygium tetragona* (10.93) etc. However highest density recorded against *Shorea robusta* (21.00) followed by *Dendrocnide sinuta* (16.20), *Dillenia pentagyna* (10.80), *Mallotus philippensis* (10.53), *Syzygium tetragona* (10.20) etc. Highest IVI has been recorded by *Shorea robusta* (24.60), *Dendrocnide sinuta* (21.03), *Dillenia pentagyna* (15.00), *Ficus hispida* (14.79) etc (Table 8.153 – 8.156).

Table 8.153. Top ten Frequency and relative frequency of Canopy cover of Gorumara

Name of the species	F	RF
Actinodaphne obovata	100.00	4.64
Mallotus philippensis	100.00	4.64
Shorea robusta	100.00	4.64
Syzygium tetragona	93.33	4.33
Aphanamixis polystachya	86.67	4.02
Bombax ceiba	86.67	4.02
Dillenia indica	86.67	4.02
Toona ciliata	86.67	4.02
Alangium chinense	80.00	3.72
Cinnamomum bejolghota	80.00	3.72

Table 8.154. Top ten Abandance and relative abandance of Canopy cover of Gorumara

Name of the species	A	RA
Dendrocnide sinuta	22.09	8.34
Shorea robusta	21.00	7.93
Ficus hispida	19.57	7.39
Dillenia pentagyna	13.50	5.10
Alangium chinense	11.42	4.31
Syzygium tetragona	10.93	4.13
Tectona grandis	10.71	4.04
Mallotus philippensis	10.53	3.98
Dillenia indica	9.77	3.69
Albizia chinensis	8.86	3.34

Table 8.155. Top ten Density and relative density of Canopy cover of Gorumara

Name of the species	D	RD
Shorea robusta	21.00	12.03
Dendrocnide sinuta	16.20	9.28
Dillenia pentagyna	10.80	6.19
Mallotus philippensis	10.53	6.04
Syzygium tetragona	10.20	5.84
Alangium chinense	9.13	5.23
Ficus hispida	9.13	5.23

Name of the species	D	RD
Dillenia indica	8.47	4.85
Aphanamixis polystachya	7.47	4.28
Toona ciliata	5.47	3.13

Table 8.156. Top ten IVI of Canopy cover of Gorumara

Name of the species	RF	RA	RD	IVI
Shorea robusta	4.64	7.93	12.03	24.60
Dendrocnide sinuta	3.41	8.34	9.28	21.03
Dillenia pentagyna	3.72	5.10	6.19	15.00
Ficus hispida	2.17	7.39	5.23	14.79
Mallotus philippensis	4.64	3.98	6.04	14.66
Syzygium tetragona	4.33	4.13	5.84	14.30
Alangium chinense	3.72	4.31	5.23	13.26
Dillenia indica	4.02	3.69	4.85	12.56
Aphanamixis polystachya	4.02	3.25	4.28	11.55
Toona ciliata	4.02	2.38	3.13	9.54

Actinodaphne sikkimensis, Aglaia spectabilis, Artocarpus lakoocha, Bauhinia purpurea, Bombax ceiba, Dalbergia sissoo, Ficus benghalensis, Gmelina arborea, Holarrhena pubescens, Lagerstroemia hirsuta, Lagerstroemia speciosa, Litsea elongate, Litsea monopetala, Meyna spinosa, Neolamarckia cadamba, Premna latifolia, Streblus asper, Terminalia bellirica and *Terminalia myriocarpa* showing maximum SDI.

8.3.4. Canopy cover of Khunia Beat (Annex. XL)

Alstonia scholaris (100.00) emerged with highest frequency in Canopy cover of Khunia Beat and followed by *Casaeria vareca* (100.00), *Dendrocnide sinuta* (100.00), *Litsea glutinosa* (100.00), *Shorea robusta* (100.00) etc (Table 8.196). Similarly highest abandance presented *Alangium chinensis* (23.44) then followed by *Dendrocnide sinuta* (23.30), *Alstonia scholaris* (23.10), *Litsea glutinosa* (21.40), *Lagerstroemia hirsuta* (15.22), *Actinidaphne obovata* (13.20) etc (Table 8.197). However highest density recorded against *Albizia lucidior* (28.30) followed by *Dendrocnide sinuta* (23.30), *Alstonia scholaris* (23.10), *Shorea robusta* (21.80), *Litsea glutinosa* (21.40) etc. Highest IVI has been recorded by *Albizia lucidior* (25.39), *Dendrocnide sinuta* (21.73), *Alstonia scholaris* (21.59), *Shorea robusta* (20.64) etc (Table 8.157 – 8.160).

Table 8.157. Top ten Frequency and relative frequency of Canopy cover of Khunia

Neame of the species	F	RF
Alstonia scholaris	100.00	4.72
Casaeria vareca	100.00	4.72
Dendrocnide sinuta	100.00	4.72
Litsea glutinosa	100.00	4.72
Shorea robusta	100.00	4.72
Albizia lucidior	100.00	4.72
Alangium chinensis	90.00	4.25
Bombax Ceiba	90.00	4.25
Lagerstroemia hirsuta	90.00	4.25
Trewia nudiflora	90.00	4.25

Table 8.158. Top ten Abandance and relative abandance of Canopy cover of Khunia

Neame of the species	A	RA
Alangium chinensis	23.44	7.69
Dendrocnide sinuta	23.30	7.64
Alstonia scholaris	23.10	7.57
Litsea glutinosa	21.40	7.02
Lagerstroemia hirsuta	15.22	4.99
Actinidaphne obovata	13.20	4.33
Gmelina arborea	10.50	3.44
Trewia nudiflora	9.00	2.95
Litsea monopetala	8.38	2.75
Albizia chinensis	6.00	1.97

Table 8.159. Top ten Density and relative density of Canopy cover of Khunia

Neame of the species	D	RD
Albizia lucidior	28.30	11.39
Dendrocnide sinuta	23.30	9.38
Alstonia scholaris	23.10	9.30
Shorea robusta	21.80	8.78
Litsea glutinosa	21.40	8.62
Alangium chinensis	21.10	8.49
Tectona grandis	16.50	6.64
Lagerstroemia hirsuta	13.70	5.52
Casaeria vareca	11.90	4.79
Trewia nudiflora	8.10	3.26

Table 8.160. Top ten IVI of Canopy cover of Khunia

Neame of the species	RF	RA	RD	IVI
Albizia lucidior	4.72	9.28	11.39	25.39
Dendrocnide sinuta	4.72	7.64	9.38	21.73
Alstonia scholaris	4.72	7.57	9.30	21.59
Shorea robusta	4.72	7.15	8.78	20.64
Alangium chinensis	4.25	7.69	8.49	20.42
Litsea glutinosa	4.72	7.02	8.62	20.35
Tectona grandis	3.77	6.76	6.64	17.18
Lagerstroemia hirsuta	4.25	4.99	5.52	14.75
Casaeria vareca	4.72	3.90	4.79	13.41
Trewia nudiflora	4.25	2.95	3.26	10.46

Aegle marmelos, Albizia chinensis, Albizia lebeck, Amoora walichii, Aphanamixis polystachya, Artocarpus heterophyllus, Bauhinia purpuria, Bombax ceiba, Cassia fistula, Cassia siamia, Combretum decandrum, Dalbergia sisoo, Ficus benghalensis, Gmelina arborea, Michelia champaca, Neolamarckia kadamba, Polyalthia simiarum, Terminalia belirica, Terminalia myriocarpa and *Toona ciliate* has been shown maximum SDI.

8.3.5. Canopy cover of Bichhabhanga Beat (Annex. XLI)

Casaeria vareca (100.00) emerged with highest frequency in Canopy cover of Bichhabhanga Beat and followed by *Lagerstroemia hirsuta* (100.00), *Shorea robusta* (100.00), *Sizygium cumini* (100.00) etc. Similarly highest abandance presented *Shorea robusta* (28.30) then followed by *Alangium chinensis* (22.88), *Lagerstroemia hirsuta* (21.70), *Casaeria vareca* (19.80) etc. However highest density recorded against *Shorea robusta* (28.30) followed by *Lagerstroemia hirsuta* (21.70), *Casaeria*

vareca (19.80), *Alangium chinensis* (18.30) etc. Highest IVI has been recorded by *Shorea robusta* (30.62), *Lagerstroemia hirsuta* (24.77), *Casaeria vareca* (23.09), *Alangium chinensis* (22.40) etc (Table 8.161 – 8.164).

Table 8.161. Top ten Frequency and relative frequency of Canopy cover of Bichhbhanga

Name of the species	F	RF
Casaeria vareca	100.00	5.56
Lagerstroemia hirsuta	100.00	5.56
Shorea robusta	100.00	5.56
Sizygium cumini	100.00	5.56
Albizia lucidior	100.00	5.56
Neolamarckia kadamba	90.00	5.00
Alangium chinensis	80.00	4.44
Alstonia scholaris	80.00	4.44
Bombax Ceiba	80.00	4.44
Mayna spinosa	80.00	4.44

Table 8.162. Top ten Abandance and relative abandance of Canopy cover of Bichhabhanga

Name of the species	A	RA
Shorea robusta	28.30	10.82
Alangium chinensis	22.88	8.75
Lagerstroemia hirsuta	21.70	8.30
Casaeria vareca	19.80	7.57
Albizia lucidior	18.90	7.23
Dendrocnide sinuta	18.25	6.98
Sizygium cumini	12.20	4.67
Aphanamixis polystachya	11.29	4.32
Alstonia scholaris	10.38	3.97
Neolamarckia kadamba	9.67	3.70

Table 8.163. Top ten Density and relative density of Canopy cover of Bichhabhanga

Name of the species	D	RD
Shorea robusta	28.30	14.24
Lagerstroemia hirsuta	21.70	10.92
Casaeria vareca	19.80	9.96
Albizia lucidior	18.90	9.51
Alangium chinensis	18.30	9.21
Sizygium cumini	12.20	6.14
Neolamarckia kadamba	8.70	4.38
Alstonia scholaris	8.30	4.18
Aphanamixis polystachya	7.90	3.97
Bombax Ceiba	7.30	3.67

Table 8.164. Top ten IVI of Canopy cover of Bichhabhanga

Name of the species	RF	RA	RD	IVI
Shorea robusta	5.56	10.82	14.24	30.62
Lagerstroemia hirsuta	5.56	8.30	10.92	24.77
Casaeria vareca	5.56	7.57	9.96	23.09
Alangium chinensis	4.44	8.75	9.21	22.40

Name of the species	RF	RA	RD	IVI
Albizia lucidior	5.56	7.23	9.51	22.29
Sizygium cumini	5.56	4.67	6.14	16.36
Neolamarckia kadamba	5.00	3.70	4.38	13.07
Dendrocnide sinuta	2.22	6.98	3.67	12.87
Alstonia scholaris	4.44	3.97	4.18	12.59
Aphanamixis polystachya	3.89	4.32	3.97	12.18

Albizia chinensis, Albizia lebeck, Amoora walichii, Artocarpus chaplasa, Bauhinia purpuria, Cassia fistula, Dalbergia sisoo, Ficus benghalensis, Ficus religiosa, Gmelina arborea, Leea guinensis, Mayna spinosa, Michelia champaca, Terminalia belirica, Terminalia myriocarpa, Toona ciliate and *Trewia nudiflora* showing highiest SDI.

8.3.6. Canopy cover of Budhuram Beat (Annex. XLII)

Alstonia scholaris (100.00) emerged with highest frequency in Canopy cover of Budhuram Beat and followed by *Casaeria glomerata* (100.00)*, Casaeria vareca* (100.00)*, Shorea robusta* (100.00)*, Sizygium cumini* (100.00) etc. Similarly highest abandance presented *Shorea robusta* (34.89) then followed by *Albizia lucidior* (30.89), *Casaeria vareca* (23.78), *Sizygium cumini* (14.67), *Alangium chinensis* (14.13), *Tectona grandis* (12.25) etc. However highest density recorded against *Shorea robusta* (34.89) followed by *Albizia lucidior* (30.89), *Casaeria vareca* (23.78), *Sizygium cumini* (14.67), *Alangium chinensis* (12.56) etc. Highest IVI has been recorded by *Shorea robusta* (30.28)*, Albizia lucidior* (27.32)*, Casaeria vareca* (22.05)*, Sizygium cumini* (15.30) etc (Table 8.165 – 8.168).

Table 8.165. Top ten Frequency and relative frequency of Canopy cover of Budhuram

Name of the species	F	RF
Alstonia scholaris	100.00	4.43
Casaeria glomerata	100.00	4.43
Casaeria vareca	100.00	4.43
Shorea robusta	100.00	4.43
Sizygium cumini	100.00	4.43
Albizia lucidior	100.00	4.43
Alangium chinensis	88.89	3.94
Dendrocnide sinuta	88.89	3.94
Lagerstroemia hirsuta	88.89	3.94
Litsea monopetala	88.89	3.94

Table 8.166. Top ten Abandance and relative abandance of Canopy cover of Budhuram

Name of the species	A	RA
Shorea robusta	34.89	11.74
Albizia lucidior	30.89	10.40
Casaeria vareca	23.78	8.00
Sizygium cumini	14.67	4.94
Alangium chinensis	14.13	4.75
Tectona grandis	12.25	4.12
Litsea monopetala	11.13	3.74
Dendrocnide sinuta	10.88	3.66
Lagerstroemia hirsuta	10.88	3.66
Toona ciliata	10.71	3.61

Table 8.167. Top ten Density and relative density of Canopy cover of Budhuram

Name of the species	D	RD
Shorea robusta	34.89	14.11
Albizia lucidior	30.89	12.49
Casaeria vareca	23.78	9.61
Sizygium cumini	14.67	5.93
Alangium chinensis	12.56	5.08
Tectona grandis	10.89	4.40
Alstonia scholaris	9.89	4.00
Litsea monopetala	9.89	4.00
Casaeria glomerata	9.67	3.91
Dendrocnide sinuta	9.67	3.91

Table 8.168. Top ten IVI of Canopy cover of Budhuram

Name of the species	RF	RA	RD	IVI
Shorea robusta	4.43	11.74	14.11	30.28
Albizia lucidior	4.43	10.40	12.49	27.32
Casaeria vareca	4.43	8.00	9.61	22.05
Sizygium cumini	4.43	4.94	5.93	15.30
Alangium chinensis	3.94	4.75	5.08	13.77
Tectona grandis	3.94	4.12	4.40	12.47
Alstonia scholaris	4.43	3.33	4.00	11.76
Litsea monopetala	3.94	3.74	4.00	11.68
Casaeria glomerata	4.43	3.25	3.91	11.60
Dendrocnide sinuta	3.94	3.66	3.91	11.51

Albizia chinensis, Amoora walichii, Aphanamixis polystachya, Artocarpus chaplasa, Bauhinia variegate, Bombax ceiba, Cassia siamia, Chukrasia tabularis, Combretum decandrum, Dalbergia sisoo, Ficus benghalensis, Gmelina arborea, Leea aquata, Litsea glutinosa, Mangifera indica, Neolamarckia kadamba, Sizygium operculatum and *Terminalia myriocarpa* presenting maximum SDI.

Fig. 8.7. showing diversity and species richness of the canopy covers of Gorumara National Park. Magalef index showing high R^2 Value.

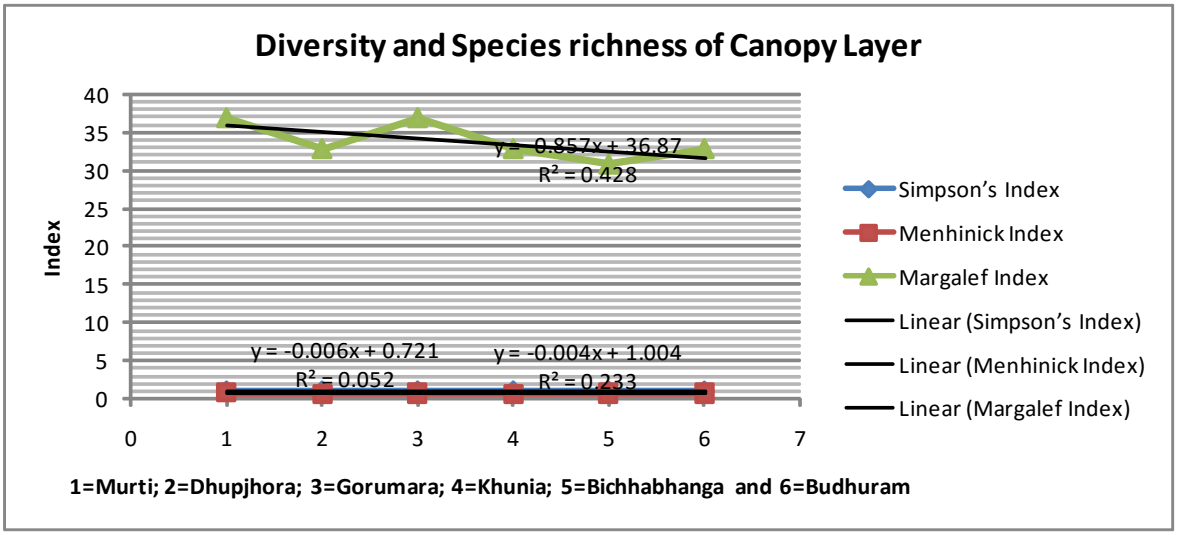

Fig.8.7. Species diversity and species richness of Canopy cover of Gorumara Natinal Park

8.4 Conclusion

Premonsoon ground covers of GNP

In premonsoon ground covers, *Commelina sufruticosa* (95.54) emerged with highest frequency in Murti where, *Ichnocarpus frutescens* (92.86) leads the frequency in Dhupjhora. *Axonopus compressus* (97.33) presented maximum frequency in Gorumara, *Pupalia lappacea* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Ageratum conyzoides* (97.78) in Budhuram. *Achyrospermum wallichianum, Diplazium esculentum, Oplismenus burmannii, Ageratum conyzoides, Pronephreum nudatum, Chromolaena odorata* etc presented very high frequency in all over the study areas.

Similarly highest abandance presented in Murti by *Centella asiatica* (6.47). where, *Axonopus compressus* (6.12) presented maximum abundance in Dhupjhora, *Elatostema monandrum* (5.17) in Gorumara, *Ichnocarpus frutescens* (3.46) in Khunia, *Globba racemosa* (11.92) in Bichhabhanga, *Molineria capitulata* (6.00) in Budhuram. Other species shows maximum abundance in all over the study areas are *Dryopteris sikkimensis, Ageratum conyzoides, Chloranthus erectus, Oplismenus burmannii, Diplazium esculentum, Clerodendrum infortunatum*, *Coffea benghalensis* etc.

Oplismenus burmannii (2.10) presented maximum density in Murti where, maximum density of Dhupjhora presented by *Axonopus compressus* (3.59), *Elatostema monandrum* (2.89) in Gorumara, *Ichnocarpus frutescens* (3.18) in Khunia, *Elatostema monandrum* (3.94) in Bichhabhanga and in Budhuram by *Chloranthus erectus* (4.87). other species which were presented a interesting density values in allover the study areas are *Lepidagathis incurve, Ageratum conyzoides, Mikania micrantha, Pronephreum nudatum etc.*

Murti Beat presented a maximum IVI values by *Oplismenus burmannii* (15.04)*, Centella asiatica* (12.97)*, Natsiatum herpeticum* (12.27)*, Pronephreum nudatum* (12.11) etc. where Dhupjhora by *Axonopus compressus* (3.40)*, Ichnocarpus frutescens* (5.39)*, Dryopteris sikkimensis* (4.39)*, Achyrospermum wallichianum* (4.89) etc. Gorumara presented by *Elatostema monandrum* (21.44)*, Diplazium esculentum* (19.24)*, Axonopus compressus* (19.13)*, Lepidagathis incurva* (17.84) etc, Khunia by *Ichnocarpus frutescens* (20.19)*, Pupalia lappacea* (16.34)*, Axonopus compressus* (15.46)*, Acmella calva* (14.20) etc, Bichhabhanga by *Globba racemosa* (24.50)*, Elatostema monandrum* (20.43)*, Ageratum conyzoides* (20.35)*, Acmella calva* (17.09) etc. and *Chloranthus erectus* (23.15)*, Ageratum conyzoides* (19.71)*, Axonopus compressus* (18.52)*, Mikania micrantha* (16.49) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas.

Similarly, a few number of species like *Chloranthus erectus, Pupalia lappacea, Rungia pectinata, Achyrospermum wallichianum , Elatostema monandrum, Persicaria chinensis, Commelina sufruticosa, Floscopa scandens, Natsiatum herpeticum, Achyranthes bidentata, Alternantheara philoxeroides, Clerodendrum infortunatum , Coffea benghalensis, Pronephreum nudatum, Anisomeles indica, Axonopus compressus, Cyperus compressus, Dicliptera bupleuroides, Elephantopus scaber, Euphorbia hirta, Ichnocarpus frutescens, Oplismenus burmannii* etc presented the maximum SDI value.

Simpson's Index (EH) maximum recorded in Murti by *Acacia pennata* (56.59), Dhupjhora by *Pronephreum nudatum* (161.6562), Gorumara by *Achyrospermum wallichianum* (59.79836), Khunia by *Acacia pennata* (116.6408), Bichhabhanga by *Achyranthes bidentata* (86.55733), and in Budhuram by *Anisomeles indica* (154.678). other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Clerodendrum infortunatum, Coffea benghalensis, Commelina diffusa, Synedrella nodiflora, Persicaria chinensis*etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 0.571629, Dhupjhoran 0.510899, Gorumara 0.465165, Khunia 0.655970, Bichhabhanga 0.631930 and Budhuram 0.564817. Similarly Murti Beat presented the Margalef

Richness Index (RI) 30.8748, where, Dhupjhora 28.8762, Gorumara 23.8732, Khunia 27.8668, Bichhabhanga 28.8693 and Budhram 25.8694.

Monsoon ground covers of GNP

In monsoon ground covers, *Axonopus compressus* (98.89) emerged with highest frequency in Murti where, *Achyrospermum wallichianum* (97.14) in Dhupjhora, *Ageratum conyzoides* (94.67) in Gorumara, *Coffea benghalensis* (96.00) in Khunia, *Ageratum conyzoides* (96.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Commelina sufruticosa, Mikania micrantha, Oxalis corniculata, Oplismenus burmannii, Ichnocarpus frutescens, Elatostema monandrum, Cyperus cyperoides, Chromolaena odorata* etc.

Similarly highest abundance presented in Murti by *Duchesnea indica* (6.23), *Mikania micrantha* (4.73) in Dhupjhora, *Acacia pennata* (1.90) in Gorumara, *Achyrospermum wallichianum* (5.52) in Khunia and (19.50) in Bichhabhanga and *Oplismenus compositus* (6.45) in Budhuram. Other few species also prented maximum abundance in allover the atudy areas are *Acmella calva, Pupalia lappacea, Clerodendrum infortunatum*, *Dryopteris sikkimensis, Chloranthus erectus, Natsiatum herpeticum, Drymaria cordata, Chromolaena odorata*, *Acmella calva, Axonopus compressus, Oxalis corniculata, Coffea benghalensis* etc.

Acmella calva (3.77) presented highiest density in Murti, while, *Mikania micrantha* (4.53) in Dhupjhora, *Axonopus compressus* (2.88) in Gorumara, *Achyrospermum wallichianum* (5.08) in Khunia, *Achyrospermum wallichianum* (4.68) in Bichhabhanga and *Oplismenus compositus* (5.44) in Budhuram presented highiest density. Other associated species which have a interesting density are *Oplismenus burmannii* (3.50), *Chloranthus erectus* (2.98), *Natsiatum herpeticum* (2.97), *Ichnocarpus frutescens, Piper sylvaticum, Pronephreum nudatum, Ageratum conyzoides* etc.

During monsoon season, *Acmella calva* (15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *Chloranthus erectus* (13.02) etc. presented maximum IVI in Murti, but, *Mikania micrantha* (17.06), *Achyrospermum wallichianum* (13.13), *Piper sylvaticum* (13.05), *Oplismenus burmannii* (12.16) etc. in Dhupjhora, *Axonopus compressus* (17.20), *Achyrospermum wallichianum* (16.14), *Spermacoce alata* (13.56), *Mikania micrantha* (13.16) etc. in Gorumara, *Achyrospermum wallichianum* (22.30), *Axonopus compressus* (16.85), *Ichnocarpus frutescens* (13.91), *Pronephreum nudatum* (13.91) etc. in Khunia, *Achyrospermum wallichianum* (30.48), *Elatostema monandrum* (13.69), *Piper sylvaticum* (12.71), *Ageratum conyzoides* (12.22) etc. in Bichhabhanga and *Oplismenus compositus* (18.86), *Elatostema monandrum* (17.03), *Chloranthus erectus* (15.35), *Pronephreum nudatum* (14.52) etc. in Budhuram recorded maximum IVI.

Few common species like *Acacia pennata, Achyrospermum wallichianum* , *Clerodendrum infortunatum* , *Clerodendrum infortunatum* , *Cryptolepis dubia* , *Drymaria cordata, Elatostema monandrum, Floscopa scandens, Ichnocarpus frutescens, Molineria capitulate, Phlogacanthus thyrsiformis* , *Rungia pectinata, Synedrella nodiflora, Tetrastigma serrulatum, Axonopus compressus, Boehmeria glomerulifera, Coffea benghalensis, Cyanthillium cinereum* , *Duchesnea indica, Persicaria chinensis, Spermacoce alata* , *Synedrella nodiflora* , *Youngia japonica*, *Oxalis corniculata, Amerimnon stipulatum* , *Synedrella nodiflora* etc showing maximum SDI in allover the study areas.

Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata* (63.94906), Dhupjhora by *Youngia japonica* (211.7118), Gorumara by *Molineria capitulata* (133.4294), Khunia by *Amerimnon stipulatum* (187.9153), Bichhabhanga by *Drymaria cordata* (124.1942), and in Budhuram by *Achyranthes bidentata* (212.4392). Other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Clerodendrum infortunatum, Coffea benghalensis, Commelina diffusa, Synedrella nodiflora, Persicaria chinensis*etc. *Acacia pennata, Achyrospermum wallichianum, Molineria capitulate, Boehmeria glomerulifera, Youngia japonica,* Floscopa *scandens, Duchesnea indica, Synedrella nodiflora* etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 0.460650, Dhupjhoran 0.541158, Gorumara 0.553660, Khunia 0.617780, Bichhabhanga 0.670355 and Budhuram 0.639351. Similarly Murti Beat presented the Margalef Richness Index (RI) 32.8829, where, Dhupjhora 34.8801, Gorumara 29.8748, Khunia 30.8723, Bichhabhanga 34.8736 and Budhram 33.8742.

Postmonsoon ground covers of GNP

In Postmonsoon ground covers, *Axonopus compressus* (98.89, 97.33) emerged with highest frequency in Murti, Gorumara where, *Ichnocarpus frutescens* (97.14) in Dhupjhora, *Coffea benghalensis* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Commelina sufruticosa, Mikania micrantha, Chloranthus erectus, Dryopteris sikkimensis, Oxalis corniculata, Oplismenus burmannii, Ichnocarpus frutescens, Elatostema monandrum, Sauropus quadrangularis, Cyperus cyperoides, Chromolaena odorata* etc.

Similarly highest abundance presented in Murti, Dhupjhora by *Acmella calva* (4.99, 6.39), *Axonopus compressus* (7.09) in Dhupjhora, *Diplazium esculentum* (7.33) in Gorumara, *Achyrospermum wallichianum* (5.52) in Khunia and (19.50) in Bichhabhanga and *Chloranthus erectus* (9.44) in Budhuram. Other few species also presented maximum abundance in all over the study areas are *Pupalia lappacea, Clerodendrum infortunatum*, *Dryopteris sikkimensis, Molineria capitulate, Oplismenus burmannii, Chloranthus erectus, Ageratum conyzoides, Ichnocarpus frutescens, Oxalis corniculata, Coffea benghalensis, Mikania micrantha, Phyllanthus reticulates, Elatostema monandrum, Rungia pectinata* etc.

Acmella calva (3.77) presented highiest density in Murti, while, *Chloranthus erectus* (5.51, 8.18) in Dhupjhora and Budhuram, *Elatostema monandrum* (5.15, 6.30) in Gorumara and Bichhabhanga, *Achyrospermum wallichianum* (5.08) in Khunia presented highiest density. Other associated species which have a interesting density are *Mikania micrantha, Oplismenus burmannii*, *Chloranthus erectus*, *Natsiatum herpeticum*, *Ichnocarpus frutescens, Ageratum conyzoides, Dryopteris sikkimensis, Diplazium esculentum,* etc.

During postmonsoon season, *Acmella calva* (15.50)*, Mikania micrantha* (15.23)*, Oplismenus burmannii* (14.48)*, Chloranthus erectus* (13.02) etc. presented maximum IVI in Murti, but, *Chloranthus erectus* (15.78)*, Ageratum conyzoides* (15.19)*, Cyperus compressus* (15.15)*, Acmella calva* (15.03) in Dhupjhora, *Elatostema monandrum* (20.10)*, Achyrospermum wallichianum* (19.28)*, Diplazium esculentum* (17.86)*, Axonopus compressus* (17.54) etc. in Gorumara, *Achyrospermum wallichianum* (20.18)*, Axonopus compressus* (15.21)*, Ichnocarpus frutescens* (12.52)*, Pronephreum nudatum* (12.52) etc. in Khunia, *Achyrospermum wallichianum* (27.49)*, Elatostema monandrum* (19.71)*, Ageratum conyzoides* (17.27)*, Mikania micrantha* (15.74) etc. in Bichhabhanga and *Chloranthus erectus* (22.18)*, Axonopus compressus* (21.20)*, Ageratum conyzoides* (20.72)*, Oplismenus burmannii* (17.01) etc. in Budhuram recorded maximum IVI.

Few common species like *Acacia pennata, Achyrospermum wallichianum*, *Achyranthes bidentata, Anisomeles indica, Blumea lacera, Centella asiatica, Chromolaena odorata , Clerodendrum infortunatum* , *Asystasia macrocarpa, philoxeroides, Cryptolepis dubia* , *Natsiatum herpeticum, Nelsonia canescens,Chromolaena odorata , Drymaria cordata, Rumex dentatus, Rungia pectinata, Sauropus quadrangularis, Elatostema monandrum, Floscopa scandens, Ichnocarpus frutescens, Molineria capitulate, Phlogacanthus thyrsiformis* , *Rungia pectinata, Prunella vulgaris, Cynodon dactylon, Dicliptera bupleuroides, Hypericum japonicum, Tetrastigma serrulatum, Axonopus compressus, Boehmeria glomerulifera, Molineria capitulate, Lepidagathis incurva , Elephantopus scaber, Sauropus quadrangularis, Coffea benghalensis, Duchesnea indica, Persicaria chinensis, Synedrella nodiflora* etc showing maximum SDI in allover the study areas.

Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata* (63.94906), Dhupjhora by *Rumex dentatus* (277.1452), Gorumara by *Molineria capitulata* (185.58), Khunia by *Blumea lacera*

(210.3026), Bichhabhanga by *Saccharum spontaneum* (145.8058), and in Budhuram by *Prunella vulgaris* (257.6947). Other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Anisomeles indica, Coffea benghalensis, Commelina diffusa, Rumex dentatus, Cynodon dactylon, Acacia pennata, Achyrospermum wallichianum, Molineria capitulate, Achyranthes bidentata, Nelsonia canescens, Rungia pectinata, Asystasia macrocarpa, Cryptolepis dubia , Alternantheara philoxeroides, Lepidagathis incurve, Pupalia lappacea, Phlogacanthus thyrsiformis, Floscopa scandens, Synedrella nodiflora* etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 0.460650, Dhupjhoran 0.460447, Gorumara 0.452730, Khunia 0.710096, Bichhabhanga 0.607251 and Budhuram 0.569362. Similarly Murti Beat presented the Margalef Richness Index (RI) 32.8829, where, Dhupjhora 34.8846, Gorumara 29.8808, Khunia 36.8735, Bichhabhanga 34.8767 and Budhram 33.8777.

Premonsoon Shrub layer of GNP

In premonsoon ground covers, *Ichnocarpus frutescens* (100.00) emerged with highest frequency in Murti where, *Chromolaena odorata* (96.43) leads the frequency in Dhupjhora. *Argyreia roxburghii* (96.67) presented maximum frequency in Gorumara, *Mikania micrantha* (95.00 and 100.00) in Khunia and Budhuram, *Litsea glutinosa, Bridelia retusa* (100.00) in Bichhabhanga. *Chromolaena odorata*, *Toddalia asiatica, Croton caudatus*, *Maesa indica, Natsiatum herpeticum, Celastrus paniculatus, Argyreia roxburghii, Dioscorea pentaphylla, Pericampylus glaucus, Chromolaena odorata* etc presented very high frequency in all over the study areas.

Similarly highest abandance presented in Murti, Dhupjhora and Khunia by *Alpinia nigra* (17.75). Where, *Parabaena sagittata* (8.38), in Gorumara, *Morinda angustifolia* (8.08), in Bichhabhanga, *Mikania micrantha* (9.06) in Budhuram. Other species shows maximum abundance in all over the study areas are *Ichnocarpus frutescens, Tetrastigma serrulatum Chromolaena odorata Actinodaphne obovata Alangium chinense Pericampylus glaucus Merremia vitifolia Pericampylus glaucus Argyreia roxburghii, Sloanea sterculiacea Pueraria phaseoloides Phlogacanthus thyrsiformis Litsea glutinosa Caesalpinia cucullata Natsiatum herpeticum* etc.

Maesa indica (5.39) presented maximum density in Murti where, maximum density of Dhupjhora, Bichhabhanga and Budhuram presented by *Mikania micrantha* (4.25, 5.75 and 9.06), *Argyreia roxburghii* (5.23) in Gorumara and *Croton caudatus* (4.45) in Khunia. other species which were presented a interesting density values in allover the study areas are *Parabaena sagittata, Alpinia nigra, Maesa indica, Pueraria phaseoloides*, *Croton caudatus, Ichnocarpus frutescens, Litsea glutinosa, Chromolaena odorata, Dillenia indica, Tetrastigma* serrulatum, Natsiatum herpeticum, Parabaena sagittata, Morinda angustifolia, Merremia vitifolia etc.

Murti Beat presented a maximum IVI values by *Maesa indica* (17.15), *Alpinia nigra* (16.66), *Litsea glutinosa* (16.47), *Chromolaena odorata* (12.65), *Natsiatum herpeticum* (12.37), *Ichnocarpus frutescens* (11.82) etc. where Dhupjhora by *Ichnocarpus frutescens* (18.58), *Chromolaena odorata* (16.39), *Argyreia roxburghii* (15.89), *Alpinia nigra* (15.59) etc. Gorumara presented by *Argyreia roxburghii* (21.60), *Parabaena sagittata* (19.75), *Ichnocarpus frutescens* (19.32), *Chromolaena odorata* (17.18) etc., Khunia by *Alpinia nigra* (27.21), *Argyreia roxburghii* (16.90), *Mikania micrantha* (15.16), *Chromolaena odorata* (13.23) etc., Bichhabhanga by *Mikania micrantha* (19.52), *Parabaena sagittata* (18.59), *Morinda angustifolia* (18.40), *Chromolaena odorata* (17.38) etc. and *Mikania micrantha* (26.15), *Ichnocarpus frutescens* (21.33), *Chromolaena odorata* (19.29), *Tetrastigma serrulatum* (17.79) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas.

Similarly, a few number of species like *Abrus pulchellus* , *Actinodaphne obovata*, *Aglaia spectabilis*, *Alangium chinense, Alstonia scholaris*, *Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea*, *Bridelia retusa,Caesalpinia cucullata, Celastrus paniculatus*, *Cinnamomum bejolghota*, *Coffea benghalensis, Dillenia indica, Dillenia pentagyna, Dioscorea*

pentaphylla, Glycosmis pentaphylla, Holarrhena pubescens, Impatiens trilobata, Litsea glutinosa, Maesa indica, Morinda angustifolia, Parabaena sagittata, *Phlogacanthus thyrsiformis*, *Pericampylus glaucus, Pterocarpus acerifolius* , *Pueraria sikkimensis* , *Sloanea sterculiacea* , *Smilax zeylanica,Sorindeia madagascariensis*, *Streblus asper, Syzygium tetragona, Tetrastigma campylocarpum, Tetrastigma planicauli, Thunbergia grandiflora, Toddalia asiatica, Zizyphus mauritiana* and *Wrightia arborea* etc. presented the maximum SDI value 1.

Simpson's Index (EH) maximum recorded in Murti by *Streblus asper* (611.4638), Dhupjhora by *Zizyphus mauritiana* (365.5565), Gorumara by *Abrus pulchellus* (413.3263), Khunia by *Toddalia asiatica* (469.2142), Bichhabhanga by *Actinodaphne obovata* (142.9482), and in Budhuram by *Pterocarpus acerifolius* (161.4426). Other recorded species cotain maximum EH values in all of the areas are *Abrus pulchellus Alstonia scholaris Sloanea sterculiacea Caesalpinia cucullata Syzygium tetragona Tetrastigma campylocarpum Baliospermum solanifolium Holarrhena pubescens Glycosmis pentaphylla Mallotus philippensis Dioscorea esculenta Streblus asper Pterocarpus acerifolius Angiopteris evecta Wrightia arborea Toddalia asiatica Bauhinia purpurea Parabaena sagittata* etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 1.143027, Dhupjhoran 0.939123, Gorumara 0.919757, Khunia 1.049093, Bichhabhanga 0.939384 and Budhuram 0.955192. Similarly Murti Beat presented the Margalef Richness Index (RI) 52.8697, where, Dhupjhora 40.8676, Gorumara 35.8637, Khunia 42.8653, Bichhabhanga 33.8607 and Budhram 33.8600.

Monsoon Shrub layer of GNP

In monsoon ground covers, *Argyreia roxburghii* (100.00, 100.00 & 93.33) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100) in Khunia, *Pueraria phaseoloides* (100.00) in Bichhabhanga and *Chromolaena odorata* (94.44) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Mikania micrantha* (100.00), *Chromolaena odorata* (97.22), *Pueraria phaseoloides* (97.22), *Phlogacanthus thyrsiformis* (100.00), *Croton caudatus* (83.33), *Maesa indica* (100.00) & *Natsiatum herpeticum* (83.33) etc.

Similarly highest abundance presented in Murti by *Holarrhena pubescens* (18.25), *Croton caudatus* (13.21) in Dhupjhora, *Parabaena sagittata* (14.25) in Gorumara, *Alpinia nigra* (64.80) in Khunia, *Maesa indica* (12.05) in Bichhabhanga and *Chromolaena odorata* (12.76) in Budhuram. Other few species also prented maximum abundance in allover the atudy areas are *Argyreia roxburghii, Ichnocarpus frutescens, Natsiatum herpeticum, Chromolaena odorata, Mikania micrantha Argyreia roxburghii Alpinia nigra* etc.

Argyreia roxburghii (9.64) presented highiest density in Murti, while, *Mikania micrantha* (11.64) in Dhupjhora, *Mikania micrantha* (8.90) in Gorumara, *Ichnocarpus frutescens* (100) in Khunia, *Maesa indica* (12.05) in Bichhabhanga and *Chromolaena odorata* (12.06) in Budhuram presented highiest density. Other associated species which have a interesting density are *Mikania micrantha Merremia vitifolia Actinodaphne obovata Tetrastigma serrulatum , Alpinia nigra Ichnocarpus frutescens Argyreia roxburghii* etc.

During monsoon season, *Argyreia roxburghii* (20.68), *Ichnocarpus frutescens* (20.49), *Mikania micrantha* (18.97), *Chromolaena odorata* (17.85) etc. presented maximum IVI in Murti, but, *Mikania micrantha* (23.75), *Croton caudatus* (23.72), *Argyreia roxburghii* (21.61), *Ichnocarpus frutescens* (19.76) etc in Dhupjhora, *Ichnocarpus frutescens* (26.88), *Mikania micrantha* (24.76), *Argyreia roxburghii* (24.62), *Parabaena sagittata* (23.29) etc. in Gorumara, *Alpinia nigra* (40.39), *Chromolaena odorata* (22.33), *Argyreia roxburghii* (19.79), *Mikania micrantha* (19.02) etc. in Khunia, *Maesa indica* (25.46), *Mikania micrantha* (24.86), *Ichnocarpus frutescens* (24.44), *Pericampylus glaucus* (16.80) etc. in Bichhabhanga and *Chromolaena odorata* (27.80), *Mikania*

micrantha (27.48), *Ichnocarpus frutescens* (25.92), *Merremia vitifolia* (17.44) etc. in Budhuram recorded maximum IVI.

Few common species like *Abrus pulchellus* , *Actinodaphne obovata* , *Actinodaphne sikkimensis* , *Aglaia spectabilis* , *Alangium chinense, Alstonia scholaris* , *Alpinia nigra Angiopteris evecta, Aristolochia indica* , *Baliospermum solanifolium, Bridelia retusa, Bauhinia purpurea*, *Bridelia retusa, Caesalpinia cucullata*, *Cinnamomum bejolghota*, *Clausena excavate, Dioscorea pentaphylla, Holarrhena pubescens, Merremia vitifolia*, *Morinda angustifolia, Pericampylus glaucus, Pterocarpus acerifolius*, *Pueraria phaseoloides*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Smilax zeylanica, Sorindeia madagascariensis*, *Stephania glabra, Syzygium tetragona, Tetrastigma planicauli, Thunbergia grandiflora* and *Wrightia arborea* etc showing maximum SDI in allover the study areas.

Simpson's Index (EH) maximum recorded in Murti by *Glycosmis pentaphylla* (610.1924), Dhupjhora by *Zizyphus mauritiana* (515.5455), Gorumara by *Pterocarpus acerifolius* (568.7283), Khunia by *Abrus pulchellus* (298.1147), Bichhabhanga by *Actinodaphne obovata* (203.4955), and in Budhuram by *Pterocarpus acerifolius* (199.4133). Other recorded species cotain maximum EH values in all of the areas are *Toddalia asiatica, Angiopteris evecta, Coffea benghalensis, Pericampylus glaucus, Sorindeia madagascariensis , Cissampelos pareira*, *Bauhinia purpurea, Angiopteris evecta, Actinodaphne sikkimensis, Wrightia arborea, Actinodaphne obovata, Caesalpinia cucullata*, *Sloanea sterculiacea*, *Clausena excavate, Syzygium tetragona, Tetrastigma campylocarpum, Thunbergia grandiflora* etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 0.853887, Dhupjhoran 0.788811, Gorumara 0.787591, Khunia 0.774749, Bichhabhanga 0.810063 and Budhuram 0.898317. Similarly Murti Beat presented the Margalef Richness Index (RI) 48.8765, where, Dhupjhora 41.8742, Gorumara 36.8701, Khunia 38.8724, Bichhabhanga 35.8682 and Budhram 35.8645.

Postmonsoon Shrub layer of GNP

In Postmonsoon ground covers, *Argyreia roxburghii* (100.00) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100.00) in Khunia, *Bridelia retusa* (100.00) in Bichhabhanga and *Mikania micrantha* (100.00) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Chromolaena odorata*, *Litsea glutinosa, Tetrastigma serrulatum, Croton caudatus , Syzygium tetragona* etc.

Similarly highest abundance presented in Murti by *Argyreia roxburghii* (9.64), Dhupjhora by *Croton caudatus* (14.18), *Chromolaena odorata* (15.94, 12.76) in Khunia and Budhuram, *Parabaena sagittata* (12.00, 11.94) in Gorumara and Bichhabhanga. Other few species also presented maximum abundance in all over the study areas are *Ichnocarpus frutescens, Natsiatum herpeticum*, *Morinda angustifolia, Shorea robusta, Mikania micrantha, Merremia vitifolia, Pericampylus glaucus, Tetrastigma serrulatum* etc.

Argyreia roxburghii (9.64 & 8.83) presented highiest density in Murti and Gorumara, while, *Croton caudatus* (11.14) in Dhupjhora, *Stephania glabra* (4.45) in Bichhabhanga, *Chromolaena odorata* (14.35) in Khunia and Budhuram presented highiest density. Other associated species which have a interesting density are *Ichnocarpus frutescens, Mikania micrantha*, *Natsiatum herpeticum*, *Parabaena sagittata*, *Litsea glutinosa, Dillenia indica, Phlogacanthus thyrsiformis, Tetrastigma serrulatum, Merremia vitifolia* etc.

During postmonsoon season, *Argyreia roxburghii* (23.81), *Ichnocarpus frutescens* (23.59), *Mikania micrantha* (21.83), *Chromolaena odorata* (20.55) etc. presented maximum IVI in Murti, but, *Croton caudatus* (22.94), *Argyreia roxburghii* (20.85), *Mikania micrantha* (20.85), *Chromolaena odorata* (20.74) etc. in Dhupjhora, *Chromolaena odorata* (24.77), *Argyreia roxburghii*

(24.59), *Mikania micrantha* (22.43), *Parabaena sagittata* (20.35) etc. in Gorumara, *Chromolaena odorata* (25.50), *Argyreia roxburghii* (22.48), *Mikania micrantha* (21.47), *Ichnocarpus frutescens* (20.24) etc. in Khunia, *Parabaena sagittata* (24.45), *Ichnocarpus frutescens* (22.51), *Mikania micrantha* (22.42), *Pericampylus glaucus* (17.36) etc. in Bichhabhanga and *Chromolaena odorata* (25.76), *Mikania micrantha* (25.27), *Ichnocarpus frutescens* (24.03), *Tetrastigma serrulatum* (17.86) etc. in Budhuram recorded maximum IVI.

Few common species like *Abrus pulchellus*, *Actinodaphne obovata*, *Actinodaphne sikkimensis*, *Aglaia spectabilis*, *Alstonia scholaris*, *Angiopteris evecta, Aristolochia indica*, *Baliospermum solanifolium, Bauhinia purpurea*, *Bridelia retusa, Cissampelos pareira, Clausena excavate, Cryptolepis dubia,Caesalpinia cucullata, Celastrus paniculatus*, *Cinnamomum bejolghota*, *Coffea benghalensis, Dillenia indica, Dillenia pentagyna, Dioscorea esculenta, Dioscorea pentaphylla, Glycosmis pentaphylla, Litsea monopetala, Maesa indica, Mallotus polycarpus*, *Merremia vitifolia, Morinda angustifolia, Parabaena sagittata*, *Pericampylus glaucus, Phlogacanthus thyrsiformis*, *Pterocarpus acerifolius* , *Pueraria phaseoloides*, *Pueraria sikkimensis*, *Sloanea sterculiacea*, *Stephania glabra, Syzygium tetragona, Smilax zeylanica, Sorindeia madagascariensis*, *Stephania glabra, Streblus asperTetrastigma campylocarpum, Tetrastigma planicauli, Tetrastigma serrulatum, Thunbergia grandiflora*, *Toddalia asiatica* and *Wrightia arborea* etc showing maximum SDI in allover the study areas.

Simpson's Index (EH) maximum recorded in Murti by *Streblus asper* (761.0204), Dhupjhora by *Zizyphus mauritiana* (529.6169), Gorumara by *Pterocarpus acerifolius* (570.9368), Khunia by *Toddalia asiatica* (600.7942), Bichhabhanga by *Actinodaphne obovata* (195.7899), and in Budhuram by *Pterocarpus acerifolius* (213.4993). Other recorded species cotain maximum EH values in all of the areas are *Streblus asper, Premna latifolia, Abrus pulchellus , Actinodaphne obovata , Syzygium tetragona, Tetrastigma campylocarpum, Ardisia solanacea, Smilax zeylanica,, Sloanea sterculiacea, Caesalpinia cucullata, Celastrus paniculatus, Maesa indica Baliospermum solanifolium, Alstonia scholaris, Bauhinia purpurea, Clausena excavata, Cissampelos pareira* etc.

Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Index (D) 0.898177, Dhupjhoran 0.755127, Gorumara 0.785812, Khunia 0.883477, Bichhabhanga 0.802322 and Budhuram 0.862044. Similarly Murti Beat presented the Margalef Richness Index (RI) 47.8743, where, Dhupjhora 40.8748, Gorumara 36.8702, Khunia 41.8705, Bichhabhanga 34.8676 and Budhram 35.8660.

Canopy covers of GNP

In the tree layer, *Actinidaphne obovata* (100.00) emerged with highest frequency in Murti and Gorumara, where, *Alangium chinensis* (100.00) leads the frequency in Dhupjhora, *Alstonia scholaris* (100.00) in Budhuram and Khunia, *Casaeria vareca* (100.00) in Bichhabhanga. *Albizia chinensis* (100.00), *Amoora walichii, Litsea glutinosa*, *Shorea robusta*, *Dendrocnide sinuta, Mallotus philippensis, Syzygium tetragona, Aphanamixis polystachya, Lagerstroemia hirsuta* etc presented very high frequency in all over the study areas.

Similarly highest abandance presented in Murti, Dhupjhora, Bichhabhanga and Budhuram by *Shorea robusta* (respectively 21.00, 26.86, 28.30 and 34.89). Where, *Dendrocnide sinuta* (22.09) presented maximum abundance in Gorumara, *Alangium chinensis* (23.44) in Khunia. Other species shows maximum abundance in all over the study areas are *Trewia nudiflora, Litsea glutinosa, Albizia chinensis, Dillenia pentagyna, Ficus hispida, Syzygium tetragona, Albizia lucidior* etc.

Shorea robusta (respectively 21.00, 26.86, 21.00, 28.30 and 34.89) presented maximum density in Murti, Dhupjhora, Gorumara, Bichhabhanga and Budhuram. Where, maximum density of Khunia presented by *Albizia lucidior* (28.30). Other species which were presented a interesting density values in allover the study areas are *Litsea glutinosa*, *Casaeria vareca*, *Albizia chinensis*, *Alstonia scholaris, Dillenia pentagyna, Mallotus philippensis, Syzygium tetragona etc.*

The maximum IVI value leads by *Shorea robusta* in allover the study areas. Its associated species which has a great IVI valiue are *Litsea glutinosa, Casaeria vareca, Albizia chinensis, Dendrocnide sinuta, Dillenia pentagyna, Ficus hispida*, *Albizia lucidior, Lagerstroemia hirsuta, Alangium chinensis* etc.

Actinodaphne sikkimensis , Aglaia spectabilis , Aglaia perviridis, Ailanthus excels, Albizia lebeck, Aphanamixis polystachya, Amoora walichii, Artocarpus chaplasa, Artocarpus heterophyllus, Bauhinia purpuria, Bombax Ceiba, Bridelia retusa, Cassia fistula, Castanopsis indica , Dalbergia sisoo, Ficus benghalensis, Gmelina arborea, Holarrhena pubescens, Lagerstroemia hirsuta , Lagerstroemia speciosa , Litsea elongate, Litsea monopetala, Meyna spinosa , Neolamarckia cadamba, Premna latifolia, Streblus asper, Leea aquata, Mayna spinosa, Michelia champaca, Polyalthia simiarum, Sena siamia, Sizygium operculatum, Tectona grandis, Terminalia belirica, Terminalia myriocarpa and *Toona ciliate* showing maximum SDI 1 in allover the study area.

Simpson's Index (EH) maximum recorded in Murti by *Castanopsis indica* (405.99863), Dhupjhora by *Terminalia belirica* (673.8532), Gorumara by *Ficus benghalensis* (465.3478), Khunia by *Aegle marmelos* (430.883), Bichhabhanga by *Artocarpus chaplasa* (494.5687), and in Budhuram by *Ficus benghalensis* (392.5362). other recorded species cotain maximum EH value in all of the areas are *Polyalthia simiarum, Sena siamia, Michelia champaca, Albizia lebeck, Artocarpus chaplasa, Meyna spinosa, Gmelina arborea, Combretum decandrum, Terminalia belirica, Terminalia myriocarpa* and *Sizygium operculatum.*

Incase of Species Richness in canopy covers of Murti Beat presented Menhinick Richness Index (D) 0.783519, Dhupjhoran 0.62, Gorumara 0.72, Khunia 0.66, Bichhabhanga 0.70 and Budhuram 0.70. Similarly Murti Beat presented the Margalef Richness Index (RI) 36.8703, where, Dhupjhora 32.87, Gorumara 36.87, Khunia 32.87, Bichhabhanga 30.87 and Budhram 32.87.

Chapter 9

NON TIMBER FOREST PRODUCES

NON-TIMBER FOREST PRODUCES

Man is part of nature, evolved in natural surroundings and entirely dependent on natural resources for his survival. Man created so many artificial mind blowing ornaments for their own recreation and during his endless modification of nature, he forgot to respect and conserve nature. Man's activities changed the nature to that extend which is now attacking back to the civilization and threatening the survival of its highly modified advanced civilization. Today he realized that, his journey started from the wilderness. When he was completely dependent on forests for their survival. Apart from food, shelter and materials for making houses, only a few other articles were essential to meet up his needs like making of hunting instruments, dresses, satisfying evil forces which were causing distress and diseases to him and his pets, etc (Sarkar, 2011; Sarkar, 2014; Biswas, 2015).

The forest villager, who forms the part of the wild environment, has the know-how to use the wide array of forest products for their sustenance. City duellers also uses forest products collecting from markets may be in partial processed condition. For to fulfil their every need, forest-villagers are generally unethically used by some agents for destroying forest resources through over and and unscientific collections of natural products (Biswas, 2015). In this aspect, Moore (1995) said, "Economic growth by its very nature creates negative spill over effects for the environment". Sarkar (2014) argued that "today humans continue to extract resources from the environment and dump the wastes back into the environment, in the past two hundred years, the rate of forest extraction continued to increase with the improvement of health care techniques, as the population structure also continued to increase in parallel".

9.1 Importance of NTFP

Vandebroek *et al*. (2011) said that, our socio-cultural environment grew within the human society for its own survival and separate knowledge base has developed in the form of ethnobotany. 'Scientific research is revealing an ever increasing number of links between biodiversity and human health, not only in terms of food resources or food security, but also with regard to materials to treat and cure diseases' (Pandey *et al*, 2010; Chakravorty *et al*, 2011). Apart from timber, forests and different other types of vegetation are the store houses for wide array of 'Non-Timber Forest Produces' (NTFP). And, the present trend of forest management is to reduce the timber extraction and, on the other hand, increasing the exploitation of numerous marketable NTFPs (Pandit *et al*, 2004). People of forest villages and of nearby areas regularly harvest twigs/ leaves/ fruits/ flowers/ rhizomes/ tubers, etc. from wild vegetation and put on sale for the urban people. Such sustainable harvest do not disturb the formation of the vegetation, and, certainly, helps in better forest management. Medicinal plants forms a very important class of NTFPs, which constitute the principal source of ingredients for traditional medicines (Almeida *et al.*, 2006; Kumar *et al.*, 2011; Machkour-M'Rabet *et al.*, 2011). Over the World, so far, about 4,22,000 species of flowering plants are reported (Govaerts, 2001), of which

over 50,000 species are used for medicinal purposes (Schippmann *et al.*, 2002). In India 43 % of the total available flowering plants are used as medicinal (Pushpangadan, 1995). The use of different plant substances for medicine is a bridge, linking conservative users of all groups and religions. Forest dwellers inherit a rich traditional knowledge and are very much concerned about their degradation in wild (Uniyal *et al.*, 2006). NTFPs collected by forest villagers for making ropes, plate from leaves, collecting and selling wild mushrooms and honey (Moerman, 1998) are having wide market potential. People also harvest and use different fruits and nuts, vegetables, mushrooms for their own subsistence (FAO, 2010). Around 75,000 flowering plants are edible of which about 3000 are regarded as source of food (Krishnamurthy, 2003).

9.2. NTFP resources of GNP

During the present study in GNP, survey for traditional uses of local plants was conducted in different forest villages of GNP and in three forest markets and/or bazars like Lataguri Market, Dhupjhora Farm Market and Chalsa Bazaar taking help of many local people, including collectors and traditional medical practioners. A total of 335 species of useful plants has been recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or riped fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals (Table 9.1).

Table 9.1. NTF species reported [Saha *etal.* 2013] and recognized from the GNP

Used as	No. of species
Ethomedicinal plants	127
Ethno-veterinary medicinal plants	45
Edible plants	57
Poisonous plants	19
Ornamental or decorative	91
Religious plants	20
Fodder plants	260
Fuel wood	54
Spices	2
Total plants	**335**

During 2009 – 2010, the survey was conducted in Lataguri, Dhupjhora Farm Market and Chalsa Bazar and recorded some NTFPs and their prices. The recorded price list is given in Table 9.2.

9.3 Ethnomedicinal Plants

Forests villagers now also adopted to moderm treatment system. They regularly consult with doctors and health assistant of local health centre. So the knowledge of use the medicinal plants in varius diseases decreases regularly. The local *Kabiraj* Mr. Mattu Oraon, Murti beat, said that, once upon a time, his father was treated 10 to 15 patient per day. But, now a few people, who have no capability to bear the cost of modern medicin, come to him for treatment. Local people came to him regularly to treat their pet animals. Mrs. Kabita Barman, worker of Dhupjhora Gachhbari, has a great knowledge about medicinal plants which she learned from her grand father. She guided me to identify so many medicinal plants from Dhupjhora beat. Total 127 species traditionally used medicinal plant species has been recorded from GNP and enumerated below in Table 9.3

Table 9.2. The prices of NTFPs on sale in the forest markets of Lataguri, Dhupjhora Farm Market and Chalsa Bazar during 2009 – 2010

Name of the Plants	Part Used	Local Market Value		Government Value		Use type	End Product
		Qty	Rate (kg)	Qty	Rate (kg)		
Adenanthera pavonina	Seed	1 kg	40	-	-	Decoration	Showpiece
Aegle marmelos	Fruit	1 pc	10	1kg	450	Dry/Churna	Medicine
Alstonia scholaris	Bark	1kg	40	-	-	Dry	Medicine
Alternanthera sessilis	Plants	250g	5	-	-	Fresh	Vegetable
Amaranthus viridis	Plants	250g	5	-	-	Fresh	Vegetable
Andrographis paniculata	Plants	250g	80	100g	45	Dry/Churna	Medicine
Aristolochia indica	Roots	250g	100	-	-	Dry	Medicine
Artemisia indica	Plants	1kg	70	-	-	Dry	Medicine
Artocarpus heterophyllus	Fruit	1pc	10-May	-	-	Fresh	Edible
Asparagus racemosus	Roots	250g	100	100g	75	Dry/Churna	Medicine
Bambusa balcooa	Culm	1pc	60	-	-	Fresh	Household
Bambusa tulda	Culm	1pc	60	-	-	Fresh	Household
Bambusa vulgaris	Culm	1pc	55	-	-	Fresh	Decoration
Bauhinia purpurea	Bark	250g	25	-	-	Dry	Medicine
Bombax ceiba	Bark	250g	60	80g	75	Dry/Churna	Medicine
Cannabis sativa	Leaves, fruits	250g	5	-	-	Dry	Drink/ smoke occasionally
Cassia fistula	Bark	250g	25	-	-	Dry	Medicine
Castanopsis indica	Fruit	1kg	15	-	-	Dry	Showpiece
Centella asiatica	Leaves	-	-	100g	45	Churna	Medicine
Chenopodium album	Plants	250g	5	-	-	Fresh	Vegetable
Cinnamomum bejolghota	Bark	1kg	20	-	-	Dry	Agarbatti
Citrus limon	Fruit	4pcs	10	-	-	Fresh	Edible
Citrus maxima	Fruit	1pc	5	-	-	Fresh	Edible
Coccinia grandiflora	Plants	250g	10	-	-	Fresh	Vegetable
Colocasia antiquorum	Corm	1kg	10	-	-	Fresh	Vegetable
Dillenia indica	Ripe Fruit	1pc	3	-	-	Fresh	Edible
Dioscorea alata	Bulbils & Rhyzomatus corm	1kg	10	-	-	Fresh	Vegetable
Dioscorea bulbifera	Bulbils & Rhyzomatus corm	1kg	10	-	-	Fresh	Vegetable
Dioscorea deltoidea	Bulbils & Rhyzomatus corm	1kg	10	-	-	Fresh	Vegetable

Continue to next

Name of the Plants	Part Used	Local Market Value		Government Value		Use type	End Product
		Qty	Rate (kg]	Qty	Rate (kg]		
Dioscorea pentaphylla	Bulbils & Rhyzomatus corm	1kg	10	-	-	Fresh	Vegetable
Dioscorea prazeri	Bulbils & Rhyzomatus corm	1kg	10	-	-	Fresh	Vegetable
Elaeocarpus floribundus	Fruits	1kg	12	-	-	Fresh	Edible
Entada rheedii	Seeds	1kg	70	-	-	Dry	Medicine
Enydra fluctuans	Plants	250g	5	-	-	Fresh	Vegetable
Glinus oppositifoltus	Plants	250g	10	-	-	Fresh	Vegetable
Holarrhena pubescens	Bark	1kg	30	-	-	Dry	Medicine
Holmskioldia sanguinea	Calyx	100g	5	-	-	Dry	Decoration
Houttuynia cordata	Plants	250g	20	-	-	Dry	Medicinal
	Plants	500g	10	-	-	Fresh	Chatni/ Vegetable
Ipomoea aquatica	Plants	500g	10	-	-	Fresh	Vegetable
Justicia adhatoda	Leaves	100g	10	100g	45	Dry/Churna	Medicine
Justicia gendarussa	Leaves	100g	8	-	-	Dry	Medicine
Lagerstroemia parviflora	Fruits	1kg	15	-	-	Dry	Decoration
Lagerstroemia speciosa	Fruits	1kg	15	-	-	Dry	Decoration
Lasia spinosa	Spadix/ Inflorescence	1pc	3	-	-	Fresh	Vegetable
Litchi chinensis	Fruits	1kg	30	-	-	Fresh	Edible
Mangifera indica	Fruits	1kg	25	-	-	Fresh	Edible
Manihot esculenta	Roots	1kg	15	-	-	Fresh	Boil and Eaten
Momordica charantia	Fruits	1kg	10	-	-	Fresh	Vegetable
Momordica dioica	Fruits	1kg	8	-	-	Fresh	Vegetable
Morinda angustifolia	Stem	-	-	1kg	35	Dry/ Churna	Medicine
Morus indica	Fruits	100g	5	-	-	Fresh	Edible
Mucuna pruriens	Seeds	100g	30	100g	75	Dry/ Churna	Medicine
Musa balbisiana	Fruits	4pcs	12	-	-	Fresh	Vegetable
	Inflorescemce	1pc	10	-	-	Fresh	Vegetable
Ocimum tenuiflorum	Leaves	-	-	100g	45	Dry/ Churna	Tulsi Tea

Continue to next

Name of the Plants	Part Used	Local Market Value		Government Value		Use type	End Product
		Qty	Rate (kg]	Qty	Rate (kg]		
Oroxylum indicum	Seeds	10g	40	-	-	Dry	Decoration
Paederia foetida	Leaves	-	-	100g	45	Dry/ Churna	Medicine
Phlogacanthus thyrsiformis	Leaves	100g	15	-	-	Dry	Medicine
	Inflor-escens	5-6 pcs	10	-	-	Fresh	Vegetable
Phyllanthus emblica	Fruits	-	-	100g	45	Dry/ Churna	Trifala/ Medicine
	Fruits	1kg	25	-	-	Fresh	Edible
Piper betloides	Leaves	32 pcs	8	-	-	Fresh	Edible
Piper longum	Fruits	100g	10	100g	25	Dry	Medicine
Piper peepuloides	Fruits	100g	10	-	-	Dry	Medicine
Psidium guajava	Fruits	1kg	10	-	-	Fresh	Edible
Rauvolfia serpentina	Roots	1kg	180	-	-	Dry	Medicine
Sapindus rarak	Fruits	-	-	100g	45	Dry/ Churna	Hair fresh
	Fruits	1kg	25	-	-	Fresh	Use for hair
Shorea robusta	Latex	500g	50	100g	15	Dry	Sal Dhup
Sterculia villosa	Fruits	1kg	18	-	-	Dry	Decoration
Syzygium cumini	Seeds	-	-	100g	4	Dry	Medicine
	Fruits	1kg	15	-	-	Fresh	Edible
Syzygium jambos	Fruits	1kg	15	-	-	Fresh	Edible
Terminalia arjuna	Bark	1kg	60	100g	45	Dry/ Churna	Medicine/ Arjun Tea
	Fruits	1kg	10	-	-	Dry	Decoration
Terminalia bellirica	Fruits	1kg	200	100g	45	Dry/ Churna	Medicine/ Trifala
Terminalia chebula	Fruits	1kg	200	100g	45	Churna	Medicine/ Trifala
Thysanolaena latifolia	Plants with Inflorescence	1 jharu	10	-	-	Dry	Jharu
Tinospora crispa	Stem	-	-	100g	75	Dry/ Churna	Medicine
	Stem	1kg	90	-	-	Fresh	Medicine
Vitex negundo	Leaves	-	-	100g	45	Dry/ Churna	Medicine
Ziziphus jujuba	Fruits	1kg	10	-	-	Fresh	Edible

Table 9.3: Enumeration of Medicinal Plants of GNP

Scientific Name	Parts used	Uses
Ageratum conyzoides [Asteraceae]; *Goutam & AP Das 0442*	Leaves, roots, flowers, whole plants	Leaves used in wounds, cuts and burns; root juice antibiotic, plants used to cure fever
Alstonia scholaris [Apocynaceae]; *Chhatim*; *Goutam & A.P. Das 117*	Bark, leaves	Anthelmintic, laxative; good in heart disease, skin disease, leucoderma, asthma, ulcers
Ampelocissus barbata [Vitaceae]; *Goutam & AP Das 0519*	Whole plant	Plants are used in fever, cough, tonic
Andrographis paniculata [Acanthaceae]; *Kalmegh*; *Goutam & A.P. Das 1123*	Plants	Dental disease, antibacterial, anti inflamatory, fever, dysentery, diarrhoea, cough, sore throat, tonsillitis, bronchitis, hypertension, snake bite.
Ardisia solanacea [Primulaceae]; *Goutam & AP Das 0249*	Roots	Fever, rheumatism, diarrhoea.
Asparagus racemosus [Asparagaceae]; *Shatamuli; Goutam &A.P. Das 32*	Roots	Roots are used in dysentry, diarrhoea, leprosy, diabetes, jaundice, urinary disorders; it has anti fungal and anti bacterial activities.
Bauhinia purpurea [Fabaceae]; *Kanchan; Goutam & A.P. Das 97*	Barks, roots, flowers	Barks used in diarrhoea; roots used in animal bite; flowers are lexative and roots carminative.
Bidens pilosa [Asteraceae]; *Kapar jorani, Goutam & AP Das 0853*	Whole plant	Used in toothache, rheumatism, leprosy, skin disease; use to check blood flow; leaves juice used in ear and eye complaints.
Bischofia javanica [Bischofiaceae]; *Kainjal, Goutam & AP Das 1319*	Leaves	Leaves juice used in sores, tonsilitis, throat pain.
Boehmeria rugulosa [Urticaceae]; *Goutam & AP Das 1157*	Bark	Snake bite, diuretic, colic of pregnancy.
Bombax ceiba [Malvaceae]; *Simul; Goutam & A.P. Das 335*	Roots, gums, flowers	Used in diarrhoea, dysentery, used as astringent, stimulant and emetic.
Buddleja asiatica [Scrophulariaceae]; *Bon nisinda, Goutam & AP Das 1149*	Leaves, flowers, stems	Used in skin complaints and as an abortification.
Callicarpa arborea [Lamiaceae]; *Goutam & AP Das 0295*	Bark	Bark is carminative, used in rheumatism, gonorrhoea and skin diseases.
Calotropis gigantea [Apocynaceae]; *Ank, Goutam & AP Das 1164*	Whole plant	Sores & skin disease, leprosy, leucoderma, ulcers. Leaves are applied to paralysed parts, painful joints, swellings, bronchitis, asthma, skeletal fracture. Plants are emetic, purgative, anthelmintic, antifungal.
Cannabis sativa [Cannabaceae]; *Bhang; Goutam & A.P. Das 65*	Leaves, inflorescence	Used in hysteria, asthma, neuralgia, stomachic, astringent, alterative, hypertention, diabetis, spas-modic cough and indigestion.

Continue to next

Scientific Name	Parts used	Uses
Cassia fistula [Fabaceae]; *Bandarlathi; Goutam & A.P. Das 349*	Leaves, bark, root, seeds	Ringworm, purgative, laxative, astringent, tonic, syphilis, skin disease, leprosy, ulcers, antipyretic, opthalmic, dyspepsia, constipation, fever, strangury, diabetes, demulcent.
Castanopsis indica [Fagaceae]; *Kathbadam; Goutam & A.P. Das 352*	Bark	Antiviral, hypotensive, diuretic and anticancerous.
Centella asiatica [Apiaceae]; *Thankuni; Goutam & A.P. Das 313*	Plants	Diabetes, pneumonia, tonic, antibacterial, anti-inflammatory, diuretic, digestive, diarrhoea, dysentery, jaundice, constipation, leucorrhoea.
Choerospondias axillaris [Anacardiaceae]; *Goutam & AP Das 1127*	Fruits, seed-oil	Antiplasmodic.
Cinnamomum glanduliferum [Lauraceae]; *Malagiri, Goutam & AP Das 1144*	Seeds, wood	Antibacterial, respiratory problems, uterotonic, dyspepsia, colic, diarrhoea, cough, asthma, snake bite.
Cissampelos pareira [Menispermaceae]; *Goutam & AP Das 0032*	Leaves, bark, roots	Antipyeretic, diuretic, laxative, dyspepsia, dropsy, dysentery, urinary trouble, ulcers and colic.
Citrus maxima [Rutaceae]; *Jambura; Goutam & A.P. Das 42*	Fruits	Used to leprosy, asthma, cough epilepsy, mental aberration, anthelmintic, tonic, diarrhoea, headache, eye trouble, cardiotonic.
Citrus medica [Rutaceae]; *Lebu; Goutam & A.P. Das 44*	Fruits	Used in typhoid, indigestion, dysentery.
Colebrookea oppositifolia [Lamiaceae]; *Goutam & AP Das 1177*	Leaves, roots	Skin infection, epilepsy, gastric.
Cheilocostus speciosus [Costaceae]; *Kemua, Goutam & AP Das 0195*	Roots stem	Diabetes, anti inflamatory, fever, biliuria, rheumatism, neuralgia.
Curcuma zedoaria [Zingiberaceae]; *Soti, Goutam & AP Das 1323*	Rhizome	Used as anthelmintic, antipyretic, leucoderma, bronchitis, piles, asthma, fever, epilepsy, laxative tonic, carminative, emetic, pains, toothache, and leucorrhoea.
Datura metel [Solanaceae]; *Dhutura, Goutam & AP Das 1159*	Fruit	Hydrophobia, convulsion, neuralgia, rheumatic swelling, sciatica, dog bite, asthma.
Datura stramonium [Solanaceae]; *Dhutura, Goutam & AP Das 1329*	Fruit	Asthma, whooping cough, parkinsonism, bronchial and gastro intestinal problems, digestive, neuralgia, rheumatic pain.
Dillenia indica [Dilleniaceae]; *Chalta; Goutam & A.P. Das 373*	Barks, leaves, fruits	Stomachache, fever and cough, astringent, laxative.

Continue to next

Scientific Name	Parts used	Uses
Dioscorea alata [Dioscoreaceae]; *Chuprialu; Goutam & A.P. Das 652*	Tubers	Diuretic, anthelmintic, diabetes, leprosy, gonorrhoea, strangury, contraceptive.
Dioscorea bulbifera [Dioscoreaceae]; *Chuprialu*; *Goutam & A.P. Das 653*	Tuber	Alternative, tonic, aphrodisiac, stomachic, anthelmintic, dyspepsia, urinary discharge, bronchitis, leucoderma, piles, tumours, strangury, expectorant, asthma, ulcers.
Dioscorea pentaphylla [Dioscoreaceae]; *Pachpata alu*; *Goutam & A.P. Das 656*	Tuber, plants	Used in dropsy, rheumatism, anti inflamable.
Drymaria cordata [Caryophyllaceae]; *Abhijalo, Goutam & AP Das 0030*	Whole plants	Used in sinus, headache, cold, snake bite, fever, asthma, diptheria, pneumonia, throat pain.
Eclipta prostrata [Asteraceae]; *Keshut, Goutam & AP Das 0773*	Whole plants	The used in skin diseases, wounds, ulcers, leprosy, fever, jaundice. It is good for blackening and strengthening of the hair.
Eleusine indica [Poaceae]; *Goutam & AP Das 0574*	The grain	Used in astringent, cooling, blood disease, small pox, pneumonia, purgative.
Enydra fluctuans [Asteraceae]; *Helancha; Goutam & A.P. Das 164*	Young twig	Leaves eaten as a vegetable. Blood purifier.
Entada rheedii [Fabaceae]; *Gila; Goutam & A.P. Das 166*	Seeds	Mumps, body pain, cold, used as oral contraceptive, astringent, emetic, narcotic.
Chromolaena odorata [Asterace ae]; *Asamlata, Goutam & AP Das* 0105	Roots, leaves	Emetic, purgative. Used as antiseptic in cuts and burns
Euphorbia hirta [Euphobiaceae]; *Chhoto dudhi*, *Goutam & AP Das 0382*	Whole plants	Used in asthma, bronchitis and other respiratory disorder.
Euphorbia pulcherrima [Euphorbiaceae]; *Lalupati*; *Goutam & A.P.Das 836*	Leaves, flowers	Laxative, skin disease, anticancer.
Euphorbia royleana [Euphorbiaceae]; *Sij*; *Goutam & A.P.Das 872*	Latex	Anthelmintic, cathartic.
Ficus benghalensis [Moraceae]; *Bot, Goutam & AP Das 1328*	Leaves, twig	Astringent, ulcers, vomiting, fever, inflamation, leprosy, tonic, piles, disease of nose, gonorrhoea, syphilis, dysentery, liver problems, rheumatism, toothache, diabetes.
Ficus benjamina [Moraceae]; *Sami*; *Goutam & A.P.Das 911*	Leaves, latex	Ulcers, complaints of cornea.

Continue to next

Scientific Name	Parts used	Uses
Ficus religiosa [Moraceae]; *Pakur, Goutam & AP Das 1721*	Whole plants	Used in disease of blood, leucorrhoea, burning sensation, foul test, ulcers, astringent, bone fracture, urine discharge, inflamation, vomiting, gonorrhoea, laxative, alterative, asthma, antibacterial.
Ficus semicordata [Moraceae]; *Goutam & AP Das 1492*	Milky latex , fruits and roots	Ulcers,colic, leprosy, used in bladder complaints.
Glinus oppositifolius [Molluginaceae]; *Gima*; *Goutam & A.P. Das 069*	Whole plants	Used in stomachic, juice applied to itch and other such skin troubles. Also a popular vegetables.
Gynocardia odorata [Achariaceae]; Chalmogra/ Gante, *Goutam & AP Das 1191*	Fruits, seeds	Anthelmintic, fever, piles, ulcers, bronchitis, diabetes, skin disease, leprosy, rheumatism.
Hedychium coronarium [Zingiberaceae]; *Dolon Champa, Goutam & AP Das 1265*	Rhizomes	Carminative, stimulant, applied to sprains.
Hedyotis scandens [Rubiaceae]; *Goutam & AP Das 1337*	Roots, whole plants	Eye disease, colic pain, sprains, boils, childbirth problems.
Holarrhena pubescens [Apocynaceae]; *Kuchila; Goutam & A.P. Das 627*	Bark, stem latex	Dysentery, lung disease, tumour, skin eruption, irritation.
Houttuynia cordata [Saururaceae]; *Ashtani; Goutam & A.P. Das 357*	Plants	Stomach disorder, irregular menstruation, opthalmia, poultice, hemorrhoids.
Imperata cylindrica [Poaceae]; *Kush, Goutam & AP Das 0656*	Whole plants	Antiviral, good in fever, cough, jaundice, kidney problems, internal bleeding, nose bleeding, lung problems, anticancer.
Ipomoea aquatica [Convolvulaceae]; *Kolmi; Goutam & A.P. Das 064*	Young twig	A good vegetables, used for women suffering from nervous and general debility.
Justicia adhatoda [Acanthaceae]; *Basak; Goutam & A.P. Das 112*	Leaves	Piles, bronchial asthma, bronchitis, pyorrhea, cough, ulcers, menorrhagia, tuberculosis .
Justicia gendarusa [Acanthaceae]; *Kalakasunda, Goutam & A.P. Das 171*	Leaves, roots	Used in chronic rheumatism, facial paralysis, cough, bronchitis, arthritis, intermittent fevers.
Bryophyllum pinnatum [Crassulaceae]; *Patharkuchi, Goutam & AP Das 0223*	Leaves	The fresh leaves are used in the treatment of bums, wounds, impetigo, ulcer and other external application.
Lasia spinosa [Araceae]; *Kantakochu; Goutam & A.P. Das 648*	Leaves, inflorescence	Plant recommended for colic, rheumatism, and intestinal diseases.
Lepidagathis incurva [Acanthaceae]; *Goutam & AP Das 0543*	Leaves, young twig	Leaves and young twig are chewed to relieve cough.

Continue to next

Scientific Name	Parts used	Uses
Leucas indica [Lamiaceae]; *Swet dron*, *Goutam & AP Das 0292*	Leaves, young twig	The juice of the leaves is highly recommended in diabetes and is useful as a nasa drop.
Litsea glutinosa [Lauraceae]; *Pipul*, *Goutam & AP Das 0618*	Leaves	Mucilaginous bark used in diarrhoea and dysentery, rheumatic gout joints.
Mallotus philippensis [Euphorbiaceae]; *Sindure, Goutam & AP Das 0735*	Leaves, fruits	Used to improve appetite, constipation, anthelmintic, purgative, carminative, ulcers, wounds, tumour, bladder stone, bronchitis, enlarge spleen, scabies, ringworm, skin disease, vermifuge, purgative.
Manihot esculenta [Euphorbiaceae]; *Shimultarul; Goutam & A.P. Das 367*	Root	Used to cure ulcers.
Melastoma malabathricum [Melastomataceae]; *Futki, Goutam & AP Das 0224*	Bark, leaves	Bark and leaves used for skin troubles.
Premna latifolia [Lamiaceae]; *Gineri, Goutam & AP Das 0891*	Leaves	Leaves and tender shoots eaten in curries as diuretic, blood purifier and used in dropsy.
Psidium guajava [Myrataceae]; *Peyara*; *Goutam & A.P. Das 1238*	Leaves, bark, fruit	Dysentery, astringent, ulcers, bronchitis, colic, tonic, laxative, diarrhoea, toothache.
Pterospermum acerifolium [Malvaceae]; *Goutam & AP Das 0473*	Leaves, flowers	Tonic, ulcers, leprosy, urinary discharge, tumour, anthelmintic, laxative.
Rauvolfia serpentina [Apocynaceae]; *Swarpagandha, Chando*; *Goutam & A.P. Das 638*	Roots	Hypnotic, sedative, snake bite, blood pressure, insomnia, scorpion sting.
Rhus chinensis [Anacardiaceae]; *Bhalay, Goutam & AP Das 1098*	Fruits	Dysentery, indigestion, diarrhoea, colic, gulls, swelling and wounds, paralysis.
Ricinus communis [Euphorbiaceae]; *Rerhi, Goutam & AP Das 0371*	Bark, seeds	Seed oil is used as a purgative. Bark is used to treat skin inflammations and rashes.
Rungia pectinata [Acanthaceae]; *Goutam & AP Das 0281*	Whole plants	Juice of plants is applied as febrifuge.
Sapindus rarak [Sapindaceae]; *Ritha*; *Goutam & A.P. Das 1257*	Fruits	Fruits saponaceous, used like soapnuts as a detergent to falling of hair.
Sauropus compressus [Euphorbiaceae]; *Chikti, Goutam & AP Das 1036*	Leaves	The fresh leaves are used for the treatment of retained Placenta. A mouth-wash made of the juice of fresh leaves and honey and applied to the tongue.
Schima wallichii [Theaceae]; *Chilaone, Goutam & AP Das 1039*	Bark	Anthalmintic, vermicide, gonorrhoea.

Continue to next

Scientific Name	Parts used	Uses
Scoparia dulcis [Scrophulariaceae]; *Mithapata, Goutam & AP Das 0797*	Plants	Piles, diuretic, hyperthermia, cough, sore throat, boils, menorrhigia.
Semecarpus anacardium [Anacardiaceae]; *Bhalay, Goutam & AP Das 1258*	Bark, fruits	Skin disease, dysentery, fever, piles, tumour, ulcers, urinary discharge, inflamation, laxative, carminative, paralysis, epilepsy, nervous disease, tonic.
Shorea robusta [Dipterocarpaceae]; *Sal; Goutam & A.P. Das 637*	Resin, leaves	Diarrhoea, astringent, dysentery, fumigating, incense.
Sida acuta [Malvaceae]; *Jharu, Goutam & AP Das 0079*	Leaves, roots	Leaves and roots used in stomachic and antipyretic, used in nervous and urinary disorders.
Sida cordata [Malvaceae]; *Jharu, Goutam & AP Das 0126*	Roota	The roots are useful in fever and arthritis. The leaves are good for diarrhoea.
Sida cordifolia [Malvaceae]; *Jharu, Jharu, Goutam & AP Das 0100*	Tender shoots	The plants are used for fever, fits, leucorrhoea, colic and nervous discorders.
Sida rhombifolia [Malvaceae]; *Jharu, Goutam & AP Das 0132*	Leaves, roots	The roots and leaves are used in rheumatism and colic.
Solanum americanum [Solanaceae]; *Goat begun, Goutam & AP Das 1362*	Tender shoots	The plant is useful in rheumatalgia, swellings, cough, asthma, bronchitis, wounds, ulcers, vomiting, leprosy, skin diseases and fever.
Stephania glabra [Menispermaceae]; *Bhuin Kumra, Goutam & AP Das 0098*	Root tuber	Jaundice, diabetes, asthma, dysentery, tuberculosis, fever.
Stephania japonica [Menispermaceae]; *Goutam & AP Das 0518*	Root tuber	Jaundice, diabetes, fever, astringent, dyspepsia, diarrhoea, piles, urinary discharge.
Syzygium cumini [Myrtaceae]; *Jam*; *Goutam & A.P. Das 188*	Bark, leaves, fruits	The bark is carminative, diuretic, digestive. The tender leaves are used for vomiting. The fruits and seeds are used in diabetes.
Terminalia arjuna [Combretaceae]; *Arjun; Goutam & A.P. Das 1412*	Bark, Fruits	Liver tonic, improve digestion
Terminalia bellirica [Combretaceae]; *Kathbadam*, *Boira*; *Goutam & A.P. Das 376*	Fruits, bark	One of the ingredients of the triphala of ayurvedic medicine, anaemia, leuco-derma, astringent, pungent, laxative, bronchitis, acrid, anthelmintic, inflamation, disease of eye and nose, problems of bladder and piles.
Terminalia chebula [Combretaceae]; *Haritaki*; *Goutam & A.P. Das 360*	Fruits	Used in stomachic, expectorant, carminative, anthelmintic, tonic, alterative, astringent, dysentery, vomitting, anaemia, elephantiasis, disease of eye, hiccups, tonic.
Terminalia myriocarpa [Combretaceae]; *Puccasaj, Goutam & AP Das 0985*	Bark	Cardiac stimulant and diuretic.

Continue to next

Scientific Name	Parts used	Uses
Thysanolaena latifolia [Poaceae] ; *Jharu*; *Goutam & A.P.Das 636*	Stems, roots	Boils and used in mouth wash.
Tinospora crispa [Menispermaceae]; *Gulancha*; *Goutam & A.P. Das 189*	Leaves, stems, aerial roots	Ear pain, infection, fever, jaundice, vomiting, skin disease, piles.
Toona ciliata [Meliaceae]; *Tun, Goutam & AP Das 1429*	Bark	Dysentery, ulcers, menstrual disorder, astringent.
Trichosanthes cordata [Cucurbit aceae]; *Goutam & AP Das 1116*	Young twig	The young twig is used in burning sensation, dyspepsia, flatulence, intermittent fevers, chronic fevers, Vomiting and skin diseases.
Trichosanthes lepiniana [Cucurb itaceae]; *Goutam & AP Das 1107*	Young twig, fruits	The unripe fruit and the tender shoots used as vegetable to improve appetite and digestion.
Tridax procumbens [Asteraceae]; *Goutam & AP Das 1451*	Whole plant	Leaf juice is insecticidal, also used to check hemorrhage of wounds.
Typhonium trilobatum [Araceae]; *Kharkon, Goutam & AP Das 0054*	Whole plants	The rhizome is used with effect for treat in sore throat, headache, gastric ulcer, couth asthma.
Urtica dioca [Urticaceae]; *Sisnu, Goutam & AP Das 1457*	Flowers, plants, roots	High blood pressure, anthelmintic, diuretic, jaundice, carminative, complaints of lungs and internal organs, sciatica, heart troubles, cough, rheumatism.
Vallaris solanacea [Apocynaceae]; *Goutam & AP Das 0594*	Latex, bark	Latex and bark is applied to wounds and sores.
Vitex negundo [Verbenaceae]; *Nishinda; Goutam & A.P. Das 1249*	Leaves, roots, plant	Toothache, asthma, bronchitis, leucoderma, tonic, rheumatism, antidote to venom and scorpion sting, fever, febrifuge, enlargement of spleen, astringent, anthelmintic.
Woodfordia fruticosa [Lythraceae]; *Goutam & AP Das 0730*	Flowers, bark	Dysentery, astringent tonic, sores and boils, piles, leprosy, disease of blood, toothache, leucorrhoea, menorrhagia, dysentery.
Wrightia arborea [Apocynaceae] ; *Khira, Goutam & AP Das 0115*	Bark	Dried bark is used in dysentery.
Zanthoxylum acanthopodium [Rutaceae]; *Timbur*, *Goutam & AP Das 1472*	Aerial parts	Used in eye and ear disease, brain disease, purity of blood, fever, dyspepsia, cholera, toothache, stomachache, anthelmintic, carminative, mouth freshener.
Zanthoxylum rhetsa [Rutaceae]; *Timbur, Goutam & AP Das 1476*	Fruits	Fruits used in toothache and mouth freshener.
Zizyphus mauritiana [Rhamnaceae]; Kul; Goutam & A.P. Das 195	Leaves, bark, fruits, root	Dysentery, diarrhoea, blood disease, eye disease, ulcers, strangury, fever, antipyretic, headache, boils, leicorrhoea, asthma, wounds.

Scientific Name	Parts used	Uses
Zanthoxylum acanthopodium [Rutaceae]; *Timbur*, *Goutam & AP Das 1472*	Aerial parts	Used in eye and ear disease, brain disease, purity of blood, fever, dyspepsia, cholera, toothache, stomachache, anthelmintic, carminative, mouth freshener.
Zanthoxylum rhetsa [Rutaceae]; *Timbur, Goutam & AP Das 1476*	Fruits	Fruits used in toothache and mouth freshener.
Zizyphus mauritiana [Rhamnaceae]; Kul; Goutam & A.P. Das 195	Leaves, bark, fruits, root	Dysentery, diarrhoea, blood disease, eye disease, ulcers, strangury, fever, antipyretic, headache, boils, leicorrhoea, asthma, wounds.

9.4. Veterinary Medicinal Plants

Main domesticated animals of surrounding forests villagers are cows, goats, pigs, cats, dogs and fowls. These animals also suffer from different diseases and they are also treated by local traditional way of treatment. The Animal Hospital is not so popular or known to the villagers. Only one veterinary doctors has been appointed for Gorumara National Park who has no time to spend for domestic animals of forest villagers. So they treated mainly using plant materials. The present detail study shows that, the villagers use 45 species of plant materials to treat their pets which are enumerated below –

Table 9.4: Enumeration of Veterinary Medicinal Plants

Name of the Plants	Used parts
Achyranthus aspera [Amaranthaceae]; *Apang; Goutam & AP Das 1155*	Whole plant used in stomach troubles, uterine stimulant, rheumatism of goats and cows.
Aegle marmelos [Rutaceae]; *Bel*; *Goutam & A.P. Das 0070*	Fruits and leaves are used as vermifuge, in spleen complaints of cattle.
Alstonia scholaris [Apocynaceae]; *Chhatim*; *Goutam & A.P. Das 0117*	Bark powder as vermicide of pigs, cows and goats.
Alternanthera sessilis [Amaranthaceae]; *Chhenchi sag*; *Goutam & A.P. Das 222*	Whole plants are fed to cattle in diarrhoea and fever.
Amaranthus spinosus [Amaranthaceae]; *Notey*; *Goutam & A.P. Das 131*	Whole plants are fed to cows and buffaloes to enhance lactation.
Amorphophallus bulbifer [Araceae]; *Bon ol; Goutam & AP Das 1315*	Tuber smeared with little amount of salt and rubbed on tongue of cow for curing sore on tongue.
Ardisia solanacea [Primulaceae]; *Bon Jam; Goutam & AP Das 0249*	Roots and leaves are fed in fever and diarrhea of pigs.
Argemone mexicana [Papaveraceae]; *Sial Kanta, Goutam & AP Das 1371*	Whole plants paste externally used body pain and skin diseases of goats.
Aristolochia indica [Aristolochiaceae]; *Ishwarmul*; *Goutam & A.P. Das 783*	Roots are fed in fever of cattle.
Artocarpus lacucha [Moraceae]; *Daoa; Goutam & AP Das 1338*	Latex in dysentery; unripe fruits in blood complaints, eye trouble and cough; ripe fruits in appetite, improve test; seeds purgative; stem is vermifuge, in spleen complaints and bone fracture of cattle

Continue to next

Name of the Plants	Used parts
Azadirachta indica [Meliaceae]; *Nim; Goutam & AP Das 967*	Leaf extracts use in skin diseases of cows and goats.
Bischofia javanica [Bischofiaceae]; *Kainjal, Goutam & AP Das 1319*	Leaf paste is massage on body of cattle for removing lice.
Bombax ceiba [Malvaceae]; *Simul; Goutam & A.P. Das 335*	Roots and flowers are fed in dysentery of cow.
Bryophyllum pinnatum [Crassulaceae]; *Patharkuchi, Goutam & AP Das 0223*	Toasted leaves are applied on wounds, boils, and bites of venomous insects.
Calotropis gigantea [Apocynaceae]; *Ank, Goutam & AP Das 1164*	Whole plant are externally used in sores and skin disease, swellings and skeletal fracture of domestic animals.
Cannabis sativa [Cannabaceae]; *Bhang; Goutam & A.P. Das 065*	Fresh shoots are kept in the fowl shed in time of incubation for removing/ repelling insects from the place and as anti-mosquito agent.
Careya arborea [Lecythidaceae]; *Kumbhi, Goutam & AP Das 0153*	Bark, leaves and fruits are fed to cattle to remove lice.
Cassia fistula [Fabaceae]; *Bandarlathi; Goutam & A.P. Das 349*	Leaves, bark, root and seeds are fed for ringworm of goats.
Centella asiatica [Apiaceae]; *Thankuni; Goutam & A.P. Das 313*	Whole Plants with dry fish powder is used in drowsiness and white stool in hen.
Cheilocostus speciosus [Costaceae]; *Kemua, Goutam & AP Das 0195*	Rhizomes are fed to cows to improve health and fetility.
Cissus quadrangularis [Vitaceae]; *Harjora, Goutam & AP Das 1069*	Whole plant paste externally usewd in burns and wounds of cattles.
Coccinia grandis [Cucurbitaceae]; Telakucha; *Goutam & A.P. Das 719*	Leafy shoots are fed to the catle in indigestion.
Colocasia antiquorum [Araceae]; *Panikochu*; *Goutam & A.P. Das 134*	Lamina and petioles are chopped and boiled in sufficient water and fed to the pigs to induce fertility.
Clerodendrum infortunatum [Lamiaceae]; *Bhant*; *Goutam & A.P. Das 1034*	Leafy shoots is fed to the cows and goats in case of hyper salivation.
Crinum amoenum [Amaryllidaceae]; *Akasi; Goutam & A.P. Das **10**34*	Bulb along with garlic *(Alium sativum* Linnaeus] is given in asthma of cows, and is also fed to prevent flatulence of stomach.
Curcuma longa [Zingiberaceae]; *Halud; Goutam & A.P. Das 1324*	Paste of rhizome is applied on swellings and sores of cows and goats.
Curcuma zedoaria [Zingiberaceae]; *Soti, Goutam & AP Das 1323*	Rhizome are used in pains of legs of cow.
Cynodon dactylon [Poaceae]; *Dubba, Goutam & AP Das 0689*	Whole Plants used in body-sore of cattle, with the rhizome of *Curcuma longa.*
Datura metel [Solanaceae]; *Dhutura, Goutam & AP Das 1159*	Fruit extracts are fed to cow, goats and pig in dog bite.
Deeringia amaranthoides [Amaranthaceae]; *Goutam & AP Das 0241*	Roots and leaves applied to sores.

Continue to next

Name of the Plants	Used parts
Euphorbia hirta [Euphobiaceae]; *Chhoto dudhi*, *Goutam & AP Das 0382*	Whole Plants are fed to milking cows for improving lactation.
Ficus benghalensis [Moraceae]; *Bot, Goutam & AP Das 1328*	Leaves, bark and latex are used in indigestion and dysentery of cows and goats.
Hydrocotyle sibthorpioides [Araliaceae]; *Chhoto thankuni, Goutam & AP Das 1342*	Whole Plants fed to the cow with cinnamon and cardamom in pneumonia.
Holarrhena pubescens [Apocynaceae]; *Kuchila/ Kurchi; Goutam & A.P. Das 627*	Bark and roots are fed to cattle to cure from fever and dysentery.
Justicia adhatoda [Acanthaceae]; *Basak; Goutam & A.P. Das 112*	Leaves are pounded and given to the cows to cure pneumonia.
Mimosa pudica [Fabaceae];	Shoots extract with the rhizome of *Curcuma longa* is externally applied on wounds of cows.
Musa balbisiana [Musaceae]; *Bicha Kala; Goutam & A.P. Das 392*	Pseudostem given to the cattle to prevent heatstroke, ripen fruits are fed to the cows to check dysentery.
Neolamarckia cadamba [Rubiaceae]; *Kadam, Goutam & AP Das 0587*	Leafy shoots is fed to the catles to check dysentery.
Nyctanthes arbor-tristis [Nyctaginaceae] ; *Siuli, Goutam & AP Das 1087*	Leaf extract fed to the hens to cure fever.
Paederia foetida [Rubiaceae]; *Gondhopata*; *Goutam & A.P. Das 199*	Leafy shoots are fed in flatulence of stomach of cows.
Persicaria hydropiper [Polygonaceae]; *Bish Jhar, Goutam & AP Das 0130*	Leafy shoots are rubbed on the body of cattle for removing lice.
Pericampylus glaucus [Menispermaceae]; *Goutam & A.P. Das 999*	Leafy shoots is fed to the cows and goats in case of hyper salivation.
Piper longum [Piperaceae]; *Pipul*; *Goutam & A.P. Das 393*	Fruits paste is mixed with rice water in digestive problems of cows and goats.
Stephania japonica [Menispermaceae]; *Goutam & AP Das 0518*	Leafy shoots is fed to the cows and goats in fever.
Tinospora crispa [Menispermaceae]; *Gulancga*; *Goutam & A.P. Das 189*	Leaves, stems and aerial roots are used in wounds infection, fever and skin diseasenof cow.
Vitex negundo [Lamiaceae]; *Nishinda; Goutam & A.P. Das 1249*	Leaves are fed in body pain and wound of catles.

9.5 Poisonous Plants of GNP

Local people uses some plants as fish poison to catch fishes in dry seasons mainly. They also use some plants to cath birds from the Wetlands. From their knowledge, some poisonus plants enumerated below –

Table 9.5: Enumeration of Poisonous Plants

Name of the Plants	Poisonous parts
Abrus precatorius [Fabaceae]; *Kuch; Goutam & AP Das 0962*	Seeds are highly poisonus to human health.
Abrus pulchellus [Fabaceae]; *Kuch; Goutam & AP Das 811*	Seeds are highly poisonus to human health.
Acmella uliginosa [Asteraceae]; *Usani sag, Goutam & AP Das 1306*	Flowers are poisonus to human health.
Adenanthera pavonina [Fabaceae]; *Chandan bichi*; *Goutam & A.P. Das 758*	Seeds are highly poisonus to human health.
Alstonia scholaris [Apocynaceae]; *Chhatim*; *Goutam & A.P. Das 117*	Crushed stem-bark and leaves are use as fish poison.
Cannabis sativa [Cannabaceae]; *Bhang; Goutam & A.P. Das 65*	Leaves and inflorescence extract have harmful effects for human nervous system; hallucinogenic.
Careya arborea [Lecythidaceae]; *Kumbhi, Goutam & AP Das 0153*	Extracts of root and stem-bark is used to stupify fishes.
Catunaregam spinosa [Rubiaceae]; *Maina kanta, Goutam & AP Das 958*	Boiled young fruits can make the birds temporarily unconsusness.
Cheilocostus speciosus [Costaceae]; *Kemua, Goutam & AP Das 0195*	Rhizome extract is a fish poison.
Clerodendrum infortunatum [Lamiaceae]; *Bhant*; *Goutam & A.P. Das 1034*	Whole plants extracts are used to catching fish.
Datura metel [Solanaceae]; *Dhutura, Goutam & AP Das 1159*	Juice of fruits and leaves can create madness in people.
Datura stramonium [Solanaceae]; *Dhutura, Goutam & AP Das 1329*	Juice of fruits and leaves can create madness in people.
Girardinia diversifolia [Urticaceae]; *Bhangrey*; *Goutam & A.P. Das 869*	Leaves and stem covered by poisoned spines.
Lantana camara [Verbenaceae]; *Bish Tulsi*; *Goutam & A.P. Das 881*	Whole plants are poisonus to cattle.
Meyna spinosa [Rubiaceae]; *Maina kanta; Goutam & A.P. Das 768*	Fruits are pounded and mixed in pond water for killing fishes.
Persicaria hydropiper [Polygonaceae]; *Bish Jhar, Goutam & AP Das 0130*	Leafy shoots extract as insecticide and fish poison.
Rhus chinensis [Anacardiaceae]; *Bhalay, Goutam & AP Das 1098*	Leaves extracts and latex are highly poisonus to skins.
Semecarpus anacardium [Anacardiaceae]; *Bhalay, Goutam & AP Das 1258*	Leaves extracts and latex are highly poisonus to skins.
Solanum anguivi [Solanaceae]; *Bringhati, Goutam & AP Das 1078*	Fruits are highly poisonus to human health.
Tabernamontana divaricata [Apocynaceae]; *Sada ful, Goutam & AP Das 1041*	Latex, leaves and fruits are highly poisonus to human health.
Urtica dioca [Urticaceae]; *Sisnu, Goutam & AP Das 1457*	Leaves and stem covered by poisoned spines.

9.6. Recorded Religious Plants

Forests villagers are mainly Traibal, Nepali and Rajbanshi. Their place of worship is mainly two types – (i) every house has own *Than* and also *Kali* and *Shiva* and (ii) out side of the house (mainly roadside) under the *Ficus benghalensis* has *Mashan debota* and also *Stone* as like as *Shiva Ling*. They has also other pujas like *Lakshmi puja, Teesta Burir Puja, Swaswati puja, Shani puja, Janma astami, Manasha puja, Ambubachi* etc. every pujas and their traditional social activities has selected some plant materials which they regularly use. The plants which they use their different religious purposes are enumerated below:

Table 9.6: Enumeration of Religious Plants

Name of the Plants	Religious use	Used part
Aegle marmelos [Rutaceae]; *Bel*; *Goutam & A.P. Das 70*	Pray to *God Shiva* and other every religious purposes	Leaves and Fruits
Bambusa balcooa [Poaceae]; *Boro Bansh*; *Goutam & A.P. Das 419*	Use kula, Jhuri/dali and chalni in different religious purposes	Culm, Leaves
Bambusa tulda [Poaceae]; *Talda bansh; Goutam & AP Das 0715*	Use kula, Jhuri/dali and chalni in different religious purposes	Culm, Leaves
Butea monosperma [Fabaceae]; *Palash, Goutam & AP Das 0295*	Swarasati puja	Flowers
Bombax ceiba [Malvaceae]; *Simul; Goutam & A.P. Das 335*	Pray to God Shiva and Mashan Thakur	Tree, Flowers and Seed hair
Cannabis sativa [Cannabaceae]; *Bhang; Goutam & A.P. Das 65*	God Shiva puja and Kali puja	Bark, Leaves and Inflorescence
Cynodon dactylon [Poaceae]; *Dubba, Goutam & AP Das 0689*	Every religious purposes	Leaves
Datura metel [Solanaceae]; *Dhutura, Goutam & AP Das 1159*	Pray to God Shiva	Fruits, Flowers
Datura stramonium [Solanaceae]; *Dhutura, Goutam & AP Das 1329*	Pray to God Shiva	Fruits, Flowers
Ficus benghalensis [Moraceae]; *Bot, Goutam & AP Das 1328*	Pray as God	Leaves, Twigs, Tree
Ficus neriifolia [Moraceae]; *Jagya dumur; Goutam & A.P. Das 873*	Jagya in time of Pray of God	Leaves, Woody twigs
Ficus religiosa [Moraceae]; *Pakur, Goutam & AP Das 1721*	Pray as God	Leaves, Twigs, Tree
Imperata cylindrica [Poaceae]; *Kush, Goutam & AP Das 0656*	Every religious purposes	Culm
Mangifera indica [Anacardiaceae]; *Aam*; *Goutam & A.P. Das 1103*	Every religious purposes	Leaves, Fruits
Manihot esculenta [Euphorbiaceae]; *Shimultarul; Goutam & A.P. Das 367*	Use as sacred tree	Leaves, Tree
Musa balbisiana Colla [Musaceae]; *Bicha Kala; Goutam & A.P. Das 392*	Every religious purposes	Leaves, Fruits
Ocimum tenuiflorum [Lamiaceae]; *Tulsi; Goutam & A.P. Das 198*	Every religious purposes excep Narayan puja	Leaves, Plants

Continue to next

Name of the Plants	Religious use	Used part
Oroxylum indicum [Bignoniaceae]; *Totala*; *Goutam &A.P. Das 63*	Sacred Tree	Tree
Saccharum spontaneum [Poaceae]; *Kash, Goutam & AP Das 0322*	Every religious purposes	Culm
Shorea robusta [Dipterocarpaceae]; *Sal; Goutam & A.P. Das 637*	Used in every religious purposes	Bark, regin
Terminalia chebula [Combretaceae]; *Haritaki*; *Goutam & A.P. Das 360*	Every religious purposes	Fruits

9.7. Enumeration of Edible Species of GNP

People of forest villages collected their daily usable vegetables, fruits and flowers from the wild or some they also planted in their won house are enumerated below –

Table 9.7: Use parts of Edible plants

Name of the Plants	Young Plants	Leaves	Roots	Stem	Flowers	Calyx	Fruits	Seeds	Petiole	Corm/ Rhyzome	Bulbils
Aegle marmelos	-	-	-	-	-	-	1	-	-	-	-
Alternanthera sessilis	1	-	-	-	-	-	-	-	-	-	-
Amaranthus blitum	1	-	-	-	-	-	-	-	-	-	-
Amaranthus spinosus	1	-	-	-	-	-	-	-	-	-	-
Amaranthus viridis	1	-	-	-	-	-	-	-	-	-	-
Artocarpus heterophyllus	-	-	-	-	-	-	1	1	-	-	-
Artocarpus lacucha	-	-	-	-	-	-	1	-	-	-	-
Asparagus racemosus	1	-	1	-	-	-	-	-	-	-	-
Castanopsis indica	-	-	-	-	-	-	-	1	-	-	-
Chenopodium album	1	1	-	1	-	-	-	-	-	-	-
Citrus limon	-	-	-	-	-	-	1	-	-	-	-
Citrus maxima	-	-	-	-	-	-	1	-	-	-	-
Coccinia grandiflora	1	1	-	-	-	-	1	-	-	-	-
Colocasia antiquorum	-	1	-	-	1	-	-	-	1	-	-
Deeringia amaranthoides	1	1	-	-	-	-	-	-	-	-	-
Dillenia indica	-	-	-	1	-	1	-	-	-	-	-
Dillenia pentagyna	-	-	-	-	-	1	-	-	-	-	-
Dioscorea alata	-	-	-	-	-	-	-	-	-	1	1
Dioscorea bulbifera	-	-	-	-	-	-	-	-	-	1	1
Dioscorea pentaphylla	-	-	-	-	-	-	-	-	-	1	1
Dioscorea prazeri	-	-	-	-	-	-	-	-	-	1	1
Duchesnea indica	-	-	-	-	-	-	1	-	-	-	-
Dysphania ambrosioides	1	1	-	-	-	-	-	-	-	-	-
Elaeocarpus floribundus	-	-	-	-	-	-	1	-	-	-	-
Enydra fluctuans	1	-	-	-	-	-	-	-	-	-	-
Girardinia diversifolia	1	-	-	-	-	-	-	-	-	-	-
Glinus oppositifolius	1	-	-	-	-	-	-	-	-	-	-
Grewia asiatica	-	-	-	-	-	-	1	-	-	-	-
Houttuynia cordata	1	1	-	-	-	-	-	-	-	-	-
Ipomoea aquatica	1	-	-	-	-	-	-	-	-	-	-
Lasia spinosa	-	-	-	-	1	-	-	-	-	-	-
Leucas indica	1	1	-	-	-	-	-	-	-	-	-
Litchi chinensis	-	-	-	-	-	-	1	-	-	-	-
Mangifera indica	-	-	-	-	-	-	1	-	-	-	-

Continue to next

Name of the Plants	Young Plants	Leaves	Roots	Stem	Flowers	Calyx	Fruits	Seeds	Petiole	Corm/ Rhyzome	Bulbils
Manihot esculenta	-	-	1	-	-	-	-	-	-	-	-
Momordica charantia	1	1	-	-	-	-	1	-	-	-	-
Momordica dioica	-	-	-	-	-	-	1	-	-	-	-
Morus indica	-	-	-	-	-	-	1	-	-	-	-
Musa balbisiana	-	-	-	-	1	-	1	-	-	-	-
Paederia foetida	1	1	-	-	-	-	-	-	-	-	-
Phyllanthus emblica	-	-	-	-	-	-	1	-	-	-	-
Physalis minima	-	-	-	-	-	-	1	-	-	-	-
Piper betloides	-	1	-	-	-	-	-	-	-	-	-
Piper peepuloides	1	1	-	-	-	-	1	-	-	-	-
Premna bengalensis	-	1	-	-	-	-	-	-	-	-	-
Premna mollissima	-	1	-	-	-	-	-	-	-	-	-
Psidium guajava	-	-	-	-	-	-	1	-	-	-	-
Solanum pimpinellifolium	1	-	-	-	-	-	1	-	-	-	-
Syzygium cumini	-	-	-	-	-	-	1	-	-	-	-
Syzygium jambos	-	-	-	-	-	-	1	-	-	-	-
Terminalia bellirica	-	-	-	-	-	-	1	1	-	-	-
Terminalia chebula	-	-	-	-	-	-	1	-	-	-	-
Typhonium trilobatum	1	-	-	-	-	-	-	-	-	-	-
Zanthoxylum rhetsa	-	-	-	-	-	-	1	-	-	-	-
Ziziphus jujuba	-	-	-	-	-	-	1	-	-	-	-
Ziziphus oenopolia	-	-	-	-	-	-	1	-	-	-	-
Ziziphus rugosa	-	-	-	-	-	-	1	-	-	-	-
Total	**20**	**13**	**2**	**2**	**3**	**2**	**28**	**3**	**1**	**4**	**4**

9.8. Fodder Plants of GNP

Forests villagers, Forests guards, Mahuts are collected fodder plants from the forests for their catles, goats, pigs and also elephants *i.e.* Kunki hanti. They collected 260 species of plants for their pet like cows, goats, pigs, bufellows and elephants etc., are enumerated below –

Table 9.8: Fodder plants with their Used Parts of Plants

Name of Plants	Parts used
Acacia pennata [Fabaceae]; *Arare kanta; Goutam & AP Das 0289*	Leaves and barks
Achyrospermum wallichianum [Lamiaceae]; *Goutam & AP Das 1289*	Whole plants
Acmella calva [Asteraceae]; *Usani sag; Goutam & AP Das 0206*	Whole plants
Acmella uliginosa [Asteraceae]; *Usani sag, Goutam & AP Das 1306*	Whole plants
Actinodaphne longipes [Lauraceae]; *Goutam & AP Das 1311*	Leaves, young twigs and barks
Actinodaphne obovata [Lauraceae]; *Goutam & AP Das 1385*	Leaves, young twigs
Actinodaphne sikkimensis [Lauraceae]; *Goutam & AP Das 1226*	Leaves, young twigs and barks
Adenanthera pavonina [Fabaceae]; *Chandan bichi*; *Goutam & A.P. Das 758*	Leaves and barks
Aesculus assamica [Sapindaceae]; *Eksira; Goutam & AP Das 1164*	Leaves
Ageratum conyzoides [Asteraceae]; *Goutam & AP Das 0442*	Whole plants
Ageratum houstonianum [Asteraceae]; *Goutam & AP Das0138*	Whole plants
Ageratum houstonianum [Asteraceae]; *Goutam & AP Das0138*	Leaves, young twigs and barks
Alpinia calcarata [Zingiberaceae]; *Purundi; Goutam & AP Das 0716*	Whole plants
Alpinia nigra [Zingiberaceae]; *Purundi; Goutam & AP Das 0155*	Whole plants
Alstonia scholaris [Apocynaceae]; *Chhatim*; *Goutam & A.P. Das 117*	Leaves and barks
Alternanthera sessilis [Amaranthaceae]; *Chhenchi sag*; *Goutam & A.P. Das 222*	Whole plants
Amaranthus blitum [Amaranthaceae]; *Papri notey; Goutam & AP Das 0424*	Whole plants
Amaranthus spinosus [Amaranthaceae]; *Kanta notey; Goutam & AP Das 0330*	Whole plants

Continue to next

Name of Plants	Parts used
Amaranthus viridis [Amaranthaceae]; *Notey*; *Goutam & A.P. Das 131*	Whole plants
Ampelocissus barbata [Vitaceae]; *Goutam & AP Das 0519*	Whole plants
Anisomeles indica [Lamiaceae]; *Bhut tulsi; Goutam & AP Das 0283*	Whole plants
Ardisia solanacea [Primulaceae]; *Bon Jam; Goutam & AP Das 0249*	Whole plants
Arthraxon hispidus [Poaceae]; *Bas ghhas, Goutam & AP Das 1315*	Whole plants
Arthraxon lancifolius [Poaceae]; *Bas ghhas, Goutam & AP Das 1187*	Whole plants
Artocarpus chama [Moraceae]; *Lator; Goutam & AP Das 1104*	Leaves, Fruits and barks
Artocarpus heterophyllus [Moraceae]; *Kanthal*; *Goutam & A.P. Das 761*	Leaves, Fruits
Artocarpus lacucha [Moraceae]; *Daoa; Goutam & AP Das 1338*	Leaves, Fruits
Arundinella bengalensis [Poaceae]; *Goutam & AP Das 1317*	Whole plants
Arundinella nepalensis [Poaceae]; *Goutam & AP Das 1174*	Whole plants
Bambusa balcooa [Poaceae]; *Boro Bansh*; *Goutam & A.P. Das 419*	Whole plants
Bambusa tulda [Poaceae]; *Talda bansh; Goutam & AP Das 0715*	Whole plants
Bambusa vulgaris [Poaceae]; *Haldi bansh; Goutam & AP Das 0678*	Whole plants
Bauhinia purpurea [Caesalpiniaceae]; *Kanchan; Goutam & A.P. Das 97*	Leaves
Berchemia floribunda [Rhamnaceae]; *Lata; Goutam & AP Das 0476*	Whole plants
Bidens pilosa [Asteraceae]; *Kapar jorani, Goutam & AP Das 0853*	Whole plants
Bischofia javanica [Bischofiaceae]; *Kainjal, Goutam & AP Das 1319*	Leaves, young twigs and barks
Bombax ceiba [Malvaceae]; *Simul; Goutam & A.P. Das 335*	Leaves and flowers
Bridelia retusa [Phyllanthaceae]; *Goutam & AP Das 0575*	Whole plants
Bridelia sikkimensis [Phyllanthaceae]; *Goutam & AP Das 1156*	Leaves
Callicarpa arborea [Lamiaceae]; *Goutam & AP Das 0295*	Whole plants
Carex ligulata [Cyperaceae]; *Goutam & AP Das 1148*	Whole plants
Careya arborea [Lecythidaceae]; *Kumbhi, Goutam & AP Das 0153*	Leaves
Casearia vareca [Salicaceae]; *Lalbichi, Goutam & AP Das 1103*	Leaves, young twigs
Cassia fistula [Fabaceae]; *Bandarlathi; Goutam & A.P. Das 349*	Leaves, young twigs and barks
Cassia javanica subsp. *nodosa* [Fabaceae]; *Goutam & AP Das 0122*	Leaves, young twigs and barks
Chenopodium album [Amaranthaceae]; *Bethua*; *Goutam & A.P. Das 663*	Whole plants
Choerospondias axillaris [Anacardiaceae]; *Goutam & AP Das 1127*	Leaves
Chromolaena odorata [Asteraceae]; *Asamlata, Goutam & AP Das* 0105	Whole plants
Chukrasia tabularis [Meliaceae]; *Chikrasi, Goutam & AP Das 0454*	Leaves
Cinnamomum bejolghota [Lauraceae]; *Sincoule; Goutam & A.P. Das 452*	Leaves, young twigs and barks
Cissampelos pareira [Menispermaceae]; *Goutam & AP Das 0032*	Whole plants
Coccinia grandiflora [Cucurbitaceae]; *Telakucha*; *Goutam & A.P. Das 719*	Whole plants
Coffea benghalensis [Rubiaceae]; *Chaitiful, sada ful, Goutam & AP Das 0462*	Whole plants
Commelina benghalensis [Commelinaceae]; *Goutam & AP Das 0156*	Whole plants
Commelina diffusa [Commelinaceae]; *Goutam & AP Das 0182*	Whole plants
Commelina maculata [Commelinaceae]; *Goutam & AP Das 1172*	Whole plants
Commelina suffruticosa [Commelinaceae]; *Goutam & AP Das 0201*	Whole plants
Crateva religiosa [Capparaceae]; *Bonna, Goutam & AP Das 0207*	Leaves
Cyperus rotundus L.[Cyperaceae]; *Mutha, Goutam & AP Das 0370*	Leaves, young twigs and barks
Dioscorea prazeri [Dioscoreaceae]; *Kham alu*; *Goutam & A.P. Das 190*	Leaves
Cyanthillium cinereum [Asteraceae]; *Goutam & AP Das 0674*	Whole plants
Cynodon dactylon [Poaceae]; *Dubba, Goutam & AP Das 0689*	Whole plants
Cyperus compressus [Cyperaceae]; *Goutam & AP Das 0211*	Whole plants
Cyperus cyperoides [Cyperaceae]; *Goutam & AP Das 0237*	Whole plants
Cyperus iria [Cyperaceae]; *Goutam & AP Das 0343*	Whole plants
Cyperus pangorei [Cyperaceae]; *Goutam & AP Das 0084*	Whole plants
Eclipta prostrata [Asteraceae]; *Keshut, Goutam & AP Das 0773*	Whole plants
Deeringia amaranthoides [Amaranthaceae]; *Goutam & AP Das 0241*	Whole plants

Continue to next

Name of Plants	Parts used
Desmodium triflorum [Fabaceae]; *Tinpata, Goutam & AP Das 0154*	Whole plants
Dillenia indica [Dilleniaceae]; *Chalta; Goutam & AP Das 0666*	Leaves, Fruits
Dillenia pentagyna [Dilleniaceae]; *Tartari, Goutam & AP Das 0695*	Leaves, Fruits
Dioscorea bulbifera [Dioscoreaceae]; *Chuprialu*; *Goutam & A.P. Das 653*	Whole plants
Dioscorea deltoidea [Dioscoreaceae]; *Chupri alu*; *Goutam & A.P. Das 702*	Whole plants
Dioscorea pentaphylla [Dioscoreaceae]; *Pachpata alu*; *Goutam & A.P. Das 656*	Whole plants
Drymaria cordata [Caryophyllaceae]; *Abhijalo, Goutam & AP Das 0030*	Whole plants
Duchesnea indica [Rosaceae]; *Lalfol, Goutam & AP Das 0137*	Whole plants
Dysoxylum mollissimum [Meliaceae]; *Goutam & AP Das 1333*	Leaves, young twigs and barks
Dysphania ambrosioides [Amaranthaceae]; *Gondhani, Goutam & AP Das 0145*	Whole plants
Echinochloa crus-galli [Poaceae]; *Goutam & AP Das 0730*	Whole plants
Eichhornia crassipes [Pontederiaceae]; *Kachuri pana, Goutam & AP Das 0179*	Leaves and petiole
Elaeocarpus floribundus [Elaeocarpaceae]; *Jalpai*; *Goutam & A.P. Das 978*	Leaves
Eleocharis retroflexa [Cyperaceae]; *Goutam & AP Das 0220*	Whole plants
Elephantopus scaber [Asteraceae]; *Goutam & AP Das 0709*	Whole plants
Eleusine indica [Poaceae]; *Goutam & AP Das 0574*	Whole plants
Eragrostis tenella [Poaceae]; *Goutam & AP Das 0514*	Whole plants
Eragrostis unioloides [Poaceae]; *Goutam & AP Das 0572*	Whole plants
Euphorbia hirta [Euphobiaceae]; *Chhoto dudhi*, *Goutam & AP Das 0382*	Whole plants
Eurya acuminata [Pentaphylacaceae]; *Goutam & AP Das 1136*	Leaves
Ficus benghalensis [Moraceae]; *Bot, Goutam & AP Das 1328*	Leaves and hypanthodium
Ficus benjamina [Moraceae]; *Sami*; *Goutam & A.P.Das 911*	Leaves and hypanthodium
Ficus hispida [Moraceae]; *Dumur, Goutam & AP Das 1633*	Leaves and hypanthodium
Ficus religiosa [Moraceae]; *Pakur, Goutam & AP Das 1721*	Leaves and hypanthodium
Ficus semicordata [Moraceae]; *Goutam & AP Das 1492*	Leaves and hypanthodium
Fimbristylis aestivalis [Cyperaceae]; *Goutam & AP Das 0616*	Whole plants
Fimbristylis dichotoma [Cyperaceae]; *Goutam & AP Das 0555*	Whole plants
Flueggea virosa [Phyllanthaceae]; *Goutam & AP Das 0704*	Whole plants
Globba racemosa [Zingiberaceae]; *Goutam & AP Das 0204*	Whole plants
Gouania tiliifolia [Rhamnaceae]; *Goutam & AP Das 0420*	Whole plants
Grewia asiatica [Malvaceae]; *Goutam & AP Das 1338*	Leaves, young twigs and barks
Gynocardia odorata [Achariaceae]; Chalmogra/ Gante, *Goutam & AP Das 1191*	Leaves, Fruits
Hedyotis scandens [Rubiaceae]; *Goutam & AP Das 1337*	Whole plants
Hodgsonia macrocarpa [Cucurbitaceae]; *Goutam & AP Das 1341*	Whole plants
Holarrhena pubescens [Apocynaceae]; *Kuchila/ Kurchi; Goutam & A.P. Das 627*	Whole plants
Holmskioldia sanguinea [Lamiaceae]; *Tupi ful, Goutam & A.P. Das 365*	Whole plants
Hydrocotyle sibthorpioides [Araliaceae]; *Chhoto thankuni, Goutam & AP Das 1342*	Whole plants
Ichnocarpus frutescens [Apocynaceae]; *Dudhi lata, Goutam & AP Das 0008*	Whole plants
Imperata cylindrica [Poaceae]; *Kush, Goutam & AP Das 0656*	Whole plants
Ipomoea aquatica [Convolvulaceae]; *Kolmi; Goutam & A.P. Das 064*	Whole plants
Ipomoea indica [Convolvulaceae]; *Goutam & AP Das 1345*	Whole plants
Jasminum dispermum [Oleaceae]; *Juin, Goutam & AP Das 1188*	Whole plants
Justicia adhatoda [Acanthaceae]; *Basak; Goutam & A.P. Das 112*	Whole plants
Kyllinga brevifolia [Cyperaceae]; *Goutam & AP Das 0485*	Whole plants
Kyllinga nemoralis [Cyperaceae]; *Goutam & AP Das 0550*	Whole plants
Lagerstroemia parviflora [Lythraceae]; *Sidha*; *Goutam & A.P. Das 697*	Whole plants

Continue to next

Name of Plants	Parts used
Lagerstroemia speciosa [Lythraceae]; *Jarul*; *Goutam & A.P. Das 994*	Leaves, young twigs and barks
Kyllinga brevifolia [Cyperaceae]; *Goutam & AP Das 0485*	Leaves, young twigs and barks
Leea aequata [Vitaceae]; *Goutam & AP Das 0386*	Leaves
Leea asiatica [Vitaceae]; *Goutam & AP Das 0375*	Leaves
Leea guineensis [Vitaceae]; *Goutam & AP Das 1191*	Leaves
Leea indica [Vitaceae]; *Goutam & AP Das 1198*	Leaves
Leea macrophylla [Vitaceae]; *Goutam & AP Das 0442*	Leaves
Lepidagathis incurva [Acanthaceae]; *Goutam & AP Das 0543*	Whole plants
Limnophila heterophylla [Plantaginaceae]; *Goutam & AP Das 1256*	Whole plants
Limnophila racemosa [Plantaginaceae];*Goutam & AP Das 1086*	Whole plants
Lindernia crustacea [Linderniaceae]; *Goutam & AP Das 1007*	Whole plants
Lindernia ruellioides [Linderniaceae]; *Goutam & AP Das 1019*	Whole plants
Litchi chinensis [Sapindaceae]; *Lichu*; *Goutam & A.P. Das 1377*	Leaves, Fruits
Litsea elongata [Lauraceae]; *Goutam & AP Das 1047*	Leaves
Litsea glutinosa [Lauraceae]; *Pipul*, *Goutam & AP Das 0618*	Leaves
Litsea laeta [Lauraceae]; *Goutam & AP Das 1065*	Leaves
Litsea longifolia [Lauraceae]; *Goutam & AP Das 1358*	Leaves
Litsea monopetala [Lauraceae]; *Goutam & AP Das 0685*	Leaves
Litsea panamanja [Lauraceae]; *Goutam & AP Das 1242*	Leaves
Machilus parviflora [Lauraceae]; *Kaolo, Goutam & AP Das 1193*	Leaves
Maesa indica [Primulaceae]; *Goutam & AP Das 0177*	Leaves
Maesa macrophylla [Primulaceae]; *Goutam & AP Das 1196*	Leaves, young twigs
Mallotus philippensis [Euphorbiaceae]; *Sindure, Goutam & AP Das 0735*	Leaves, young twigs
Mallotus nudiflorus [Euphorbiaceae]; *Pithali, Goutam & AP Das 1207*	Leaves, young twigs and barks
Mangifera indica [Anacardiaceae]; *Aam*; *Goutam & A.P. Das 1103*	Leaves, young twigs and barks
Manihot esculenta [Euphorbiaceae]; *Shimultarul; Goutam & A.P. Das 367*	Leaves, Fruits
Mazus pumilus [Phrymaceae]; *Goutam & AP Das 1037*	Leaves
Leucas indica [Lamiaceae]; *Swet dron*, *Goutam & AP Das 0292*	Whole plants
Mikania micrantha [Asteraceae]; *Goutam & AP Das 0711*	Whole plants
Mitracarpus hirtus [Rubiaceae]; *Goutam & AP Das 1038*	Whole plants
Momordica dioica [Cucurbitaceae]; *Kakrol*; *Goutam &A.P. Das 383*	Whole plants
Monochoria hastata [Pontederiaceae]; *Goutam & AP Das 0212*	Whole plants
Monochoria vaginalis [Pontederiaceae]; *Goutam & AP Das 0257*	Whole plants
Morus indica [Moraceae]; *Tut*; *Goutam & A.P. Das 359*	Leaves, young twigs and barks
Mucuna pruriens [Fabaceae]; *Bandarkhujla*; *Goutam & A.P. Das 645*	Whole plants
Murdannia nudiflora [Commelinaceae]; *Goutam & AP Das 0613*	Whole plants
Musa balbisiana Colla [Musaceae]; *Bicha Kala; Goutam & A.P. Das 392*	Whole plants
Mussaenda roxburghii [Rubiaceae]; *Sada pata, Goutam & AP Das 0987*	Leaves, young twigs and barks
Naravelia zeylanica [Ranunculaceae]; *Chhagali, Goutam & AP Das 1187*	Whole plants
Neolamarckia cadamba [Rubiaceae]; *Kadam, Goutam & AP Das 0587*	Leaves, young twigs, fruits and barks
Ochlandra scriptoria [Poaceae]; *Goutam & AP Das 0963*	Whole plants
Oenanthe benghalensis [Apiaceae]; *Goutam & AP Das 0749*	Whole plants
Hedychium coronarium [Zingiberaceae]; *Dolon Champa, Goutam & AP Das 1265*	Whole plants
Oldenlandia corymbosa [Rubiaceae]; *Goutam & AP Das 0599*	Whole plants
Oldenlandia diffusa [Rubiaceae]; *Goutam & AP Das 0526*	Whole plants
Oldenlandia verticillata [Rubiaceae]; *Goutam & AP Das 0653*	Whole plants
Oplismenus burmanni [Poaceae]; *Goutam & AP Das 0396*	Whole plants
Oplismenus compositus [Poaceae]; *Goutam & AP Das 0443*	Whole plants
Oroxylum indicum [Bignoniaceae]; *Totala*; *Goutam &A.P. Das 63*	Leaves, young twigs, barks and flowers
Oxalis corniculata [Oxalidaceae]; *Ambuli, Goutam & AP Das 0706*	Whole plants

Continue to next

Name of Plants	Parts used
Paederia foetida [Rubiaceae]; *Gondhopata*; *Goutam & A.P. Das 199*	Whole plants
Panicum auritum [Poaceae]; *Goutam & AP Das 0847*	Whole plants
Parabaena sagittata [Menispermaceae]; *Goutam & AP Das 0841*	Whole plants
Paramignya monophylla [Rutaceae]; *Goutam & AP Das 0833*	Leaves, young twigs and barks
Paspalum conjugatum [Poaceae]; *Goutam & AP Das 0403*	Whole plants
Pericampylus glaucus [Menispermaceae]; *Goutam & A.P. Das 999*	Whole plants
Persicaria barbata [Polygonaceae]; *Goutam & AP Das 0415*	Whole plants
Persicaria chinensis [Polygonaceae]; *Goutam & AP Das 0395*	Whole plants
Persicaria hydropiper [Polygonaceae]; *Bish Jhar, Goutam & AP Das 0130*	Whole plants
Phlogacanthus thyrsiformis [Acanthaceae]; *Rambhang*; *Goutam & A.P. Das 327*	Whole plants
Phrynium pubinerve [Marantaceae]; *Goutam & AP Das 0232*	Whole plants
Phyllanthus urinaria [Phyllanthaceae]; *Goutam & AP Das 0464*	Whole plants
Phyllanthus virgatus [Phyllanthaceae]; *Goutam & AP Das 0419*	Whole plants
Physalis minima [Solanaceae]; *Taperi, Goutam & AP Das 0839*	Whole plants
Pogostemon amaranthoides [Lamiaceae]; *Goutam & AP Das 0603*	Whole plants
Polycarpon prostratum [Caryophyllaceae]; *Goutam & AP Das 0414*	Whole plants
Polygonum pubescens [Polygonaceae]; *Goutam & AP Das 0062*	Whole plants
Pouzolzia zeylanica [Urticaceae]; *Goutam & AP Das 0198*	Whole plants
Psychotria erratica [Rubiaceae]; *Goutam & AP Das 1099*	Whole plants
Pupalia lappacea [Amaranthaceae]; *Goutam & AP Das 0181*	Whole plants
Richardia scabra [Rubiaceae]; *Goutam & AP Das 0494*	Whole plants
Rotala rotundifolia [Lythraceae]; *Goutam & AP Das 0043*	Whole plants
Rumex dentatus [Polygonaceae]; *Goutam & AP Das 0040*	Whole plants
Rumex maritimus [Polygonaceae]; *Goutam & AP Das 0050*	Whole plants
Rungia pectinata [Acanthaceae]; *Goutam & AP Das 0281*	Whole plants
Saccharum arundinaceum [Poaceae]; *Dhadda, Goutam & AP Das 1028*	Whole plants
Saccharum narenga [Poaceae]; *Boro chepti, Goutam & AP Das 1032*	Whole plants
Saccharum spontaneum [Poaceae]; *Kash, Goutam & AP Das 0322*	Whole plants
Salix tetrasperma [Salicaceae]; *Pani Sal, Goutam & AP Das 0270*	Leaves, young twigs and barks
Sapindus rarak [Sapindaceae]; *Ritha*; *Goutam & A.P. Das 1257*	Leaves, young twigs and barks
Sauropus compressus [Euphorbiaceae]; *Chikti, Goutam & AP Das 1036*	Whole plants
Sauropus quadrangularis [Phyllanthaceae]; *Chikti, Goutam & AP Das 0366*	Whole plants
Schima wallichii [Theaceae]; *Chilaone, Goutam & AP Das 1039*	Leaves
Scoparia dulcis [Scrophulariaceae]; *mithapata, Goutam & AP Das 0797*	Whole plants
Senna alata [Fabaceae]; *Jhun jhuni, Goutam & AP Das 0213*	Leaves
Senna occidentalis [Fabaceae]; *Goutam & AP Das 0162*	Whole plants
Senna siamea [Fabaceae]; *Goutam & AP Das 0127*	Whole plants
Senna tora [Fabaceae]; *Jhun jhuni, Goutam & AP Das 0178*	Whole plants
Setaria glauca [Poaceae]; *Goutam & AP Das 0489*	Whole plants
Setaria palmifolia [Poaceae]; *Palm ghas, Goutam & AP Das 0450*	Whole plants
Shorea robusta [Dipterocarpaceae]; *Sal; Goutam & A.P. Das 637*	Whole plants
Sida acuta [Malvaceae]; *Jharu, Goutam & AP Das 0079*	Leaves, young twigs and barks
Sida cordata [Malvaceae]; *Jharu, Goutam & AP Das 0126*	Whole plants
Sida cordifolia [Malvaceae]; *Jharu, Jharu, Goutam & AP Das 0100*	Whole plants
Sida rhombifolia [Malvaceae]; *Jharu, Goutam & AP Das 0132*	Whole plants
Sloanea sterculiacea [Elaeocarpaceae]; *Kadam kottus, Goutam & AP Das 1361*	Whole plants
Smilax perfoliata [Smilacaceae]; *Goutam & AP Das 0242*	Leaves, young twigs and barks
Premna latifolia [Lamiaceae]; *Gineri, Goutam & AP Das 0891*	Whole plants
Solanum americanum [Solanaceae]; *Goat begun, Goutam & AP Das 1362*	Whole plants
Solanum pimpinellifolium [Solanaceae]; *Goutam & AP Das 1367*	Whole plants
Solanum torvum [Solanaceae]; *Goat begun, Goutam & AP Das 1371*	Whole plants

Continue to next

Name of Plants	Parts used
Spermacoce alata [Rubiaceae]; *Alughas, Goutam & AP Das 0529*	Whole plants
Spermacoce ocymoides [Rubiaceae]; *Goutam & AP Das 0632*	Whole plants
Stellaria wallichiana[Caryophyllaceae]; *Goutam & AP Das 0363*	Whole plants
Stellaria uliginosa [Caryophyllaceae]; *Goutam & AP Das 0712*	Whole plants
Stephania glabra [Menispermaceae]; *Bhuin Kumra, Goutam & AP Das 0098*	Whole plants
Synedrella nodiflora [Asteraceae]; *Goutam & AP Das 0854*	Whole plants
Syzygium aqueum [Myrtaceae]; *Jamun, Goutam & AP Das 1373*	Leaves, Fruits
Syzygium claviflorum [Myrtaceae]; *Jamun, Goutam & AP Das 1374*	Leaves, Fruits
Syzygium cumini [Myrtaceae]; *Jam*; *Goutam & A.P. Das 188*	Leaves, Fruits
Syzygium jambos [Myrtaceae]; *Jamun, Goutam & AP Das 0252*	Leaves, Fruits
Syzygium kurzii [Myrtaceae]; *Janum, Goutam & AP Das 1048*	Leaves, Fruits
Terminalia myriocarpa [Combretaceae]; *Puccasaj, Goutam & AP Das 0985*	Leaves, Fruits
Terminalia arjuna [Combretaceae]; *Arjun*; *Goutam & A.P. Das 1412*	Leaves, Fruits
Terminalia bellirica [Combretaceae]; *Kathbadam*, *Boira*; *Goutam & A.P. Das 376*	Leaves, Fruits
Terminalia chebula [Combretaceae]; *Haritaki*; *Goutam & A.P. Das 360*	Leaves, Fruits
Tetrastigma bracteolatum [[Vitaceae]; *Goutam & AP Das 1405*	Whole plants
Tetrastigma dubium [Vitaceae]; *Goutam & AP Das 1193*	Whole plants
Tetrastigma serrulatum [Vitaceae]; *Goutam & AP Das 0391*	Whole plants
Thysanolaena latifolia [Poaceae]; *Jharu*; *Goutam & A.P.Das 636*	Whole plants
Tinospora crispa [Menispermaceae]; *Gulancha*; *Goutam & A.P. Das 189*	Whole plants
Toona ciliata [Meliaceae]; *Tun, Goutam & AP Das 1429*	Leaves, young twigs and barks
Trichosanthes cordata [Cucurbitaceae]; *Goutam & AP Das 1116*	Whole plants
Trichosanthes lepiniana [Cucurbitaceae]; *Goutam & AP Das 1107*	Whole plants
Tridax procumbens [Asteraceae]; *Goutam & AP Das 1451*	Whole plants
Stephania japonica [Menispermaceae]; *Goutam & AP Das 0518*	Leaves
Vallaris solanacea [Apocynaceae]; *Goutam & AP Das 0594*	Whole plants
Vitex negundo [Lamiaceae]; *Nishinda; Goutam & A.P. Das 1249*	Leaves
Woodfordia fruticosa [Lythraceae]; *Goutam & AP Das 0730*	Whole plants
Wrightia arborea [Apocynaceae]; *Khira, Goutam & AP Das 0115*	Whole plants
Zanonia indica [Cucurbitaceae]; *Goutam & AP Das 1451*	Whole plants
Zanthoxylum rhetsa [Rutaceae]; *Timbur, Goutam & AP Das 1476*	Leaves
Zingiber montanum [Zingiberaceae]; *Goutam & AP Das 0246*	Whole plants
Zingiber zerumbet [Zingiberaceae]; *Goutam & AP Das 1212*	Whole plants
Phyllanthus emblica [Phyllanthaceae]; *Amlaki*; *Goutam & A.P. Das 180*	Leaves and fruits

9.9. Discussion

From the present survey, a total of 335 species of useful plants has been recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or riped fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals (Fig 9.1). 39 percent plants collected by the local villagers for their won domestic animals fodder. 8 percent of the total collected species has used as fuel wood in their earthen oven. A total 127 species of medicinal plants i.e. 19 percent plants collected by few person for medicin purpose. They largly collected *Andrographis paniculata, Asparagus racemosus, Bischofia javanica, Calotropis gigantean, Cannabis sativa, Cassia fistula, Centella asiatica, Cinnamomum glanduliferum , Citrus medica, Datura metel, Dioscorea alata, Drymaria cordata, Eclipta prostrate*, *Entada rheedii, Ficus benghalensis, Leucas indica, Mimosa pudica, Morinda angustifolia, Oroxylam indicum, Paederia foetida, Phlogacanthus thyrsiflorus, Piper betleoides, Piper longum, Piper peepuloides, Rauvolfia serpentine, Terminalia arjuna* **,** *Terminalia bellirica, Terminalia chebula, Stephania glabra and Tinospora crispa.*

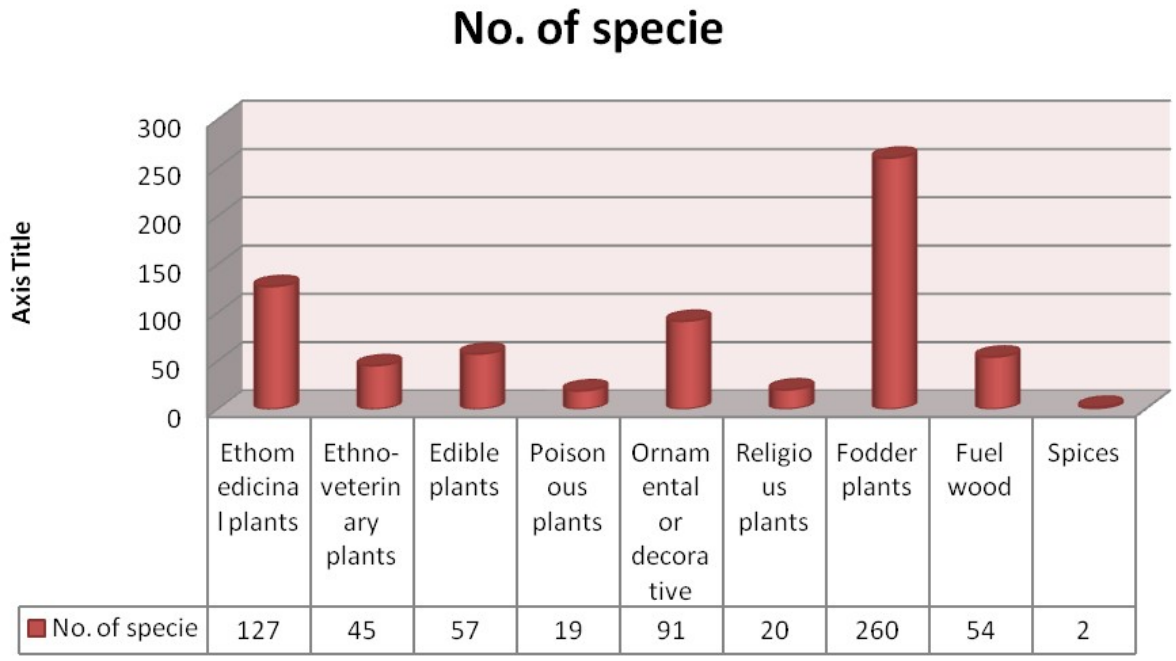

Fig. 9.1. Comparative studies of NTFPs plants of GNP

They also collected and use 45 species of medicinal plants to cure their pets from various diseases and disorder. 13 percent of total NTFPs species collected or planted for ornamental or decorative purpose (Fig 9.2).

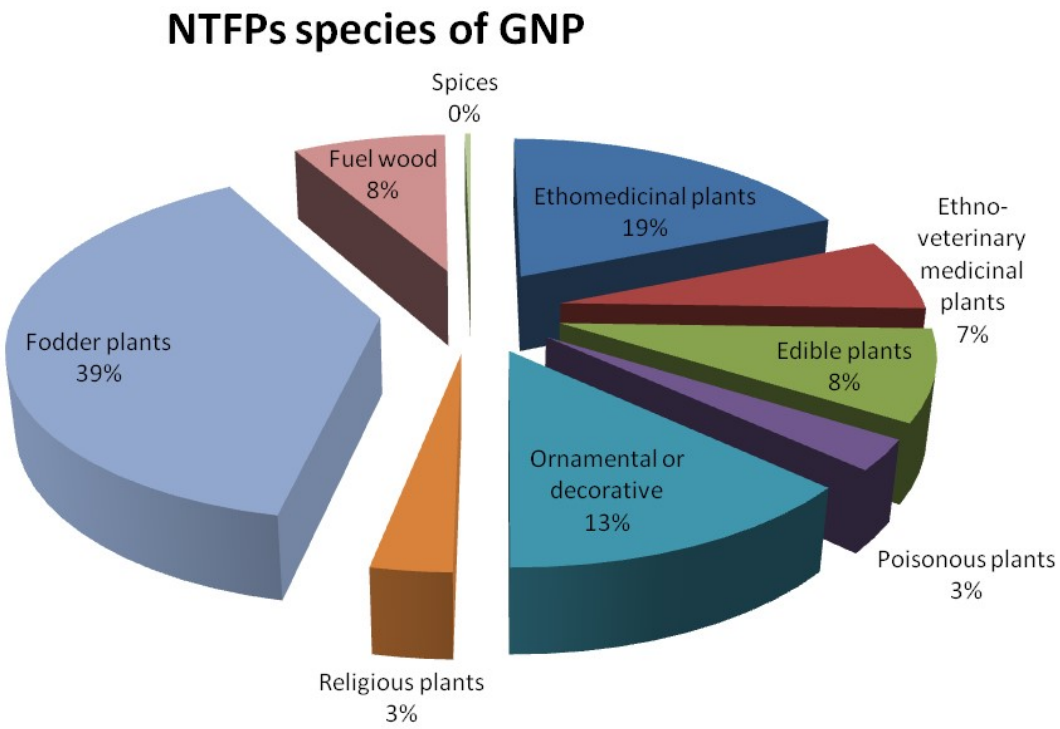

Fig. 9.2. Different use category of plants against total NTFPs recorded plants

They also collected 3 percent plants for hunting or catching fish. Plants fruits or leaves used as poison materials. 8percent of the total NTFPs species collected for directly consume in daily life.

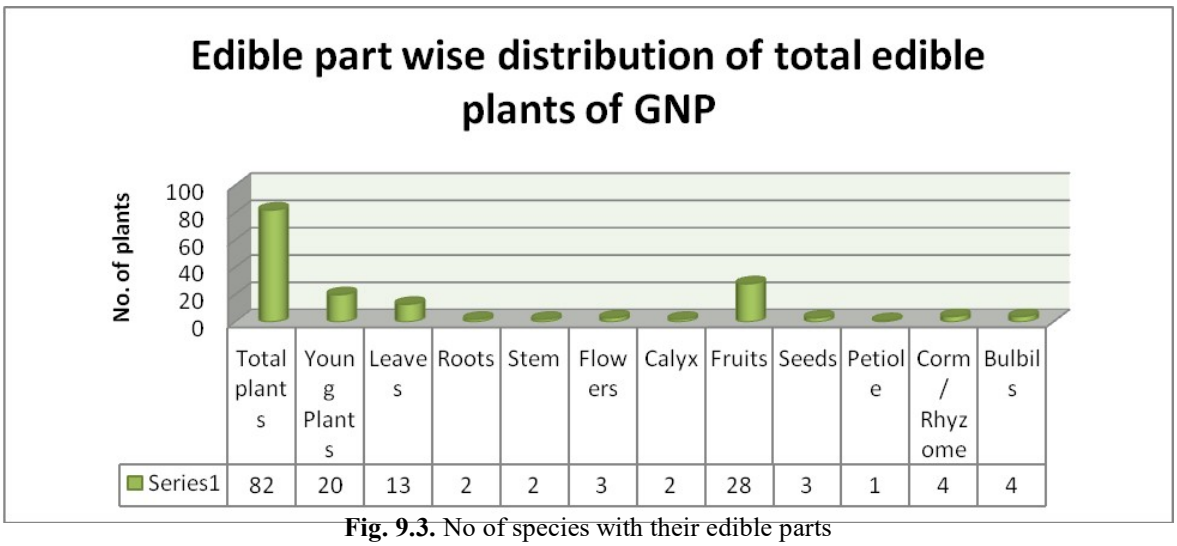

Fig. 9.3. No of species with their edible parts

Out of 82 species i.e. 8 percent of the total NTFPs plants, 20 species used as plant vegetable where whole plants has used to cook. Leaves of 13 species has used as vegetable. 28 species fruits used as vegetable of edible fruits (Fig. 9.3).

20 species of plants i.e. 3 percent of the total NTFPs recorded species has use by the local villagers in their daily cultural and ritual life like marrage, puja or other social programme.

Chapter 10

DISCUSION

DISCUSION

Gorumara National Park (GNP) is a virgin broadleaf forest but the vegetation is very much disturbed. The Park belongs to the Bio-Geographical zone 7B (Lower Gangetic Plain) as recognised by Rodgers and Panwar (1988). Total area of this bottle shaped National Park is 79.99 sq km. The National Park is located in the flood plains of Jaldhaka and Murti rivers and other medium and small rivers and rivulets which have created a pocket of grassland there. The GNP has immense significance in view of it being situated in the middle of the elephant migratory route between the rivers Teesta and Torsa in North Bengal. Gorumara can become one part of the Managed elephant ranges for containing and sustaining the wild elephant population of North Bengal. Especially, the Tondu, Selka, Gorumara, Panjhora and Indong blocks serve as a major habitat for elephants and with more scientific management of these areas through the increase of fodder, cover and water resources, the elephant depredation problems can be substantially reduced. Main faunal resource of the GNP is Indian one horned Rhinos, Asian Elephant and Gaur. GNP has approximately 48 species of carnivores and herbivores, approximately 193 species of birds, 22 species of reptiles, 7 species of turtles, 27 species of fishes and other macro and micro fauna.

10.1 The Flora

After the comprehensive floristic survey, it is noted that the Gorumara National Park is houshing an enormously rich flora. A total of 876 species of spermatophytes has been recorded from the intensive survey since the year 2006. Of these, angiosperms are represented by 872 species from 525 genera belonging to 159 families (Table 7.1). In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP during the present exploration. The reason for sustentation of enormous richness in floral diversity within the forest is basically being the natural habitation areas and suitable climate of Terai and Duars foothills. The area receives annual precipitation of 200 – 400 cm, the major amount of which is received mainly during the monsoon months. However, little amount of rain is received almost in all other months. This type of distribution of precipitation maintains good relative humidity almost round the area that heled the formation of very good broadleaf floristic wealth in GNP and in nearby vegetation. The analysis of the flora revealed that there are numerous tropical, subtropical and even temperate elements those are common with the East Himalayan region. The beels, nallahas, other low-laying areas, scrubs, forests etc. provided enormous variety of habitats and that is reflected in the richness of the flora. The detailed analysis of the total spermatophytic flora of the forest shows that dicots have much dominance over the monocots and naturally occurring gymnosperms is represented by *Gnetum montanum* only. The recorded other three gymnosperms are introduced and are restricted in the gardens only. The GNP is falling within the natural distribution area of Cycas pectinata but during the present exploration its natural occurrence within the park was not detected.

The recorded largest genus in the GNP flora is *Ficus* of Moraceae, represented with 10 species and is followed by *Cyperus* of Cyperaceae, *Litsea of* Lauraceae*, Dioscorea* of Dioscoreaceae, *Cissus* of Vitaceae, *Desmodium* of Fabaceae etc. The best represented 10 genera in the GNP flora has been presented in Table 10.1.

Table: 10.1. Top 10 representative genera of GNP

Genus	Species
Cyperus	9
Ficus	8
Litsea	8
Solanum	7
Eleocharis	6
Persicaria	6
Phyllanthus	6
Dioscorea	5
Commelina	5
Piper	5

At the family level, the highest number of 53 species was recorded for the Fabaceae and it is followed by Asteraceae (33), Acanthaceae (19), Malvaceae (17) etc of Magnoliopsida. Recorded highest number of 34 species for Poaceae and is followed by Cyperaceae (24), Araceae (14), Commelinaceae (12) and then Orchidaceae (11) of Liliosida (Fig. 10.1).

The present work in GNP, the appeared as the largest Fabaceae with 22 genera and 53 species and it is followed by Poaceae, Asteraceae, Rubiaceae, Cyperaceae, Lamiaceae, Acanthaceae, Moraceae, Malvaceae, Euphorbiaceae and Urticaceae and is presented in (Fig. 10.2).

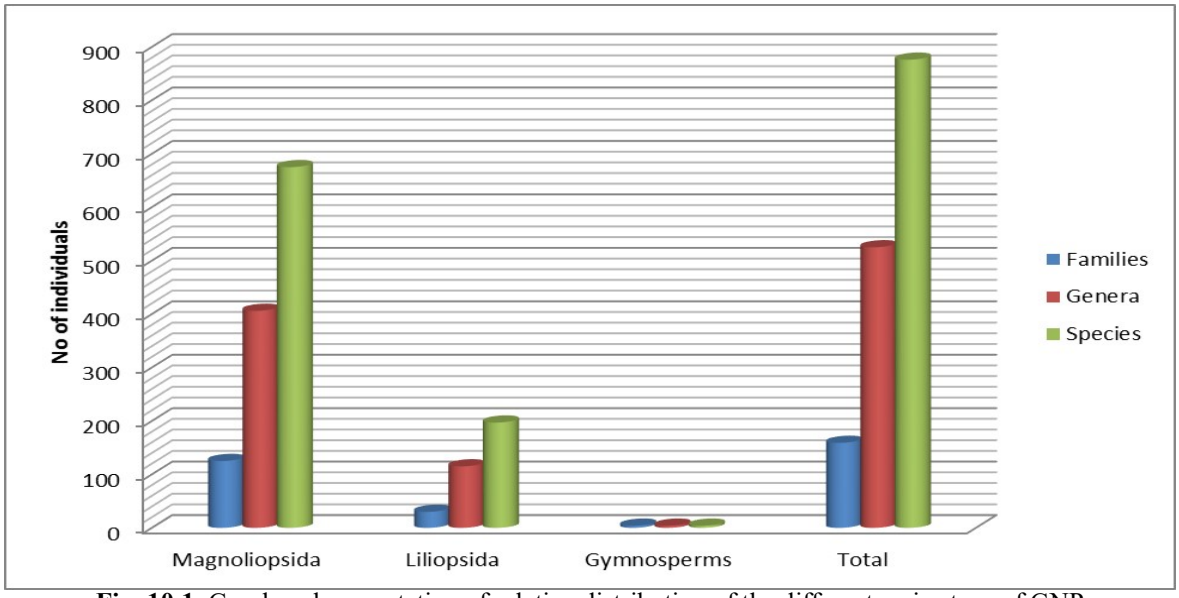

Fig. 10.1. Graphycal presentation of relative distribution of the different major taxa of GNP

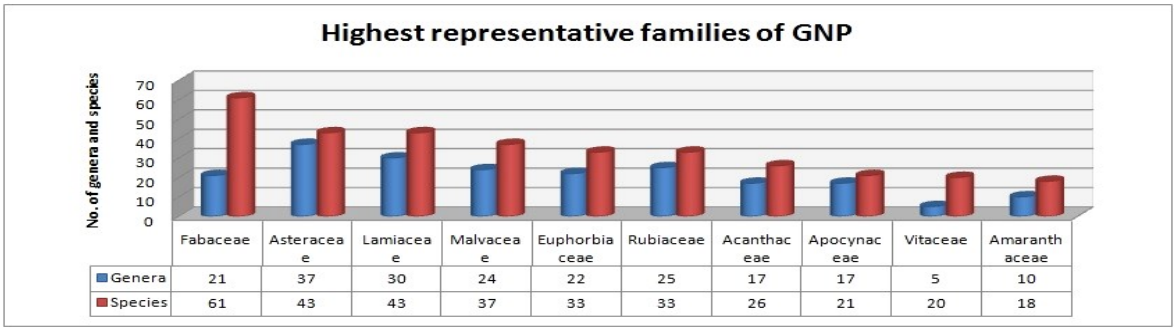

Fig. 10.2. Graphycal presentation of relative distribution of genera and species of top ten families of GNP

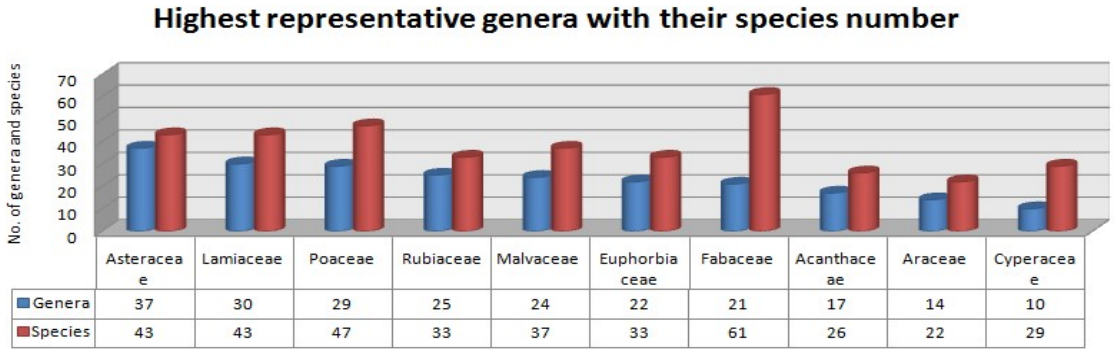

Fig. 10.3: The highest represented ten genera in GNP flora

10.1.1 Rare and threatened plants

The Gorumara National Park is one of the important conservatories for rare and threatened species of plants in the area. During the study, some of the threatened species of India, under *Red Data Books of Indian Plants* (Nayar and Shastri 1987, 1988, 1990) has also been recorded.These plants seems to be widely distributed inside the conservatory. The rarity of or threat to a majority of those could be due to several natural causes, but it could also be due to severe anthropogenic factors like habitat destruction through timber extraction, grazing, fishing, tourisms etc. Unskilled and unscientific harvest of large number of species by local plant-traders for several identical purposes are attributing directly or indirectly in the population structure or even the loss of species from their natural habitat.

The knowledge of plants being used in medicine is high in the Indian Himalayan region and also in the Terai and Duars regions. There are major gaps in the knowledge of biological resources and the means by which biological diversity is being maintained (Heywood and Baste 1995; Biswas 2015). *Dioscorea deltoidea* is a endangered species found in this area.Two species, *Shorea robusta* and *Toona ciliata* has been recognized as 'Lower Risk/ Least Concern' under ver 2.3 in the Red List of IUCN [http://www.iucnredlist.org/], Indian Red Data Book [Nayar and Sastry, 1987, 1988] and Red List of Botanical Survey of India [http://bsi.gov.in/content/259_1_InventorisationofEndangeredPlantSpecies. Aspx]. The only naturally occurring gymnosperm, *Gnetum montanum* is also a threatened species (Das & Yadav 2011). Insectivorous plants like different species of *Utricularia* and *Drosera burmanii* are also threatened plants but are with good representation in the GNP vegetation.

The entire Terai-Duars region provide more or less similar type of terrestrial vegetation, principally dominated by Shorea robusta. This region is a transit area, on its northern side there is Himalayan vegetation and vegetation of the Gangetic plains on the south. Many species migrated from these two sides are also taking shelter in this area.

10.1.2 Exotic Elements

In the Himalayas and its foothill region is rich with a total of 190 invasive alien species under 112 genera, belonging to 47 families (Chandra Sekar, 2012). Out of 190 invasive alien species, dicotyledons flora is represented by 40 families, 95 genera and 170 species and monocotyledons by 7 families, 17 genera and 20 species. Scattered research work on the exotic and alien species of India has been carried out by Maheswari 1962; Matthew, 1969; Maiti and Guha Bakshi, 1984; Das 1984; Das and Chanda, 1986; Das *et al* 1984; Khuroo *et al*. 2007a, 2008, 2010, 2012; Negi and Hajra 2007; Singh *et al*. 2010. Nayar (1977) has discussed the changing pattern of vegetation due to some exotic and invasive species. Liu *et al* (2005, 2006, 2008) has worked in detail on the exotic plants in China that has also included the Himalayan region. A preliminary list of exotic and introduce plants of India has been compiled by Pandey (2000) and Reddy (2008). Out of the 876 species of recorded flora, 98 species has been recognized as exotics. Out of these 63 has been naturalized (Tables 7.11 & 10.2).

Table 10.2: Taxonomic distribution and status of exotic plants in the flora of GNP

Taxa	Number of Exotic species		
	Introduced	**Naturalized**	**Total**
Gymnosperms	3	0	3
Dicotyledons	23	61	84
Monocotyledons	4	7	11
TOTAL:	**30**	**68**	**98**

Out of 98 exotic species, 25 species came from Tropical America, 15 from South America, 12 from Brazil and Mexico and only 6 species are of Asian origin. List of recorded exotic species is given in Table 7.12.

Among the monocots there are much less number of exotics but majority of them has been naturalized. Plants like *Eichhornia crassipes, Axonopus compressus, Pennisetum pauperum, Xyris pauciflora*, etc. are quite common inside the park area.

Mainly cultivated species are planted in gardens near the offices and villagers grow many such plants in their compounds either for their utilitarian characters or for ornamentation. Some exotic species were also found in the core area forests and these are all naturalized. Out of 4 Gymnosperm species 3 species has been detected as exotic elements. As much as seven monocotyledons species found there as naturalized exotic elements (Fig. 10.4).

Houshing so many exotic species within a National Park is certainly disadvantageous. Many such species, e.g. *Lantana camara, Eupatorium odoratum, Ageratum conyjoides, Axonopus compressus*, etc. are occupying large areas of the park leading to the restricted distribution of many weaker local species. In wetland areas of the park invasion of *Eichhornia crassipes* is highly devastating as it is covering the water surface quickly and is not allowing the penetration of sunlight for the plants living below. So, proper strategies need to be formulated to keep these exotics under control.

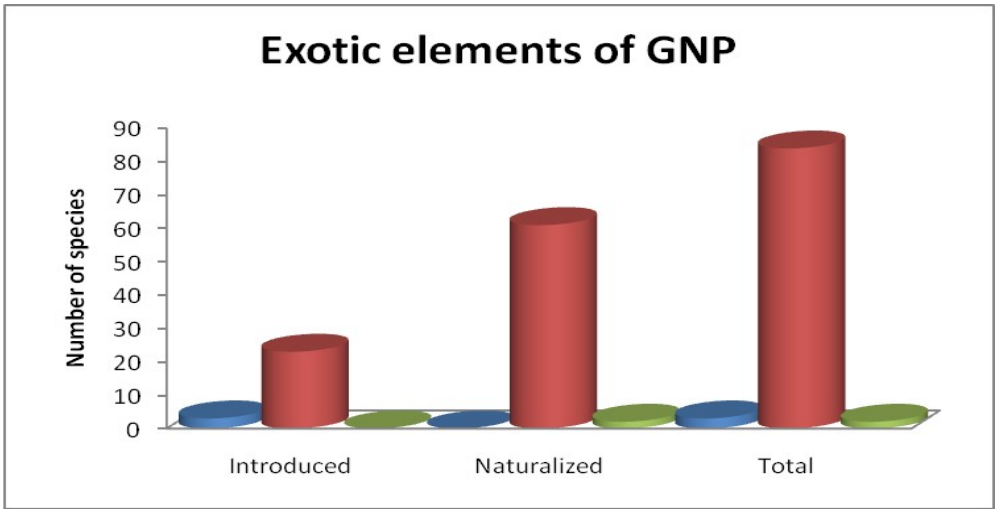

Fig. 10.4. Graphical presentation of Exotic elements in the flora of GNP

10.1.3 Flowering calendar

Flowering calendar of the temperate flora of Darjeeling Hills (1500 – 2400 m) was previously prepared by Das and Chanda (1987) and for the Sambalpur District flora by Panda *et al*. (1992). The flowering seasons of species in Terai and Duars flora is little known till date. The flowering seasons of majority of the floristic elements of Rasik Beel complex has been recorded by Biswas (2015) and the present study recorded a clear flowering and fruiting season picture of GNP flora during the survey work and has been presented in the Fig. 10.5.

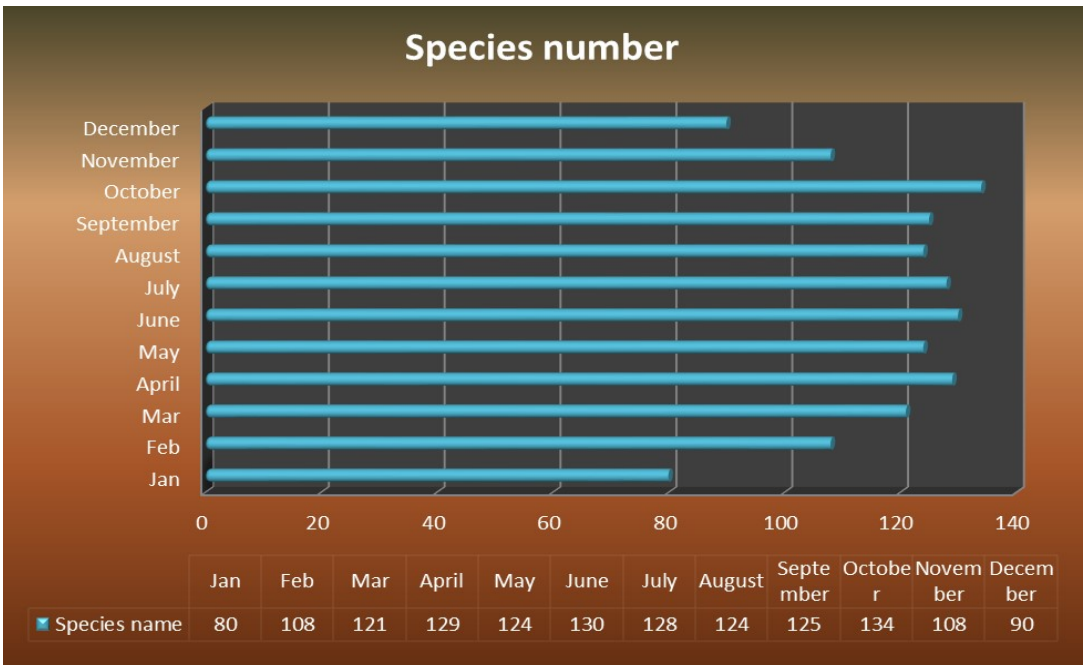

Fig. 10.5. Species showing maximum duration of flowering

*Acmella uliginosa, Ageratum conyzoides, Emilia sonchifolia, Lantana camara, Solanum americanum, Tabernaemontana divericata*etc are blooming for the round the year (Table 7.16) then followed by *Acmella paniculata, Achyrospermum wallichianum, Acmella calva, Bidens pilosa, Ficus hispida, Gnaphalium purpureum, Pseudognaphalium luteoalbum, Solanum torvum* etc blooming for 10 to 11 months, sometimes may be round the year (Fig. 7.4).

April, May, June and July and later September to October may be called as nature's flower festival for GNP flora, because maximum number of angiospermic species found to bloom during these two periods every year. December to January appears to be the resting months, as very less number species go for flowering and most of these are winter annuals (Fig. 10.6). the length of the flowering for some species is also related to the soil-water relation. Quick drying of soil forcely end the flowering, whereas the same species continue to flower in some other sectors where the available soil-water is good enough for the purpose.

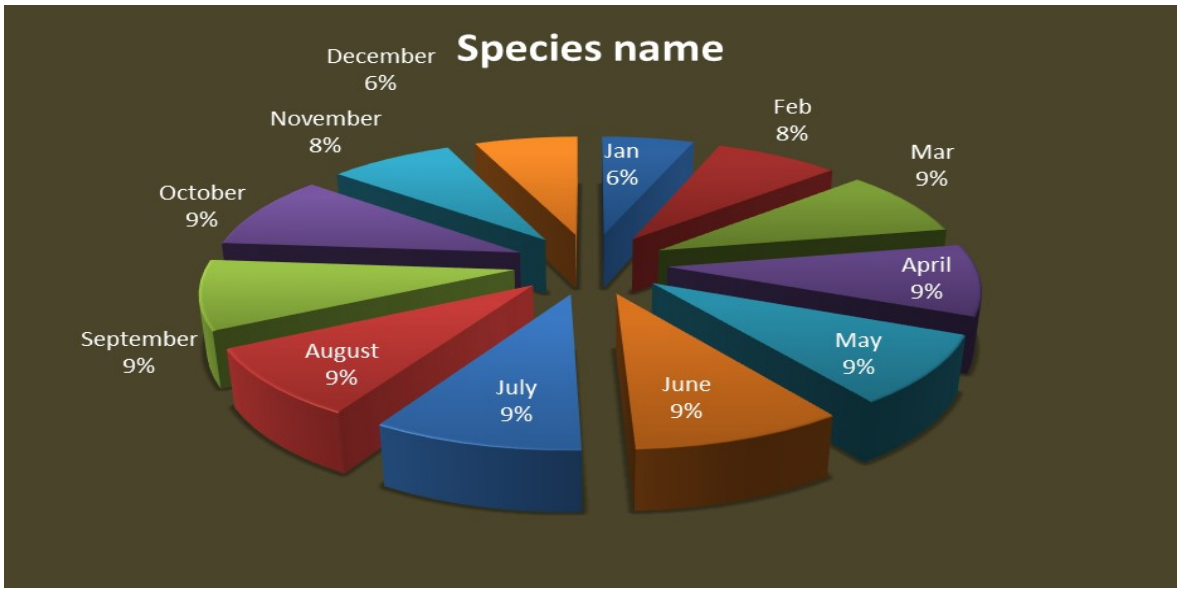

Fig. 10.6. Yearly flowering distribution of GNP flora

10.1.4 Effects of Anthropogenic activities

Some Forest Beats like Murti, Bichha Bhanga, Bhudhuram are very much disturbed by the local villagers and poachers. The villagers are collecting many plants and plant-parts of commercial importance and daily-used materials from the forests. If this practice is continued for few more years, then most of the locally valuable, medicinal and economically important plant species of the forests will be vanished from the National Park. They are damaging vegetation when collecting fuel wood and fodder for their cattle and other domestic animals and are up-rooting most of the medicinal plants, irrespective of their age and maturity level without thinking the future of those plants in the habitat. The population of Aquatic rotifers, Molluscs, Zoo planktons and phytoplanktons are also being seriously affected by them due to fishery related activities in the water bodies like Indong, Gorati, Medlajhora, Dhupjhora etc. located in the core area. At the same time, the basic stock of food for the aquatic-birds, both native and migratory birds, are being affected due to all these activities. Poor knowledge of NTFP collection by local villagers is also adversely affecting the diversity and developing food crisis for aquatic and other birds. Too much trace on ecotourism is also seriously disturbing the local floral and faunal communities and also the overall environment of the area.

10.1.5 *Ex-situ* conservation

There is no facility for the *ex-situ* conservation of plants in the study area except for some species of Bamboos and *Phyllanthus emblica* planted to increase the supply of Elephants fodders and fruits for Birds. Forest department may try to stop these practices by planting naturally growing species like *Terminalia spp, Mangifera spp, Artocarpus sp.* etc. In the Murti River Beds, plantation forest area is also increasing and the species under use for the purpose are mainly *Phyllanthus emblica, Salix tetrasperma, Lagerstroemia speciosa, Lagerstroemia hypoluca, Terminalia arjuna, Terminalia bellirica, Syzygium cumini, Putranjiva roxburghii, Cassia javanica* ssp. *nodosa, Delonix regia, Lagerstroemia indica, Litchi chinensis, Spathodea campanulata* etc. It appears that for a conservatory devoted mainly for the bird conservation enough thought need to be given for the selection of species for plantation as those should be suitable for supply of food round-the-year and to provide suitable habitat for their nesting activities. If such conditions are developed then larger number of bird species, local as well as migratory, along with many other plants and animals will enrich such artificially created habitat. In addition, such activities will increase the forest area, stabilize the loose soil and will improve the water-relation for the vegetation.

10.2 Phytosociology of GNP

10.2.1 Ground-Cover Vegetation of GNP

Premonsoon habitat is characterized by the prevailing dry habitat conditions and is a continuation of the postmonsoon environment. But, due to better soil-water relation the soil, even in terrestrial sectors, can support some vegetation in both of these two seasons. So, the forest floor will never look barren and many ground cover species will continue to grow. Details of the premonsoon vegetation has been provided in Chapter 8 (Phytosociology) where it was shown that large number of species are surviving there with appreciable population structure. And, it is also interesting to note that species with high RD, RF, RA and IVI are different in different Forest Beat areas. Similarly, a good number of species has scored the maximum SDI value 1.

Figure 10.7 indicates that Diversity indices do not change abruptly in different seasons except the monsoon when large number of short-lived ephimerls grow, complete their life cycle and the die. During premonsoon season there are occasional showers of rain and the ambient temperature remain high. So many geophytes start sprouting and many therophytes start producing seedlings during this season leading to the increase in species diversity and that form the climax during monsoon.

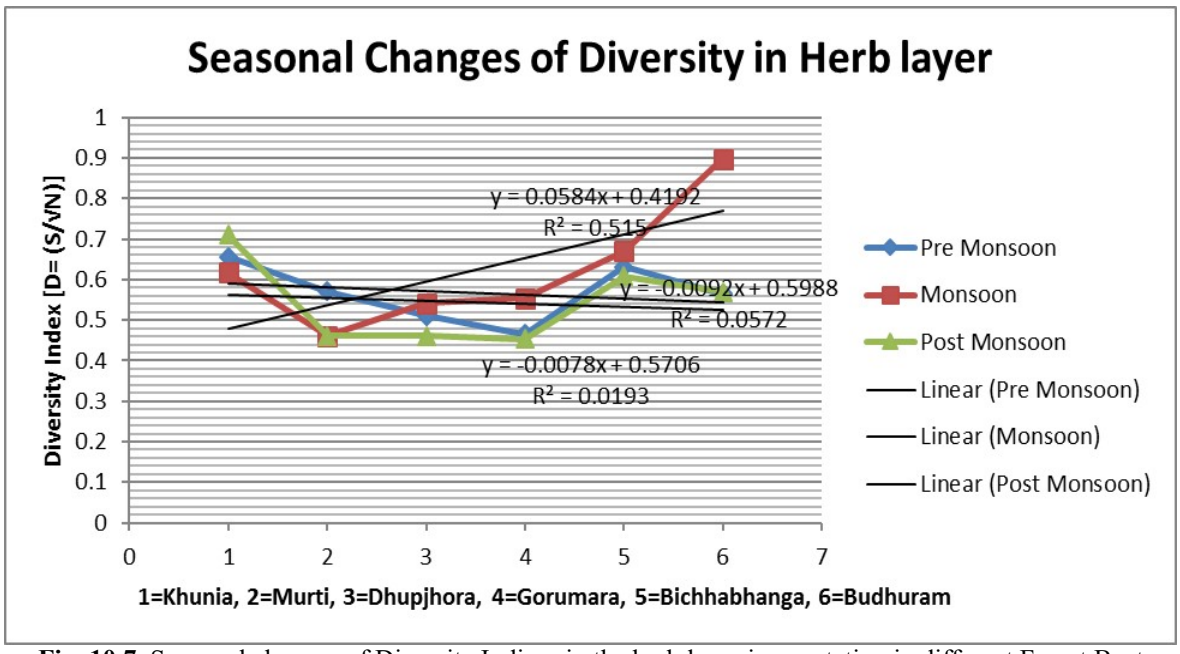

Fig. 10.7. Seasonal changes of Diversity Indices in the herb layer in vegetation in different Forest Beat

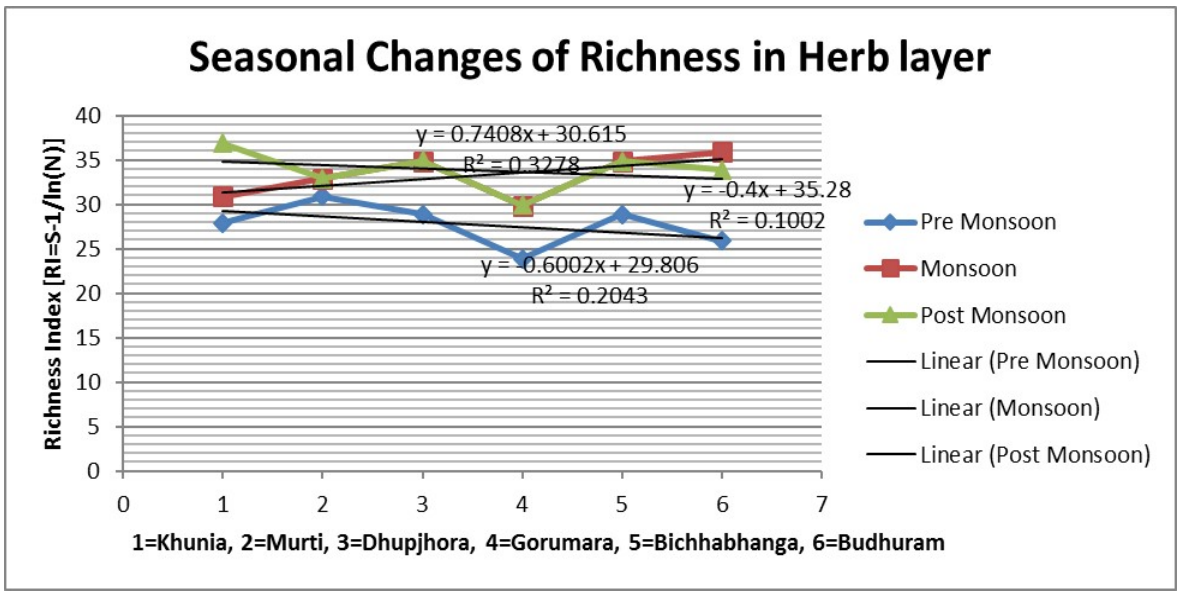

Fig. 10.8. Seasonal changes of Richness Indices in the herb layer in vegetation in different Forest Beat

Richness of a vegetation is expressed in Menhinick Richness Index (D). Fig. 10.8 shows the Richness Index in different seasons in different Forest Beat areas. And, the richness remain high in different seasons including post monsoon. Postmonsoon is also one important season for many species specially those adopted to grow in low ambient temperature. These small annuals can collect sufficient water from the environment as the dense fog in winter contribute some water to the habitat. Rivers flowing through the GNP are all originating in the Himalayas and carry huge amount of seeds of Himalayan plants. These seeds find the winter in GNP hospitable for them and they form a different type of association and thereby increase both Diversity and the Richness of the vegetation.

10.2.2. Shrub Layer Vegetation of GNP

Occurrence of shrub-species is comparatively less inside the deep forests with close canopy. But, the areas with open forests and in disturbed areas good number of shrub species form their own vegetation

type. Shrubs generally accompany some perennial soft-wooded shrubby-climbers. Like ground cover vegetation, in shrub layer too different species dominate in different sectors of the Park, i.e. in different Forest Beat areas. However, some aggressive naturalized exotics like *Chromolaena odorata* and *Lantana camara* are over-powering the local shrubs. Again, some shrubby-climbers like *Ichnocarpus frutescens*, *Argyreia roxburghii*, *Mikania micrantha, Natsiatum herpeticum, Celastrus paniculatus,* etc. are dominating over the erect shrubs as they can quickly climb over the shrubs and form dense network of their branches. However, even under such stressed condition, there is high diversity in the shrub layer which was expressed through the recognition of different species with high RF, RD, RA, and IVI. Shrubs are perennial plants but some of them are with suffrutescent habit. These plants rejects their areal branches in dry period and survive through their perennial root-stock. Interestingly, in GNP environment these plants never show perfect nature of suffrutescence. At least few lower branches remain green and leafy mainly due to the good soil-water relation of the habitat. Here the growth is hampered more by the low ambient temperature rather than water scarcity.

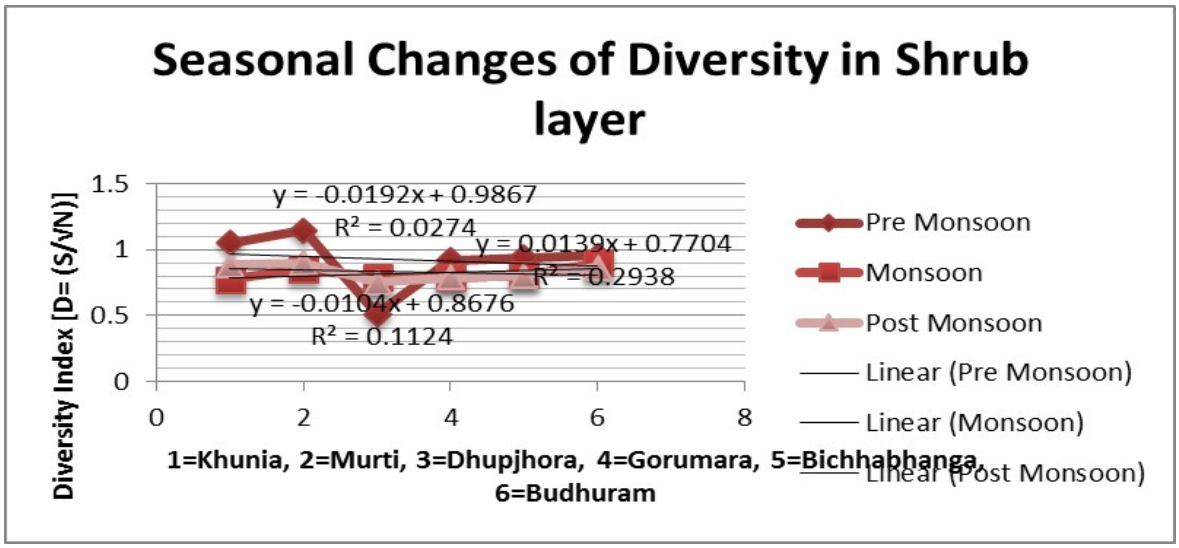

Fig. 10.9. Seasonal changes of Diversity in the shrub-layer vegetation in GNP

Figure 10.9 indicates that Diversity indices do not change abruptly in different seasons. This is certainly due to the perennial nature of the aerial parts of these plants. Pre- and post-monsoon shrub layer remain almost constant. But, in monsoon at Dhupjhora the diversity decreased suddenly. This is due the excessive growth of few species those covers and dominate over many other shrubs. These are mostly the shrubby-climbers and these plants grows profusely on most of the bushes. Sometimes, they climb over the trees also. But, in most of the areas post monsoon vegetation looks better than pre-monsoon vegetation. This is due to the partial disappearance of some suffrutescent elements. However, the linear graphs show very little deviation in diversity in different seasons. Tree saplings and coppice growth sometime lead to the recognition of some tree-species as dominants for the shrub layer. These are found in most of the damaged forests due to human interferences.

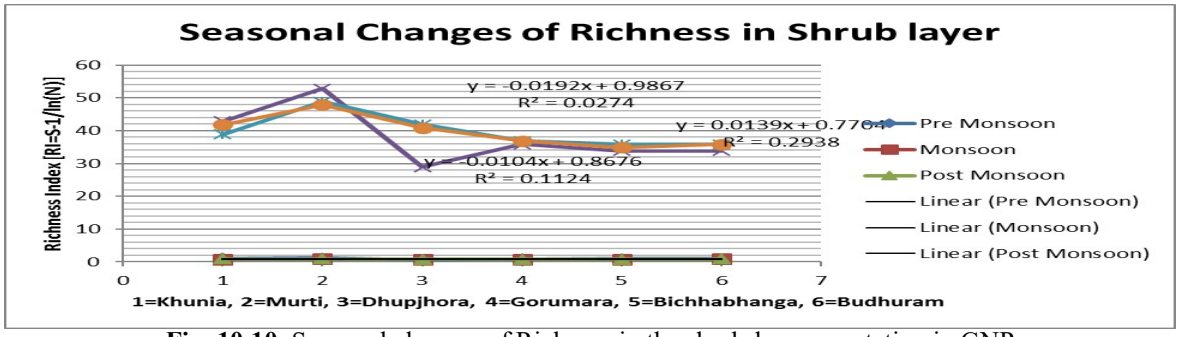

Fig. 10.10. Seasonal changes of Richness in the shrub-layer vegetation in GNP

Shrubs are perennial floristic elements. So, within one year, in different seasons, change in their population structure will not show any considerable or important change. Under such static situation the changes in Richness will not be visible. This has been presented in Fig. 10.10. However, there are prominent differences in Richness in different sectors of GNP. Scrutinee of Figs. 10.9 and 10.10 indicates the similar such differences and Dhupjhora Beat being the poorest while the Murti Beat with shows the highest diversity and richness status.

10.2.3. Canopy Layer of GNP

As it appeared from the present survey that the distribution pattern of different species of trees is not similar in different sectors of the Park. A good number of species were recorded with absolute frequency in different Forest Beat areas. However, there are some signs of man made changes. Probably before bringing the area under conservation good timbers were harvested which led to the reduction of the population of some species including *Shorea robusta*. The determination of species like *Actinidaphne obovata, Alangium chinensis, Alstonia scholaris, Albizia chinensis, Casaeria vareca,* etc. with absolute frequency is probably the indication of former forest extraction. However, even under this situation, *Shorea robusta* scored the highest value of IVI with its highest abundance recorded from Budhuram Beat area.

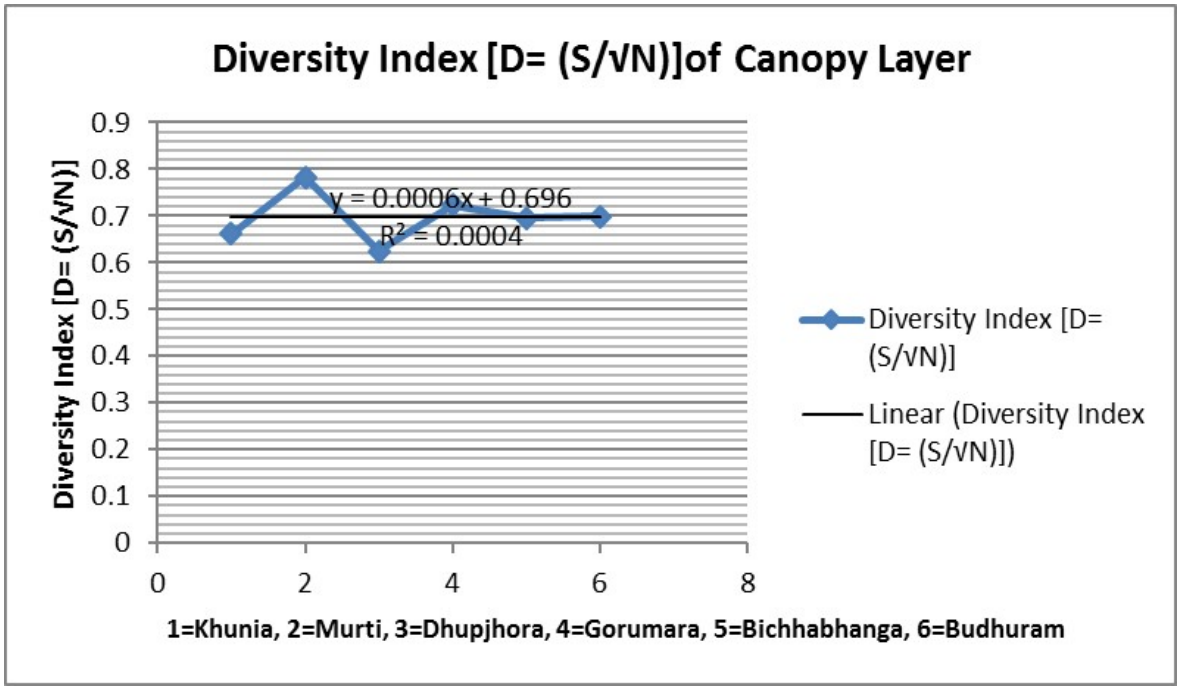

Fig. 10.11. Diversity Indices for the canopy layer vegetation in GNP

The determined diversity in canopy layer for different Forest Beat areas show quite high levels of diversity with Murti Beat recorded the highest (Fig. 10.11). Record of overall D = 0.7 is a quite high value. Like ground cover and shrub-layer, for canopy also Dhupjhora Beat scored the lowest Diversity Index value.

The highest Margalef Richness Indices (RI) has been recorded for the Murti Beat and the lowest value for Bichhabhanga Beat. However, as a whole, a high level of richness is maintained in the entire Gorumara National Park (Fig. 10.12).

Like ground cover vegetation, for canopy also quite a good number of species are recorded with the SDI value of 1.

Considering all these observations and Indices it is now clear that Shorea robusta forms the main skeleton for the forests of Gorumara National Park. However, a number of other species like

Actinidaphne obovata, Alangium chinensis, Alstonia scholaris, Albizia chinensis, Casaeria vareca, etc. is producing the picture of a mixed vegetation due to their high Abundance Index values.

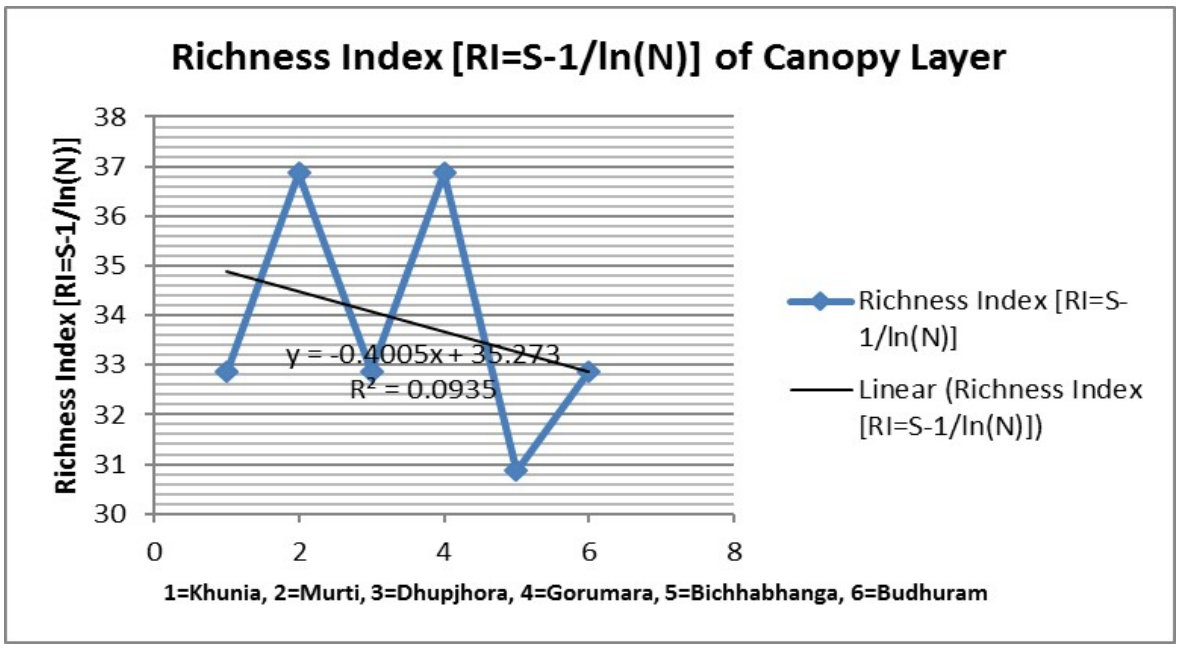

Fig. 10.12. The Richness Index for Canopy layer vegetation in GNP

In GNP all three major forest strata are with high Diversity and Richness values. But, the spread of some highly invasive shrubs exerting pressure on many local species. The authority need to develop some strategies to control the spread of these species otherwise low height plants and geophytes will be worst affected that is not desirable in any way!

10.3.1. Non-Timber Forest Produces

During the present study in GNP, survey for traditional uses of local plats was conducted from five different forest villages located on the periphery of GNP and in three local forest markets namely Lataguri Market, Dhupjhora Farm Market and Chalsa bazaar taking help of many local people, including collectors and practitioners. A total of 335 species of useful plants recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or edible ripe fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals (Fig. 10.13).

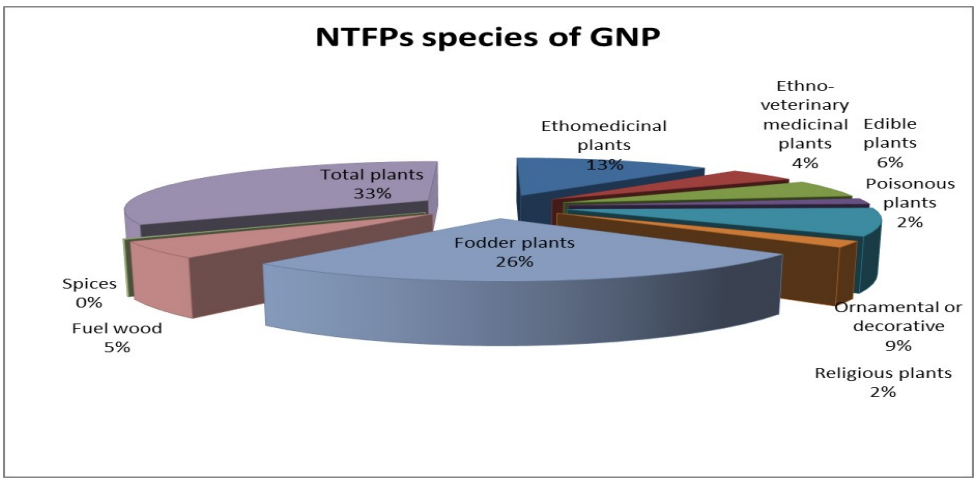

Fig. 10.13. Classification of NTFPs of GNP and its surrounding areas

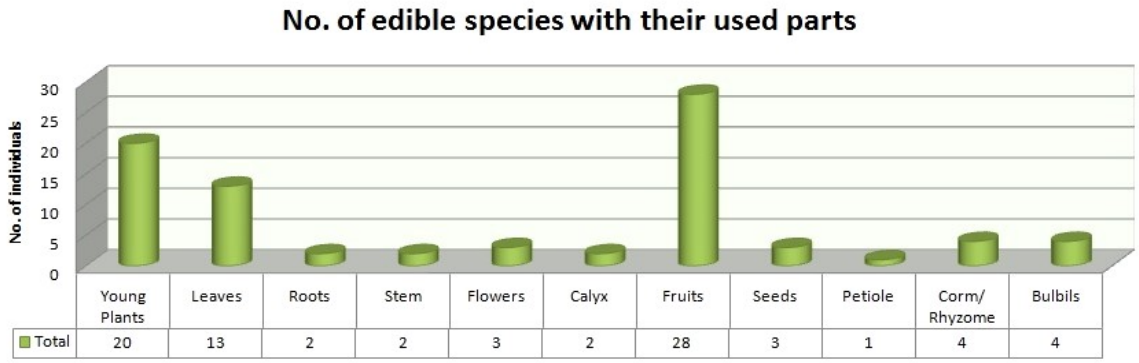

Fig. 10.14. Distribution of useful parts of the recorded edible plants of GNP

Many of the collected NTFPs are marketed locally. However traders are also involved despatching many such articles for different distant domestic markets where from some are also exported. Skilled collectors can collect those in proper stage and to the sustainable limit. It is also essential to impart proper training to the intended villages for this purpose. In addition, some such plants can be brought into the cultivation, especially the medicinal plants, so that the market demand can be fulfilled with best quality materials in one hand and the conservation of their wild population on the other. Villagers of the surrounding area will certainly be benefitted out of this. For fodder also through different wings of the Forest Department different types of fodders can be cultivated and can be provided to the farmers. This will save the biological diversity of the park.

Chapter 11

CONCLUSION

CONCLUSION

The present floristic survey in the Gorumara National Park has recorded the occurrence of a rich spermatophytic flora. The taxonomic distribution of such plants is also quite wide. There are representation of primitive taxa like Chloranthaceae, Annonaceae, Magnoliaceae, Ranunculaceae, Butomaceae, etc. in one hand advance taxa like Compositae (Asteraceae), Lamiaceae, Orchidaceae etc. Many RET and endemic elements are also living in this park. The Park is also the store house for a large number of NTFP materials many of which are of high market potential and also of medicinal importance.

But, there are some anthropogenic pressure on the park including pressure of tourism. The conservation efficiency in GNP can be increased if some improvement measures can be taken:

1. Strict control over tourism

2. Entry of local people for different purposes enter the Park. Their activities can be effectively controlled.

3. NTFP collectors need to be trained properly so that such activities do not adversely affect the conservation of biodiversity.

4. Cultivation of many of their wild edible and medicinal plants can improve the economy of the Park dependent people and that will decrease their dependence on the conserved vegetation.

5. In the Park more stress is given on the conservation as well as wellbeing of the gem animals living there because those are the major attraction for the tourists. However, similar attention is to be given also for the plants of the park.

6. Conservation and commercial exploitation can't go hand in hand. So, authority may decide to reduce tourism and related activities within the park.

7. It is also essential to take proper measures to increase the population structure of RET and endemic plants.

8. Some aggressive weeds are causing havoc due to their fast growth and it is now essential to determine the ways to control such plants.

9. Uninterrupted corridor for the migration of wild flora and fauna need to be established immediately among all the Protected Areas of this region.

10. Whatever may be the degree of importance all developmental works should be taken up in such ways so that conservation efforts are not affected at all!

Gorumara National Park is the pride of the area with its rich flora and fauna. It is also a part of the chain of conserved areas for biodiversity as per IUCN guideline. The cluster of Protected Areas in Duars is consisting of Mahananda Wildlife Sanctuary, Gorumara National Park, Jaldapara National Park, Chapramari Wildlife Sanctuary, Buxa National Park, Buxa Tiger Reserve and a good number of Reserve Forests.

From the phytosociological analysis, the flora clearly showing its importance in the point of its diversity and species richness. Canopy cover is showing high IVI values in Gorumara, Dhupjhora and Murti, where the ground cover is very rich in Khunia.

SUMMARY

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SUMMARY

Gorumara National Park is located in Duars and is falling within the territory of Jalpaiguri District of West Bengal. The entire forest tract of Gorumara National Park comes under the North Indian moist tropical forest. The species which is commonly found within the forest and is most important from the economic and ecological stand points is *Shorea robusta.* The National Park is presently consists of two territorial Forest Ranges (North and South), one mobile Forest Range, six Beats (Dhup Jhora, Gorumara, Bichhabhanga, Budhuram, Murti and Khunia) and three camps. Gorumara National Park is geographically located between 88º 45' 19" to 88º 51' 18" E Longitudes and between 26º 48' 05" to 26º 41' 20" N Latitudes. It is nearly a flat area with few small undulations which is the characteristic of this region and covering an altitude of 100 m to 136 m only. The National Park spreads in between the prominent localities like Lataguri, Chalsa and Nagrakata beside the National high way 31 that connects Siliguri with Guwahati.

The main and most important river running at the boundary or through the National Park is Jaldhaka. It becomes shallow and remain almost with no surface water during dry season and remains full and fierce during monsoon. The river-bed is rising continuously as a result of the deposition of large quantity of slit, pebbles, boulders and detritus material carrying from the hills. Other rivers passing through GNP include Murti, Garati and Indong. Few other rivulets and streams are also passing through this Park. Some of these rivulets and streams passing through GNP are seasonal in nature, carrying water only during monsoon and remain dry for rest of the year. The National park lies in the Bio-geographical zone 7B (Lower Gangetic plain) as recognized by Wildlife Institute of India, Dehradun (Rodgers and Panwar,1988, subsequently revised in 2000). The entire forest tract of Gorumara National Park comes under the North Indian Moist Tropical Forest of Champion and Seth's (1968) Indian Forest Type classification. Gorumara National Park falls under the 2B/25 (Sal dominated mixed forests), 5B/152 (Sal, Khayer, Sissoo associated deciduous forest), 3C/C1b and 3C/C1c (Sal dominated deciduous forest). The species which is commonly found within the forest and is most important from the economic and ecological standpoint is Sal (*Shorea robusta*). This species occurs with its usual associates, namely Chilauni (*Schima wallichii*), Chikrasi (*Chukrassia tabularis*), Champ (*Magnolia champaka*) and Bahera (*Terminalia bellirica*). The other important species which are also seen are Sidha (*Lagerstroemia parviflora*), Panisaj (*Amoora rohituka*), Kainjal (*Bischofia javanica*), Simul (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Siris (*Albizia* spp.). Riverine Forests (5B/152) are seen on the bank of river Jaldhaka and other parts of the National Park. It is a deciduous type of forest which is dominated by Khair, Sissoo and association of tall grasses. Primary grassland vegetation is invaded first by Khair and Sissoo, and create home for the entry of Simul, Sidha and many other seral species like Toon (*Toona ciliata*), Gamar (*Gmelina arborea*), Kainjal (*Bischofia javanica*), Pithali (*Mallotus nudiflorus*) and Kadam (*Neolamarckia cadamba*) etc. with successive changes in edaphic conditions and progressive stability as one moves away from the river front. Tanki (*Bauhinia purpurea*) is fairly common in the neighborhood of river

beds where the permanent water table is quite deep. Harra (*Grewia asiatica*), Kainjal, Chalta (*Dillenia indica*) and some other seral species like Toon, Gamar etc. appear to do well where the water table is not low. Sal Forests (3C/C1) include both Eastern Bhabar (3C/C1b) and Eastern Terai sal (3C/C1c). Sal forests occur on the well drained alluvial soil. Course gravels and boulders in the bhabar area carry a fair percentage of sal in admixture of various deciduous species chiefly by Bahera, Sidha, Tartari (*Dillenia pentagyna*), Odal (*Sterculia villosa*), Kumbhi (*Careya arborea*) and Chilaune (*Schima wallichii*). The numerous other species those are found there include Parari (*Stereospermum tetragonum*), Kowla (*Machilus villosa*), Angari (*Phoebe attenuata*) and Bahera (*Terminalia bellirica).*

The average day temperature varies from 10°C to 25°C from November to February, between 25p C to30^{p} C during May to September and between 22p C to 27p C during the rest of the year. South west monsoon is the main source of rainfall. Maximum rainfall occurs from mid-June to September, July and August usually are the wettest months. Maximum rainfall occurred from mid-June to September and July-August usually is the wettest months. The average annual rainfall is about 260 to 340 cm per year. Maximum relative humidity varies between 85 % - 95 %, seldom below 75 % with a maximum during June to September and minimum during December to February. The annual average humidity also remain quite high, i.e. 90.52 in the morning and 74.27 in the afternoon. The Sun-shine begins to rise from October and maximum Sum-shine is received up to November. After November, the Sun-shine start to decrease and during December to February the nights remain very cold with much fog and dew formations.

The importance of the Gorumara National Park from the ecological, conservational and economic points of view the absence of a detailed flora, mainly of vascular plants was felt seriously –

i. To prepare a detailed spermatophytic flora of Gorumara National Park

ii. To prepare flowering and fruiting calendars of its floristic elements, this will be useful to the future workers in numerous other branches of science including medicine, reproductive biology, crop improvement programs, etc.

iii. To evaluate the recorded taxa for their endemic/ rare/ threatened status and to determine their population structure and distribution pattern

iv. To recognize the disturbances created by various anthropogenic and/or physical agents on local vegetation

v. To prepare a detailed data base on the exotic plants growing in the park

vi. To understand the pattern of diversity of flora in the park

vii. To record the NTFP potential of the park and their substantial utilization

viii. To understand the key points of conservation of flora and vegetation of the park; etc.

The entire area of Gorumara National Park (GNP) was surveyed during the years 2007 to 2013 with the assistance of Wildlife Wing of Forest Department, Government of West Bengal. With the complete recording of field-characters in field notebooks, the specimens were temporarily preserved in polythene bags in the field, with the mouth being kept air tight. Old news prints were used to rap the specimens and then put into a light herbarium press and tied tightly with rope. All the specimens were properly poisoned by dipping in 6 % solution of $HgCl_2$ in rectified spirit (ethanol), decanting and then again placing within the blotters and in the press. Properly dried specimens were mounted on standard herbarium sheets (41.5 x 28 cm) using glue and stitched with threads. There after the herbarium labels (15.5 x 10 cm) with important information recorded in the field were fixed on the right hand bottom corner of each herbarium-sheet. These labels contained the following important information: (a) Area under exploration, (b) Field number, (c) Date of collection, (d) Name, (e) Family, (f) Vernacular names, (e) Locality, (f) Altitudes, (g) Habit and habitat, (h) Flowers and fruits, (j) Notes, (k) Name of collector and determinator, etc. The specimens were then temporarily stored in a Herbarium cabinets in the NBU Herbarium for further study.

During this survey 40 randomly distributed quadrates of 20m x 20m has been taken from different Beat areas in three different seasons, namely designated as *pre-monsoon* [March – April], *monsoon* [May – July] and *post-monsoon* [September – November]. Nested Quadrate technique has been used with 20m x 20m quadrates for trees and 5m x 5m quadrates for shrubs and 1m x 1m quadrates for ground covering herbaceous plants. The smaller quadrates were nested within the large [i.e. 20m x 20m] quadrates. Recorded data were transferred to MS Excel worksheet and different parameters like Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI) of each and every species were determined using appropriate formulae.

The spermatophytic plants with their accepted names as per *The Plant List*, through proper taxonomic treatments of recorded species and infra-specific taxa, collected from Gorumara National Park has been arranged in compliance with the presently accepted APG-III (2009) system of classification. Further, for better convenience the presentation of each species in the enumeration the genera and species under the families are arranged in alphabetical order. In case of Gymnosperms, family, genera and species also arranged in alphabetical order. The following sequence of enumeration is taken into consideration while enumerating each identified plants.

(a) Accepted name, (b) Basionym if any, (c) Synonyms if any, (d) Homonym if any, (e) Vernacular name if any, (f) Description, (g) Flowering and fruiting periods, (h) Specimen cited, (i) Local distribution, and

After the comprehensive floristic survey, it is noted that the Gorumara National Park is presented enormously rich flora. A total of 876 species of spermatophytes has been recorded from the intensive survey since the year 2006. Of these, angiosperms are represented by 872 species under 521 genera belonging to 155 families . In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP during the present exploration.

The present floristic work on GNP deals with the recorded 155 Spermatophytic families, out of which 125 are dicotyledonous and the remaining 30 are monocotyledonous; 675 species under 406 genera are recorded from 125 dicotyledons families and 197 species belonging to 115 genera in 30 monocot families. Only 4 species of gymnosperm belonging to 4 genera under 4 families were recorded under.

The study area is comparatively too small and is housing only 876 species of vascular plants as has been recorded through the intensive survey since the year 2007. Of these, angiosperms are represented by 872 species under 525 genera belonging to 159 families. In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP. The largest genus is *Ficus* of Moraceae with 10 species and is followed by *Cyperus* of Cyperaceae, *Litsea* of Lauraceae, *Dioscorea* of Dioscoreaceae, *Cissus* of Vitaceae, *Desmodium* of Fabaceae etc. Out of the recorded flora, 89 species has been recognized as exotics. Out of these 63 has been naturalized, 25 species came from Tropical America, 15 from South America, 12 from Brazil and Mexico and only 6 species are of Asian origin.

April, May, June and July and later September to October may be called as nature's flower festival of GNP flora, because maximum flowering species (9% of the total studied flowering species in each month) found to bloom during these two periods every year. December to January appears to be the resting month.

The sampling was done in three different seasons of the year: (i) Pre-monsoon [March to April], Monsoon [May to July] and Post-monsoon [September to November]. The data obtained were computed to determine different phytosociological parameters, namely Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI). And, finally, using these processed data different diversity and richness Index were calculated for better understanding of the vegetation.

In premonsoon groung covers, *Commelina sufruticosa* (95.54) emerged with highest frequency in Murti where, *Ichnocarpus frutescens* (92.86) leads the frequency in Dhupjhora. *Axonopus compressus*(97.33) presented maximum frequency in Gorumara, *Pupalia lappacea*(96.00) in Khunia, *Elatostema monandrum*(98.00) in Bichhabhanga and *Ageratum conyzoides* (97.78) in Budhuram. *Achyrospermum wallichianum, Diplazium esculentum, Oplismenus burmannii* etc presented very high frequency in all over the study areas. Similarly highest abandance presented in Murti by *Centella asiatica* (6.47). where, *Axonopus compressus* (6.12) presented maximum abundance in Dhupjhora, *Elatostema monandrum* (5.17) in Gorumara, *Ichnocarpus frutescens* (3.46) in Khunia, *Globba racemosa* (11.92) in Bichhabhanga, *Molineria capitulata* (6.00) in Budhuram. *Oplismenus burmannii* (2.10) presented maximum density in Murti where, maximum density of Dhupjhora presented by *Axonopus compressus* (3.59), *Elatostema monandrum* (2.89) in Gorumara, *Ichnocarpus frutescens* (3.18) in Khunia, *Elatostema monandrum* (3.94) in Bichhabhanga and in Budhuram by *Chloranthus erectus* (4.87). Murti Beat presented a maximum IVI values by *Oplismenus burmannii* (15.04)*, Centella asiatica* (12.97)*, Natsiatum herpeticum* (12.27) etc, Khunia by *Ichnocarpus frutescens* (20.19)*, Pupalia lappacea* (16.34)*, Axonopus compressus* (15.46)*, Acmella calva* (14.20)etc, Bichhabhanga by *Globba racemosa* (24.50)*, Elatostema monandrum* (20.43)*, Ageratum conyzoides* (20.35)*, Acmella calva* (17.09)etc. and *Chloranthus erectus* (23.15)*, Ageratum conyzoides* (19.71)*, Axonopus compressus* (18.52)*, Mikania micrantha* (16.49)etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas. Similarly, a few number of species like *Chloranthus erectus, Pupalia lappacea, Rungia pectinata, Achyrospermum wallichianum* etc presented the maximum SDI value 1. Simpson's Index (EH) maximum recorded in Murti by *Acacia pennata* (56.59), Dhupjhora by *Pronephreum nudatum* (161.6562), Gorumara by *Achyrospermum wallichianum* (59.79836), Khunia by *Acacia pennata* (116.6408), Bichhabhanga by *Achyranthes bidentata* (86.55733), and in Budhuram by *Anisomeles indica* (154.678). other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Clerodendrum infortunatum, Coffea bengalensis, Commelina diffusa, Synedrella nodiflora, Persicaria chinensis*etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.571629, Dhupjhoran 0.510899, Gorumara 0.465165, Khunia 0.655970, Bichhabhanga 0.631930 and Budhuram 0.564817. Similarly Murti Beat presented the Margalef Richness Indices (RI) 30.8748, where, Dhupjhora 28.8762, Gorumara 23.8732, Khunia 27.8668, Bichhabhanga 28.8693 and Budhram 25.8694.

In monsoon ground covers, *Axonopus compressus*(98.89) emerged with highest frequency in Murti where, *Achyrospermum wallichianum* (97.14) in Dhupjhora, *Ageratum conyzoides*(94.67) in Gorumara, *Coffea bengalensis* (96.00) in Khunia, *Ageratum conyzoides*(96.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. Similarly highest abundance presented in Murti by *Duchesnea indica*(6.23), *Mikania micrantha* (4.73) in Dhupjhora, *Acacia pennata* (1.90) in Gorumara, *Achyrospermumwallichianum*(5.52) in Khunia and (19.50) in Bichhabhanga and *Oplismenus compositus* (6.45) in Budhuram. *Acmella calva*(3.77) presented highiest density in Murti, while, *Mikania micrantha* (4.53) in Dhupjhora, *Axonopus compressus*(2.88) in Gorumara, *Achyrospermum wallichianum* (5.08) in Khunia, *Achyrospermum wallichianum* (4.68) in Bichhabhanga and *Oplismenus compositus* (5.44) in Budhuram presented highiest density. During monsoon season, *Acmella calva* (15.50)*, Mikania micrantha* (15.23)*, Oplismenus burmannii* (14.48)*, Chloranthuserectus* (13.02)etc. presented maximum IVI in Murti, but, *Mikania micrantha* (17.06)*, Achyrospermum wallichianum* (13.13)*, Piper sylvaticum* (13.05)*, Oplismenus burmannii* (12.16)etc. in Dhupjhora, *Axonopus compressus* (17.20)*, Mikania micrantha* (13.16)etc. in Gorumara, *Achyrospermum wallichianum* (22.30)*, Axonopus compressus*(16.85)*, Ichnocarpus frutescens*(13.91)*, Pronephreum nudatum* (13.91)etc. in Khunia, *Achyrospermum wallichianum* (30.48)*, Elatostema monandrum* (13.69)*, Piper sylvaticum* (12.71)*, Ageratum conyzoides*(12.22)etc. in Bichhabhanga and *Oplismenus compositus* (18.86)*, Pronephreum nudatum* (14.52) etc. in Budhuram recorded maximum IVI. Few common species like *Acaciapennata, Achyrospermum wallichianum* , *Clerodendrum infortunatum*, *Synedrella nodiflora* etc showing maximum SDI in allover the study areas. Simpson's Index (EH) maximum recorded in Murti by

Rungia pectinata(63.94906), Dhupjhora by *Youngia japonica* (211.7118), Gorumara by *Molineriacapitulata* (133.4294), Khunia by *Amerimnon stipulatum* (187.9153), Bichhabhanga by *Drymaria cordata* (124.1942), and in Budhuram by *Achyranthes bidentata*(212.4392). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.541158, Gorumara 0.553660, Khunia 0.617780, Bichhabhanga 0.670355 and Budhuram 0.639351. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8801, Gorumara 29.8748, Khunia 30.8723, Bichhabhanga 34.8736 and Budhram 33.8742.

In Postmonsoon ground covers, *Axonopus compressus*(98.89, 97.33) emerged with highest frequency in Murti, Gorumara where, *Ichnocarpus frutescens* (97.14) in Dhupjhora, *Coffea bengalensis* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. Similarly highest abundance presented in Murti, Dhupjhora by *Acmella calva* (4.99, 6.39), *Axonopus compressus* (7.09) in Dhupjhora, *Diplazium esculentum* (7.33) in Gorumara, *Achyrospermumwallichianum*(5.52) in Khunia and (19.50) in Bichhabhanga and *Chloranthus erectus* (9.44) in Budhuram. During postmonsoon season, *Acmella calva*(15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *Chloranthuserectus* (13.02)etc. presented maximum IVI in Murti, but, *Chloranthus erectus* (15.78), *Ageratum conyzoides* (15.19), *Cyperus compressus* (15.15), *Acmella calva* (15.03)in Dhupjhora, *Elatostema monandrum* (17.54) etc in Gorumara, *Achyrospermum wallichianum* (20.18), *Axonopus compressus* (15.21), *Ichnocarpus frutescens* (12.52), *Pronephreum nudatum* (12.52) etc. in Khunia, *Achyrospermum wallichianum* (27.49), *Elatostema monandrum* (19.71), *Ageratum conyzoides* (17.27), *Mikania micrantha* (15.74)etc.in Bichhabhanga and *Chloranthus erectus* (22.18), *Axonopus compressus* (21.20), *Ageratum conyzoides* (20.72), *Oplismenus burmannii* (17.01) etc. in Budhuram recorded maximum IVI.

Few common species like *Acaciapennata, Achyrospermum wallichianum*, *Achyranthes bidentata, Anisomeles indica, Blumea lacera, Centella asiatica, Synedrella nodiflora* etc showing maximum SDI in allover the study areas.

Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata*(63.94906), Dhupjhora by *Rumex dentatus* (277.1452), Gorumara by *Molineriacapitulata* (185.58), Khunia by *Blumea lacera* (210.3026), Bichhabhanga by *Saccharum spontaneum* (145.8058), and in Budhuram by *Prunella vulgaris* (257.6947). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.460447, Gorumara 0.452730, Khunia 0.710096, Bichhabhanga 0.607251 and Budhuram 0.569362. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8846, Gorumara 29.8808, Khunia 36.8735, Bichhabhanga 34.8767 and Budhram 33.8777.

In premonsoon groung covers, *Ichnocarpus frutescens* (100.00) emerged with highest frequency in Murti where, *Chromolaena odorata* (96.43) leads the frequency in Dhupjhora. *Argyreia roxburghii* (96.67) presented maximum frequency in Gorumara, *Mikania micrantha* (95.00 and 100.00) in Khunia and Budhuram, *Litsea glutinosa, Bridelia retusa* (100.00) in Bichhabhanga. *Chromolaena odorata* , *Chromolaena odorata* etc presented very high frequency in all over the study areas.

Similarly highest abandance presented in Murti,Dhupjhora and Khunia by *Alpinia nigra* (17.75). Where, *Parabaena sagittata* (8.38), in Gorumara, *Morinda angustifolia* (8.08), in Bichhabhanga, *Mikania micrantha* (9.06) in Budhuram. *Maesa indica* (5.39) presented maximum density in Murti where, maximum density of Dhupjhora, Bichhabhangaand Budhuram presented by *Mikania micrantha* (4.25, 5.75 and 9.06), *Argyreia roxburghii* (5.23) in Gorumara and *Croton caudatus* (4.45) in Khunia. other species which were presented a interesting density values in allover the study areas are *Parabaena sagittata, Alpinia nigra, Maesa indica* etc.

Simpson's Index (EH) maximum recorded in Murti by *Streblus asper*(611.4638), Dhupjhora by *Zizyphus mauritiana* (365.5565), Gorumara by *Abrus pulchellus* (413.3263), Khunia by *Toddalia*

asiatica(469.2142), Bichhabhanga by *Actinodaphne obovata* (142.9482), and in Budhuram by *Pterocarpus acerifolius* (161.4426). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D)1.143027, Dhupjhoran 0.939123, Gorumara 0.919757, Khunia 1.049093, Bichhabhanga 0.939384 and Budhuram 0.955192. Similarly Murti Beat presented the Margalef Richness Indices (RI) 52.8697, where, Dhupjhora 40.8676, Gorumara 35.8637, Khunia 42.8653, Bichhabhanga 33.8607 and Budhram 33.8600. In monsoon ground covers, *Argyreia roxburghii* (100.00, 100.00 & 93.33) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100) in Khunia, *Pueraria phaseoloides* (100.00) in Bichhabhanga and *Chromolaena odorata* (94.44) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Mikania micrantha* (100.00). Similarly highest abundance presented in Murti by *Holarrhena pubescens* (18.25), *Croton caudatus* (13.21) in Dhupjhora, *Parabaena sagittata* (14.25) in Gorumara, *Alpinia nigra*(64.80) in Khunia, *Maesa indica* (12.05) in Bichhabhanga and *Chromolaena odorata* (12.76) in Budhuram. *Argyreia roxburghii* (9.64) presented highiest density in Murti, while, *Mikania micrantha* (11.64) in Dhupjhora, *Mikania micrantha* (8.90) in Gorumara, *Ichnocarpus frutescens* (100) in Khunia, *Maesa indica*(12.05) in Bichhabhanga and *Chromolaena odorata* (12.06) in Budhuram presented highiest density. During monsoon season, *Argyreia roxburghii* (20.68), *Ichnocarpus frutescens* (20.49), *Mikania micrantha* (18.97), *Chromolaena odorata* (17.85) etc. presented maximum IVI in Murti. Simpson's Index (EH) maximum recorded in Murti by *Glycosmis pentaphylla*(610.1924), Dhupjhora by *Zizyphus mauritiana*(515.5455), Gorumara by *Pterocarpus acerifolius* (568.7283), Khunia by *Abrus pulchellus* (298.1147), Bichhabhanga by *Actinodaphne obovata* (203.4955), and in Budhuram by *Pterocarpus acerifolius* (199.4133). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.853887, Dhupjhoran 0.788811, Gorumara 0.787591, Khunia 0.774749, Bichhabhanga 0.810063 and Budhuram 0.898317. Similarly Murti Beat presented the Margalef Richness Indices (RI) 48.8765, where, Dhupjhora 41.8742, Gorumara 36.8701, Khunia 38.8724, Bichhabhanga 35.8682 and Budhram 35.8645.

In Postmonsoon ground covers, *Argyreia roxburghii* (100.00) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100.00) inKhunia, *Bridelia retusa* (100.00) in Bichhabhanga and *Mikania micrantha* (100.00) in Budhuram presented the maximum frequency. During postmonsoon season, *Argyreia roxburghii* (23.81), *Ichnocarpus frutescens* (23.59), *Mikania micrantha* (21.83), *Chromolaena odorata* (20.55) etc. presented maximum IVI in Murti. Simpson's Index (EH) maximum recorded in Murti by *Streblus asper* (761.0204), Dhupjhora by *Zizyphus mauritiana* (529.6169), Gorumara by *Pterocarpus* 570.9368), Khunia by *Toddalia asiatica* (600.7942), Bichhabhanga by *Actinodaphne obovata* (195.7899), and in Budhuram by *Pterocarpus acerifolius* (213.4993). Other recorded species cotain maximum EH values in all of the areas are *Streblus asper, Premna latifolia, Abrus pulchellus, Actinodaphne obovata* etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.898177, Dhupjhoran 0.755127, Gorumara 0.785812, Khunia 0.883477, Bichhabhanga 0.802322 and Budhuram 0.862044. Similarly Murti Beat presented the Margalef Richness Indices (RI) 47.8743, where, Dhupjhora 40.8748, Gorumara 36.8702, Khunia 41.8705, Bichhabhanga 34.8676 and Budhram 35.8660. In the tree layer, *Actinidaphne obovata* (100.00) emerged with highest frequency in Murti and Gorumara, where, *Alangium chinensis* (100.00) leads the frequency in Dhupjhora, *Alstonia scholaris* (100.00) in Budhuram and Khunia, *Casaeria vareca* (100.00) in Bichhabhanga. Similarly highest abandance presented in Murti, Dhupjhora, Bichhabhanga and Budhuram by *Shorea robusta* (respectively 21.00, 26.86, 28.30 and 34.89). *Shorea robusta* (respectively 21.00, 26.86, 21.00, 28.30 and 34.89) presented maximum density in Murti, Dhupjhora, Gorumara, Bichhabhanga and Budhuram. Where, maximum density of Khunia presented by *Albizia lucidior* (28.30). The maximum IVI value leads by *Shorea robusta* in allover the study areas. *Actinodaphne sikkimensis , Aglaia spectabilis , Artocarpus chaplasa etc* showing maximum SDI 1 in allover the study area. Simpson's Index (EH) maximum recorded in Murti by *Castanopsis indica*

(405.99863), Dhupjhora by *Terminalia belirica* (673.8532), Gorumara by *Ficus benghalensis* (465.3478), Khunia by *Aegle marmelos*(430.883), Bichhabhanga by *Artocarpus chaplasa*(494.5687), and in Budhuram by *Ficus benghalensis* (392.5362). Incase of Species Richness in canopy covers of Murti Beat presented Menhinick Richness Indices (D) 0.783519, Dhupjhoran 0.62, Gorumara 0.72, Khunia 0.66, Bichhabhanga 0.70 and Budhuram 0.70. Similarly Murti Beat presented the Margalef Richness Indices (RI) 36.8703, where, Dhupjhora 32.87, Gorumara 36.87, Khunia 32.87, Bichhabhanga 30.87 and Budhram 32.87. Total 127 species traditionally used medicinal plant species has been recorded from GNP and enumerated. From the present survey, a total of 335 species of useful plants has been recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or riped fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals. 39 percent plants collected by the local villagers for their won domestic animals fodder. 8 percent of the total collected species has used as fuel wood in their earthen oven. A total 127 species of medicinal plants i.e. 19 percent plants collected by few person for medicin purpose. They also collected and use 45 species of medicinal plants to cure their pets from various diseases and disorder. 13 percent of total NTFPs species collected or planted for ornamental or decorative purpose. Out of 82 species i.e. 8 percent of the total NTFPs plants, 20 species used as plant vegetable where whole plants has used to cook. Leaves of 13 species has used as vegetable. 28 species fruits used as vegetable of edible fruits. 20 species of plants i.e. 3 percent of the total NTFPs recorded species has use by the local villagers in their daily cultural and ritual life like marrage, puja or other social programme.

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ANNEXURE

Annexure I: Premonsoon Ground cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon - Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	23.33	1.53	2.00	2.65	0.47	1.43	5.61	1.000	1	0.571629	30.8748
Achyrospermum wallichianum	38.89	2.55	1.40	1.86	0.54	1.67	6.07	1.000			
Acmella calva	48.89	3.21	2.20	2.92	1.08	3.30	9.43	0.999			
Ageratum conyzoides	41.11	2.70	3.05	4.05	1.26	3.84	10.59	0.999			
Axonopus compressus	64.44	4.23	1.50	1.99	0.97	2.96	9.17	0.999			
Centella asiatica	16.67	1.09	6.47	8.58	1.08	3.30	12.97	0.999			
Chloranthus erectus	53.33	3.50	2.42	3.20	1.29	3.94	10.65	0.998			
Chromolaena odorata	46.67	3.06	1.69	2.24	0.79	2.41	7.72	0.999			
Clerodendrum infortunatum	27.78	1.82	3.88	5.15	1.08	3.30	10.27	0.999			
Coffea bengalensis	42.22	2.77	3.11	4.12	1.31	4.01	10.90	0.998			
Commelina sufruticosa	95.56	6.27	1.10	1.46	1.06	3.23	10.96	0.999			
Cryptolepis dubia	70.00	4.59	1.21	1.60	0.84	2.58	8.78	0.999			
Cyperus compressus	93.33	6.12	1.17	1.55	1.09	3.33	11.00	0.999			
Diplazium esculentum	72.22	4.74	2.06	2.73	1.49	4.56	12.03	0.998			
Dryopteris sikkimensis	30.00	1.97	4.37	5.80	1.31	4.01	11.78	0.998			
Elatostema monandrum	31.11	2.04	1.68	2.23	0.52	1.60	5.86	1.000			
Floscopa scandens	56.67	3.72	1.80	2.39	1.02	3.13	9.24	0.999			
Hypericum japonicum	51.11	3.35	1.93	2.57	0.99	3.03	8.94	0.999			
Ichnocarpus frutescens	41.11	2.70	2.05	2.72	0.84	2.58	8.00	0.999			
Lepidagathis incurva	43.33	2.84	1.87	2.48	0.81	2.48	7.81	0.999			
Mikania micrantha	46.67	3.06	3.05	4.04	1.42	4.35	11.45	0.998			
Molineria capitulata	72.22	4.74	1.09	1.45	0.79	2.41	8.60	0.999			
Natsiatum herpeticum	41.11	2.70	3.70	4.91	1.52	4.66	12.27	0.998			
Oplismenus burmannii	57.78	3.79	3.63	4.82	2.10	6.43	15.04	0.996			
Persicaria chinensis	54.44	3.57	2.37	3.14	1.29	3.94	10.65	0.998			
Piper sylvaticum	63.33	4.15	1.65	2.19	1.04	3.20	9.54	0.999			
Pronephreum nudatum	68.89	4.52	2.21	2.93	1.52	4.66	12.11	0.998			
Pupalia lappacea	20.00	1.31	3.56	4.71	0.71	2.18	8.20	1.000			
Rungia pectinata	26.67	1.75	2.54	3.37	0.68	2.07	7.19	1.000			
Synedrella nodiflora	25.56	1.68	2.96	3.92	0.76	2.31	7.91	0.999			
Tetrastigma serrulatum	60.00	3.94	1.69	2.23	1.01	3.09	9.26	0.999			

Annexure II: Premonsoon Ground cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyranthes bidentata	32.86	1.91	1.78	2.35	0.59	1.27	5.52	1.000	1	0.510899	28.8762
Achyrospermum wallichianum	84.29	4.89	3.08	4.06	2.60	5.65	14.60	0.997			
Acmella calva	75.71	4.39	2.60	3.43	1.97	4.28	12.10	0.998			
Ageratum conyzoides	50.00	2.90	3.69	4.85	1.84	4.00	11.75	0.998			
Alternantheara philoxeroides	30.00	1.74	2.29	3.01	0.69	1.49	6.24	1.000			
Axonopus compressus	58.57	3.40	6.12	8.06	3.59	7.79	19.24	0.994			
Chloranthus erectus	54.29	3.15	3.24	4.26	1.76	3.82	11.23	0.999			
Chromolaena odorata	58.57	3.40	2.34	3.08	1.37	2.98	9.46	0.999			
Clerodendrum infortunatum	12.86	0.75	1.56	2.05	0.20	0.43	3.23	1.000			
Coffea bengalensis	17.14	0.99	3.50	4.61	0.60	1.30	6.90	1.000			
Commelina diffusa	60.00	3.48	2.33	3.07	1.40	3.04	9.59	0.999			
Cyperus compressus	45.71	2.65	3.03	3.99	1.39	3.01	9.65	0.999			
Diplazium esculentum	65.71	3.81	2.98	3.92	1.96	4.25	11.98	0.998			
Dryopteris sikkimensis	75.71	4.39	3.66	4.82	2.77	6.02	15.23	0.996			
Elatostema monandrum	72.86	4.23	2.96	3.90	2.16	4.69	12.81	0.998			
Floscopa scandens	65.71	3.81	0.93	1.23	0.61	1.33	6.38	1.000			
Ichnocarpus frutescens	92.86	5.39	3.03	3.99	2.81	6.11	15.49	0.996			
Lepidagathis incurva	81.43	4.72	3.04	3.99	2.47	5.37	14.09	0.997			
Mikania micrantha	84.29	4.89	1.98	2.61	1.67	3.63	11.13	0.999			
Mimosa pudica	64.29	3.73	1.82	2.40	1.17	2.55	8.67	0.999			
Molineria capitulata	58.57	3.40	3.49	4.59	2.04	4.44	12.42	0.998			
Natsiatum herpeticum	58.57	3.40	2.39	3.15	1.40	3.04	9.58	0.999			
Oplismenus burmannii	80.00	4.64	2.29	3.01	1.83	3.97	11.62	0.998			
Persicaria chinensis	67.14	3.89	1.30	1.71	0.87	1.89	7.50	1.000			
Piper sylvaticum	52.86	3.07	2.22	2.92	1.17	2.55	8.53	0.999			
Pronephreum nudatum	12.86	0.75	1.33	1.75	0.17	0.37	2.87	1.000			
Pupalia lappacea	70.00	4.06	2.18	2.87	1.53	3.32	10.25	0.999			
Spermacoce latifolia	72.86	4.23	2.14	2.81	1.56	3.38	10.42	0.999			
Synedrella nodiflora	68.57	3.98	2.69	3.54	1.84	4.00	11.52	0.998			

Annexure III: Premonsoon Ground cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyrospermum wallichianum	16.00	0.98	2.67	5.09	0.43	1.20	7.27	1.000	1	0.465165	23.8732
Acmella calva	77.33	4.72	1.67	3.19	1.29	3.64	11.56	0.999			
Ageratum conyzoides	96.00	5.86	2.57	4.91	2.47	6.95	17.72	0.995			
Axonopus compressus	97.33	5.94	2.84	5.42	2.76	7.78	19.13	0.994			
Chloranthus erectus	81.33	4.96	1.59	3.04	1.29	3.64	11.64	0.999			
Chromolaena odorata	70.67	4.31	1.74	3.32	1.23	3.46	11.08	0.999			
Clerodendrum infortunatum	68.00	4.15	1.22	2.32	0.83	2.33	8.80	0.999			
Commelina diffusa	56.00	3.42	1.40	2.68	0.79	2.22	8.32	1.000			
Cyperus compressus	60.00	3.66	1.84	3.52	1.11	3.12	10.30	0.999			
Diplazium esculentum	54.67	3.34	4.61	8.80	2.52	7.10	19.24	0.995			
Dryopteris sikkimensis	70.67	4.31	2.40	4.58	1.69	4.77	13.66	0.998			
Elatostema monandrum	56.00	3.42	5.17	9.87	2.89	8.15	21.44	0.993			
Ichnocarpus frutescens	81.33	4.96	3.03	5.79	2.47	6.95	17.71	0.995			
Lepidagathis incurva	96.00	5.86	2.60	4.96	2.49	7.02	17.84	0.995			
Mikania micrantha	62.67	3.82	1.45	2.76	0.91	2.55	9.14	0.999			
Mimosa pudica	90.67	5.53	1.46	2.78	1.32	3.72	12.03	0.999			
Natsiatum herpeticum	89.33	5.45	2.04	3.91	1.83	5.15	14.50	0.997			
Oplismenus burmannii	78.67	4.80	1.83	3.50	1.44	4.06	12.35	0.998			
Oxalis corniculata	44.00	2.69	1.27	2.43	0.56	1.58	6.69	1.000			
Persicaria chinensis	60.00	3.66	1.67	3.18	1.00	2.82	9.66	0.999			
Piper sylvaticum	77.33	4.72	1.57	3.00	1.21	3.42	11.13	0.999			
Rungia pectinata	41.33	2.52	1.65	3.14	0.68	1.92	7.58	1.000			
Sauropus quadrangularis	37.33	2.28	2.11	4.02	0.79	2.22	8.52	1.000			
Spermacoce latifolia	76.00	4.64	1.98	3.79	1.51	4.24	12.67	0.998			

Annexure IV: Premonsoon Ground cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	16.00	0.84	1.25	2.39	0.20	0.55	3.79	1.000	1	0.655970	27.8668
Achyranthes bidentata	82.00	4.32	1.39	2.66	1.14	3.13	10.11	0.999			
Achyrospermum wallichianum	78.00	4.11	2.08	3.98	1.62	4.45	12.53	0.998			
Acmella calva	78.00	4.11	2.49	4.76	1.94	5.32	14.20	0.997			
Ageratum conyzoides	94.00	4.95	1.89	3.63	1.78	4.88	13.46	0.998			
Asystasia macrocarpa	32.00	1.69	1.31	2.51	0.42	1.15	5.35	1.000			
Axonopus compressus	92.00	4.85	2.39	4.58	2.20	6.04	15.46	0.996			
Chloranthus erectus	70.00	3.69	1.06	2.02	0.74	2.03	7.74	1.000			
Chromolaena odorata	90.00	4.74	1.91	3.66	1.72	4.72	13.12	0.998			
Clerodendrum infortunatum	84.00	4.43	1.86	3.56	1.56	4.28	12.26	0.998			
Commelina sufruticosa	62.00	3.27	1.03	1.98	0.64	1.76	7.00	1.000			
Cyperus compressus	84.00	4.43	1.86	3.56	1.56	4.28	12.26	0.998			
Diplazium esculentum	92.00	4.85	1.98	3.79	1.82	4.99	13.63	0.998			
Dryopteris sikkimensis	76.00	4.00	2.03	3.88	1.54	4.23	12.11	0.998			
Elatostema monandrum	42.00	2.21	1.14	2.19	0.48	1.32	5.72	1.000			
Floscopa scandens	64.00	3.37	0.97	1.85	0.62	1.70	6.93	1.000			
Ichnocarpus frutescens	92.00	4.85	3.46	6.62	3.18	8.73	20.19	0.992			
Mikania micrantha	82.00	4.32	1.73	3.32	1.42	3.90	11.53	0.999			
Molineria capitulata	74.00	3.90	1.54	2.95	1.14	3.13	9.98	0.999			
Natsiatum herpeticum	42.00	2.21	1.76	3.37	0.74	2.03	7.62	1.000			
Oplismenus compositus	86.00	4.53	2.26	4.32	1.94	5.32	14.17	0.997			
Persicaria chinensis	24.00	1.26	1.50	2.87	0.36	0.99	5.12	1.000			
Phlogacanthus thyrsiformis	48.00	2.53	1.58	3.03	0.76	2.09	7.65	1.000			
Piper sylvaticum	90.00	4.74	1.98	3.79	1.78	4.88	13.41	0.998			
Pronephreum nudatum	28.00	1.48	3.00	5.74	0.84	2.31	9.52	0.999			
Pupalia lappacea	96.00	5.06	2.48	4.75	2.38	6.53	16.34	0.996			
Rungia pectinata	36.00	1.90	3.00	5.74	1.08	2.96	10.60	0.999			
Spermacoce latifolia	64.00	3.37	1.31	2.51	0.84	2.31	8.19	0.999			

Annexure V: Premonsoon Ground cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyranthes bidentata	30.00	1.70	1.13	1.55	0.34	0.81	4.06	1.000	1	0.631930	28.8693
Achyrospermum wallichianum	94.00	5.33	1.89	2.60	1.78	4.23	12.16	0.998			
Acmella calva	96.00	5.45	3.19	4.37	3.06	7.26	17.09	0.995			
Ageratum conyzoides	70.00	3.97	5.40	7.41	3.78	8.97	20.35	0.992			
Anisomeles indica	42.00	2.38	1.76	2.42	0.74	1.76	6.56	1.000			
Axonopus compressus	42.00	2.38	1.62	2.22	0.68	1.61	6.22	1.000			
Blumea lacera	74.00	4.20	3.03	4.15	2.24	5.32	13.67	0.997			
Chromolaena odorata	62.00	3.52	1.97	2.70	1.22	2.90	9.11	0.999			
Clerodendrum infortunatum	62.00	3.52	3.13	4.29	1.94	4.61	12.42	0.998			
Commelina sufruticosa	24.00	1.36	2.08	2.86	0.50	1.19	5.41	1.000			
Cyperus compressus	14.00	0.79	3.00	4.11	0.42	1.00	5.91	1.000			
Dicliptera bupleuroides	18.00	1.02	2.00	2.74	0.36	0.85	4.62	1.000			
Diplazium esculentum	90.00	5.11	1.93	2.65	1.74	4.13	11.89	0.998			
Dryopteris sikkimensis	72.00	4.09	3.25	4.46	2.34	5.56	14.10	0.997			
Elatostema monandrum	98.00	5.56	4.02	5.51	3.94	9.35	20.43	0.991			
Elephantopus scaber	34.00	1.93	1.94	2.66	0.66	1.57	6.16	1.000			
Euphorbia hirta	32.00	1.82	1.31	1.80	0.42	1.00	4.61	1.000			
Globba racemosa	24.00	1.36	11.92	16.34	2.86	6.79	24.50	0.995			
Ichnocarpus frutescens	26.00	1.48	1.92	2.64	0.50	1.19	5.30	1.000			
Mikania micrantha	84.00	4.77	1.45	1.99	1.22	2.90	9.66	0.999			
Oplismenus burmannii	52.00	2.95	1.31	1.79	0.68	1.61	6.36	1.000			
Persicaria chinensis	76.00	4.31	2.00	2.74	1.52	3.61	10.67	0.999			
Phyllanthus reticulatus	74.00	4.20	1.81	2.48	1.34	3.18	9.86	0.999			
Piper sylvaticum	94.00	5.33	2.06	2.83	1.94	4.61	12.77	0.998			
Pupalia lappacea	74.00	4.20	1.14	1.56	0.84	1.99	7.75	1.000			
Rungia pectinata	76.00	4.31	1.39	1.91	1.06	2.52	8.74	0.999			
Spermacoce latifolia	82.00	4.65	2.10	2.88	1.72	4.08	11.61	0.998			
Synedrella nodiflora	82.00	4.65	1.49	2.04	1.22	2.90	9.59	0.999			
Youngia japonica	64.00	3.63	1.66	2.27	1.06	2.52	8.42	0.999			

Annexure VI: Premonsoon Ground cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyrospermum wallichianum	91.11	5.35	3.20	4.40	2.91	6.18	15.93	0.996	1	0.564817	25.8694
Ageratum conyzoides	97.78	5.74	4.05	5.57	3.96	8.40	19.71	0.993			
Anisomeles indica	15.56	0.91	1.14	1.57	0.18	0.38	2.86	1.000			
Axonopus compressus	91.11	5.35	3.98	5.47	3.62	7.69	18.52	0.994			
Centella asiatica	53.33	3.13	1.88	2.58	1.00	2.12	7.84	1.000			
Chloranthus erectus	86.67	5.09	5.62	7.73	4.87	10.34	23.15	0.989			
Chromolaena odorata	88.89	5.22	1.58	2.17	1.40	2.97	10.36	0.999			
Coffea bengalensis	86.67	5.09	1.82	2.51	1.58	3.35	10.95	0.999			
Cyperus compressus	53.33	3.13	2.21	3.04	1.18	2.50	8.67	0.999			
Dicliptera bupleuroides	20.00	1.17	3.78	5.20	0.76	1.60	7.98	1.000			
Diplazium esculentum	86.67	5.09	1.82	2.51	1.58	3.35	10.95	0.999			
Dryopteris sikkimensis	80.00	4.70	3.03	4.17	2.42	5.14	14.01	0.997			
Elatostema monandrum	68.89	4.05	2.81	3.86	1.93	4.11	12.01	0.998			
Hypericum japonicum	26.67	1.57	1.92	2.64	0.51	1.09	5.29	1.000			
Ichnocarpus frutescens	80.00	4.70	1.47	2.03	1.18	2.50	9.23	0.999			
Mikania micrantha	73.33	4.31	4.15	5.71	3.04	6.47	16.49	0.996			
Molineria capitulata	4.44	0.26	6.00	8.26	0.27	0.57	9.08	1.000			
Natsiatum herpeticum	55.56	3.26	3.68	5.06	2.04	4.34	12.67	0.998			
Oplismenus burmannii	73.33	4.31	2.70	3.71	1.98	4.20	12.22	0.998			
Piper sylvaticum	80.00	4.70	2.92	4.01	2.33	4.96	13.67	0.998			
Pronephreum nudatum	91.11	5.35	3.27	4.50	2.98	6.32	16.17	0.996			
Pupalia lappacea	82.22	4.83	1.51	2.08	1.24	2.64	9.56	0.999			
Rungia pectinata	53.33	3.13	1.63	2.24	0.87	1.84	7.21	1.000			
Spermacoce latifolia	46.67	2.74	3.38	4.65	1.58	3.35	10.74	0.999			
Synedrella nodiflora	33.33	1.96	1.87	2.57	0.62	1.32	5.85	1.000			
Tetrastigma serrulatum	82.22	4.83	1.30	1.79	1.07	2.27	8.88	0.999			

Annexure VII: Monsoon Ground cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	38.89	1.76	2.06	2.26	0.80	1.40	5.42	1.000	1	0.460650	32.8829
Achyrospermum wallichianum	38.89	1.76	2.23	2.45	0.87	1.52	5.73	1.000			
Acmella calva	75.56	3.42	4.99	5.48	3.77	6.61	15.50	0.996			
Ageratum conyzoides	62.22	2.82	2.98	3.28	1.86	3.25	9.35	0.999			
Axonopus compressus	98.89	4.47	1.30	1.43	1.29	2.26	8.17	0.999			
Chloranthus erectus	72.22	3.27	4.12	4.53	2.98	5.22	13.02	0.997			
Clerodendrum infortunatum	27.78	1.26	4.56	5.01	1.27	2.22	8.49	1.000			
Clerodendrum infortunatum	50.00	2.26	2.13	2.34	1.07	1.87	6.48	1.000			
Coffea bengalensis	84.44	3.82	2.84	3.12	2.40	4.21	11.15	0.998			
Commelina sufruticosa	95.56	4.32	1.83	2.01	1.74	3.06	9.39	0.999			
Cryptolepis dubia	70.00	3.17	1.54	1.69	1.08	1.89	6.75	1.000			
Cyperus compressus	93.33	4.22	1.51	1.66	1.41	2.47	8.36	0.999			
Diplazium esculentum	72.22	3.27	3.29	3.62	2.38	4.17	11.06	0.998			
Drymaria cordata	51.11	2.31	2.09	2.29	1.07	1.87	6.48	1.000			
Dryopteris sikkimensis	30.00	1.36	4.37	4.80	1.31	2.30	8.46	0.999			
Duchesnea indica	38.89	1.76	6.23	6.84	2.42	4.25	12.85	0.998			
Elatostema monandrum	31.11	1.41	2.39	2.63	0.74	1.31	5.34	1.000			
Floscopa scandens	51.11	2.31	2.43	2.68	1.24	2.18	7.17	1.000			
Ichnocarpus frutescens	67.78	3.07	1.84	2.02	1.24	2.18	7.27	1.000			
Mikania micrantha	95.56	4.32	3.93	4.32	3.76	6.59	15.23	0.996			
Molineria capitulata	72.22	3.27	1.51	1.66	1.09	1.91	6.83	1.000			
Natsiatum herpeticum	75.56	3.42	3.93	4.31	2.97	5.20	12.94	0.997			
Oplismenus burmannii	94.44	4.27	3.71	4.07	3.50	6.14	14.48	0.996			
Oxalis corniculata	94.44	4.27	1.46	1.60	1.38	2.42	8.29	0.999			
Persicaria chinensis	75.56	3.42	3.81	4.19	2.88	5.05	12.65	0.997			
Phlogacanthus thyrsiformis	82.22	3.72	1.27	1.40	1.04	1.83	6.95	1.000			
Piper sylvaticum	86.67	3.92	1.49	1.63	1.29	2.26	7.82	0.999			
Pronephreum nudatum	83.33	3.77	1.57	1.73	1.31	2.30	7.80	0.999			
Pupalia lappacea	42.22	1.91	4.92	5.41	2.08	3.64	10.96	0.999			
Rungia pectinata	20.00	0.90	3.56	3.91	0.71	1.25	6.06	1.000			
Spermacoce alata	83.33	3.77	2.08	2.29	1.73	3.04	9.10	0.999			
Synedrella nodiflora	83.33	3.77	1.52	1.67	1.27	2.22	7.66	1.000			
Tetrastigma serrulatum	71.11	3.22	1.53	1.68	1.09	1.91	6.81	1.000			

Annexure VIII: Monsoon Ground cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyrospermum wallichianum	30.00	1.35	2.81	3.07	0.84	1.41	5.83	1.000	1	0.541158	34.8801
Achyrospermum wallichianum	97.14	4.38	3.22	3.52	3.13	5.24	13.13	0.997			
Acmella calva	80.00	3.60	2.04	2.23	1.63	2.73	8.55	0.999			
Ageratum conyzoides	82.86	3.73	2.00	2.19	1.66	2.77	8.69	0.999			
Axonopus compressus	50.00	2.25	2.43	2.66	1.21	2.03	6.94	1.000			
Boehmeria glomerulifera	61.43	2.77	1.42	1.55	0.87	1.46	5.78	1.000			
Chloranthus erectus	87.14	3.93	3.54	3.87	3.09	5.16	12.96	0.997			
Chromolaena odorata	87.14	3.93	3.54	3.87	3.09	5.16	12.96	0.997			
Clerodendrum infortunatum	72.86	3.28	2.24	2.44	1.63	2.73	8.45	0.999			
Coffea bengalensis	67.14	3.02	1.45	1.58	0.97	1.63	6.23	1.000			
Commelina sufruticosa	60.00	2.70	3.21	3.51	1.93	3.23	9.44	0.999			
Cryptolepis dubia	7.14	0.32	3.20	3.50	0.23	0.38	4.20	1.000			
Cyanthillium cinereum	91.43	4.12	1.08	1.18	0.99	1.65	6.95	1.000			
Cyperus cyperoides	92.86	4.18	3.32	3.63	3.09	5.16	12.98	0.997			
Diplazium esculentum	64.29	2.90	2.87	3.13	1.84	3.08	9.11	0.999			
Drymaria cordata	17.14	0.77	3.58	3.92	0.61	1.03	5.72	1.000			
Dryopteris sikkimensis	80.00	3.60	2.89	3.16	2.31	3.87	10.64	0.999			
Duchesnea indica	21.43	0.97	3.00	3.28	0.64	1.08	5.32	1.000			
Elatostema monandrum	95.71	4.31	2.12	2.32	2.03	3.39	10.02	0.999			
Ichnocarpus frutescens	97.14	4.38	3.40	3.71	3.30	5.52	13.61	0.997			
Mikania micrantha	95.71	4.31	4.73	5.17	4.53	7.58	17.06	0.994			
Molineria capitulata	12.86	0.58	1.56	1.70	0.20	0.33	2.61	1.000			
Natsiatum herpeticum	81.43	3.67	3.74	4.09	3.04	5.09	12.85	0.997			
Oplismenus burmannii	84.29	3.80	3.34	3.65	2.81	4.71	12.16	0.998			
Oxalis corniculata	67.14	3.02	2.04	2.23	1.37	2.30	7.55	0.999			
Persicaria chinensis	64.29	2.90	1.98	2.16	1.27	2.13	7.19	1.000			
Phlogacanthus thyrsiformis	58.57	2.64	2.39	2.61	1.40	2.34	7.59	0.999			
Piper sylvaticum	84.29	3.80	3.69	4.04	3.11	5.21	13.05	0.997			
Pronephreum nudatum	80.00	3.60	2.98	3.26	2.39	3.99	10.86	0.998			
Pupalia lappacea	52.86	2.38	2.59	2.84	1.37	2.30	7.51	0.999			
Rungia pectinata	65.71	2.96	1.48	1.62	0.97	1.63	6.20	1.000			
Spermacoce alata	30.00	1.35	2.67	2.92	0.80	1.34	5.61	1.000			
Synedrella nodiflora	17.14	0.77	2.42	2.64	0.41	0.69	4.11	1.000			
Tetrastigma serrulatum	70.00	3.15	1.16	1.27	0.81	1.36	5.79	1.000			
Youngia japonica	12.86	0.58	1.33	1.46	0.17	0.29	2.32	1.000			

Annexure IX: Monsoon Ground cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	28.00	1.41	1.90	3.16	0.53	1.36	5.93	1.000	1	0.553660	29.8748
Achyranthes bidentata	74.67	3.76	1.21	2.01	0.91	2.32	8.09	0.999			
Achyrospermum wallichianum	90.67	4.57	2.91	4.83	2.64	6.74	16.14	0.995			
Acmella calva	77.33	3.90	1.19	1.97	0.92	2.35	8.22	0.999			
Ageratum conyzoides	94.67	4.77	1.61	2.66	1.52	3.88	11.32	0.999			
Axonopus compressus	90.67	4.57	3.18	5.27	2.88	7.36	17.20	0.995			
Boehmeria glomerulifera	16.00	0.81	2.67	4.42	0.43	1.09	6.32	1.000			
Chloranthus erectus	81.33	4.10	2.02	3.35	1.64	4.19	11.63	0.998			
Chromolaena odorata	89.33	4.50	1.43	2.38	1.28	3.27	10.15	0.999			
Clerodendrum infortunatum	68.00	3.43	1.92	3.19	1.31	3.34	9.95	0.999			
Commelina sufruticosa	56.00	2.82	2.05	3.40	1.15	2.93	9.15	0.999			
Cyperus compressus	60.00	3.02	2.13	3.54	1.28	3.27	9.83	0.999			
Diplazium esculentum	52.00	2.62	3.49	5.78	1.81	4.63	13.04	0.998			
Dryopteris sikkimensis	60.00	3.02	3.04	5.05	1.83	4.67	12.74	0.998			
Elatostema monandrum	74.67	3.76	1.57	2.61	1.17	3.00	9.37	0.999			
Floscopa scandens	78.67	3.97	1.15	1.91	0.91	2.32	8.19	0.999			
Ichnocarpus frutescens	81.33	4.10	2.10	3.48	1.71	4.36	11.94	0.998			
Mikania micrantha	90.67	4.57	2.16	3.59	1.96	5.01	13.16	0.998			
Molineria capitulata	6.67	0.34	2.80	4.64	0.19	0.48	5.46	1.000			
Natsiatum herpeticum	62.67	3.16	1.45	2.40	0.91	2.32	7.87	0.999			
Oplismenus burmannii	89.33	4.50	2.04	3.39	1.83	4.67	12.56	0.998			
Oxalis corniculata	37.33	1.88	2.11	3.50	0.79	2.01	7.39	1.000			
Persicaria chinensis	76.00	3.83	2.00	3.32	1.52	3.88	11.03	0.999			
Phlogacanthus thyrsiformis	60.00	3.02	1.49	2.47	0.89	2.28	7.78	0.999			
Piper sylvaticum	78.67	3.97	2.36	3.91	1.85	4.73	12.61	0.998			
Pronephreum nudatum	85.33	4.30	1.36	2.26	1.16	2.96	9.52	0.999			
Pupalia lappacea	62.67	3.16	1.45	2.40	0.91	2.32	7.87	0.999			
Rungia pectinata	41.33	2.08	1.65	2.73	0.68	1.74	6.55	1.000			
Spermacoce alata	76.00	3.83	2.70	4.48	2.05	5.25	13.56	0.997			
Youngia japonica	44.00	2.22	1.15	1.91	0.51	1.29	5.42	1.000			

Annexure X: Monsoon Ground cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	16.00	0.79	1.25	1.73	0.20	0.40	2.92	1.000	1	0.617780	30.8723
Achyranthes bidentata	82.00	4.06	1.66	2.30	1.36	2.70	9.06	0.999			
Achyrospermum wallichianum	92.00	4.56	5.52	7.66	5.08	10.09	22.30	0.990			
Acmella calva	78.00	3.87	3.18	4.41	2.48	4.92	13.20	0.998			
Ageratum conyzoides	94.00	4.66	2.68	3.72	2.52	5.00	13.38	0.998			
Amerimnon stipulatum	10.00	0.50	1.60	2.22	0.16	0.32	3.03	1.000			
Axonopus compressus	92.00	4.56	3.83	5.31	3.52	6.99	16.85	0.995			
Chromolaena odorata	76.00	3.77	2.29	3.17	1.74	3.46	10.40	0.999			
Clerodendrum infortunatum	70.00	3.47	1.54	2.14	1.08	2.14	7.75	1.000			
Coffea bengalensis	96.00	4.76	2.60	3.61	2.50	4.96	13.33	0.998			
Commelina sufruticosa	66.00	3.27	1.85	2.56	1.22	2.42	8.26	0.999			
Cyperus cyperoides	84.00	4.16	2.10	2.91	1.76	3.49	10.56	0.999			
Diplazium esculentum	74.00	3.67	1.84	2.55	1.36	2.70	8.92	0.999			
Dryopteris sikkimensis	84.00	4.16	2.12	2.94	1.78	3.53	10.64	0.999			
Elatostema monandrum	92.00	4.56	2.80	3.89	2.58	5.12	13.57	0.997			
Floscopa scandens	18.00	0.89	1.33	1.85	0.24	0.48	3.22	1.000			
Ichnocarpus frutescens	90.00	4.46	2.98	4.13	2.68	5.32	13.91	0.997			
Mikania micrantha	78.00	3.87	2.51	3.48	1.96	3.89	11.24	0.999			
Natsiatum herpeticum	82.00	4.06	2.12	2.94	1.74	3.46	10.46	0.999			
Nelsonia canescens	26.00	1.29	2.46	3.41	0.64	1.27	5.97	1.000			
Oplismenus burmannii	86.00	4.26	1.58	2.19	1.36	2.70	9.16	0.999			
Oxalis corniculata	36.00	1.78	3.00	4.16	1.08	2.14	8.09	1.000			
Persicaria chinensis	84.00	4.16	1.57	2.18	1.32	2.62	8.96	0.999			
Phlogacanthus thyrsiformis	24.00	1.19	1.50	2.08	0.36	0.71	3.98	1.000			
Piper sylvaticum	86.00	4.26	2.95	4.10	2.54	5.04	13.40	0.997			
Pronephreum nudatum	90.00	4.46	2.98	4.13	2.68	5.32	13.91	0.997			
Pupalia lappacea	30.00	1.49	1.20	1.66	0.36	0.71	3.87	1.000			
Rungia pectinata	28.00	1.39	3.36	4.66	0.94	1.87	7.91	1.000			
Spermacoce alata	82.00	4.06	2.37	3.28	1.94	3.85	11.20	0.999			
Synedrella nodiflora	24.00	1.19	1.75	2.43	0.42	0.83	4.45	1.000			
Tetrastigma serrulatum	48.00	2.38	1.58	2.20	0.76	1.51	6.08	1.000			

Annexure XI: Monsoon Ground cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyranthes bidentata	42.00	1.81	2.00	2.14	0.84	1.54	5.49	1.000	0.99	0.670355	34.8736
Achyrospermum wallichianum	24.00	1.04	19.50	20.86	4.68	8.58	30.48	0.993			
Acmella calva	92.00	3.97	1.61	1.72	1.48	2.71	8.41	0.999			
Ageratum conyzoides	96.00	4.15	2.85	3.05	2.74	5.03	12.22	0.997			
Axonopus compressus	70.00	3.02	3.20	3.42	2.24	4.11	10.55	0.998			
Boehmeria glomerulifera	42.00	1.81	1.24	1.32	0.52	0.95	4.09	1.000			
Chloranthus erectus	62.00	2.68	2.81	3.00	1.74	3.19	8.87	0.999			
Chromolaena odorata	82.00	3.54	1.54	1.64	1.26	2.31	7.50	0.999			
Clerodendrum infortunatum	64.00	2.76	1.16	1.24	0.74	1.36	5.36	1.000			
Coffea bengalensis	94.00	4.06	2.57	2.75	2.42	4.44	11.25	0.998			
Commelina sufruticosa	10.00	0.43	4.80	5.14	0.48	0.88	6.45	1.000			
Cyanthillium cinereum	42.00	1.81	1.62	1.73	0.68	1.25	4.79	1.000			
Cyperus compressus	82.00	3.54	1.66	1.77	1.36	2.49	7.81	0.999			
Cyperus cyperoides	94.00	4.06	2.04	2.19	1.92	3.52	9.77	0.999			
Diplazium esculentum	90.00	3.89	2.18	2.33	1.96	3.60	9.81	0.999			
Drymaria cordata	18.00	0.78	1.67	1.78	0.30	0.55	3.11	1.000			
Dryopteris sikkimensis	72.00	3.11	3.53	3.77	2.54	4.66	11.54	0.998			
Duchesnea indica	32.00	1.38	1.31	1.40	0.42	0.77	3.56	1.000			
Elatostema monandrum	94.00	4.06	3.45	3.69	3.24	5.94	13.69	0.996			
Floscopa scandens	42.00	1.81	2.43	2.60	1.02	1.87	6.28	1.000			
Ichnocarpus frutescens	96.00	4.15	1.83	1.96	1.76	3.23	9.33	0.999			
Mikania micrantha	94.00	4.06	2.91	3.12	2.74	5.03	12.20	0.997			
Molineria capitulata	18.00	0.78	2.78	2.97	0.50	0.92	4.67	1.000			
Natsiatum herpeticum	84.00	3.63	2.05	2.19	1.72	3.15	8.97	0.999			
Oplismenus burmannii	96.00	4.15	2.69	2.88	2.58	4.73	11.75	0.998			
Oxalis corniculata	64.00	2.76	1.78	1.91	1.14	2.09	6.76	1.000			
Persicaria chinensis	78.00	3.37	1.64	1.76	1.28	2.35	7.47	0.999			
Phlogacanthus thyrsiformis	74.00	3.20	1.14	1.21	0.84	1.54	5.95	1.000			
Piper sylvaticum	90.00	3.89	3.24	3.47	2.92	5.36	12.71	0.997			
Pronephreum nudatum	76.00	3.28	2.34	2.51	1.78	3.26	9.05	0.999			
Pupalia lappacea	74.00	3.20	1.14	1.21	0.84	1.54	5.95	1.000			
Rungia pectinata	92.00	3.97	1.33	1.42	1.22	2.24	7.63	1.000			
Spermacoce alata	82.00	3.54	2.12	2.27	1.74	3.19	9.00	0.999			
Synedrella nodiflora	24.00	1.04	1.92	2.05	0.46	0.84	3.93	1.000			
Youngia japonica	30.00	1.30	1.40	1.50	0.42	0.77	3.56	1.000			

Annexure XII: Monsoon Ground cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	20.00	0.97	1.11	1.06	0.22	0.35	2.37	1.000	0.99	0.639351	33.8742
Achyranthes bidentata	11.11	0.54	1.60	1.52	0.18	0.28	2.34	1.000			
Achyrospermum wallichianum	100.00	4.83	3.62	3.44	3.62	5.76	14.03	0.997			
Acmella calva	71.11	3.43	1.31	1.25	0.93	1.49	6.17	1.000			
Ageratum conyzoides	97.78	4.72	2.02	1.92	1.98	3.15	9.79	0.999			
Axonopus compressus	91.11	4.40	3.02	2.87	2.76	4.38	11.66	0.998			
Boehmeria glomerulifera	26.67	1.29	1.33	1.27	0.36	0.57	3.12	1.000			
Chloranthus erectus	86.67	4.18	4.79	4.55	4.16	6.61	15.35	0.996			
Chromolaena odorata	88.89	4.29	1.68	1.59	1.49	2.37	8.25	0.999			
Clerodendrum infortunatum	17.78	0.86	5.13	4.87	0.91	1.45	7.18	1.000			
Coffea bengalensis	86.67	4.18	2.23	2.12	1.93	3.08	9.38	0.999			
Commelina sufruticosa	26.67	1.29	3.00	2.85	0.80	1.27	5.41	1.000			
Cyanthillium cinereum	57.78	2.79	2.35	2.23	1.36	2.16	7.17	1.000			
Cyperus compressus	53.33	2.58	3.63	3.44	1.93	3.08	9.09	0.999			
Diplazium esculentum	86.67	4.18	2.28	2.17	1.98	3.15	9.50	0.999			
Dryopteris sikkimensis	80.00	3.86	3.72	3.53	2.98	4.74	12.14	0.998			
Duchesnea indica	20.00	0.97	3.78	3.59	0.76	1.20	5.76	1.000			
Elatostema monandrum	93.33	4.51	5.14	4.88	4.80	7.64	17.03	0.994			
Floscopa scandens	26.67	1.29	4.83	4.59	1.29	2.05	7.93	1.000			
Ichnocarpus frutescens	95.56	4.61	1.33	1.26	1.27	2.02	7.89	1.000			
Mikania micrantha	73.33	3.54	4.61	4.37	3.38	5.37	13.29	0.997			
Molineria capitulata	4.44	0.21	6.00	5.70	0.27	0.42	6.34	1.000			
Natsiatum herpeticum	55.56	2.68	4.48	4.25	2.49	3.96	10.90	0.998			
Oplismenus compositus	84.44	4.08	6.45	6.12	5.44	8.66	18.86	0.993			
Persicaria chinensis	26.67	1.29	3.75	3.56	1.00	1.59	6.44	1.000			
Phlogacanthus thyrsiformis	77.78	3.76	1.83	1.74	1.42	2.26	7.75	0.999			
Piper sylvaticum	91.11	4.40	3.34	3.17	3.04	4.84	12.42	0.998			
Pronephreum nudatum	91.11	4.40	4.22	4.01	3.84	6.12	14.52	0.996			
Pupalia lappacea	82.22	3.97	1.51	1.44	1.24	1.98	7.39	1.000			
Rungia pectinata	71.11	3.43	1.47	1.39	1.04	1.66	6.49	1.000			
Spermacoce alata	46.67	2.25	4.24	4.02	1.98	3.15	9.43	0.999			
Synedrella nodiflora	33.33	1.61	1.87	1.77	0.62	0.99	4.37	1.000			
Tetrastigma serrulatum	82.22	3.97	1.30	1.23	1.07	1.70	6.90	1.000			
Youngia japonica	13.33	0.64	2.33	2.22	0.31	0.50	3.35	1.000			

Annexure XIII: Postmonsoon Ground cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	38.89	1.76	2.06	2.26	0.80	1.40	5.42	1.000	1	0.460650	32.8829
Achyrospermum wallichianum	38.89	1.76	2.23	2.45	0.87	1.52	5.73	1.000			
Acmella calva	75.56	3.42	4.99	5.48	3.77	6.61	15.50	0.996			
Ageratum conyzoides	62.22	2.82	2.98	3.28	1.86	3.25	9.35	0.999			
Axonopus compressus	98.89	4.47	1.30	1.43	1.29	2.26	8.17	0.999			
Chloranthus erectus	72.22	3.27	4.12	4.53	2.98	5.22	13.02	0.997			
Chloranthus erectus	94.44	4.27	1.46	1.60	1.38	2.42	8.29	0.999			
Chromolaena odorata	50.00	2.26	2.13	2.34	1.07	1.87	6.48	1.000			
Clerodendrum infortunatum	27.78	1.26	4.56	5.01	1.27	2.22	8.49	1.000			
Coffea bengalensis	84.44	3.82	2.84	3.12	2.40	4.21	11.15	0.998			
Commelina diffusa	95.56	4.32	1.83	2.01	1.74	3.06	9.39	0.999			
Cryptolepis dubia	70.00	3.17	1.54	1.69	1.08	1.89	6.75	1.000			
Cyperus compressus	93.33	4.22	1.51	1.66	1.41	2.47	8.36	0.999			
Diplazium esculentum	72.22	3.27	3.29	3.62	2.38	4.17	11.06	0.998			
Dryopteris sikkimensis	30.00	1.36	4.37	4.80	1.31	2.30	8.46	0.999			
Elatostema monandrum	31.11	1.41	2.39	2.63	0.74	1.31	5.34	1.000			
Floscopa scandens	51.11	2.31	2.43	2.68	1.24	2.18	7.17	1.000			
Ichnocarpus frutescens	67.78	3.07	1.84	2.02	1.24	2.18	7.27	1.000			
Mikania micrantha	95.56	4.32	3.93	4.32	3.76	6.59	15.23	0.996			
Molineria capitulata	72.22	3.27	1.51	1.66	1.09	1.91	6.83	1.000			
Natsiatum herpeticum	75.56	3.42	3.93	4.31	2.97	5.20	12.94	0.997			
Oplismenus burmannii	94.44	4.27	3.71	4.07	3.50	6.14	14.48	0.996			
Persicaria chinensis	75.56	3.42	3.81	4.19	2.88	5.05	12.65	0.997			
Phlogacanthus thyrsiformis	82.22	3.72	1.27	1.40	1.04	1.83	6.95	1.000			
Piper sylvaticum	86.67	3.92	1.49	1.63	1.29	2.26	7.82	0.999			
Pronephreum nudatum	83.33	3.77	1.57	1.73	1.31	2.30	7.80	0.999			
Pupalia lappacea	42.22	1.91	4.92	5.41	2.08	3.64	10.96	0.999			
Rungia pectinata	20.00	0.90	3.56	3.91	0.71	1.25	6.06	1.000			
Sauropus quadrangularis	51.11	2.31	2.09	2.29	1.07	1.87	6.48	1.000			
Spermacoce latifolia	83.33	3.77	2.08	2.29	1.73	3.04	9.10	0.999			
Synedrella nodiflora	83.33	3.77	1.52	1.67	1.27	2.22	7.66	1.000			
Tetrastigma serrulatum	71.11	3.22	1.53	1.68	1.09	1.91	6.81	1.000			
Youngia japonica	38.89	1.76	6.23	6.84	2.42	4.25	12.85	0.998			

Annexure XIV: Postmonsoon Ground cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyranthes bidentata	32.86	1.48	2.09	1.70	0.69	0.83	4.02	1.000	1	0.460447	34.8846
Achyrospermum wallichianum	81.43	3.68	4.12	3.37	3.36	4.07	11.11	0.998			
Acmella calva	80.00	3.61	6.39	5.22	5.11	6.20	15.03	0.996			
Ageratum conyzoides	82.86	3.74	6.29	5.14	5.21	6.32	15.19	0.996			
Alternantheara philoxeroides	21.43	0.97	3.00	2.45	0.64	0.78	4.20	1.000			
Axonopus compressus	50.00	2.26	7.09	5.79	3.54	4.29	12.33	0.998			
Chloranthus erectus	87.14	3.93	6.33	5.17	5.51	6.68	15.78	0.996			
Chromolaena odorata	87.14	3.93	3.10	2.53	2.70	3.27	9.73	0.999			
Clerodendrum infortunatum	72.86	3.29	2.24	1.83	1.63	1.97	7.09	1.000			
Coffea bengalensis	67.14	3.03	1.45	1.18	0.97	1.18	5.39	1.000			
Commelina diffusa	54.29	2.45	3.55	2.90	1.93	2.34	7.69	0.999			
Cryptolepis dubia	7.14	0.32	3.20	2.61	0.23	0.28	3.21	1.000			
Cyperus compressus	92.86	4.19	5.65	4.61	5.24	6.35	15.15	0.996			
Diplazium esculentum	81.43	3.68	4.23	3.45	3.44	4.17	11.30	0.998			
Dryopteris sikkimensis	80.00	3.61	4.52	3.69	3.61	4.38	11.68	0.998			
Elatostema monandrum	95.71	4.32	4.04	3.30	3.87	4.69	12.31	0.998			
Floscopa scandens	58.57	2.64	2.39	1.95	1.40	1.70	6.29	1.000			
Ichnocarpus frutescens	97.14	4.38	3.88	3.17	3.77	4.57	12.12	0.998			
Lepidagathis incurva	17.14	0.77	3.58	2.93	0.61	0.74	4.44	1.000			
Mikania micrantha	92.86	4.19	4.88	3.98	4.53	5.49	13.66	0.997			
Mimosa pudica	67.14	3.03	2.04	1.67	1.37	1.66	6.36	1.000			
Molineria capitulata	12.86	0.58	1.56	1.27	0.20	0.24	2.09	1.000			
Natsiatum herpeticum	81.43	3.68	3.74	3.05	3.04	3.69	10.41	0.999			
Oplismenus burmannii	84.29	3.80	5.29	4.32	4.46	5.40	13.52	0.997			
Oxalis corniculata	61.43	2.77	2.02	1.65	1.24	1.51	5.93	1.000			
Persicaria chinensis	64.29	2.90	1.98	1.61	1.27	1.54	6.06	1.000			
Piper sylvaticum	84.29	3.80	3.69	3.02	3.11	3.77	10.59	0.999			
Pronephreum nudatum	80.00	3.61	3.88	3.16	3.10	3.76	10.53	0.999			
Pupalia lappacea	52.86	2.39	2.59	2.12	1.37	1.66	6.17	1.000			
Rumex dentatus	12.86	0.58	1.33	1.09	0.17	0.21	1.88	1.000			
Rungia pectinata	65.71	2.97	1.48	1.21	0.97	1.18	5.35	1.000			
Sauropus quadrangularis	91.43	4.13	1.08	0.88	0.99	1.19	6.20	1.000			
Spermacoce latifolia	30.00	1.35	2.67	2.18	0.80	0.97	4.50	1.000			
Synedrella nodiflora	17.14	0.77	4.83	3.95	0.83	1.00	5.72	1.000			
Tetrastigma serrulatum	70.00	3.16	2.29	1.87	1.60	1.94	6.96	1.000			

Annexure XV: Postmonsoon Ground cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Acacia pennata	28.00	1.40	3.10	3.69	0.87	1.48	6.57	1.000	0.99	0.452730	29.8808
Achyranthes bidentata	74.67	3.74	1.00	1.19	0.75	1.28	6.20	1.000			
Achyrospermum wallichianum	96.00	4.80	5.11	6.09	4.91	8.38	19.28	0.993			
Acmella calva	77.33	3.87	1.93	2.30	1.49	2.55	8.72	0.999			
Ageratum conyzoides	96.00	4.80	3.00	3.58	2.88	4.92	13.30	0.998			
Asystasia macrocarpa	16.00	0.80	2.67	3.18	0.43	0.73	4.71	1.000			
Axonopus compressus	97.33	4.87	4.44	5.29	4.32	7.38	17.54	0.995			
Chloranthus erectus	81.33	4.07	3.05	3.64	2.48	4.24	11.94	0.998			
Chromolaena odorata	70.67	3.54	1.74	2.07	1.23	2.10	7.70	1.000			
Clerodendrum infortunatum	68.00	3.40	1.53	1.82	1.04	1.78	7.00	1.000			
Commelina sufruticosa	56.00	2.80	2.31	2.75	1.29	2.21	7.76	1.000			
Cyperus compressus	60.00	3.00	2.56	3.05	1.53	2.62	8.67	0.999			
Diplazium esculentum	52.00	2.60	7.33	8.74	3.81	6.51	17.86	0.996			
Dryopteris sikkimensis	94.67	4.74	4.39	5.24	4.16	7.11	17.08	0.995			
Elatostema monandrum	90.67	4.54	5.68	6.77	5.15	8.79	20.10	0.992			
Floscopa scandens	56.00	2.80	1.62	1.93	0.91	1.55	6.28	1.000			
Ichnocarpus frutescens	81.33	4.07	3.54	4.22	2.88	4.92	13.21	0.998			
Mikania micrantha	90.67	4.54	2.29	2.74	2.08	3.55	10.82	0.999			
Molineria capitulata	6.67	0.33	2.80	3.34	0.19	0.32	3.99	1.000			
Natsiatum herpeticum	62.67	3.14	1.45	1.73	0.91	1.55	6.41	1.000			
Nelsonia canescens	44.00	2.20	1.27	1.52	0.56	0.96	4.68	1.000			
Oplismenus compositus	89.33	4.47	3.18	3.79	2.84	4.85	13.11	0.998			
Persicaria chinensis	76.00	3.80	3.25	3.87	2.47	4.21	11.89	0.998			
Phlogacanthus thyrsiformis	60.00	3.00	1.67	1.99	1.00	1.71	6.70	1.000			
Piper sylvaticum	78.67	3.94	3.32	3.96	2.61	4.46	12.36	0.998			
Pronephreum nudatum	77.33	3.87	1.57	1.87	1.21	2.07	7.81	1.000			
Pupalia lappacea	62.67	3.14	1.45	1.73	0.91	1.55	6.41	1.000			
Rungia pectinata	41.33	2.07	1.65	1.96	0.68	1.16	5.19	1.000			
Sauropus quadrangularis	37.33	1.87	2.11	2.51	0.79	1.34	5.72	1.000			
Spermacoce latifolia	76.00	3.80	2.88	3.43	2.19	3.73	10.97	0.999			

Annexure XVI: Postmonsoon Ground cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyranthes bidentata	82.00	3.55	1.66	2.05	1.36	2.50	8.11	0.999	0.99	0.710096	36.8735
Achyrospermum wallichianum	92.00	3.99	5.52	6.84	5.08	9.36	20.18	0.991			
Acmella calva	78.00	3.38	3.18	3.94	2.48	4.57	11.88	0.998			
Ageratum conyzoides	94.00	4.07	2.68	3.32	2.52	4.64	12.03	0.998			
Ageratum conyzoides	64.00	2.77	1.09	1.35	0.70	1.29	5.42	1.000			
Anisomeles indica	16.00	0.69	1.25	1.55	0.20	0.37	2.61	1.000			
Axonopus compressus	92.00	3.99	3.83	4.74	3.52	6.48	15.21	0.996			
Blumea lacera	10.00	0.43	1.60	1.98	0.16	0.29	2.71	1.000			
Chromolaena odorata	76.00	3.29	2.29	2.83	1.74	3.20	9.33	0.999			
Clerodendrum infortunatum	70.00	3.03	1.54	1.91	1.08	1.99	6.93	1.000			
Coffea bengalensis	96.00	4.16	2.60	3.22	2.50	4.60	11.99	0.998			
Commelina sufruticosa	66.00	2.86	1.85	2.29	1.22	2.25	7.40	1.000			
Cyperus compressus	84.00	3.64	2.10	2.59	1.76	3.24	9.48	0.999			
Dicliptera bupleuroides	62.00	2.69	1.03	1.28	0.64	1.18	5.14	1.000			
Diplazium esculentum	74.00	3.21	1.84	2.28	1.36	2.50	7.99	0.999			
Dryopteris sikkimensis	84.00	3.64	2.12	2.62	1.78	3.28	9.54	0.999			
Elatostema monandrum	92.00	3.99	2.80	3.47	2.58	4.75	12.21	0.998			
Elephantopus scaber	32.00	1.39	1.31	1.63	0.42	0.77	3.79	1.000			
Euphorbia hirta	26.00	1.13	2.46	3.05	0.64	1.18	5.35	1.000			
Floscopa scandens	18.00	0.78	1.33	1.65	0.24	0.44	2.87	1.000			
Globba racemosa	42.00	1.82	1.67	2.06	0.70	1.29	5.17	1.000			
Ichnocarpus frutescens	90.00	3.90	2.98	3.69	2.68	4.94	12.52	0.998			
Maesa indica	64.00	2.77	1.47	1.82	0.94	1.73	6.32	1.000			
Mikania micrantha	78.00	3.38	2.51	3.11	1.96	3.61	10.10	0.999			
Natsiatum herpeticum	82.00	3.55	2.12	2.63	1.74	3.20	9.38	0.999			
Oplismenus burmannii	86.00	3.73	1.58	1.96	1.36	2.50	8.19	0.999			
Persicaria chinensis	84.00	3.64	1.57	1.95	1.32	2.43	8.02	0.999			
Phlogacanthus thyrsiformis	24.00	1.04	1.50	1.86	0.36	0.66	3.56	1.000			
Phyllanthus reticulatus	36.00	1.56	3.00	3.71	1.08	1.99	7.26	1.000			
Piper sylvaticum	86.00	3.73	2.95	3.66	2.54	4.68	12.06	0.998			
Pronephreum nudatum	90.00	3.90	2.98	3.69	2.68	4.94	12.52	0.998			
Prunella vulgaris	26.00	1.13	2.08	2.57	0.54	0.99	4.69	1.000			
Pupalia lappacea	30.00	1.30	1.20	1.49	0.36	0.66	3.45	1.000			
Rungia pectinata	28.00	1.21	3.36	4.16	0.94	1.73	7.10	1.000			
Spermacoce latifolia	82.00	3.55	2.37	2.93	1.94	3.57	10.06	0.999			
Synedrella nodiflora	24.00	1.04	1.75	2.17	0.42	0.77	3.98	1.000			
Youngia japonica	48.00	2.08	1.58	1.96	0.76	1.40	5.44	1.000			

Annexure XVII: Postmonsoon Ground cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyrospermum wallichianum	24.00	1.03	20.42	19.08	4.90	7.38	27.49	0.995	1	0.607251	34.8767
Acmella calva	92.00	3.96	1.61	1.50	1.48	2.23	7.69	1.000			
Ageratum conyzoides	96.00	4.13	5.52	5.16	5.30	7.98	17.27	0.994			
Anisomeles indica	64.00	2.75	1.16	1.08	0.74	1.11	4.95	1.000			
Axonopus compressus	70.00	3.01	6.20	5.79	4.34	6.53	15.34	0.996			
Blumea lacera	42.00	1.81	1.24	1.16	0.52	0.78	3.75	1.000			
Boerhavia coccinea	42.00	1.81	1.62	1.51	0.68	1.02	4.34	1.000			
Chloranthus erectus	62.00	2.67	6.10	5.70	3.78	5.69	14.05	0.997			
Chromolaena odorata	82.00	3.53	1.54	1.44	1.26	1.90	6.86	1.000			
Coffea bengalensis	30.00	1.29	1.40	1.31	0.42	0.63	3.23	1.000			
Coffea bengalensis	94.00	4.04	2.57	2.41	2.42	3.64	10.09	0.999			
Commelina sufruticosa	14.00	0.60	3.43	3.20	0.48	0.72	4.53	1.000			
Cyperus compressus	94.00	4.04	2.04	1.91	1.92	2.89	8.84	0.999			
Diplazium esculentum	90.00	3.87	2.18	2.04	1.96	2.95	8.86	0.999			
Dryopteris sikkimensis	72.00	3.10	3.53	3.30	2.54	3.82	10.22	0.999			
Elatostema monandrum	98.00	4.22	6.43	6.01	6.30	9.48	19.71	0.991			
Floscopa scandens	42.00	1.81	2.43	2.27	1.02	1.54	5.61	1.000			
Ichnocarpus frutescens	96.00	4.13	1.83	1.71	1.76	2.65	8.49	0.999			
Mikania micrantha	94.00	4.04	4.98	4.65	4.68	7.04	15.74	0.995			
Molineria capitulata	18.00	0.77	2.78	2.60	0.50	0.75	4.12	1.000			
Natsiatum herpeticum	84.00	3.61	2.05	1.91	1.72	2.59	8.12	0.999			
Oplismenus burmannii	96.00	4.13	2.69	2.51	2.58	3.88	10.53	0.999			
Oxalis corniculata	64.00	2.75	1.78	1.66	1.14	1.72	6.13	1.000			
Persicaria chinensis	78.00	3.36	1.64	1.53	1.28	1.93	6.82	1.000			
Phlogacanthus thyrsiformis	74.00	3.18	1.14	1.06	0.84	1.26	5.51	1.000			
Piper sylvaticum	90.00	3.87	3.24	3.03	2.92	4.39	11.30	0.998			
Pronephreum nudatum	76.00	3.27	2.34	2.19	1.78	2.68	8.14	0.999			
Prunella vulgaris	42.00	1.81	2.00	1.87	0.84	1.26	4.94	1.000			
Pupalia lappacea	74.00	3.18	1.14	1.06	0.84	1.26	5.51	1.000			
Rumex dentatus	32.00	1.38	1.31	1.23	0.42	0.63	3.24	1.000			
Rungia pectinata	92.00	3.96	1.33	1.24	1.22	1.84	7.03	1.000			
Saccharum spontaneum	18.00	0.77	1.67	1.56	0.30	0.45	2.78	1.000			
Spermacoce latifolia	82.00	3.53	2.12	1.98	1.74	2.62	8.13	0.999			
Synedrella nodiflora	24.00	1.03	1.92	1.79	0.46	0.69	3.52	1.000			
Tetrastigma serrulatum	82.00	3.53	1.66	1.55	1.36	2.05	7.13	1.000			

Annexure XVIII: Postmonsoon Ground cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Achyrospermum wallichianum	17.78	0.85	5.13	4.18	0.91	1.15	6.18	1.000	0.98	0.569362	33.8777
Achyrospermum wallichianum	100.00	4.81	3.62	2.95	3.62	4.57	12.33	0.998			
Acmella calva	71.11	3.42	1.31	1.07	0.93	1.18	5.67	1.000			
Ageratum conyzoides	97.78	4.70	7.82	6.37	7.64	9.65	20.72	0.991			
Anisomeles indica	20.00	0.96	1.11	0.91	0.22	0.28	2.15	1.000			
Axonopus compressus	91.11	4.38	8.56	6.98	7.80	9.84	21.20	0.990			
Centella asiatica	57.78	2.78	2.35	1.91	1.36	1.71	6.40	1.000			
Chloranthus erectus	86.67	4.17	9.44	7.69	8.18	10.32	22.18	0.989			
Chromolaena odorata	88.89	4.27	1.68	1.37	1.49	1.88	7.52	1.000			
Coffea bengalensis	86.67	4.17	2.23	1.82	1.93	2.44	8.42	0.999			
Commelina sufruticosa	26.67	1.28	3.00	2.45	0.80	1.01	4.74	1.000			
Cynodon dactylon	26.67	1.28	1.33	1.09	0.36	0.45	2.82	1.000			
Cyperus compressus	53.33	2.56	3.63	2.95	1.93	2.44	7.96	0.999			
Dicliptera bupleuroides	20.00	0.96	3.78	3.08	0.76	0.95	4.99	1.000			
Diplazium esculentum	86.67	4.17	2.28	1.86	1.98	2.50	8.52	0.999			
Dryopteris sikkimensis	80.00	3.85	3.72	3.03	2.98	3.76	10.64	0.999			
Elatostema monandrum	93.33	4.49	5.60	4.56	5.22	6.59	15.64	0.996			
Floscopa scandens	26.67	1.28	4.83	3.94	1.29	1.63	6.85	1.000			
Hypericum japonicum	77.78	3.74	1.83	1.49	1.42	1.79	7.02	1.000			
Ichnocarpus frutescens	95.56	4.59	1.33	1.08	1.27	1.60	7.27	1.000			
Lepidagathis incurva	13.33	0.64	2.33	1.90	0.31	0.39	2.94	1.000			
Mikania micrantha	73.33	3.53	5.73	4.67	4.20	5.30	13.49	0.997			
Molineria capitulata	4.44	0.21	6.00	4.89	0.27	0.34	5.44	1.000			
Natsiatum herpeticum	55.56	2.67	4.48	3.65	2.49	3.14	9.46	0.999			
Oplismenus burmannii	93.33	4.49	6.29	5.12	5.87	7.40	17.01	0.995			
Persicaria chinensis	26.67	1.28	3.75	3.06	1.00	1.26	5.60	1.000			
Piper sylvaticum	91.11	4.38	3.34	2.72	3.04	3.84	10.95	0.999			
Pronephreum nudatum	91.11	4.38	4.22	3.44	3.84	4.85	12.67	0.998			
Prunella vulgaris	11.11	0.53	1.60	1.30	0.18	0.22	2.06	1.000			
Pupalia lappacea	82.22	3.95	1.51	1.23	1.24	1.57	6.76	1.000			
Rungia pectinata	71.11	3.42	1.47	1.20	1.04	1.32	5.93	1.000			
Spermacoce latifolia	46.67	2.24	4.24	3.45	1.98	2.50	8.19	0.999			
Synedrella nodiflora	33.33	1.60	1.87	1.52	0.62	0.79	3.91	1.000			
Tetrastigma serrulatum	82.22	3.95	1.30	1.06	1.07	1.35	6.36	1.000			

Annexure XIX: Premonsoon Shrub cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	33.33	1.41	3.00	2.18	1.00	1.67	5.26	1.000	1	1.143027	52.8697
Actinodaphne obovata	58.33	2.46	1.67	1.21	0.97	1.63	5.30	1.000			
Actinodaphne sikkimensis	75.00	3.17	1.22	0.89	0.92	1.53	5.59	1.000			
Aglaia spectabilis	36.11	1.52	3.62	2.63	1.31	2.19	6.34	1.000			
Alpinia nigra	11.11	0.47	17.75	12.89	1.97	3.30	16.66	0.999			
Alstonia scholaris	58.33	2.46	1.19	0.86	0.69	1.16	4.49	1.000			
Angiopteris evecta	8.33	0.35	1.67	1.21	0.14	0.23	1.79	1.000			
Argyreia roxburghii	72.22	3.05	3.23	2.35	2.33	3.91	9.30	0.998			
Aristolochia indica	41.67	1.76	2.27	1.65	0.94	1.58	4.99	1.000			
Baliospermum solanifolium	25.00	1.06	1.33	0.97	0.33	0.56	2.58	1.000			
Bauhinia purpurea	8.33	0.35	2.67	1.94	0.22	0.37	2.66	1.000			
Bridelia retusa	86.11	3.63	1.06	0.77	0.92	1.53	5.94	1.000			
Caesalpinia cucullata	5.56	0.23	4.50	3.27	0.25	0.42	3.92	1.000			
Celastrus paniculatus	36.11	1.52	1.31	0.95	0.47	0.79	3.26	1.000			
Chromolaena odorata	97.22	4.10	3.63	2.64	3.53	5.91	12.65	0.997			
Cinnamomum bejolghota	50.00	2.11	2.28	1.65	1.14	1.91	5.67	1.000			
Coffea bengalensis	11.11	0.47	1.50	1.09	0.17	0.28	1.84	1.000			
Croton caudatus	72.22	3.05	3.73	2.71	2.69	4.51	10.27	0.998			
Deeringia amaranthoides	16.67	0.70	1.50	1.09	0.25	0.42	2.21	1.000			
Dillenia indica	30.56	1.29	1.91	1.39	0.58	0.98	3.65	1.000			
Dillenia indica	25.00	1.06	2.44	1.78	0.61	1.02	3.85	1.000			
Dillenia pentagyna	13.89	0.59	1.60	1.16	0.22	0.37	2.12	1.000			
Dioscorea esculenta	52.78	2.23	1.11	0.80	0.58	0.98	4.01	1.000			
Dioscorea pentaphylla	22.22	0.94	1.88	1.36	0.42	0.70	3.00	1.000			
Glycosmis pentaphylla	5.56	0.23	2.00	1.45	0.11	0.19	1.87	1.000			
Ichnocarpus frutescens	100.00	4.22	3.17	2.30	3.17	5.30	11.82	0.997			
Litsea glutinosa	94.44	3.99	5.41	3.93	5.11	8.56	16.47	0.993			
Maesa indica	97.22	4.10	5.54	4.03	5.39	9.02	17.15	0.992			
Mallotus philippensis	5.56	0.23	1.50	1.09	0.08	0.14	1.46	1.000			
Mallotus polycarpus	33.33	1.41	2.67	1.94	0.89	1.49	4.83	1.000			
Merremia vitifolia	41.67	1.76	2.80	2.03	1.17	1.95	5.75	1.000			
Mikania micrantha	100.00	4.22	2.11	1.53	2.11	3.53	9.29	0.999			
Morinda angustifolia	19.44	0.82	6.57	4.77	1.28	2.14	7.73	1.000			
Natsiatum herpeticum	91.67	3.87	3.76	2.73	3.44	5.77	12.37	0.997			
Parabaena sagittata	38.89	1.64	0.86	0.62	0.33	0.56	2.82	1.000			
Pericampylus glaucus	13.89	0.59	1.80	1.31	0.25	0.42	2.31	1.000			
Phlogacanthus thyrsiformis	86.11	3.63	1.32	0.96	1.14	1.91	6.50	1.000			
Pterocarpus acerifolius	33.33	1.41	3.17	2.30	1.06	1.77	5.47	1.000			
Pueraria phaseoloides	58.33	2.46	2.57	1.87	1.50	2.51	6.84	0.999			
Pueraria sikkimensis	38.89	1.64	2.93	2.13	1.14	1.91	5.68	1.000			
Sloanea sterculiacea	52.78	2.23	1.11	0.80	0.58	0.98	4.01	1.000			
Smilax zeylanica	61.11	2.58	1.41	1.02	0.86	1.44	5.04	1.000			
Sorindeia madagascariensis	25.00	1.06	1.33	0.97	0.33	0.56	2.58	1.000			
Stephania glabra	25.00	1.06	3.00	2.18	0.75	1.26	4.49	1.000			
Streblus asper	5.56	0.23	1.00	0.73	0.06	0.09	1.05	1.000			
Syzygium tetragona	30.56	1.29	1.09	0.79	0.33	0.56	2.64	1.000			
Tetrastigma campylocarpum	77.78	3.28	1.29	0.93	1.00	1.67	5.89	1.000			
Tetrastigma planicauli	52.78	2.23	2.21	1.61	1.17	1.95	5.79	1.000			
Tetrastigma serrulatum	94.44	3.99	1.50	1.09	1.42	2.37	7.45	0.999			
Thunbergia grandiflora	33.33	1.41	3.00	2.18	1.00	1.67	5.26	1.000			
Toddalia asiatica	5.56	0.23	1.50	1.09	0.08	0.14	1.46	1.000			
Wrightia arborea	13.89	0.59	1.80	1.31	0.25	0.42	2.31	1.000			

Annexure XX: Premonsoon Shrub cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	21.43	1.19	2.00	1.52	0.43	0.63	3.34	1.000	0.98	0.939123	40.8676
Actinodaphne obovata	39.29	2.17	1.45	1.11	0.57	0.84	4.12	1.000			
Actinodaphne sikkimensis	75.00	4.15	3.24	2.47	2.43	3.57	10.18	0.999			
Alpinia nigra	42.86	2.37	9.50	7.23	4.07	5.98	15.59	0.996			
Alstonia scholaris	32.14	1.78	1.67	1.27	0.54	0.79	3.83	1.000			
Argyreia roxburghii	89.29	4.94	5.28	4.02	4.71	6.93	15.89	0.995			
Aristolochia indica	25.00	1.38	4.57	3.48	1.14	1.68	6.54	1.000			
Bauhinia purpurea	25.00	1.38	1.14	0.87	0.29	0.42	2.67	1.000			
Bridelia retusa	50.00	2.77	2.57	1.96	1.29	1.89	6.61	1.000			
Caesalpinia cucullata	21.43	1.19	1.83	1.40	0.39	0.58	3.16	1.000			
Chromolaena odorata	96.43	5.34	5.07	3.86	4.89	7.19	16.39	0.995			
Cinnamomum bejolghota	42.86	2.37	1.75	1.33	0.75	1.10	4.81	1.000			
Croton caudatus	78.57	4.35	4.36	3.32	3.43	5.04	12.71	0.997			
Cryptolepis dubia	28.57	1.58	1.88	1.43	0.54	0.79	3.80	1.000			
Deeringia amaranthoides	39.29	2.17	3.18	2.42	1.25	1.84	6.43	1.000			
Dillenia indica	50.00	2.77	1.50	1.14	0.75	1.10	5.01	1.000			
Dioscorea pentaphylla	46.43	2.57	3.31	2.52	1.54	2.26	7.34	1.000			
Ichnocarpus frutescens	82.14	4.55	7.13	5.43	5.86	8.60	18.58	0.993			
Impatiens trilobata	25.00	1.38	2.00	1.52	0.50	0.73	3.64	1.000			
Litsea glutinosa	50.00	2.77	1.71	1.31	0.86	1.26	5.33	1.000			
Maesa indica	75.00	4.15	4.62	3.52	3.46	5.09	12.76	0.997			
Merremia vitifolia	78.57	4.35	4.32	3.29	3.39	4.98	12.62	0.998			
Mikania micrantha	85.71	4.74	4.96	3.78	4.25	6.24	14.76	0.996			
Morinda angustifolia	67.86	3.75	3.21	2.44	2.18	3.20	9.40	0.999			
Natsiatum herpeticum	39.29	2.17	3.91	2.98	1.54	2.26	7.41	1.000			
Parabaena sagittata	21.43	1.19	1.50	1.14	0.32	0.47	2.80	1.000			
Pericampylus glaucus	28.57	1.58	2.25	1.71	0.64	0.94	4.24	1.000			
Phlogacanthus thyrsiformis	50.00	2.77	5.57	4.24	2.79	4.09	11.10	0.998			
Pueraria phaseoloides	67.86	3.75	5.95	4.53	4.04	5.93	14.21	0.997			
Pueraria sikkimensis	35.71	1.98	1.60	1.22	0.57	0.84	4.03	1.000			
Sloanea sterculiacea	32.14	1.78	2.78	2.12	0.89	1.31	5.21	1.000			
Smilax zeylanica	28.57	1.58	3.00	2.28	0.86	1.26	5.12	1.000			
Sorindeia madagascariensis	25.00	1.38	1.71	1.31	0.43	0.63	3.32	1.000			
Syzygium tetragona	42.86	2.37	2.08	1.59	0.89	1.31	5.27	1.000			
Tetrastigma campylocarpum	17.86	0.99	2.40	1.83	0.43	0.63	3.45	1.000			
Tetrastigma planicauli	10.71	0.59	4.00	3.05	0.43	0.63	4.27	1.000			
Tetrastigma serrulatum	75.00	4.15	4.62	3.52	3.46	5.09	12.76	0.997			
Thunbergia grandiflora	17.86	0.99	2.80	2.13	0.50	0.73	3.86	1.000			
Toddalia asiatica	7.14	0.40	2.00	1.52	0.14	0.21	2.13	1.000			
Wrightia arborea	28.57	1.58	1.88	1.43	0.54	0.79	3.80	1.000			
Zizyphus mauritiana	10.71	0.59	1.00	0.76	0.11	0.16	1.51	1.000			

Annexure XXI: Premonsoon Shrub cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	6.67	0.45	1.00	0.88	0.07	0.13	1.46	1.000	1	0.919757	35.8637
Actinodaphne obovata	30.00	2.05	1.67	1.47	0.50	0.98	4.49	1.000			
Aglaia spectabilis	16.67	1.14	1.60	1.41	0.27	0.52	3.07	1.000			
Alstonia scholaris	30.00	2.05	1.33	1.17	0.40	0.78	4.00	1.000			
Angiopteris evecta	3.33	0.23	3.00	2.64	0.10	0.20	3.06	1.000			
Argyreia roxburghii	96.67	6.59	5.41	4.76	5.23	10.25	21.60	0.990			
Aristolochia indica	26.67	1.82	1.50	1.32	0.40	0.78	3.92	1.000			
Bauhinia purpurea	16.67	1.14	1.60	1.41	0.27	0.52	3.07	1.000			
Caesalpinia cucullata	10.00	0.68	2.33	2.05	0.23	0.46	3.19	1.000			
Celastrus paniculatus	30.00	2.05	2.67	2.35	0.80	1.57	5.96	1.000			
Chromolaena odorata	80.00	5.45	4.79	4.22	3.83	7.51	17.18	0.994			
Cinnamomum bejolghota	80.00	5.45	2.17	1.91	1.73	3.39	10.75	0.999			
Croton caudatus	83.33	5.68	3.88	3.41	3.23	6.33	15.43	0.996			
Dillenia indica	70.00	4.77	3.24	2.85	2.27	4.44	12.06	0.998			
Dioscorea pentaphylla	46.67	3.18	1.50	1.32	0.70	1.37	5.87	1.000			
Ichnocarpus frutescens	93.33	6.36	4.79	4.21	4.47	8.75	19.32	0.992			
Litsea glutinosa	56.67	3.86	3.59	3.16	2.03	3.98	11.00	0.998			
Merremia vitifolia	70.00	4.77	2.00	1.76	1.40	2.74	9.27	0.999			
Mikania micrantha	86.67	5.91	4.15	3.65	3.60	7.05	16.61	0.995			
Morinda angustifolia	20.00	1.36	3.50	3.08	0.70	1.37	5.81	1.000			
Natsiatum herpeticum	70.00	4.77	3.19	2.81	2.23	4.37	11.95	0.998			
Parabaena sagittata	53.33	3.64	8.38	7.37	4.47	8.75	19.75	0.992			
Pericampylus glaucus	26.67	1.82	1.50	1.32	0.40	0.78	3.92	1.000			
Phlogacanthus thyrsiformis	53.33	3.64	3.69	3.24	1.97	3.85	10.73	0.999			
Pterocarpus acerifolius	3.33	0.23	2.00	1.76	0.07	0.13	2.12	1.000			
Pueraria phaseoloides	6.67	0.45	3.50	3.08	0.23	0.46	3.99	1.000			
Pueraria sikkimensis	10.00	0.68	4.67	4.11	0.47	0.91	5.70	1.000			
Sloanea sterculiacea	6.67	0.45	7.50	6.60	0.50	0.98	8.03	1.000			
Smilax zeylanica	30.00	2.05	4.67	4.11	1.40	2.74	8.89	0.999			
Sorindeia madagascariensis	13.33	0.91	1.75	1.54	0.23	0.46	2.91	1.000			
Syzygium tetragona	26.67	1.82	2.75	2.42	0.73	1.44	5.67	1.000			
Tetrastigma campylocarpum	46.67	3.18	3.79	3.33	1.77	3.46	9.97	0.999			
Tetrastigma planicauli	70.00	4.77	1.24	1.09	0.87	1.70	7.56	1.000			
Tetrastigma serrulatum	73.33	5.00	3.95	3.48	2.90	5.68	14.16	0.997			
Thunbergia grandiflora	16.67	1.14	2.40	2.11	0.40	0.78	4.03	1.000			
Wrightia arborea	6.67	0.45	3.00	2.64	0.20	0.39	3.49	1.000			

Annexure XXII: Premonsoon Shrub cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	10.00	0.51	1.50	0.83	0.15	0.18	1.51	1.000	1	1.049093	42.8653
Actinodaphne obovata	15.00	0.76	2.33	1.28	0.35	0.42	2.46	1.000			
Aglaia spectabilis	15.00	0.76	2.67	1.47	0.40	0.48	2.70	1.000			
Alpinia nigra	25.00	1.27	30.60	16.84	7.65	9.11	27.21	0.992			
Alstonia scholaris	40.00	2.03	1.50	0.83	0.60	0.71	3.57	1.000			
Argyreia roxburghii	90.00	4.56	7.61	4.19	6.85	8.15	16.90	0.993			
Aristolochia indica	45.00	2.28	2.33	1.28	1.05	1.25	4.81	1.000			
Baliospermum solanifolium	60.00	3.04	1.25	0.69	0.75	0.89	4.62	1.000			
Bridelia retusa	60.00	3.04	3.25	1.79	1.95	2.32	7.15	0.999			
Caesalpinia cucullata	15.00	0.76	2.00	1.10	0.30	0.36	2.22	1.000			
Celastrus paniculatus	10.00	0.51	3.00	1.65	0.30	0.36	2.51	1.000			
Chromolaena odorata	70.00	3.54	7.00	3.85	4.90	5.83	13.23	0.997			
Cinnamomum bejolghota	45.00	2.28	2.67	1.47	1.20	1.43	5.17	1.000			
Croton caudatus	80.00	4.05	5.56	3.06	4.45	5.30	12.41	0.997			
Dillenia indica	80.00	4.05	2.31	1.27	1.85	2.20	7.53	1.000			
Dillenia indica	75.00	3.80	2.27	1.25	1.70	2.02	7.07	1.000			
Dioscorea esculenta	5.00	0.25	3.00	1.65	0.15	0.18	2.08	1.000			
Dioscorea pentaphylla	90.00	4.56	2.06	1.13	1.85	2.20	7.89	1.000			
Holarrhena pubescens	10.00	0.51	2.00	1.10	0.20	0.24	1.85	1.000			
Ichnocarpus frutescens	70.00	3.54	6.86	3.77	4.80	5.71	13.03	0.997			
Litsea glutinosa	40.00	2.03	5.25	2.89	2.10	2.50	7.41	0.999			
Mallotus polycarpus	50.00	2.53	1.90	1.05	0.95	1.13	4.71	1.000			
Merremia vitifolia	45.00	2.28	9.00	4.95	4.05	4.82	12.05	0.998			
Mikania micrantha	95.00	4.81	6.16	3.39	5.85	6.96	15.16	0.995			
Morinda angustifolia	60.00	3.04	2.17	1.19	1.30	1.55	5.78	1.000			
Natsiatum herpeticum	70.00	3.54	7.00	3.85	4.90	5.83	13.23	0.997			
Parabaena sagittata	60.00	3.04	2.42	1.33	1.45	1.73	6.09	1.000			
Pericampylus glaucus	20.00	1.01	7.75	4.27	1.55	1.85	7.12	1.000			
Pericampylus glaucus	90.00	4.56	2.06	1.13	1.85	2.20	7.89	1.000			
Phlogacanthus thyrsiformis	60.00	3.04	4.58	2.52	2.75	3.27	8.83	0.999			
Pterocarpus acerifolius	65.00	3.29	1.00	0.55	0.65	0.77	4.62	1.000			
Pueraria sikkimensis	55.00	2.78	2.91	1.60	1.60	1.90	6.29	1.000			
Sloanea sterculiacea	10.00	0.51	3.00	1.65	0.30	0.36	2.51	1.000			
Smilax zeylanica	25.00	1.27	6.80	3.74	1.70	2.02	7.03	1.000			
Streblus asper	10.00	0.51	1.50	0.83	0.15	0.18	1.51	1.000			
Syzygium tetragona	40.00	2.03	3.50	1.93	1.40	1.67	5.62	1.000			
Tetrastigma campylocarpum	30.00	1.52	6.00	3.30	1.80	2.14	6.96	1.000			
Tetrastigma planicauli	55.00	2.78	2.82	1.55	1.55	1.85	6.18	1.000			
Tetrastigma serrulatum	70.00	3.54	5.79	3.18	4.05	4.82	11.55	0.998			
Thunbergia grandiflora	45.00	2.28	2.33	1.28	1.05	1.25	4.81	1.000			
Toddalia asiatica	10.00	0.51	1.00	0.55	0.10	0.12	1.18	1.000			
Wrightia arborea	15.00	0.76	2.67	1.47	0.40	0.48	2.70	1.000			
Zizyphus mauritiana	45.00	2.28	2.33	1.28	1.05	1.25	4.81	1.000			

Annexure XXIII: Premonsoon Shrub cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Holarrhena pubescens	25.00	1.28	1.60	1.57	0.40	0.61	3.46	1.000	1	0.939384	33.8607
Actinodaphne obovata	15.00	0.77	2.00	1.96	0.30	0.46	3.19	1.000			
Alstonia scholaris	45.00	2.30	1.56	1.53	0.70	1.07	4.89	1.000			
Baliospermum solanifolium	40.00	2.04	1.00	0.98	0.40	0.61	3.63	1.000			
Alangium chinense	20.00	1.02	6.25	6.14	1.25	1.91	9.06	1.000			
Morinda angustifolia	60.00	3.06	8.08	7.94	4.85	7.40	18.40	0.995			
Aristolochia indica	40.00	2.04	2.25	2.21	0.90	1.37	5.62	1.000			
Bauhinia purpurea	45.00	2.30	1.33	1.31	0.60	0.92	4.52	1.000			
Bridelia retusa	100.00	5.10	1.70	1.67	1.70	2.60	9.37	0.999			
Parabaena sagittata	90.00	4.59	5.94	5.84	5.35	8.17	18.60	0.993			
Caesalpinia cucullata	60.00	3.06	1.17	1.15	0.70	1.07	5.28	1.000			
Cinnamomum bejolghota	75.00	3.83	1.00	0.98	0.75	1.15	5.95	1.000			
Croton caudatus	65.00	3.32	2.92	2.87	1.90	2.90	9.09	0.999			
Dillenia indica	90.00	4.59	2.83	2.78	2.55	3.89	11.27	0.999			
Dioscorea pentaphylla	70.00	3.57	2.57	2.52	1.80	2.75	8.84	0.999			
Chromolaena odorata	95.00	4.85	5.16	5.06	4.90	7.48	17.39	0.994			
Ichnocarpus frutescens	100.00	5.10	3.90	3.83	3.90	5.95	14.89	0.996			
Aglaia spectabilis	55.00	2.81	1.36	1.34	0.75	1.15	5.29	1.000			
Litsea glutinosa	45.00	2.30	1.44	1.42	0.65	0.99	4.71	1.000			
Merremia vitifolia	75.00	3.83	4.47	4.39	3.35	5.11	13.33	0.997			
Mikania micrantha	100.00	5.10	5.75	5.65	5.75	8.78	19.53	0.992			
Celastrus paniculatus	105.00	5.36	3.19	3.13	3.35	5.11	13.60	0.997			
Natsiatum herpeticum	85.00	4.34	5.53	5.43	4.70	7.18	16.94	0.995			
Pericampylus glaucus	80.00	4.08	5.69	5.58	4.55	6.95	16.61	0.995			
Phlogacanthus thyrsiformis	90.00	4.59	4.39	4.31	3.95	6.03	14.93	0.996			
Maesa indica	55.00	2.81	1.09	1.07	0.60	0.92	4.79	1.000			
Pueraria sikkimensis	45.00	2.30	1.89	1.85	0.85	1.30	5.45	1.000			
Sloanea sterculiacea	15.00	0.77	4.33	4.25	0.65	0.99	6.01	1.000			
Smilax zeylanica	35.00	1.79	1.57	1.54	0.55	0.84	4.17	1.000			
Syzygium tetragona	15.00	0.77	2.00	1.96	0.30	0.46	3.19	1.000			
Tetrastigma campylocarpum	20.00	1.02	1.75	1.72	0.35	0.53	3.27	1.000			
Tetrastigma planicauli	25.00	1.28	1.80	1.77	0.45	0.69	3.73	1.000			
Thunbergia grandiflora	45.00	2.30	2.33	2.29	1.05	1.60	6.19	1.000			
Wrightia arborea	35.00	1.79	2.00	1.96	0.70	1.07	4.82	1.000			

Annexure XXIV: Premonsoon Shrub cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	16.67	0.90	2.00	1.74	0.33	0.47	3.11	1.000	1	0.955192	33.8600
Actinodaphne obovata	44.44	2.41	6.38	5.53	2.83	4.03	11.97	0.998			
Aglaia spectabilis	27.78	1.51	5.00	4.34	1.39	1.97	7.82	1.000			
Alstonia scholaris	16.67	0.90	2.67	2.32	0.44	0.63	3.85	1.000			
Argyreia roxburghii	66.67	3.61	4.42	3.83	2.94	4.18	11.63	0.998			
Aristolochia indica	66.67	3.61	2.00	1.74	1.33	1.89	7.25	1.000			
Bauhinia purpurea	27.78	1.51	1.60	1.39	0.44	0.63	3.53	1.000			
Bridelia retusa	50.00	2.71	4.22	3.67	2.11	3.00	9.38	0.999			
Caesalpinia cucullata	16.67	0.90	2.33	2.03	0.39	0.55	3.48	1.000			
Celastrus paniculatus	77.78	4.22	2.21	1.92	1.72	2.45	8.59	0.999			
Chromolaena odorata	94.44	5.12	6.41	5.57	6.06	8.60	19.29	0.993			
Cinnamomum bejolghota	66.67	3.61	2.25	1.95	1.50	2.13	7.70	1.000			
Croton caudatus	83.33	4.52	5.27	4.57	4.39	6.24	15.33	0.996			
Dillenia indica	44.44	2.41	3.25	2.82	1.44	2.05	7.28	1.000			
Dillenia pentagyna	61.11	3.31	1.27	1.10	0.78	1.10	5.52	1.000			
Dioscorea pentaphylla	44.44	2.41	1.50	1.30	0.67	0.95	4.66	1.000			
Ichnocarpus frutescens	88.89	4.82	7.75	6.73	6.89	9.79	21.33	0.990			
Litsea glutinosa	77.78	4.22	2.79	2.42	2.17	3.08	9.71	0.999			
Merremia vitifolia	72.22	3.92	4.85	4.21	3.50	4.97	13.10	0.998			
Mikania micrantha	100.00	5.42	9.06	7.86	9.06	12.87	26.15	0.984			
Morinda angustifolia	61.11	3.31	1.36	1.18	0.83	1.18	5.68	1.000			
Natsiatum herpeticum	83.33	4.52	5.80	5.04	4.83	6.87	16.42	0.995			
Phlogacanthus thyrsiformis	50.00	2.71	2.33	2.03	1.17	1.66	6.39	1.000			
Pterocarpus acerifolius	11.11	0.60	2.50	2.17	0.28	0.39	3.17	1.000			
Pueraria sikkimensis	27.78	1.51	2.40	2.08	0.67	0.95	4.54	1.000			
Sloanea sterculiacea	27.78	1.51	1.20	1.04	0.33	0.47	3.02	1.000			
Smilax zeylanica	66.67	3.61	2.58	2.24	1.72	2.45	8.30	0.999			
Sorindeia madagascariensis	11.11	0.60	5.50	4.78	0.61	0.87	6.25	1.000			
Syzygium tetragona	66.67	3.61	1.58	1.37	1.06	1.50	6.49	1.000			
Tetrastigma campylocarpum	50.00	2.71	1.11	0.96	0.56	0.79	4.46	1.000			
Tetrastigma planicauli	44.44	2.41	3.13	2.71	1.39	1.97	7.10	1.000			
Tetrastigma serrulatum	83.33	4.52	6.47	5.61	5.39	7.66	17.79	0.994			
Thunbergia grandiflora	50.00	2.71	1.00	0.87	0.50	0.71	4.29	1.000			
Wrightia arborea	66.67	3.61	1.00	0.87	0.67	0.95	5.43	1.000			

Annexure XXV: Monsoon Shrub cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	33.33	1.40	3.00	1.85	1.00	1.09	4.34	1.000	0.99	0.853887	48.8765
Actinodaphne obovata	58.33	2.45	1.67	1.03	0.97	1.06	4.54	1.000			
Actinodaphne sikkimensis	75.00	3.15	1.22	0.75	0.92	1.00	4.91	1.000			
Alangium chinense	52.78	2.22	1.11	0.68	0.58	0.64	3.54	1.000			
Alstonia scholaris	58.33	2.45	1.19	0.73	0.69	0.76	3.94	1.000			
Angiopteris evecta	8.33	0.35	1.67	1.03	0.14	0.15	1.53	1.000			
Ardisia solanacea	91.67	3.85	1.73	1.06	1.58	1.73	6.65	1.000			
Argyreia roxburghii	100.00	4.20	9.64	5.94	9.64	10.54	20.68	0.989			
Aristolochia indica	41.67	1.75	2.27	1.40	0.94	1.03	4.18	1.000			
Baliospermum solanifolium	41.67	1.75	2.80	1.73	1.17	1.28	4.75	1.000			
Bridelia retusa	86.11	3.62	1.06	0.66	0.92	1.00	5.28	1.000			
Celastrus paniculatus	72.22	3.03	1.50	0.92	1.08	1.18	5.14	1.000			
Chromolaena odorata	97.22	4.08	8.20	5.05	7.97	8.72	17.85	0.992			
Cinnamomum bejolghota	50.00	2.10	2.28	1.40	1.14	1.25	4.75	1.000			
Cissampelos pareira	5.56	0.23	4.50	2.77	0.25	0.27	3.28	1.000			
Clausena excavata	25.00	1.05	1.33	0.82	0.33	0.36	2.24	1.000			
Coffea bengalensis	11.11	0.47	1.50	0.92	0.17	0.18	1.57	1.000			
Croton caudatus	75.00	3.15	3.96	2.44	2.97	3.25	8.84	0.999			
Deeringia amaranthoides	86.11	3.62	4.16	2.56	3.58	3.92	10.10	0.998			
Dillenia indica	30.56	1.28	2.45	1.51	0.75	0.82	3.62	1.000			
Dioscorea pentaphylla	22.22	0.93	1.50	0.92	0.33	0.36	2.22	1.000			
Glycosmis pentaphylla	5.56	0.23	1.50	0.92	0.08	0.09	1.25	1.000			
Holarrhena pubescens	11.11	0.47	18.25	11.25	2.03	2.22	13.93	1.000			
Ichnocarpus frutescens	100.00	4.20	9.53	5.87	9.53	10.42	20.49	0.989			
Impatiens trilobata	36.11	1.52	4.15	2.56	1.50	1.64	5.72	1.000			
Litsea glutinosa	94.44	3.97	6.38	3.93	6.03	6.59	14.49	0.996			
Maesa indica	86.11	3.62	1.23	0.76	1.06	1.15	5.53	1.000			
Maesa indica	22.22	0.93	1.00	0.62	0.22	0.24	1.79	1.000			
Mallotus philippensis	8.33	0.35	2.67	1.64	0.22	0.24	2.24	1.000			
Mallotus polycarpus	33.33	1.40	2.67	1.64	0.89	0.97	4.02	1.000			
Mikania micrantha	100.00	4.20	8.64	5.32	8.64	9.44	18.97	0.991			
Morinda angustifolia	19.44	0.82	8.14	5.02	1.58	1.73	7.57	1.000			
Murraya paniculata	16.67	0.70	1.50	0.92	0.25	0.27	1.90	1.000			
Natsiatum herpeticum	91.67	3.85	8.21	5.06	7.53	8.23	17.14	0.993			
Parabaena sagittata	38.89	1.63	0.86	0.53	0.33	0.36	2.53	1.000			
Pericampylus glaucus	11.11	0.47	1.75	1.08	0.19	0.21	1.76	1.000			
Phlogacanthus thyrsiformis	94.44	3.97	1.56	0.96	1.47	1.61	6.54	1.000			
Pterocarpus acerifolius	33.33	1.40	3.17	1.95	1.06	1.15	4.51	1.000			
Pueraria phaseoloides	97.22	4.08	5.54	3.42	5.39	5.89	13.39	0.997			
Pueraria sikkimensis	38.89	1.63	2.93	1.80	1.14	1.25	4.68	1.000			
Sloanea sterculiacea	52.78	2.22	1.11	0.68	0.58	0.64	3.54	1.000			
Stephania glabra	41.67	1.75	1.47	0.90	0.61	0.67	3.32	1.000			
Syzygium tetragona	30.56	1.28	1.09	0.67	0.33	0.36	2.32	1.000			
Tetrastigma campylocarpum	77.78	3.27	1.29	0.79	1.00	1.09	5.15	1.000			
Tetrastigma planicauli	58.33	2.45	1.86	1.14	1.08	1.18	4.78	1.000			
Thunbergia grandiflora	38.89	1.63	3.07	1.89	1.19	1.31	4.83	1.000			
Toddalia asiatica	5.56	0.23	2.00	1.23	0.11	0.12	1.59	1.000			
Wrightia arborea	13.89	0.58	2.00	1.23	0.28	0.30	2.12	1.000			

Annexure XXVI: Monsoon Shrub cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	32.14	1.58	4.11	2.60	1.32	1.31	5.48	1.000	1	0.788811	41.8742
Actinodaphne obovata	42.86	2.10	1.75	1.10	0.75	0.74	3.95	1.000			
Alpinia nigra	42.86	2.10	9.92	6.26	4.25	4.20	12.56	0.998			
Alstonia scholaris	32.14	1.58	1.33	0.84	0.43	0.42	2.84	1.000			
Argyreia roxburghii	100.00	4.90	10.32	6.52	10.32	10.19	21.61	0.990			
Aristolochia indica	25.00	1.23	5.29	3.34	1.32	1.31	5.87	1.000			
Bauhinia purpurea	25.00	1.23	1.14	0.72	0.29	0.28	2.23	1.000			
Bridelia retusa	42.86	2.10	1.92	1.21	0.82	0.81	4.12	1.000			
Chromolaena odorata	100.00	4.90	8.25	5.21	8.25	8.15	18.26	0.993			
Cinnamomum bejolghota	57.14	2.80	1.31	0.83	0.75	0.74	4.37	1.000			
Cissampelos pareira	10.71	0.53	2.33	1.47	0.25	0.25	2.25	1.000			
Clausena excavata	21.43	1.05	1.83	1.16	0.39	0.39	2.60	1.000			
Croton caudatus	85.71	4.20	13.21	8.34	11.32	11.18	23.72	0.988			
Cryptolepis dubia	28.57	1.40	1.00	0.63	0.29	0.28	2.31	1.000			
Deeringia amaranthoides	21.43	1.05	1.50	0.95	0.32	0.32	2.32	1.000			
Dillenia indica	75.00	3.68	1.19	0.75	0.89	0.88	5.31	1.000			
Dioscorea pentaphylla	64.29	3.15	3.94	2.49	2.54	2.50	8.15	0.999			
Floscopa scandens	46.43	2.28	2.15	1.36	1.00	0.99	4.62	1.000			
Gouania tiliifolia	78.57	3.85	5.32	3.36	4.18	4.13	11.34	0.998			
Ichnocarpus frutescens	100.00	4.90	9.18	5.79	9.18	9.07	19.76	0.992			
Litsea glutinosa	32.14	1.58	3.78	2.39	1.21	1.20	5.16	1.000			
Litsea monopetala	64.29	3.15	1.44	0.91	0.93	0.92	4.98	1.000			
Mallotus philippensis	39.29	1.93	3.18	2.01	1.25	1.23	5.17	1.000			
Mikania micrantha	100.00	4.90	11.64	7.35	11.64	11.50	23.75	0.987			
Morinda angustifolia	75.00	3.68	1.67	1.05	1.25	1.23	5.96	1.000			
Mucuna pruriens	28.57	1.40	1.88	1.18	0.54	0.53	3.11	1.000			
Murraya paniculata	89.29	4.38	4.88	3.08	4.36	4.30	11.76	0.998			
Natsiatum herpeticum	67.86	3.33	4.58	2.89	3.11	3.07	9.29	0.999			
Parabaena sagittata	64.29	3.15	5.39	3.40	3.46	3.42	9.98	0.999			
Pericampylus glaucus	50.00	2.45	1.57	0.99	0.79	0.78	4.22	1.000			
Phlogacanthus thyrsiformis	100.00	4.90	5.07	3.20	5.07	5.01	13.11	0.998			
Pueraria sikkimensis	35.71	1.75	1.60	1.01	0.57	0.56	3.33	1.000			
Sloanea sterculiacea	32.14	1.58	2.78	1.75	0.89	0.88	4.21	1.000			
Sorindeia madagascariensis	14.29	0.70	1.25	0.79	0.18	0.18	1.67	1.000			
Stephania glabra	21.43	1.05	2.00	1.26	0.43	0.42	2.74	1.000			
Syzygium tetragona	57.14	2.80	7.19	4.54	4.11	4.06	11.40	0.998			
Tetrastigma campylocarpum	75.00	3.68	1.62	1.02	1.21	1.20	5.90	1.000			
Tetrastigma planicauli	10.71	0.53	4.00	2.53	0.43	0.42	3.47	1.000			
Thunbergia grandiflora	10.71	0.53	3.00	1.89	0.32	0.32	2.74	1.000			
Wrightia arborea	28.57	1.40	1.88	1.18	0.54	0.53	3.11	1.000			
Zizyphus mauritiana	10.71	0.53	1.00	0.63	0.11	0.11	1.26	1.000			

Annexure XXVII: Monsoon Shrub cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	26.67	1.84	1.38	0.89	0.37	0.50	3.24	1.000	0.98	0.787591	36.8701
Actinodaphne obovata	40.00	2.77	1.75	1.14	0.70	0.95	4.86	1.000			
Actinodaphne sikkimensis	6.67	0.46	2.50	1.63	0.17	0.23	2.31	1.000			
Aglaia spectabilis	16.67	1.15	1.60	1.04	0.27	0.36	2.56	1.000			
Alangium chinense	10.00	0.69	4.00	2.60	0.40	0.54	3.84	1.000			
Alstonia scholaris	30.00	2.07	1.00	0.65	0.30	0.41	3.13	1.000			
Angiopteris evecta	3.33	0.23	3.00	1.95	0.10	0.14	2.32	1.000			
Argyreia roxburghii	93.33	6.45	9.46	6.16	8.83	12.01	24.62	0.986			
Aristolochia indica	26.67	1.84	1.50	0.98	0.40	0.54	3.36	1.000			
Bauhinia purpurea	16.67	1.15	1.60	1.04	0.27	0.36	2.56	1.000			
Chromolaena odorata	80.00	5.53	8.96	5.83	7.17	9.74	21.10	0.991			
Cinnamomum bejolghota	80.00	5.53	1.71	1.11	1.37	1.86	8.50	1.000			
Clausena excavata	30.00	2.07	2.67	1.74	0.80	1.09	4.90	1.000			
Croton caudatus	83.33	5.76	4.60	2.99	3.83	5.21	13.97	0.997			
Dillenia indica	70.00	4.84	3.24	2.11	2.27	3.08	10.03	0.999			
Dioscorea pentaphylla	6.67	0.46	4.50	2.93	0.30	0.41	3.80	1.000			
Ichnocarpus frutescens	93.33	6.45	10.64	6.93	9.93	13.50	26.88	0.982			
Litsea glutinosa	60.00	4.15	3.56	2.31	2.13	2.90	9.36	0.999			
Merremia vitifolia	70.00	4.84	1.81	1.18	1.27	1.72	7.74	1.000			
Mikania micrantha	90.00	6.22	9.89	6.44	8.90	12.10	24.76	0.985			
Morinda angustifolia	20.00	1.38	4.33	2.82	0.87	1.18	5.38	1.000			
Natsiatum herpeticum	70.00	4.84	2.81	1.83	1.97	2.67	9.34	0.999			
Parabaena sagittata	53.33	3.69	14.25	9.27	7.60	10.33	23.29	0.989			
Pericampylus glaucus	26.67	1.84	1.50	0.98	0.40	0.54	3.36	1.000			
Phlogacanthus thyrsiformis	56.67	3.92	3.41	2.22	1.93	2.63	8.77	0.999			
Pterocarpus acerifolius	3.33	0.23	2.00	1.30	0.07	0.09	1.62	1.000			
Pueraria phaseoloides	6.67	0.46	3.50	2.28	0.23	0.32	3.06	1.000			
Pueraria sikkimensis	10.00	0.69	4.67	3.04	0.47	0.63	4.36	1.000			
Sloanea sterculiacea	6.67	0.46	7.50	4.88	0.50	0.68	6.02	1.000			
Sorindeia madagascariensis	13.33	0.92	1.75	1.14	0.23	0.32	2.38	1.000			
Stephania glabra	30.00	2.07	4.11	2.68	1.23	1.68	6.43	1.000			
Syzygium tetragona	26.67	1.84	2.75	1.79	0.73	1.00	4.63	1.000			
Tetrastigma campylocarpum	20.00	1.38	10.17	6.62	2.03	2.76	10.76	0.999			
Tetrastigma planicauli	70.00	4.84	1.81	1.18	1.27	1.72	7.74	1.000			
Tetrastigma serrulatum	80.00	5.53	4.75	3.09	3.80	5.17	13.79	0.997			
Thunbergia grandiflora	13.33	0.92	2.00	1.30	0.27	0.36	2.59	1.000			
Wrightia arborea	6.67	0.46	3.00	1.95	0.20	0.27	2.68	1.000			

Annexure XXVIII: Monsoon Shrub cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	10.00	0.50	2.50	1.02	0.25	0.20	1.72	1.000	0.98	0.774749	38.8724
Actinodaphne obovata	15.00	0.75	2.00	0.81	0.30	0.24	1.80	1.000			
Aglaia spectabilis	25.00	1.26	2.40	0.98	0.60	0.47	2.71	1.000			
Aglaia spectabilis	15.00	0.75	2.67	1.08	0.40	0.32	2.15	1.000			
Alpinia nigra	25.00	1.26	64.80	26.35	16.20	12.79	40.39	0.984			
Alstonia scholaris	40.00	2.01	1.50	0.61	0.60	0.47	3.09	1.000			
Argyreia roxburghii	90.00	4.52	13.67	5.56	12.30	9.71	19.79	0.991			
Aristolochia indica	45.00	2.26	2.33	0.95	1.05	0.83	4.04	1.000			
Bridelia retusa	60.00	3.02	3.42	1.39	2.05	1.62	6.02	1.000			
Caesalpinia cucullata	15.00	0.75	2.00	0.81	0.30	0.24	1.80	1.000			
Chromolaena odorata	90.00	4.52	15.94	6.48	14.35	11.33	22.33	0.987			
Cinnamomum bejolghota	65.00	3.27	2.38	0.97	1.55	1.22	5.46	1.000			
Clausena excavata	15.00	0.75	2.67	1.08	0.40	0.32	2.15	1.000			
Croton caudatus	95.00	4.77	6.42	2.61	6.10	4.81	12.20	0.998			
Dillenia indica	85.00	4.27	2.47	1.00	2.10	1.66	6.93	1.000			
Dillenia pentagyna	60.00	3.02	1.25	0.51	0.75	0.59	4.12	1.000			
Dioscorea esculenta	90.00	4.52	2.06	0.84	1.85	1.46	6.82	1.000			
Ichnocarpus frutescens	100.00	5.03	10.90	4.43	10.90	8.60	18.06	0.993			
Litsea glutinosa	40.00	2.01	5.88	2.39	2.35	1.85	6.25	1.000			
Mallotus polycarpus	55.00	2.76	2.09	0.85	1.15	0.91	4.52	1.000			
Merremia vitifolia	45.00	2.26	10.78	4.38	4.85	3.83	10.47	0.999			
Mikania micrantha	95.00	4.77	12.32	5.01	11.70	9.23	19.02	0.992			
Morinda angustifolia	60.00	3.02	2.17	0.88	1.30	1.03	4.92	1.000			
Natsiatum herpeticum	70.00	3.52	11.29	4.59	7.90	6.24	14.34	0.996			
Parabaena sagittata	60.00	3.02	2.42	0.98	1.45	1.14	5.14	1.000			
Pericampylus glaucus	20.00	1.01	8.50	3.46	1.70	1.34	5.80	1.000			
Pericampylus glaucus	90.00	4.52	2.06	0.84	1.85	1.46	6.82	1.000			
Phlogacanthus thyrsiformis	60.00	3.02	4.58	1.86	2.75	2.17	7.05	1.000			
Pterocarpus acerifolius	65.00	3.27	1.00	0.41	0.65	0.51	4.19	1.000			
Pueraria sikkimensis	55.00	2.76	3.45	1.40	1.90	1.50	5.67	1.000			
Sloanea sterculiacea	10.00	0.50	3.00	1.22	0.30	0.24	1.96	1.000			
Smilax zeylanica	25.00	1.26	6.80	2.77	1.70	1.34	5.36	1.000			
Syzygium tetragona	40.00	2.01	3.50	1.42	1.40	1.10	4.54	1.000			
Tetrastigma campylocarpum	30.00	1.51	6.00	2.44	1.80	1.42	5.37	1.000			
Tetrastigma planicauli	55.00	2.76	2.82	1.15	1.55	1.22	5.13	1.000			
Tetrastigma serrulatum	70.00	3.52	8.00	3.25	5.60	4.42	11.19	0.998			
Thunbergia grandiflora	45.00	2.26	2.89	1.17	1.30	1.03	4.46	1.000			
Wrightia arborea	15.00	0.75	2.67	1.08	0.40	0.32	2.15	1.000			
Zizyphus mauritiana	45.00	2.26	2.33	0.95	1.05	0.83	4.04	1.000			

Annexure XXIX: Monsoon Shrub cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	35.00	1.73	1.71	1.18	0.60	0.61	3.52	1.000	1	0.810063	35.8682
Actinodaphne obovata	15.00	0.74	2.00	1.38	0.30	0.30	2.43	1.000			
Aglaia spectabilis	55.00	2.72	1.36	0.94	0.75	0.76	4.42	1.000			
Alstonia scholaris	10.00	0.49	5.50	3.80	0.55	0.56	4.85	1.000			
Aristolochia indica	40.00	1.98	2.25	1.55	0.90	0.91	4.44	1.000			
Baliospermum solanifolium	25.00	1.23	2.80	1.93	0.70	0.71	3.88	1.000			
Bauhinia purpurea	45.00	2.22	1.33	0.92	0.60	0.61	3.75	1.000			
Bridelia retusa	25.00	1.23	3.40	2.35	0.85	0.86	4.44	1.000			
Caesalpinia cucullata	60.00	2.96	1.50	1.04	0.90	0.91	4.91	1.000			
Celastrus paniculatus	40.00	1.98	1.00	0.69	0.40	0.41	3.07	1.000			
Chromolaena odorata	95.00	4.69	6.21	4.29	5.90	5.97	14.95	0.996			
Cinnamomum bejolghota	75.00	3.70	1.60	1.10	1.20	1.22	6.02	1.000			
Croton caudatus	65.00	3.21	2.92	2.02	1.90	1.92	7.15	1.000			
Dillenia indica	90.00	4.44	3.17	2.19	2.85	2.89	9.52	0.999			
Dioscorea esculenta	70.00	3.46	2.57	1.77	1.80	1.82	7.05	1.000			
Ichnocarpus frutescens	100.00	4.94	11.45	7.90	11.45	11.59	24.44	0.987			
Litsea glutinosa	45.00	2.22	1.44	1.00	0.65	0.66	3.88	1.000			
Maesa indica	100.00	4.94	12.05	8.32	12.05	12.20	25.46	0.985			
Merremia vitifolia	75.00	3.70	4.47	3.08	3.35	3.39	10.18	0.999			
Mikania micrantha	100.00	4.94	11.70	8.08	11.70	11.85	24.86	0.986			
Morinda angustifolia	60.00	2.96	9.50	6.56	5.70	5.77	15.29	0.997			
Natsiatum herpeticum	85.00	4.20	6.82	4.71	5.80	5.87	14.78	0.997			
Parabaena sagittata	15.00	0.74	5.33	3.68	0.80	0.81	5.23	1.000			
Pericampylus glaucus	80.00	3.95	8.56	5.91	6.85	6.94	16.80	0.995			
Phlogacanthus thyrsiformis	75.00	3.70	4.07	2.81	3.05	3.09	9.60	0.999			
Pueraria phaseoloides	105.00	5.19	4.24	2.93	4.45	4.51	12.62	0.998			
Pueraria sikkimensis	45.00	2.22	1.89	1.30	0.85	0.86	4.39	1.000			
Sloanea sterculiacea	15.00	0.74	4.33	2.99	0.65	0.66	4.39	1.000			
Smilax zeylanica	35.00	1.73	1.57	1.08	0.55	0.56	3.37	1.000			
Stephania glabra	55.00	2.72	1.09	0.75	0.60	0.61	4.08	1.000			
Syzygium tetragona	15.00	0.74	2.00	1.38	0.30	0.30	2.43	1.000			
Tetrastigma campylocarpum	20.00	0.99	1.75	1.21	0.35	0.35	2.55	1.000			
Tetrastigma planicauli	60.00	2.96	1.58	1.09	0.95	0.96	5.02	1.000			
Tetrastigma serrulatum	80.00	3.95	5.38	3.71	4.30	4.35	12.02	0.998			
Thunbergia grandiflora	80.00	3.95	4.31	2.98	3.45	3.49	10.42	0.999			
Wrightia arborea	35.00	1.73	2.00	1.38	0.70	0.71	3.82	1.000			

Annexure XXX: Monsoon Shrub cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	22.22	1.25	2.00	1.41	0.44	0.50	3.15	1.000	1	0.898317	35.8645
Actinodaphne obovata	55.56	3.12	7.10	4.99	3.94	4.42	12.54	0.998			
Aglaia spectabilis	27.78	1.56	5.00	3.51	1.39	1.56	6.63	1.000			
Alstonia scholaris	16.67	0.94	2.67	1.87	0.44	0.50	3.31	1.000			
Argyreia roxburghii	66.67	3.75	4.75	3.34	3.17	3.55	10.64	0.999			
Aristolochia indica	66.67	3.75	2.33	1.64	1.56	1.74	7.13	1.000			
Bauhinia purpurea	27.78	1.56	1.60	1.12	0.44	0.50	3.19	1.000			
Bridelia retusa	50.00	2.81	4.56	3.20	2.28	2.55	8.57	0.999			
Caesalpinia cucullata	16.67	0.94	2.33	1.64	0.39	0.44	3.01	1.000			
Celastrus paniculatus	27.78	1.56	3.20	2.25	0.89	1.00	4.81	1.000			
Chromolaena odorata	94.44	5.31	12.76	8.97	12.06	13.51	27.80	0.982			
Cinnamomum bejolghota	66.67	3.75	2.25	1.58	1.50	1.68	7.01	1.000			
Croton caudatus	83.33	4.69	6.47	4.54	5.39	6.04	15.27	0.996			
Dillenia indica	44.44	2.50	3.25	2.28	1.44	1.62	6.40	1.000			
Dillenia pentagyna	38.89	2.19	1.14	0.80	0.44	0.50	3.49	1.000			
Dioscorea pentaphylla	16.67	0.94	4.00	2.81	0.67	0.75	4.50	1.000			
Holarrhena pubescens	72.22	4.06	2.69	1.89	1.94	2.18	8.13	1.000			
Ichnocarpus frutescens	88.89	5.00	12.31	8.65	10.94	12.27	25.92	0.985			
Litsea glutinosa	77.78	4.37	2.79	1.96	2.17	2.43	8.76	0.999			
Merremia vitifolia	72.22	4.06	8.85	6.22	6.39	7.16	17.44	0.995			
Mikania micrantha	94.44	5.31	12.59	8.85	11.89	13.33	27.48	0.982			
Morinda angustifolia	61.11	3.44	1.36	0.96	0.83	0.93	5.33	1.000			
Natsiatum herpeticum	83.33	4.69	6.47	4.54	5.39	6.04	15.27	0.996			
Pericampylus glaucus	50.00	2.81	2.67	1.87	1.33	1.49	6.18	1.000			
Phlogacanthus thyrsiformis	50.00	2.81	2.56	1.80	1.28	1.43	6.04	1.000			
Pterocarpus acerifolius	11.11	0.62	2.50	1.76	0.28	0.31	2.69	1.000			
Pueraria sikkimensis	27.78	1.56	2.40	1.69	0.67	0.75	4.00	1.000			
Sloanea sterculiacea	27.78	1.56	1.20	0.84	0.33	0.37	2.78	1.000			
Smilax zeylanica	50.00	2.81	1.89	1.33	0.94	1.06	5.20	1.000			
Sorindeia madagascariensis	11.11	0.62	2.50	1.76	0.28	0.31	2.69	1.000			
Syzygium tetragona	27.78	1.56	1.80	1.27	0.50	0.56	3.39	1.000			
Tetrastigma campylocarpum	50.00	2.81	1.11	0.78	0.56	0.62	4.22	1.000			
Tetrastigma planicauli	33.33	1.87	1.50	1.05	0.50	0.56	3.49	1.000			
Tetrastigma serrulatum	83.33	4.69	6.53	4.59	5.44	6.10	15.38	0.996			
Thunbergia grandiflora	16.67	0.94	2.00	1.41	0.33	0.37	2.72	1.000			
Wrightia arborea	66.67	3.75	1.17	0.82	0.78	0.87	5.44	1.000			

Annexure XXXI: Postmonsoon Shrub cover of Murti Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	33.33	1.59	3.00	2.14	1.00	1.26	4.99	1.000	0.99	0.898177	47.8743
Actinodaphne obovata	58.33	2.78	1.67	1.19	0.97	1.23	5.20	1.000			
Actinodaphne sikkimensis	75.00	3.58	1.22	0.87	0.92	1.16	5.61	1.000			
Aglaia spectabilis	36.11	1.72	4.15	2.97	1.50	1.89	6.58	1.000			
Alstonia scholaris	58.33	2.78	1.19	0.85	0.69	0.88	4.51	1.000			
Angiopteris evecta	8.33	0.40	1.67	1.19	0.14	0.18	1.76	1.000			
Argyreia roxburghii	100.00	4.77	9.64	6.89	9.64	12.15	23.81	0.985			
Aristolochia indica	41.67	1.99	2.27	1.62	0.94	1.19	4.80	1.000			
Baliospermum solanifolium	5.56	0.26	2.00	1.43	0.11	0.14	1.83	1.000			
Bauhinia purpurea	8.33	0.40	2.67	1.91	0.22	0.28	2.58	1.000			
Bridelia retusa	86.11	4.11	1.06	0.76	0.92	1.16	6.02	1.000			
Caesalpinia cucullata	5.56	0.26	4.50	3.22	0.25	0.32	3.80	1.000			
Celastrus paniculatus	5.56	0.26	1.50	1.07	0.08	0.11	1.44	1.000			
Chromolaena odorata	97.22	4.64	8.20	5.86	7.97	10.05	20.55	0.990			
Cinnamomum bejolghota	50.00	2.38	2.28	1.63	1.14	1.44	5.45	1.000			
Coffea bengalensis	41.67	1.99	1.47	1.05	0.61	0.77	3.81	1.000			
Croton caudatus	75.00	3.58	3.96	2.83	2.97	3.75	10.16	0.999			
Dillenia indica	30.56	1.46	2.45	1.75	0.75	0.95	4.16	1.000			
Dillenia pentagyna	13.89	0.66	1.60	1.14	0.22	0.28	2.09	1.000			
Dioscorea esculenta	52.78	2.52	1.11	0.79	0.58	0.74	4.04	1.000			
Dioscorea pentaphylla	22.22	1.06	1.50	1.07	0.33	0.42	2.55	1.000			
Glycosmis pentaphylla	16.67	0.79	1.50	1.07	0.25	0.32	2.18	1.000			
Ichnocarpus frutescens	100.00	4.77	9.53	6.81	9.53	12.01	23.59	0.986			
Litsea glutinosa	94.44	4.50	6.38	4.56	6.03	7.60	16.66	0.994			
Maesa indica	5.56	0.26	1.50	1.07	0.08	0.11	1.44	1.000			
Mallotus polycarpus	33.33	1.59	2.67	1.91	0.89	1.12	4.62	1.000			
Merremia vitifolia	5.56	0.26	2.00	1.43	0.11	0.14	1.83	1.000			
Mikania micrantha	100.00	4.77	8.64	6.17	8.64	10.89	21.83	0.988			
Morinda angustifolia	19.44	0.93	8.14	5.82	1.58	2.00	8.74	1.000			
Natsiatum herpeticum	91.67	4.37	8.21	5.87	7.53	9.49	19.73	0.991			
Parabaena sagittata	38.89	1.85	0.86	0.61	0.33	0.42	2.89	1.000			
Pericampylus glaucus	11.11	0.53	1.75	1.25	0.19	0.25	2.03	1.000			
Phlogacanthus thyrsiformis	94.44	4.50	1.56	1.11	1.47	1.86	7.47	1.000			
Pterocarpus acerifolius	33.33	1.59	3.17	2.26	1.06	1.33	5.18	1.000			
Pueraria phaseoloides	11.11	0.53	1.50	1.07	0.17	0.21	1.81	1.000			
Pueraria sikkimensis	38.89	1.85	2.93	2.09	1.14	1.44	5.38	1.000			
Sloanea sterculiacea	52.78	2.52	1.11	0.79	0.58	0.74	4.04	1.000			
Smilax zeylanica	72.22	3.44	1.50	1.07	1.08	1.37	5.88	1.000			
Sorindeia madagascariensis	25.00	1.19	1.33	0.95	0.33	0.42	2.57	1.000			
Stephania glabra	25.00	1.19	3.00	2.14	0.75	0.95	4.28	1.000			
Streblus asper	5.56	0.26	1.00	0.71	0.06	0.07	1.05	1.000			
Syzygium tetragona	30.56	1.46	1.09	0.78	0.33	0.42	2.66	1.000			
Tetrastigma campylocarpum	77.78	3.71	1.29	0.92	1.00	1.26	5.89	1.000			
Tetrastigma planicauli	58.33	2.78	1.86	1.33	1.08	1.37	5.47	1.000			
Tetrastigma serrulatum	91.67	4.37	1.73	1.23	1.58	2.00	7.60	1.000			
Thunbergia grandiflora	38.89	1.85	3.07	2.20	1.19	1.51	5.56	1.000			
Toddalia asiatica	5.56	0.26	1.50	1.07	0.08	0.11	1.44	1.000			
Wrightia arborea	13.89	0.66	2.00	1.43	0.28	0.35	2.44	1.000			

Annexure XXXII: Postmonsoon Shrub cover of Dhupjhora Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	32.14	1.54	2.33	1.41	0.75	0.71	3.67	1.000	0.98	0.755127	40.8748
Actinodaphne obovata	42.86	2.06	1.50	0.91	0.64	0.61	3.58	1.000			
Argyreia roxburghii	100.00	4.80	10.32	6.24	10.32	9.80	20.85	0.990			
Aristolochia indica	32.14	1.54	1.56	0.94	0.50	0.47	2.96	1.000			
Aristolochia indica	25.00	1.20	5.29	3.20	1.32	1.26	5.65	1.000			
Bauhinia purpurea	25.00	1.20	1.14	0.69	0.29	0.27	2.16	1.000			
Bridelia retusa	50.00	2.40	2.64	1.60	1.32	1.26	5.26	1.000			
Caesalpinia cucullata	21.43	1.03	1.83	1.11	0.39	0.37	2.51	1.000			
Chromolaena odorata	100.00	4.80	10.25	6.20	10.25	9.74	20.74	0.991			
Cinnamomum bejolghota	64.29	3.09	1.61	0.97	1.04	0.98	5.05	1.000			
Cissampelos pareira	21.43	1.03	1.50	0.91	0.32	0.31	2.24	1.000			
Clausena excavata	7.14	0.34	2.00	1.21	0.14	0.14	1.69	1.000			
Croton caudatus	78.57	3.77	14.18	8.58	11.14	10.58	22.94	0.989			
Cryptolepis dubia	28.57	1.37	1.88	1.13	0.54	0.51	3.02	1.000			
Dillenia indica	75.00	3.60	1.19	0.72	0.89	0.85	5.17	1.000			
Dioscorea esculenta	50.00	2.40	4.21	2.55	2.11	2.00	6.95	1.000			
Dioscorea pentaphylla	46.43	2.23	2.15	1.30	1.00	0.95	4.48	1.000			
Ichnocarpus frutescens	100.00	4.80	9.43	5.70	9.43	8.96	19.46	0.992			
Litsea glutinosa	85.71	4.12	3.63	2.19	3.11	2.95	9.26	0.999			
Litsea monopetala	64.29	3.09	1.44	0.87	0.93	0.88	4.84	1.000			
Merremia vitifolia	78.57	3.77	4.45	2.70	3.50	3.32	9.79	0.999			
Mikania micrantha	100.00	4.80	10.32	6.24	10.32	9.80	20.85	0.990			
Morinda angustifolia	82.14	3.95	2.78	1.68	2.29	2.17	7.80	1.000			
Natsiatum herpeticum	67.86	3.26	4.58	2.77	3.11	2.95	8.98	0.999			
Parabaena sagittata	67.86	3.26	6.53	3.95	4.43	4.21	11.41	0.998			
Pericampylus glaucus	50.00	2.40	1.57	0.95	0.79	0.75	4.10	1.000			
Phlogacanthus thyrsiformis	50.00	2.40	6.36	3.85	3.18	3.02	9.27	0.999			
Pueraria phaseoloides	57.14	2.74	7.19	4.35	4.11	3.90	10.99	0.998			
Pueraria sikkimensis	35.71	1.72	1.60	0.97	0.57	0.54	3.23	1.000			
Shorea robusta	42.86	2.06	9.92	6.00	4.25	4.04	12.09	0.998			
Sloanea sterculiacea	32.14	1.54	2.78	1.68	0.89	0.85	4.07	1.000			
Smilax zeylanica	28.57	1.37	3.00	1.82	0.86	0.81	4.00	1.000			
Sorindeia madagascariensis	25.00	1.20	1.71	1.04	0.43	0.41	2.64	1.000			
Stephania glabra	39.29	1.89	3.18	1.93	1.25	1.19	5.00	1.000			
Syzygium tetragona	42.86	2.06	2.08	1.26	0.89	0.85	4.17	1.000			
Tetrastigma campylocarpum	75.00	3.60	1.62	0.98	1.21	1.15	5.73	1.000			
Tetrastigma planicauli	10.71	0.51	4.00	2.42	0.43	0.41	3.34	1.000			
Tetrastigma serrulatum	89.29	4.29	5.84	3.53	5.21	4.95	12.77	0.998			
Thunbergia grandiflora	17.86	0.86	2.80	1.69	0.50	0.47	3.03	1.000			
Wrightia arborea	28.57	1.37	1.88	1.13	0.54	0.51	3.02	1.000			
Zizyphus mauritiana	10.71	0.51	1.00	0.61	0.11	0.10	1.22	1.000			

Annexure XXXIII: Postmonsoon Shrub cover of Gorumara Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	16.67	1.11	1.80	1.22	0.30	0.41	2.74	1.000	0.97	0.785812	36.8702
Actinodaphne obovata	40.00	2.67	1.83	1.24	0.73	0.99	4.90	1.000			
Aglaia spectabilis	16.67	1.11	1.60	1.08	0.27	0.36	2.56	1.000			
Alstonia scholaris	30.00	2.00	1.22	0.83	0.37	0.50	3.32	1.000			
Angiopteris evecta	3.33	0.22	3.00	2.03	0.10	0.14	2.39	1.000			
Argyreia roxburghii	96.67	6.44	9.14	6.19	8.83	11.95	24.59	0.986			
Aristolochia indica	26.67	1.78	1.50	1.02	0.40	0.54	3.34	1.000			
Bauhinia purpurea	16.67	1.11	1.60	1.08	0.27	0.36	2.56	1.000			
Caesalpinia cucullata	10.00	0.67	2.33	1.58	0.23	0.32	2.56	1.000			
Chromolaena odorata	80.00	5.33	11.04	7.48	8.83	11.95	24.77	0.986			
Cinnamomum bejolghota	80.00	5.33	2.42	1.64	1.93	2.62	9.59	0.999			
Clausena excavata	30.00	2.00	2.67	1.81	0.80	1.08	4.89	1.000			
Croton caudatus	83.33	5.56	4.96	3.36	4.13	5.59	14.51	0.997			
Dillenia indica	70.00	4.67	3.24	2.19	2.27	3.07	9.93	0.999			
Dioscorea pentaphylla	46.67	3.11	1.86	1.26	0.87	1.17	5.54	1.000			
Holarrhena pubescens	6.67	0.44	3.50	2.37	0.23	0.32	3.13	1.000			
Ichnocarpus frutescens	93.33	6.22	7.07	4.79	6.60	8.93	19.95	0.992			
Litsea glutinosa	60.00	4.00	3.56	2.41	2.13	2.89	9.30	0.999			
Merremia vitifolia	70.00	4.67	2.00	1.36	1.40	1.89	7.92	1.000			
Mikania micrantha	86.67	5.78	9.00	6.10	7.80	10.55	22.43	0.989			
Morinda angustifolia	20.00	1.33	4.33	2.94	0.87	1.17	5.44	1.000			
Natsiatum herpeticum	70.00	4.67	3.90	2.65	2.73	3.70	11.01	0.999			
Parabaena sagittata	53.33	3.56	12.00	8.13	6.40	8.66	20.35	0.993			
Pericampylus glaucus	26.67	1.78	1.50	1.02	0.40	0.54	3.34	1.000			
Phlogacanthus thyrsiformis	53.33	3.56	3.94	2.67	2.10	2.84	9.07	0.999			
Pterocarpus acerifolius	3.33	0.22	2.00	1.36	0.07	0.09	1.67	1.000			
Pueraria phaseoloides	10.00	0.67	4.67	3.16	0.47	0.63	4.46	1.000			
Sloanea sterculiacea	6.67	0.44	7.50	5.08	0.50	0.68	6.20	1.000			
Smilax zeylanica	30.00	2.00	4.67	3.16	1.40	1.89	7.06	1.000			
Sorindeia madagascariensis	13.33	0.89	1.75	1.19	0.23	0.32	2.39	1.000			
Stephania glabra	10.00	0.67	4.00	2.71	0.40	0.54	3.92	1.000			
Syzygium tetragona	26.67	1.78	2.75	1.86	0.73	0.99	4.63	1.000			
Tetrastigma campylocarpum	46.67	3.11	5.86	3.97	2.73	3.70	10.78	0.999			
Tetrastigma planicauli	70.00	4.67	1.81	1.23	1.27	1.71	7.61	1.000			
Tetrastigma serrulatum	73.33	4.89	6.14	4.16	4.50	6.09	15.14	0.996			
Thunbergia grandiflora	16.67	1.11	2.40	1.63	0.40	0.54	3.28	1.000			
Wrightia arborea	6.67	0.44	3.00	2.03	0.20	0.27	2.75	1.000			

Annexure XXXIV: Postmonsoon Shrub cover of Khunia Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Abrus pulchellus	10.00	0.48	2.50	1.33	0.25	0.22	2.03	1.000	0.99	0.883477	41.8705
Actinodaphne obovata	15.00	0.72	2.00	1.06	0.30	0.27	2.05	1.000			
Aglaia spectabilis	15.00	0.72	2.67	1.42	0.40	0.35	2.49	1.000			
Argyreia roxburghii	90.00	4.32	13.67	7.27	12.30	10.88	22.48	0.988			
Aristolochia indica	40.00	1.92	1.50	0.80	0.60	0.53	3.25	1.000			
Aristolochia indica	45.00	2.16	2.33	1.24	1.05	0.93	4.33	1.000			
Bridelia retusa	60.00	2.88	3.42	1.82	2.05	1.81	6.51	1.000			
Caesalpinia cucullata	15.00	0.72	2.00	1.06	0.30	0.27	2.05	1.000			
Chromolaena odorata	90.00	4.32	15.94	8.49	14.35	12.70	25.50	0.984			
Cinnamomum bejolghota	65.00	3.12	2.38	1.27	1.55	1.37	5.76	1.000			
Croton caudatus	95.00	4.56	6.42	3.42	6.10	5.40	13.37	0.997			
Deeringia amaranthoides	15.00	0.72	2.67	1.42	0.40	0.35	2.49	1.000			
Dillenia indica	90.00	4.32	2.28	1.21	2.05	1.81	7.34	1.000			
Dillenia indica	85.00	4.08	2.47	1.31	2.10	1.86	7.25	1.000			
Dillenia pentagyna	60.00	2.88	1.25	0.67	0.75	0.66	4.21	1.000			
Dioscorea esculenta	25.00	1.20	2.40	1.28	0.60	0.53	3.01	1.000			
Dioscorea pentaphylla	90.00	4.32	2.06	1.09	1.85	1.64	7.05	1.000			
Ichnocarpus frutescens	100.00	4.80	10.90	5.80	10.90	9.65	20.24	0.991			
Litsea glutinosa	40.00	1.92	5.88	3.13	2.35	2.08	7.13	1.000			
Mallotus polycarpus	55.00	2.64	2.09	1.11	1.15	1.02	4.77	1.000			
Merremia vitifolia	45.00	2.16	10.78	5.74	4.85	4.29	12.19	0.998			
Mikania micrantha	95.00	4.56	12.32	6.56	11.70	10.35	21.47	0.989			
Morinda angustifolia	60.00	2.88	2.17	1.15	1.30	1.15	5.18	1.000			
Natsiatum herpeticum	70.00	3.36	11.29	6.01	7.90	6.99	16.36	0.995			
Parabaena sagittata	60.00	2.88	2.42	1.29	1.45	1.28	5.45	1.000			
Pericampylus glaucus	20.00	0.96	8.50	4.52	1.70	1.50	6.99	1.000			
Pericampylus glaucus	90.00	4.32	2.06	1.09	1.85	1.64	7.05	1.000			
Phlogacanthus thyrsiformis	60.00	2.88	4.58	2.44	2.75	2.43	7.75	0.999			
Premna latifolia	10.00	0.48	2.00	1.06	0.20	0.18	1.72	1.000			
Pterocarpus acerifolius	65.00	3.12	1.00	0.53	0.65	0.58	4.22	1.000			
Pueraria sikkimensis	55.00	2.64	3.45	1.84	1.90	1.68	6.16	1.000			
Sloanea sterculiacea	10.00	0.48	3.00	1.60	0.30	0.27	2.34	1.000			
Smilax zeylanica	25.00	1.20	6.80	3.62	1.70	1.50	6.32	1.000			
Streblus asper	10.00	0.48	1.50	0.80	0.15	0.13	1.41	1.000			
Syzygium tetragona	40.00	1.92	3.50	1.86	1.40	1.24	5.02	1.000			
Tetrastigma campylocarpum	30.00	1.44	6.00	3.19	1.80	1.59	6.23	1.000			
Tetrastigma planicauli	55.00	2.64	2.82	1.50	1.55	1.37	5.51	1.000			
Tetrastigma serrulatum	70.00	3.36	8.00	4.26	5.60	4.96	12.57	0.998			
Thunbergia grandiflora	45.00	2.16	2.89	1.54	1.30	1.15	4.85	1.000			
Toddalia asiatica	10.00	0.48	1.00	0.53	0.10	0.09	1.10	1.000			
Wrightia arborea	15.00	0.72	2.67	1.42	0.40	0.35	2.49	1.000			
Zizyphus mauritiana	45.00	2.16	2.33	1.24	1.05	0.93	4.33	1.000			

Annexure XXXV: Postmonsoon Shrub cover of Bichhabhanga Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinodaphne obovata	15.00	0.71	2.00	1.49	0.30	0.32	2.51	1.000	1	0.802322	34.8676
Actinodaphne sikkimensis	35.00	1.65	1.71	1.28	0.60	0.63	3.56	1.000			
Aglaia spectabilis	55.00	2.60	1.36	1.02	0.75	0.79	4.40	1.000			
Alstonia scholaris	55.00	2.60	2.09	1.56	1.15	1.21	5.37	1.000			
Ardisia solanacea	40.00	1.89	1.00	0.75	0.40	0.42	3.06	1.000			
Aristolochia indica	40.00	1.89	2.25	1.68	0.90	0.95	4.51	1.000			
Bauhinia purpurea	45.00	2.13	1.33	0.99	0.60	0.63	3.75	1.000			
Bridelia retusa	105.00	4.96	1.62	1.21	1.70	1.79	7.96	1.000			
Caesalpinia cucullata	60.00	2.84	1.17	0.87	0.70	0.74	4.44	1.000			
Celastrus paniculatus	20.00	0.95	6.25	4.66	1.25	1.31	6.92	1.000			
Chromolaena odorata	95.00	4.49	6.21	4.63	5.90	6.20	15.32	0.996			
Cinnamomum bejolghota	75.00	3.55	1.00	0.75	0.75	0.79	5.08	1.000			
Croton caudatus	65.00	3.07	3.77	2.81	2.45	2.57	8.46	0.999			
Dillenia indica	90.00	4.26	3.17	2.36	2.85	3.00	9.61	0.999			
Dioscorea pentaphylla	70.00	3.31	2.57	1.92	1.80	1.89	7.12	1.000			
Ichnocarpus frutescens	100.00	4.73	9.90	7.38	9.90	10.40	22.51	0.989			
Litsea glutinosa	45.00	2.13	1.44	1.08	0.65	0.68	3.89	1.000			
Merremia vitifolia	75.00	3.55	4.47	3.33	3.35	3.52	10.39	0.999			
Mikania micrantha	100.00	4.73	9.85	7.34	9.85	10.35	22.42	0.989			
Morinda angustifolia	60.00	2.84	9.50	7.08	5.70	5.99	15.91	0.996			
Natsiatum herpeticum	85.00	4.02	6.82	5.08	5.80	6.10	15.20	0.996			
Parabaena sagittata	90.00	4.26	11.94	8.90	10.75	11.30	24.45	0.987			
Pericampylus glaucus	80.00	3.78	8.56	6.38	6.85	7.20	17.36	0.995			
Phlogacanthus thyrsiformis	90.00	4.26	4.89	3.64	4.40	4.62	12.52	0.998			
Pterocarpus acerifolius	55.00	2.60	1.09	0.81	0.60	0.63	4.04	1.000			
Pueraria sikkimensis	45.00	2.13	1.89	1.41	0.85	0.89	4.43	1.000			
Sloanea sterculiacea	15.00	0.71	4.33	3.23	0.65	0.68	4.62	1.000			
Smilax zeylanica	35.00	1.65	1.57	1.17	0.55	0.58	3.40	1.000			
Stephania glabra	105.00	4.96	4.24	3.16	4.45	4.68	12.80	0.998			
Syzygium tetragona	15.00	0.71	2.00	1.49	0.30	0.32	2.51	1.000			
Tetrastigma campylocarpum	20.00	0.95	1.75	1.30	0.35	0.37	2.62	1.000			
Tetrastigma planicauli	60.00	2.84	1.58	1.18	0.95	1.00	5.01	1.000			
Tetrastigma serrulatum	80.00	3.78	5.38	4.00	4.30	4.52	12.31	0.998			
Thunbergia grandiflora	60.00	2.84	3.50	2.61	2.10	2.21	7.65	1.000			
Wrightia arborea	35.00	1.65	2.00	1.49	0.70	0.74	3.88	1.000			

Annexure XXXVI: Postmonsoon Shrub cover of Budhuram Beat

Name of the plants	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinodaphne obovata	55.56	2.77	7.10	4.79	3.94	4.07	11.63	0.998	1	0.862044	35.8660
Aglaia spectabilis	27.78	1.39	5.00	3.37	1.39	1.43	6.19	1.000			
Alstonia scholaris	16.67	0.83	2.67	1.80	0.44	0.46	3.09	1.000			
Argyreia roxburghii	66.67	3.32	5.25	3.54	3.50	3.61	10.48	0.999			
Aristolochia indica	66.67	3.32	2.33	1.57	1.56	1.61	6.50	1.000			
Bauhinia purpurea	27.78	1.39	1.60	1.08	0.44	0.46	2.92	1.000			
Bridelia retusa	50.00	2.49	5.33	3.60	2.67	2.75	8.84	0.999			
Caesalpinia cucullata	16.67	0.83	2.33	1.57	0.39	0.40	2.81	1.000			
Chromolaena odorata	94.44	4.71	12.76	8.61	12.06	12.44	25.76	0.985			
Cinnamomum bejolghota	66.67	3.32	2.25	1.52	1.50	1.55	6.39	1.000			
Croton caudatus	83.33	4.16	6.47	4.36	5.39	5.56	14.08	0.997			
Deeringia amaranthoides	77.78	3.88	2.50	1.69	1.94	2.01	7.57	1.000			
Dillenia indica	44.44	2.22	3.25	2.19	1.44	1.49	5.90	1.000			
Dillenia pentagyna	61.11	3.05	1.27	0.86	0.78	0.80	4.71	1.000			
Dioscorea esculenta	44.44	2.22	1.50	1.01	0.67	0.69	3.92	1.000			
Glycosmis pentaphylla	72.22	3.60	2.69	1.82	1.94	2.01	7.42	1.000			
Ichnocarpus frutescens	88.89	4.43	12.31	8.30	10.94	11.30	24.03	0.987			
Litsea glutinosa	77.78	3.88	2.79	1.88	2.17	2.24	7.99	1.000			
Merremia vitifolia	72.22	3.60	7.54	5.08	5.44	5.62	14.30	0.997			
Mikania micrantha	100.00	4.99	11.89	8.02	11.89	12.27	25.27	0.985			
Morinda angustifolia	61.11	3.05	1.36	0.92	0.83	0.86	4.83	1.000			
Natsiatum herpeticum	83.33	4.16	7.53	5.08	6.28	6.48	15.71	0.996			
Neolamarckia cadamba	22.22	1.11	2.00	1.35	0.44	0.46	2.92	1.000			
Pericampylus glaucus	50.00	2.49	2.67	1.80	1.33	1.38	5.67	1.000			
Phlogacanthus thyrsiformis	50.00	2.49	2.56	1.72	1.28	1.32	5.54	1.000			
Pterocarpus acerifolius	11.11	0.55	2.50	1.69	0.28	0.29	2.53	1.000			
Pueraria sikkimensis	27.78	1.39	2.40	1.62	0.67	0.69	3.69	1.000			
Sloanea sterculiacea	27.78	1.39	1.20	0.81	0.33	0.34	2.54	1.000			
Smilax zeylanica	66.67	3.32	2.92	1.97	1.94	2.01	7.30	1.000			
Sorindeia madagascariensis	11.11	0.55	7.00	4.72	0.78	0.80	6.08	1.000			
Syzygium tetragona	88.89	4.43	1.44	0.97	1.28	1.32	6.72	1.000			
Tetrastigma campylocarpum	50.00	2.49	1.11	0.75	0.56	0.57	3.82	1.000			
Tetrastigma planicauli	44.44	2.22	3.13	2.11	1.39	1.43	5.76	1.000			
Tetrastigma serrulatum	83.33	4.16	8.93	6.02	7.44	7.68	17.86	0.994			
Thunbergia grandiflora	50.00	2.49	1.56	1.05	0.78	0.80	4.34	1.000			
Wrightia arborea	66.67	3.32	1.17	0.79	0.78	0.80	4.91	1.000			

Annexure XXXVII: Tree coverage of Murti Beat

Name of the species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinidaphne obovata	100.00	4.06	4.33	2.82	4.33	3.50	10.38	0.999	1	0.783519	36.8703
Aglaia perviridis	66.67	2.71	2.58	1.68	1.72	1.39	5.78	1.000			
Ailanthus excelsa	50.00	2.03	1.22	0.79	0.61	0.49	3.32	1.000			
Alangium chinensis	94.44	3.84	3.12	2.03	2.94	2.38	8.24	0.999			
Albizia chinensis	100.00	4.06	8.50	5.53	8.50	6.86	16.45	0.995			
Albizia lebeck	72.22	2.93	2.08	1.35	1.50	1.21	5.50	1.000			
Alstonia scholaris	88.89	3.61	9.19	5.97	8.17	6.59	16.18	0.996			
Amoora walichii	100.00	4.06	5.28	3.43	5.28	4.26	11.75	0.998			
Aphanamixis polystachya	83.33	3.39	3.13	2.04	2.61	2.11	7.53	1.000			
Artocarpus chaplasa	33.33	1.35	2.50	1.63	0.83	0.67	3.65	1.000			
Artocarpus heterophyllus	38.89	1.58	1.57	1.02	0.61	0.49	3.10	1.000			
Bauhinia purpuria	77.78	3.16	1.50	0.98	1.17	0.94	5.08	1.000			
Bombax Ceiba	83.33	3.39	2.87	1.86	2.39	1.93	7.18	1.000			
Bridelia retusa	66.67	2.71	2.33	1.52	1.56	1.26	5.48	1.000			
Casaeria vareca	100.00	4.06	9.94	6.47	9.94	8.03	18.56	0.994			
Cassia fistula	44.44	1.81	1.00	0.65	0.44	0.36	2.81	1.000			
Castanopsis indica	16.67	0.68	1.00	0.65	0.17	0.13	1.46	1.000			
Dalbergia sisoo	72.22	2.93	1.69	1.10	1.22	0.99	5.02	1.000			
Ficus benghalensis	38.89	1.58	1.00	0.65	0.39	0.31	2.54	1.000			
Gmelina arborea	88.89	3.61	2.19	1.42	1.94	1.57	6.60	1.000			
Lagerstroemia hypoluca	66.67	2.71	1.75	1.14	1.17	0.94	4.79	1.000			
Leea aquata	55.56	2.26	2.20	1.43	1.22	0.99	4.67	1.000			
Litsea glutinosa	100.00	4.06	13.39	8.70	13.39	10.81	23.58	0.988			
Mayna spinosa	50.00	2.03	1.33	0.87	0.67	0.54	3.44	1.000			
Michelia champaca	27.78	1.13	1.40	0.91	0.39	0.31	2.35	1.000			
Neolamarckia kadamba	77.78	3.16	4.79	3.11	3.72	3.00	9.28	0.999			
Polyalthia simiarum	27.78	1.13	1.00	0.65	0.28	0.22	2.00	1.000			
Sena siamia	22.22	0.90	1.25	0.81	0.28	0.22	1.94	1.000			
Shorea robusta	100.00	4.06	21.00	13.65	21.00	16.95	34.67	0.971			
Sizygium cumini	88.89	3.61	6.06	3.94	5.39	4.35	11.90	0.998			
Sizygium operculatum	77.78	3.16	3.07	2.00	2.39	1.93	7.09	1.000			
Albizia lucidior	100.00	4.06	6.83	4.44	6.83	5.52	14.02	0.997			
Tectona grandis	27.78	1.13	8.60	5.59	2.39	1.93	8.65	1.000			
Terminalia belirica	33.33	1.35	1.17	0.76	0.39	0.31	2.43	1.000			
Terminalia myriocarpa	72.22	2.93	2.00	1.30	1.44	1.17	5.40	1.000			
Toona ciliata	50.00	2.03	4.11	2.67	2.06	1.66	6.36	1.000			
Trewia nudiflora	66.67	2.71	6.83	4.44	4.56	3.68	10.83	0.999			

Annexure XXXVIII: Tree coverage of Dhupjhora Beat

Name of the Species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinidaphne obovata	92.86	4.87	7.08	2.63	6.57	3.30	10.79	0.996	0.99	0.62	32.87
Aglaia perviridis	71.43	3.75	1.90	0.71	1.36	0.68	5.13	1.000			
Alangium chinensis	100.00	5.24	8.43	3.13	8.43	4.23	12.60	0.998			
Albizia chinensis	100.00	5.24	11.64	4.32	11.64	5.84	15.41	0.997			
Albizia lebeck	14.29	0.75	3.50	1.30	0.50	0.25	2.30	1.000			
Alstonia scholaris	100.00	5.24	9.71	3.61	9.71	4.87	13.72	0.998			
Amoora walichii	78.57	4.12	5.18	1.92	4.07	2.04	8.09	1.000			
Aphanamixis polystachya	64.29	3.37	7.67	2.85	4.93	2.47	8.69	0.999			
Artocarpus chaplasa	14.29	0.75	3.50	1.30	0.50	0.25	2.30	1.000			
Bauhinia purpuria	21.43	1.12	3.67	1.36	0.79	0.39	2.88	1.000			
Bombax Ceiba	42.86	2.25	3.50	1.30	1.50	0.75	4.30	1.000			
Bridelia retusa	35.71	1.87	9.60	3.56	3.43	1.72	7.16	1.000			
Casaeria vareca	100.00	5.24	16.50	6.13	16.50	8.28	19.65	0.993			
Cassia fistula	7.14	0.37	3.00	1.11	0.21	0.11	1.60	1.000			
Dalbergia sisoo	28.57	1.50	7.00	2.60	2.00	1.00	5.10	1.000			
Dendrocnide sinuta	100.00	5.24	13.07	4.85	13.07	6.56	16.65	0.996			
Ficus benghalensis	14.29	0.75	2.50	0.93	0.36	0.18	1.86	1.000			
Gmelina arborea	21.43	1.12	6.00	2.23	1.29	0.64	4.00	1.000			
Lagerstroemia hypoluca	78.57	4.12	8.45	3.14	6.64	3.33	10.59	0.999			
Leea guinens	57.14	3.00	5.88	2.18	3.36	1.68	6.86	1.000			
Litsea glutinosa	100.00	5.24	18.93	7.03	18.93	9.49	21.77	0.991			
Mayna spinosa	57.14	3.00	2.63	0.97	1.50	0.75	4.72	1.000			
Neolamarckia kadamba	85.71	4.49	7.25	2.69	6.21	3.12	10.30	0.999			
Polyalthia simiarum	28.57	1.50	3.00	1.11	0.86	0.43	3.04	1.000			
Albizia lucidior	100.00	5.24	24.43	9.07	24.43	12.25	26.57	0.985			
Sizygium cumini	100.00	5.24	9.07	3.37	9.07	4.55	13.16	0.998			
Sizygium operculatum	42.86	2.25	7.17	2.66	3.07	1.54	6.45	1.000			
Shorea robusta	100.00	5.24	26.86	9.97	26.86	13.47	28.69	0.982			
Tectona grandis	21.43	1.12	5.67	2.10	1.21	0.61	3.84	1.000			
Terminalia belirica	7.14	0.37	2.00	0.74	0.14	0.07	1.19	1.000			
Terminalia myriocarpa	28.57	1.50	6.25	2.32	1.79	0.90	4.71	1.000			
Toona ciliata	50.00	2.62	8.14	3.02	4.07	2.04	7.69	1.000			
Trewia nudiflora	42.86	2.25	10.17	3.77	4.36	2.19	8.21	1.000			

Annexure XIL: Tree coverage of Gorumara Beat

Name of the species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinodaphne obovata	100.00	4.64	4.20	1.59	4.20	2.41	8.64	0.999	1	0.72	36.87
Actinodaphne sikkimensis	46.67	2.17	1.71	0.65	0.80	0.46	3.27	1.000			
Aglaia spectabilis	13.33	0.62	3.00	1.13	0.40	0.23	1.98	1.000			
Alangium chinense	80.00	3.72	11.42	4.31	9.13	5.23	13.26	0.997			
Albizia chinensis	46.67	2.17	8.86	3.34	4.13	2.37	7.88	0.999			
Alstonia scholaris	60.00	2.79	8.22	3.10	4.93	2.83	8.72	0.999			
Aphanamixis polystachya	86.67	4.02	8.62	3.25	7.47	4.28	11.55	0.998			
Artocarpus lakoocha	26.67	1.24	1.50	0.57	0.40	0.23	2.03	1.000			
Bauhinia purpurea	40.00	1.86	1.83	0.69	0.73	0.42	2.97	1.000			
Bombax ceiba	86.67	4.02	3.23	1.22	2.80	1.60	6.85	1.000			
Cinnamomum bejolghota	80.00	3.72	5.25	1.98	4.20	2.41	8.10	0.999			
Dalbergia sissoo	40.00	1.86	2.00	0.75	0.80	0.46	3.07	1.000			
Dendrocnide sinuta	73.33	3.41	22.09	8.34	16.20	9.28	21.03	0.991			
Dillenia indica	86.67	4.02	9.77	3.69	8.47	4.85	12.56	0.998			
Dillenia pentagyna	80.00	3.72	13.50	5.10	10.80	6.19	15.00	0.996			
Ficus benghalensis	13.33	0.62	1.50	0.57	0.20	0.11	1.30	1.000			
Ficus hispida	46.67	2.17	19.57	7.39	9.13	5.23	14.79	0.997			
Gmelina arborea	46.67	2.17	1.00	0.38	0.47	0.27	2.81	1.000			
Holarrhena pubescens	40.00	1.86	7.17	2.71	2.87	1.64	6.21	1.000			
Lagerstroemia hirsuta	26.67	1.24	7.75	2.93	2.07	1.18	5.35	1.000			
Lagerstroemia speciosa	46.67	2.17	4.71	1.78	2.20	1.26	5.21	1.000			
Leea aequata	53.33	2.48	8.38	3.16	4.47	2.56	8.20	0.999			
Litsea elongata	73.33	3.41	3.82	1.44	2.80	1.60	6.45	1.000			
Litsea glutinosa	53.33	2.48	8.50	3.21	4.53	2.60	8.28	0.999			
Litsea monopetala	60.00	2.79	4.33	1.64	2.60	1.49	5.91	1.000			
Mallotus philippensis	100.00	4.64	10.53	3.98	10.53	6.04	14.66	0.996			
Mallotus polycarpus	80.00	3.72	5.92	2.23	4.73	2.71	8.66	0.999			
Meyna spinosa	20.00	0.93	1.67	0.63	0.33	0.19	1.75	1.000			
Neolamarckia cadamba	33.33	1.55	7.60	2.87	2.53	1.45	5.87	1.000			
Premna latifolia	26.67	1.24	7.25	2.74	1.93	1.11	5.08	1.000			
Shorea robusta	100.00	4.64	21.00	7.93	21.00	12.03	24.60	0.986			
Streblus asper	40.00	1.86	3.67	1.38	1.47	0.84	4.08	1.000			
Syzygium tetragona	93.33	4.33	10.93	4.13	10.20	5.84	14.30	0.997			
Tectona grandis	46.67	2.17	10.71	4.04	5.00	2.86	9.08	0.999			
Terminalia bellirica	40.00	1.86	3.50	1.32	1.40	0.80	3.98	1.000			
Terminalia myriocarpa	80.00	3.72	3.92	1.48	3.13	1.80	6.99	1.000			
Toona ciliata	86.67	4.02	6.31	2.38	5.47	3.13	9.54	0.999			

Annexure XL: Tree coverage of Khunia Beat

Neame of the species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinidaphne obovata	50.00	2.36	13.20	4.33	6.60	2.66	9.34	0.999	1	0.66	32.87
Aegle marmelos	30.00	1.42	1.00	0.33	0.30	0.12	1.86	1.000			
Alangium chinensis	90.00	4.25	23.44	7.69	21.10	8.49	20.42	0.993			
Albizia chinensis	70.00	3.30	6.00	1.97	4.20	1.69	6.96	1.000			
Albizia lebeck	20.00	0.94	1.50	0.49	0.30	0.12	1.56	1.000			
Alstonia scholaris	100.00	4.72	23.10	7.57	23.10	9.30	21.59	0.991			
Amoora walichii	70.00	3.30	4.71	1.55	3.30	1.33	6.18	1.000			
Aphanamixis polystachya	70.00	3.30	3.29	1.08	2.30	0.93	5.30	1.000			
Artocarpus heterophyllus	40.00	1.89	4.25	1.39	1.70	0.68	3.96	1.000			
Bauhinia purpuria	60.00	2.83	1.50	0.49	0.90	0.36	3.68	1.000			
Bombax Ceiba	90.00	4.25	4.67	1.53	4.20	1.69	7.47	1.000			
Casaeria vareca	100.00	4.72	11.90	3.90	11.90	4.79	13.41	0.998			
Cassia fistula	30.00	1.42	2.33	0.76	0.70	0.28	2.46	1.000			
Cassia siamia	40.00	1.89	5.75	1.88	2.30	0.93	4.70	1.000			
Combretum decandrum	40.00	1.89	1.25	0.41	0.50	0.20	2.50	1.000			
Dalbergia sisoo	80.00	3.77	6.75	2.21	5.40	2.17	8.16	1.000			
Dendrocnide sinuta	100.00	4.72	23.30	7.64	23.30	9.38	21.73	0.991			
Ficus benghalensis	30.00	1.42	1.33	0.44	0.40	0.16	2.01	1.000			
Gmelina arborea	20.00	0.94	10.50	3.44	2.10	0.85	5.23	1.000			
Lagerstroemia hirsuta	90.00	4.25	15.22	4.99	13.70	5.52	14.75	0.997			
Litsea glutinosa	100.00	4.72	21.40	7.02	21.40	8.62	20.35	0.993			
Litsea monopetala	80.00	3.77	8.38	2.75	6.70	2.70	9.22	0.999			
Michelia champaca	50.00	2.36	1.80	0.59	0.90	0.36	3.31	1.000			
Neolamarckia kadamba	60.00	2.83	4.17	1.37	2.50	1.01	5.20	1.000			
Polyalthia simiarum	30.00	1.42	2.00	0.66	0.60	0.24	2.31	1.000			
Shorea robusta	100.00	4.72	21.80	7.15	21.80	8.78	20.64	0.992			
Sizygium cumini	70.00	3.30	10.86	3.56	7.60	3.06	9.92	0.999			
Albizia lucidior	100.00	4.72	28.30	9.28	28.30	11.39	25.39	0.987			
Tectona grandis	80.00	3.77	20.63	6.76	16.50	6.64	17.18	0.996			
Terminalia belirica	50.00	2.36	5.40	1.77	2.70	1.09	5.22	1.000			
Terminalia myriocarpa	30.00	1.42	2.67	0.87	0.80	0.32	2.61	1.000			
Toona ciliata	60.00	2.83	3.67	1.20	2.20	0.89	4.92	1.000			
Trewia nudiflora	90.00	4.25	9.00	2.95	8.10	3.26	10.46	0.999			

Annexure XLI: Tree coverage of Bichhabhanga Beat

Name of the species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinidaphne obovata	70.00	3.89	8.71	3.33	6.10	3.07	10.29	0.999	0.96	0.70	30.87
Alangium chinensis	80.00	4.44	22.88	8.75	18.30	9.21	22.40	0.992			
Albizia chinensis	50.00	2.78	7.40	2.83	3.70	1.86	7.47	1.000			
Albizia lebeck	20.00	1.11	1.50	0.57	0.30	0.15	1.84	1.000			
Alstonia scholaris	80.00	4.44	10.38	3.97	8.30	4.18	12.59	0.998			
Amoora walichii	60.00	3.33	4.50	1.72	2.70	1.36	6.41	1.000			
Aphanamixis polystachya	70.00	3.89	11.29	4.32	7.90	3.97	12.18	0.998			
Artocarpus chaplasa	10.00	0.56	2.00	0.76	0.20	0.10	1.42	1.000			
Bauhinia purpuria	70.00	3.89	1.29	0.49	0.90	0.45	4.83	1.000			
Bombax Ceiba	80.00	4.44	9.13	3.49	7.30	3.67	11.61	0.999			
Casaeria vareca	100.00	5.56	19.80	7.57	19.80	9.96	23.09	0.990			
Cassia fistula	50.00	2.78	1.40	0.54	0.70	0.35	3.67	1.000			
Dalbergia sisoo	30.00	1.67	1.67	0.64	0.50	0.25	2.56	1.000			
Dendrocnide sinuta	40.00	2.22	18.25	6.98	7.30	3.67	12.87	0.999			
Ficus benghalensis	20.00	1.11	2.00	0.76	0.40	0.20	2.08	1.000			
Ficus religiosa	20.00	1.11	2.50	0.96	0.50	0.25	2.32	1.000			
Gmelina arborea	10.00	0.56	3.00	1.15	0.30	0.15	1.85	1.000			
Lagerstroemia hirsuta	100.00	5.56	21.70	8.30	21.70	10.92	24.77	0.988			
Leea guinensis	60.00	3.33	6.17	2.36	3.70	1.86	7.55	1.000			
Litsea glutinosa	70.00	3.89	8.43	3.22	5.90	2.97	10.08	0.999			
Mayna spinosa	80.00	4.44	2.63	1.00	2.10	1.06	6.50	1.000			
Michelia champaca	50.00	2.78	1.00	0.38	0.50	0.25	3.41	1.000			
Neolamarckia kadamba	90.00	5.00	9.67	3.70	8.70	4.38	13.07	0.998			
Shorea robusta	100.00	5.56	28.30	10.82	28.30	14.24	30.62	0.980			
Sizygium cumini	100.00	5.56	12.20	4.67	12.20	6.14	16.36	0.996			
Sizygium operculatum	70.00	3.89	8.86	3.39	6.20	3.12	10.40	0.999			
Albizia lucidior	100.00	5.56	18.90	7.23	18.90	9.51	22.29	0.991			
Terminalia belirica	20.00	1.11	1.50	0.57	0.30	0.15	1.84	1.000			
Terminalia myriocarpa	30.00	1.67	2.67	1.02	0.80	0.40	3.09	1.000			
Toona ciliata	30.00	1.67	4.00	1.53	1.20	0.60	3.80	1.000			
Trewia nudiflora	40.00	2.22	7.75	2.96	3.10	1.56	6.75	1.000			

Annexure XLII: Tree coverage of Budhuram Beat

Name of the species	F	RF	A	RA	D	RD	IVI	Shannon-Weiner Index	Simpson's Index	Menhinick Index	Margalef Index
Actinidaphne obovata	77.78	3.45	7.29	2.45	5.67	2.29	8.19	0.999	0.99	0.70	32.87
Alangium chinensis	88.89	3.94	14.13	4.75	12.56	5.08	13.77	0.997			
Albizia chinensis	55.56	2.46	9.60	3.23	5.33	2.16	7.85	1.000			
Alstonia scholaris	100.00	4.43	9.89	3.33	9.89	4.00	11.76	0.998			
Amoora walichii	66.67	2.96	6.17	2.08	4.11	1.66	6.69	1.000			
Aphanamixis polystachya	77.78	3.45	3.57	1.20	2.78	1.12	5.77	1.000			
Artocarpus chaplasa	66.67	2.96	2.33	0.79	1.56	0.63	4.37	1.000			
Bauhinia variegata	22.22	0.99	4.00	1.35	0.89	0.36	2.69	1.000			
Bombax Ceiba	44.44	1.97	9.25	3.11	4.11	1.66	6.75	1.000			
Casaeria glomerata	100.00	4.43	9.67	3.25	9.67	3.91	11.60	0.998			
Casaeria vareca	100.00	4.43	23.78	8.00	23.78	9.61	22.05	0.991			
Cassia siamia	33.33	1.48	1.33	0.45	0.44	0.18	2.11	1.000			
Chukrasia tabularis	44.44	1.97	1.75	0.59	0.78	0.31	2.87	1.000			
Combretum decandrum	22.22	0.99	2.00	0.67	0.44	0.18	1.84	1.000			
Dalbergia sisoo	33.33	1.48	4.67	1.57	1.56	0.63	3.68	1.000			
Dendrocnide sinuta	88.89	3.94	10.88	3.66	9.67	3.91	11.51	0.998			
Ficus benghalensis	33.33	1.48	1.00	0.34	0.33	0.13	1.95	1.000			
Gmelina arborea	55.56	2.46	6.80	2.29	3.78	1.53	6.28	1.000			
Lagerstroemia hirsuta	88.89	3.94	10.88	3.66	9.67	3.91	11.51	0.998			
Leea aquata	55.56	2.46	7.20	2.42	4.00	1.62	6.50	1.000			
Litsea elongata	77.78	3.45	7.29	2.45	5.67	2.29	8.19	0.999			
Litsea glutinosa	44.44	1.97	5.25	1.77	2.33	0.94	4.68	1.000			
Litsea monopetala	88.89	3.94	11.13	3.74	9.89	4.00	11.68	0.998			
Mangifera indica	88.89	3.94	4.00	1.35	3.56	1.44	6.72	1.000			
Neolamarckia kadamba	88.89	3.94	5.50	1.85	4.89	1.98	7.77	1.000			
Shorea robusta	100.00	4.43	34.89	11.74	34.89	14.11	30.28	0.980			
Sizygium cumini	100.00	4.43	14.67	4.94	14.67	5.93	15.30	0.997			
Sizygium operculatum	33.33	1.48	2.00	0.67	0.67	0.27	2.42	1.000			
Albizia lucidior	100.00	4.43	30.89	10.40	30.89	12.49	27.32	0.984			
Tectona grandis	88.89	3.94	12.25	4.12	10.89	4.40	12.47	0.998			
Terminalia myriocarpa	22.22	0.99	2.00	0.67	0.44	0.18	1.84	1.000			
Toona ciliata	77.78	3.45	10.71	3.61	8.33	3.37	10.42	0.999			
Trewia nudiflora	88.89	3.94	10.38	3.49	9.22	3.73	11.16	0.999			

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Survey for NTFP plants of the Gorumara National Park in the Jalpaiguri district of West Bengal (India)

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Abstract

Gorumara National Park (GNP) is one of the most important protected areas in Duars of West Bengal. It is marketed for its tourism and natural products potential. A total 334 of NTFP species of plants has been recorded through the present survey, which include 57 edible plants, 164 medicinal plants, 45 species used in veterinary medicine, 20 species use as various religious purposes, 19 species for poisonous substances, 54 as fuel and 260 species used as fodder by the forest villagers.

***Key word*:** Gorumara National Park, NTFPs.

INTRODUCTION

Wild plants have always been an important component of healthcare throughout the human history (Pushpangadan 2002; Toksoy *et al.* 2010; Saha *et al*. 2013). Non-Timber Forest Produces (NTFPs) are an integral part of sustainable development and survival for the forest villagers. According to Wickens (1994), the potential economic value of NTFPs and their utilization or their market value is often underestimated. NTFPs are important tools for decreasing poverty for the marginalized and forest dependent communities through contributing to livelihoods, food security, income, health and sustainable human development (Ahenkan & Boon 2008; Sarkar 2014). Approximately 350 million people of the third-world depend on NTFPs as their primary source of income, food, nutrition, and medicine (UNDP 2004; FAO 2005). The significance of NTFPs in rural livelihood has been established (Sarkar 2014), but only little is known about their collection and marketing dynamics (Pandit *et al*. 2004). In India, there are over 15,000 species of higher plants out of which nearly 3000 species (20 %) yield NTFPs, of those only about 126 species (0.8 %) have been commercially developed (Maithani 1994, Basu *et al*. 2013). Rural population specially forest dwellers in India depend on the forests not only to supplement their domestic requirements for foods, fodder and medicines but also to supplement their incomes by selling part or all of their collections in local markets (Basu *et al*. 2013). In India, more than 41 million tribals and forest dwellers harvesting natural product from the forests areas and they consume about 60 % of collected NTFPs for personal use (Prasad 1985). Primarily NTFPs include fodder, dry and fallen twigs and branches, leaves and where available mushrooms, edible tubers, flowers, fruits and medicinal herbs (Pandit *et al*. 2004; Sarkar 2014). In addition, local communities do not get the full incomes they often get only collection charges even for products that have a very high market value (Basu *et al*. 2013).

Study Area

Gorumara National Park (GNP) was established with 2 Ranges, Gorumara North and Gorumara South covering 7 beats. The areas lying around 88° 45' 19" E to 88° 51' 18" E Longitude and 26° 48' 05"N to 26° 41' 20" N Latitude. All Eco-Development Committees are giving protection of this forest as part of their agreement with the Forest Department (FD) during the implementation of Joint Forest Management (JFM) program (Sarkar *et al.* 2009). Murti, Jaldhaka, Garati and Indong are the main rivers passing through this important Protected Area (Saha *et al*. 2013). The entire forest tract of GNP comes under the North Indian moist tropical forest type in Champion & Seth's (1968) classification. Average elevation of the study area is 90 m and chiefly covered with alluvial soil; average annual rainfall is 375 cm and monthly average temperature ranges between 15° C to 32° C (Sarkar *et al*. 2009).

METHODOLOGY

First hand information regarding the NTFPs harvesting and their uses were gathered through interactions with tribal people in local forest villages. Further interactions with local *Baidyas* were also helpful to gather information regarding commonly used medicinal plants. During interactions, prepared semi-structured questionnaire (NTFPs Datasheet) was used following Jain (1995), Sarkar (2011) and Sarkar (2014). After this, detailed survey was conducted in the local markets surrounding the forest areas, *Banaja* (Govt. NTFP-shop) and recorded data from different forest offices taking care of GNP and the FD-website (http://www.ntfpwestbengal.in/important_downloads.php).

Plant specimens were processed following Jain & Rao (1977), identified in the Taxonomy and Environmental Biology Laboratory of the Department of Botany, North Bengal University, matched at CAL and NBU and finally deposited at NBU.

RESULT AND DISCUSSION

From the present study, 334 species of plants were recorded to have NTFP values. Recent survey showed that 58 species of edible plants are growing in the GNP, 164 species (27% of total) used as ethnomedicinal and 45 species (7 %) as ethnoveterinary plants; 20 species of plants used by the forest villagers in their regular ritual and religious purposes; 19 species of plants they used as poison for catching fishes from rivers and ponds and for hunting birds. GNP is very rich in fodder for Elephants, bison, pigs, different species of seer etc. But, the forest villagers collect only 260 species of plants for their cattle. The villagers regularly collect 54 species as fuel for cooking. All the recorded plants has been numerically summarized in Table 1 and Fig. 1.

Table 1. Number of different categories of NTFPs plants from GNP

Total no. of NTFPs	Medicinal	Veterinary	Edible	Fodder	Religious	Poisonous	Fuel
334	164	45	58	260	20	19	54

The villagers use the wood of so many species as fuel in cooking their daily food. But, their regular practice of fuel collection covers very nominal number (only 9 %) of the recorded species. In case of fodder plants, they collect regularly very less number (only 42 %) of plants (Fig. 1). This recorded number is based on the present field survey on their regular practice, though the total number of fodder plants is very high in the forest area.

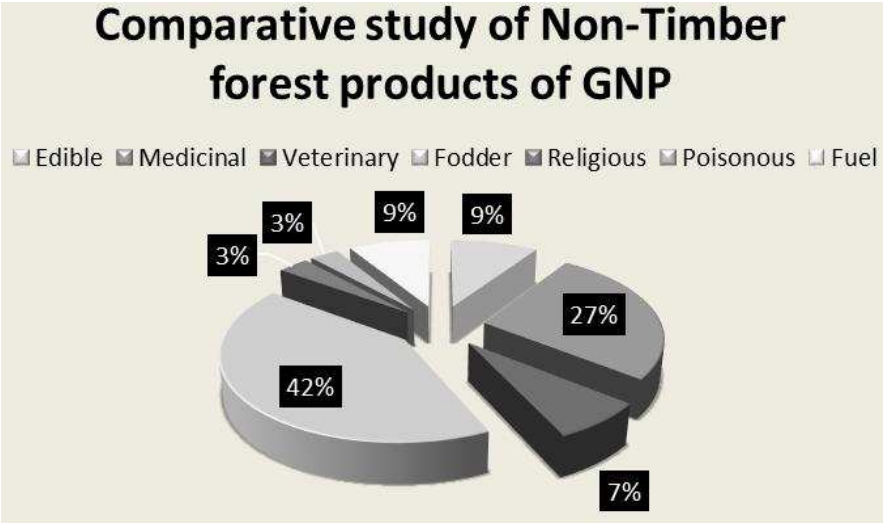

Fig. 1. Percentage of different use groups of recorded NTFPs from Gorumara National Park

The forest villagers collect 334 species of plants from Gorumara National Park, but all these species are not for their own consumption. A little amount of the recorded NTFPs are placed in the commercial market though agents or local buyers. Government forest division also harvest NTFPs for commercial purposes and they process those for marketing. So, the Government has prepared a list of NTFPs and their prices that is available in http://www.ntfpwestbengal.in/important_downloads.php. But, the local collectors recruited by public agents are always exploited by the agents and/or buyers. So, the price remain very low than the Government approved rates. The comparative price list from the local market survey of some commercial NTFPs are given in Table 2.

Table 2. Recorded marketable NTFPs from GNP along with their price in local market vis-à-vis in government circular.

Commercial NTFPs Plants [Family]; Local name; Voucher specimen (*Goutam & AP. Das* nos.)	**NTFP Part**	**Use type**	**End Product**	**Local Market Value**		**Governm-ent Value**	
				Qty	**Rate (Rs.)**	**Qty**	**Rate (Rs.)**
Adenanthera pavonina Linnaeus [Fabaceae : Mimosoidae]; *Chandan bichi*; Bichha bhanga, *758*	Seed	Decora-tion	Showpiece	1 Kg	40	-	-
Aegle marmelos (Linnaeus) Corrêa [Rutaceae]; *Bel*; Khunia, *70*	Fruit	Dry/ Churna	Medicine	1 pc	10	1kg	450
Alstonia scholaris (Linnaeus) R. Brown [Apocynaceae]; *Chhatim*; Indong, *117*	Bark	Dry	Medicine	1kg	40	-	-
Alternanthera sessilis (Linnaeus) R. Brown *ex* de Candolle [Amaranthaceae]; *Chhenchi saag*; Khunia, *222;* Murti, *542*	Whole plant	Fresh	Vegetable	250g	5	-	-
Amaranthus viridis Linnaeus [Amaranthaceae]; *Notey*; Khunia, *131*	Whole plant	Fresh	Vegetable	250g	5	-	-
Andrographis paniculata (Burman *f.*) Nees [Acanthaceae]; *Kalmegh*; Budhiram *1123*	Whole plant	Dry/Churna	Medicine	250g	80	100 g	45
Aristolochia indica Linnaeus [Aristolochiaceae]; *Ishwarmul*; Bichha Bhanga, *783*	Root	Dry	Medicine	250g	100	-	-
Artemisia indica Willdenow [Asteraceae]; *Nagnishinda/ Titepati*; Khunia, *125*	Whole plant	Dry	Medicine	1kg	70	-	-
Artocarpus heterophyllus Lamarck [Moraceae]; *Kanthal*; Budhiram, *761*	Fruit	Fresh	Edible	1pc	5-10	-	-
Asparagus racemosus Willdenow [Asparagaceae]; *Shatamuli;* Khunia, *32*	Root	Dry/Churna	Medicine	250g	100	100 g	75

Commercial NTFPs Plants [Family]; Local name; Voucher specimen (*Goutam & AP. Das* nos.)	NTFP Part	Use type	End Product	Local Market Value		Governm-ent Value	
				Qty	Rate (Rs.)	Qty	Rate (Rs.)
Bambusa balcooa Roxburgh [Poaceae]; *Boro Bansh*; Murti, *419*	Culm	Fresh	Household	1pc	60	-	-
Bambusa tulda Roxburgh [Poaceae]; *Talda Bansh*; Gorumara, *931*	Culm	Fresh	Household	1pc	60	-	-
Bambusa vulgarisSchrader [Poaceae]; *Holud Bansh*; Gorumara, *924*	Culm	Fresh	Decoration	1pc	55	-	-
Bauhinia purpurea Linnaeus [Caesalpiniaceae]; *Kanchan;* Dhupjhora, *97*	Bark	Dry	Medicine	250g	25	-	-
Bombax ceiba Linnaeus [Malvaceae]; *Simul;* Murti, *335*	Bark	Dry/Churna	Medicine	250g	60	80g	75
Cannabis sativa Linnaeus [Cannabaceae]; *Bhang;* Khunia, *Goutam & AP. Das 65*	Leaf	Dry	Intoxicati-on	250g	5	-	-
Cassia fistula Linnaeus [Fabaceae]; *Bandarlathi;* Murti, *349*	Bark	Dry	Medicine	250g	25	-	-
Castanopsis indica (Roxburgh *ex* Lindle) A. De Candolle [Fagaceae]; *Kathbadam;* Murti, *352*	Fruit	Dry	Showpiece	1kg	15	-	-
Centella asiatica (Linnaeus) Urban [Apiaceae]; *Thankuni;* Murti, *313*	Leaf	Churna	Medicine	-	-	100 g	45
Chenopodium album Linnaeus [Amaranthaceae]; *Bethua*; Dhupjhora, *663*	Whole plant	Fresh	Vegetable	250g	5	-	-
Cinnamomum bejolghota (Buchanan – Hamilton) Sweet [Lauraceae]; Murti, *452*	Bark	Dry	Agarbatti	1kg	20	-	-
Citrus limon (Linnaeus) Osbeck [Rutaceae]; *Lebu;* Khunia, *44*	Fruit	Fresh	Edible	4pcs	10	-	-
Citrus maxima (Burman) Merrill [Rutaceae]; *Jambura;* Khunia, *42*	Fruit	Fresh	Edible	1pc	5	-	-
Coccinia grandiflora Cogniaux *ex* Engler [Cucurbitaceae]; *Telakucha*; Gorumara, *719*	Whole plant	Fresh	Vegetable	250g	10	-	-
Colocasia antiquorum Schott [Araceae]; *Panikochu*; Khunia, *134, 202*	Corm	Fresh	Vegetable	1kg	10	-	-
Dillenia indica Linnaeus [Dilleniaceae]; *Chalta;* Murti, *373*	Ripe Fruit	Fresh	Edible	1pc	3	-	-
Dioscorea alata Linnaeus [Dioscoreaceae]; *Chuprialu;* Gorumara, *652*	Bulbil, root-stock	Fresh	Vegetable	1kg	10	-	-
Dioscorea bulbifera Linnaeus [Dioscoreaceae]; *Chuprialu*; Gorumara, *653*	Bulbil, root-stock	Fresh	Vegetable	1kg	10	-	-
Dioscorea deltoidea Grisebach [Dioscoreaceae]; Chupri alu; Gorumara, *702*	Bulbil, root-stock	Fresh	Vegetable	1kg	10	-	-
Dioscorea pentaphylla Linnaeus [Dioscoreaceae]; *Pachpata alu*; Gorumara, *656*	Bulbil, root-stock	Fresh	Vegetable	1kg	10	-	-
Dioscorea prazeri Prain & Burkill [Dioscoreaceae]; *Kham alu*; Khunia, *190;* Dhupjhora, *643*	Bulbil, root-stock	Fresh	Vegetable	1kg	10	-	-
Elaeocarpus floribundus Blume [Elaeocarpaceae]; *Jalpai*; Dhupjhora, *978*	Fruits	Fresh	Edible	1kg	12	-	-
Entada rheedii Sprengel [Fabaceae]; *Gila;* Dhupjhora, *166*	Seed	Dry	Medicine	1kg	70	-	-
Enydra fluctuans de Candolle [Asteraceae]; *Helancha;* Dhupjhora, *164*	Whole plant	Fresh	Vegetable	250g	5	-	-
Glinus oppositifolius (Linnaeus) A. de Candolle [Molluginaceae]; *Gima*; Khunia, *069*	Whole plant	Fresh	Vegetable	250g	10	-	-
Holarrhena pubescens Wallich *ex* G. Don [Apocynaceae]; *Kuchila;* Gorumara, *627*	Bark	Dry	Medicine	1kg	30	-	-
Holmskioldia sanguinea Retzius [Lamiaceae]; Murti, *365*	Calyx	Dry	Decoration	100g	5	-	-

Commercial NTFPs Plants [Family]; Local name; Voucher specimen (*Goutam & AP. Das* nos.)	NTFP Part	Use type	End Product	Local Market Value		Governm-ent Value	
				Qty	Rate (Rs.)	Qty	Rate (Rs.)
Houttuynia cordata Thunbergh [Saururaceae]; *Ashtani;* Murti, *357*	Whole plant	Dry	Medicinal	250g	20	-	-
	Whole plant	Fresh	Chatni/ Vegetable	500g	10	-	-
Ipomoea aquatica Forsskal [Convolvulaceae]; *Kolmi;* Khunia, *064*	Whole plant	Fresh	Vegetable	500g	10	-	-
Justicia adhatoda Linnaeus [Acanthaceae]; *Basak;* Indong, *112*	Leaf	Dry/Churna	Medicine	100g	10	100 g	45
Justicia gendarussa Burman *f.* [Acanthaceae]; Dhupjhora, *171*	Leaf	Dry	Medicine	100g	8	-	-
Lagerstroemia parviflora Roxburgh [Lythraceae]; *Sidha*; Gorumara, *697*	Fruit	Dry	Decoration	1kg	15	-	-
Lagerstroemia speciosa (Linnaeus) Persoon [Lythraceae]; *Jarul*; Gorumara, *994*	Fruit	Dry	Decoration	1kg	15	-	-
Lasia spinosa (Linnaeus) Thwaites [Araceae]; *Kantakochu;* Gorumara, *648*	Spadix/ Inflore-scence	Fresh	Vegetable	1pc	3	-	-
Litchi chinensis Sonnerat [Sapindaceae]; *Lichu*; Gorumara, *1377*	Fruit	Fresh	Edible	1kg	30	-	-
Mangifera indica Linnaeus [Anacardiaceae]; *Aam*; Budhiram, *1103*	Fruit	Fresh	Edible	1kg	25	-	-
Manihot esculenta Crantz [Euphorbiaceae]; *Shimultarul;* Murti, *367*	Root	Fresh	Eaten boiled	1kg	15	-	-
Momordica charantia Linnaeus [Cucurbitaceae]; *Uchchhe*; Dhupjhora, *177*	Fruit	Fresh	Vegetable	1kg	10	-	-
Momordica dioica Roxburgh *ex* Willdenow [Cucurbitaceae]; *Kakrol*; Murti, *383*	Fruit	Fresh	Vegetable	1kg	8	-	-
Morinda angustifolia Roxburgh [Rubiaceae]; *Haldikath;* Murti, *391*	Stem	Dry/ Churna	Medicine	-	-	1kg	35
Morus indica Linnaeus [Moraceae]; *Tut*; Murti, *359*	Fruit	Fresh	Edible	100g	5	-	-
Mucuna pruriens (Linnaeus) De Candolle [Fabaceae : Faboidae]; *Bandarchulka*; Gorumara, *645*	Seed	Dry/ Churna	Medicine	100g	30	100 g	75
Musa balbisiana Colla [Musaceae]; *Bicha Kala;* Murti, *392*	Fruit	Fresh	Vegetable	4pcs	12	-	-
	Inflore-scence	Fresh	Vegetable	1pc	10	-	-
Ocimum tenuiflorum Linnaeus [Lamiaceae]; *Tulsi;* Dhupjhora, *198*	Leaf	Dry/ Churna	Tulsi Tea	-	-	100 g	45
Oroxylum indicum (Linnaeus) Kurz [Bignoniaceae]; *Totala*; Khunia, *63*	Seed	Dry	Decoration	10g	40	-	-
Paederia foetida Linnaeus [Rubiaceae]; *Gondhopata*; Dhupjhora, *199*	Leaf	Dry/ Churna	Medicine	-	-	100 g	45
Phlogacanthus thyrsiformis (Roxburgh *ex* Hardwicke) Mabberley [Acanthaceae]; *Rambhang*; Murti, *327*	Leaf	Dry	Medicine	100g	15	-	-
Phyllanthus emblica **Linnaeus [**Phyllanthaceae]; *Amlaki*; Dhupjhora, *180*	Fruit	Dry/ Churna	Trifala/ Medicine	-	-	100 g	45
	Fruit	Fresh	Edible	1kg	25	-	-
Piper betloides Chaveer & Tanomtong [Piperaceae]; *Bhote Pan*; Gorumara, *674*	Leaf	Fresh	Edible	32 leaves	8	-	-
Piper longum Linnaeus [Piperaceae]; *Pipul*; Murti, *393*	Fruit	Dry	Medicine	100g	10	100 g	25
Piper peepuloides Roxburgh [Piperaceae]; *Pipul;* Dhupjhora, *181*	Fruit	Dry	Medicine	100g	10	-	-
Psidium guajava Linnaeus [Myrtaceae]; *Peyara*; Budhira, *1238*	Fruit	Fresh	Edible	1kg	10	-	-
Rauvolfia serpentina (Linnaeus) Bentham *ex* Kurz [Apocynaceae]; *Swarpagandha, Chando*; Gorumara, *638*	Root	Dry	Medicine	1kg	180	-	-

Commercial NTFPs Plants [Family]; Local name; Voucher specimen (*Goutam & AP. Das* nos.)	NTFP Part	Use type	End Product	Local Market Value		Governm-ent Value	
				Qty	Rate (Rs.)	Qty	Rate (Rs.)
Sapindus rarak De Candolle [Sapindaceae]; *Ritha*; Budhiram, *1257*	Fruit	Dry/ Churna	Hair fresh	-	-	100 g	45
	Fruit	Fresh	Hair wash	1kg	25	-	-
Shorea robusta Gaertner [Dipterocarpaceae]; *Sal;* Gorumara, *637*	Resin	Dry	Sal Dhup	500g	50	100 g	15
Sterculia villosa Roxburgh [Malvaceae]; *Odal*; Budhira, *1245*	Fruit	Dry	Decoration	1kg	18	-	-
Syzygium cumini (Linnaeus) Skeels [Myrtaceae]; *Jam*; Dhupjhora, *188*	Seed	Dry	Medicine	-	-	100 g	4
	Fruit	Fresh	Edible	1kg	15	-	-
Syzygium jambos (Linnaeus) Alston [Myrtaceae]; *Golabjaam*; Bichha Bhanga, *1257*	Fruit	Fresh	Edible	1kg	15	-	-
Terminalia arjuna (Roxburgh *ex* De Candolle) Wight & Arnott [Combretaceae]; *Arjun*; Dhupjhora, *1412*	Bark	Dry/ Churna	Medicine/ Arjun Tea	1kg	60	100 g	45
	Fruit	Dry	Decoration	1kg	10	-	-
Terminalia bellirica (Gaertner) Roxburgh [Combretaceae]; *Kathbadam*, *Boira*; Murti, *376*	Fruit	Dry/ Churna	Medicine/ Trifala	1kg	200	100 g	45
Terminalia chebula Retzius [Combretaceae]; *Haritaki*; Murti, *360*	Fruits	Churna	Medicine/ Trifala	1kg	200	100 g	45
Thysanolaena latifolia (Roxburgh *ex* Hornemann) Honda [Poaceae]; *Jharu*; Gorumara, *636*	Whole plant & Inflore-scence	Dry	Jharu	1 jharu	10	-	-
Tinospora crispa (Linnaeus) Hooker *f.* & Thomson [Menispermaceae]; *Gulancga*; Dhupjhora, *189*	Stem	Dry/ Churna	Medicine	-	-	100 g	75
	Stem	Fresh	Medicine	1kg	90	-	-
Vitex negundo Linnaeus [Lamiaceae]; *Nishinda;* Budhira, *1249*	Leaf	Dry/ Churna	Medicine	-	-	100 g	45
Ziziphus jujuba Miller [Rhamnaceae]; *Kul;* Dhupjhora, *195*	Fruit	Fresh	Edible	1kg	10	-	-

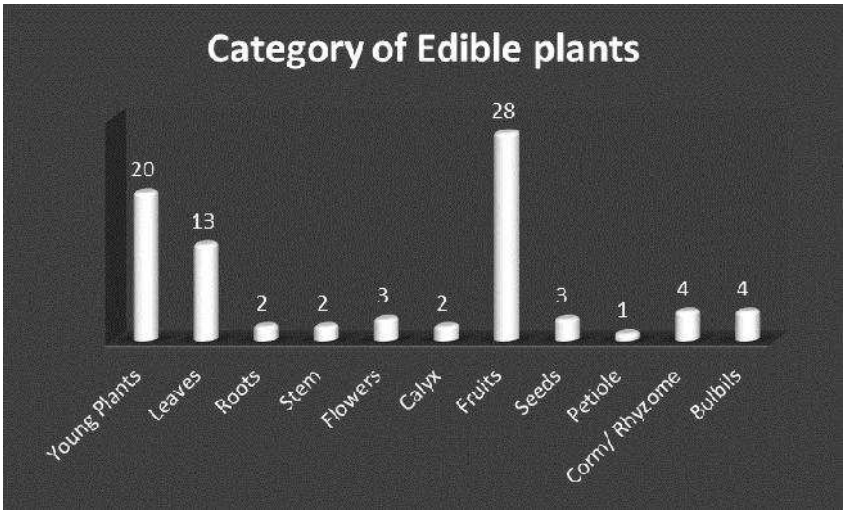

Fig. 2. Numerical classification of edible plant parts recorded from GNP

A total of 58 species of edible plants (commercial and non-commercial) has been recorded from the present survey in GNP. Of these 28 species of fruits are consumed by the forest villagers directly or as vegetable. 20 species of young plants or plant twigs are used mainly as vegetables, and 13 species are used as leafy vegetables (Fig. 2).

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Survey of medicinal plants in the Gorumara National Park, Jalpaiguri, West Bengal, India

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Abstract

Gorumara National Park is located in Duars and falling in the Jalpaiguri District of West Bengal. The National Park area is surrounded by plantations of Khayer, Jarul, Bambu, Amlaki, Chalta etc. *Shorea robusta* occurs with its usual associates namely *Schima wallichii, Magnolia champaca,* and *Terminalia bellirica*. All these species have popular medicinal use. The other important species which are also used as medicinal plants by local people include *Terminalia myriocarpa, Bischofia javanica, Bombax ceiba, Acacia catechu,* and *Albizia* spp. A total of 192 medicinally important plants have been recorded during the present three years long survey.

***Key word*:** Gorumara National Park, Medicinal plants.

INTRODUCTION

Wild plants have always been an important component of healthcare throughout the human history (Pushpangadan 2002; Toksoy *et al* 2010). Since time immemorial, people have gathered plant and animal resources from nature to meet up their various needs (Schippmann *et al* 2002). The major biodiversity rich areas of North Bengal are Terai, Duars and the Hills of Darjiling [a part of Eastern Himalaya]. The present study area, Gorumara National Park (GNP), is located in Duars and falling in the Jalpaiguri District of West Bengal. Though this is comparatively a smaller park (7945.28 hectare) but its location is very critical. Murti, Jaldhaka, Garati and Indong are the main rivers passing through this important Protected Area. The entire forest tract of GNP comes under the North Indian moist tropical forest type in Champion & Seth's (1968) classification. The trees which are commonly found within the forest and are highly important from the economic and ecological points of view includes *Shorea robusta* Gaertner *f.*. This species occurs here with its usual associates like *Schima wallichii* Choisy, *Chukrasia tabularis* A. Jussieu, *Magnolia champaca* (Linnaeus) Baillon *ex* Pierre and *Terminalia bellirica* (Gaertner) Roxburgh. The other important species which are also commonly seen in GNP includes *Lagerstroemia parviflora* Roxburgh, *Terminalia myriocarpa* Van Heurck & Müller, *Duabanga grandiflora* (DC.) Walpers, *Aglaia spectabilis* (Miquel) S.S. Jain & S. Bennet, *Aphanamixis polystachya* (Wallich) Parker, *Bischofia javanica* Blume, *Bombax ceiba* Linnaeus, *Acacia catechu* (Linnaeus *f.*) Willdenow, *Dalbergia sissoo* DC. and *Albizia spp.* etc. During botanical survey of

GNP, Mohanty (2008) recorded 70 species belonging to 38 families those have medicinal values.

The GNP area is surrounded by plantations of *Acacia catechu* (Linaeus *f.*) Willdenow, *Lagerstroemia speciosa* (Linnaeus) Persoon, *Bambusa* spp., *Phyllanthus emblica* Linnaeus, *Dillenia indica* Linnaeus, etc. All these species has popular medicinal use. The important tree species those are used as medicine by local people include *Terminalia myriocarpa* Van Heurck & Müller, *Bischofia javanica* Blume, *Bombax ceiba* Linnaeus, *Acacia catechu* (Linnaeus *f.*) Willdenow and *Albizia* spp. However, most of the medicinally interesting plants are herbs and shrubs. Keeping the richness of the medicinal plants in GNP in mind, a survey was conducted to record such plants during the years 2006 to 2009.

METHODOLOGY

First hand information regarding the medicinal uses of different plants was gathered through interactions with tribal people in local forest villages. Further interactions with local *Baidyas* were also helpful to gather information regarding commonly used medicinal plants. During interactions, prepared semi-structured questionnaire (Medicinal Plants Datasheet) was used following Jain (1995) and Sarkar (2011). To ascertain the uses of these medicinal plants the earlier published literatures of Das & Mandal (2003), Das *et al* (2010), Joy *et al* (1998), Ansari (1993), Biswas & Chopra (1982), Chomchalow & Henle (1995), Chopra *et al* (1980), Dey (1980), Dey (1984), FAO (1993), Graves (1996), Husain *et al* (1992), Kirtikar & Basu (1935), Khare (2004), Kurup *et al* (1979), Nadkarni (1998), Satyavati *et al* (1986, 1987) and Sivarajan & Balachandran (1994) were also followed.

Plant specimens were processed following Jain & Rao (1977), identified in the Taxonomy and Environmental Biology Laboratory of the Department of Botany, North Bengal University, matched at CAL and NBU and finally deposited at NBU.

RESULT AND DISCUSSION

During the present study, 127 species of medicinal plants has been recognized those are directly used by the local people. Of these, 36 are trees, 34 are shrubs and climbers and 57 are herbaceous plants. The local people not only use all the listed plants, they have also detailed knowledge about the availability, local distribution and various other aspects related to these plants. Apart from these, literature supported additional 65 species of plants of medicinal importance also has been recorded during the present explorations. However, these are not included in the present enumeration. All the 127 species of recorded medicinal plants are presented below in Table – 1 along with their uses. From the collected data, the study area of Gorumara National Park is very rich in medicinal plants of which maximum plants are used to treatment of cold, cough, fever, dysentery and diarrhea. It is very interesting to note that 29 species of recorded plants are very popular in this region as cure to dysentery and diarrhea. In majority of cases, they used leaves and bark of different species. More than 36 species of plants used against fever, cold and cough. In this case, popularly used whole plants, sometimes only roots are used. For the treatment of snake bite generally roots and barks are used. It is also noted that the local traditional practitioners find plants in GNP for the treatment of many difficult diseases like cancer, throat sore, bronchitis, gonorrhea, syphilis, leprosy, paralysis, Parkinson's disease, diphtheria, irregular menstruation, jaundice, ulcers, etc. and also for contraception, smooth delivery, abortion,

etc. In fact, local people recognize one or more plants to treat almost all types of diseases they suffer from the GNP.

GNP is a protected area but too much of tourism related commercial exploitation is, probably, affecting the biological diversity of this prestigious park of the country.

Table 1. Medicinal plants recorded from the Gorumara National Park in the Jalpaiguri district of West Bengal

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Ageratum conyzoides Linnaeus [Asteraceae]; *Bhusbhuse; Murti, Goutam & A.P. Das 331*	Leaves, flowers, roots, whole plant	Leaves used in wounds, cuts and burns; root juice antibiotic, plants used febrifuge
Alstonia scholaris (Linnaeus) R. Brown [Apocynaceae]; *Chhatim*; *Indong, Goutam & A.P. Das 117*	Bark, leaves	Anthelmintic, laxative; good in heart disease, skin disease, leucoderma, asthma, ulcers
Ampelocissus barbata (Wallich) Planchon [Vitaceae]; *Gorumara, Goutam & A.P. Das 671*	Whole plant	Plants are used in fever, cough, tonic
Andrographis paniculata (Burman *f.*) Nees [Acanthaceae]; *Kalmegh*; *Budhiram, Goutam & A.P. Das 1123*	Whole plant	Dental disease, antibacterial, anti-inflammatory, fever, dysentery, diarrhea, cough, sore throat, tonsillitis, bronchitis, hypertension, snake bite
Ardisia solanacea Roxburgh [Myrsinaceae]; *Dhupjhaora, Goutam & A.P. Das 114*	Roots	Fever, rheumatism, diarrhea
Asparagus racemosus Willdenow [Liliaceae]; *Shatamuli; Khunia, Goutam &A.P. Das 32*	Roots	Used in dysentery, diarrhea, leprosy, diabetes, jaundice, urinary disorders; anti-fungal and anti bacterial
Bauhinia purpurea Linnaeus [Caesalpiniaceae]; *Kanchan; Dhupjhora, Goutam & A.P. Das 97*	Barks, roots, flowers	Barks used in diarrhea; roots used in animal bite; flowers laxative; roots carminative
Bidens pilosa Linnaeus [Asteraceae]; *Murti, Goutam & A.P. Das 346*	Whole plant	Used in toothache, rheumatism, leprosy, skin disease; checks bleeding; leaf juice used in ear and eye complaints
Bischofia javanica Blume [Bischofiaceae]; *Kainjal; Dhupjhora, Goutam & A.P. Das 91*	Leaves	Leaf juice used in sores, tonsillitis, and throat pain
Boehmeria rugulosa Weddell [Urticaceae]; *Murti, Goutam & A.P. Das 339*	Bark	Diuretic; snake bite, colic pain during pregnancy
Bombax ceiba Linnaeus [Bombacaceae]; *Simul; Murti, Goutam & A.P. Das 335*	Roots, gums, flowers	Used in diarrhea, dysentery; also as astringent, stimulant and emetic
Buddleja asiatica Loureiro [Buddlejaceae]; *Gorumara, Goutam & A.P. Das 617*	Leaves, flowers, stems	Used in skin complaints and to induce abortion
Callicarpa arborea Roxburgh [Verbenaceae]; *Khunia, Goutam & A.P. Das 057*	Bark	Carminative, used in rheumatism, gonorrhea and skin diseases
Calotropis gigantea (Linnaeus) Dryand [Asclepiadaceae]; *Akanda*; *Khunia, Goutam & A.P. Das 58*	Whole plant	Sores & skin disease, leprosy, leucoderma, ulcers; leaves applied to paralyzed parts, painful joints, swellings, bronchitis, asthma, skeletal fracture; plants emetic, purgative, anthelmintic, antifungal
Cannabis sativa Linnaeus [Cannabinaceae]; *Bhang; Khunia, Goutam & A.P. Das 65*	Leaves, inflorescence	Used in hysteria, asthma, neuralgia, stomachic, astringent, alterative, hypertension, diabetes, spasmodic cough, indigestion

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Cassia fistula Linnaeus [Fabaceae]; *Bandarlathi; Murti, Goutam & A.P. Das 349*	Leaves, bark, root, seeds	Purgative, laxative, astringent, antipyretic, demulcent, tonic; ringworm, syphilis, skin disease, leprosy, ulcers, ophthalmic diseases, dyspepsia, constipation, fever, strangury, diabetes
Castanopsis indica (Roxburgh) A.DC. [Fagaceae]; *Kathbadam; Murti, Goutam & A.P. Das 352*	Bark	Antiviral, hypotensive, diuretic, anticancerous
Centella asiatica (Linnaeus) Urban [Apiaceae]; *Thankuni; Murti, Goutam & A.P. Das 313*	Whole plant	Tonic, antibacterial, anti-inflammatory, diuretic, digestive; diabetes, pneumonia, diarrhoea, dysentery, jaundice, constipation, leucorrhoea
Choerospondias axillaris (Roxburgh) B.L. Bruth & A.W. Hill [Anacardiaceae]; *Bonamra; Murti, Goutam & A.P. Das 366*	Fruits, seed oil	Antispasmodic
Cinnamomum glanduliferum Meissner [Lauraceae]; *Malagiri*; *Gorumara, Goutam & A.P. Das 619*	Seeds, wood	Antibacterial, uterotonic; respiratory problems, dyspepsia, colic, diarrhea, cough, asthma, snake bite
Cissampelos pareira Linnaeus [Menispermaceae]; *Gorumara, Goutam & A.P. Das 623*	Leaves, bark, roots	Antipyeretic, diuretic, laxative; dyspepsia, dropsy, dysentery, urinary trouble, ulcers, colic
Citrus maxima (Burman) Merrill [Rutaceae]; *Jambura; Khunia, Goutam & A.P. Das 42*	Fruits	To treat leprosy, asthma, cough, epilepsy, mental aberration, anthelmintic, diarrhea, headache, eye trouble; general and cardiac tonic
Citrus medica Linnaeus [Rutaceae]; *Lebu; Khunia, Goutam & A.P. Das 44*	Fruits	Used in typhoid, indigestion, dysentery
Colebrookea oppositifolia Smith [Lamiaceae]; *Gorumara, Goutam & A.P. Das 615*	Leaves, roots	Skin infection, epilepsy, gastric trouble
Costus speciosus (Koenig *ex* Retzius) J.E. Smith [Zingiberaceae]; *Kemukh*; *Gorumara, Goutam & A.P. Das 643*	Roots, stem	Diabetes, anti-inflammatory, fever, biliuria, rheumatism, neuralgia
Curcuma zedoaria (Christmann) Roscoe [Zingiberaceae]; *Gorumara, Goutam & A.P. Das 645*	Rhizome	Anthelmintic, antipyretic, laxative, tonic, carminative, emetic; leucoderma, bronchitis, piles, asthma, fever, epilepsy, pains, toothache, leucorrhoea
Datura metel Linnaeus [Solanaceae]; *Dhutro*; *Gorumara, Goutam & A.P. Das 648*	Fruits	Hydrophobia, convulsion, neuralgia, rheumatic swelling, sciatica, dog bite, asthma
Datura stramonium Sieber *ex* Bernh. [Solanaceae]; *Dhutro; Gorumara , Goutam & A.P. Das 624*	Fruits	Asthma, whooping cough, parkinsonism, bronchial and gastro intestinal problems, indigestion, neuralgia, rheumatic pain
Dillenia indica Linnaeus [Dilleniaceae]; *Chalta; Murti, Goutam & A.P. Das 373*	Barks, leaves, fruits	Stomachache, fever, cough, astringent, laxative
Dioscorea alata Linnaeus [Dioscoreaceae]; *Chuprialu; Gorumara, Goutam & A.P. Das 652*	Tubers	Diuretic, anthelmintic, diabetes, leprosy, gonorrhea, strangury, contraceptive
Dioscorea bulbifera Linnaeus [Dioscoreaceae]; *Chuprialu*; *Gorumara, Goutam & A.P. Das 653*	Tubers	Alternative, tonic, aphrodisiac, stomachic, expectorant, anthelmintic; dyspepsia, urinary discharge, bronchitis, leucoderma, piles, tumours, strangury, asthma, ulcers
Dioscorea pentaphylla Linnaeus [Dioscoreaceae]; *Pachpata alu*; *Gorumara, Goutam & A.P. Das 656*	Tubers, shoot	Used in dropsy, rheumatism, anti-inflammable

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Drymaria cordata Willd. *ex* Roemer & Schultis [Caryophyllaceae]; *Abhijalo; Gorumara, Goutam & A.P. Das 664, Goutam & A.P. Das 691*	Whole plant	Used in sinus, headache, cold, snake bite, fever, asthma, diphtheria, pneumonia, throat pain
Eclipta prostrata (Linnaeus) Linnaeus [Asteraceae]; *Kesut*; *Gorumara, Goutam & A.P. Das 693, Murti, Goutam & A.P. Das 353, Goutam & A.P. Das 378*	Whole plant	In skin diseases, wounds, ulcers, leprosy, fever, jaundice; good for blackening and strengthening hair
Eleusine coracana (Linnaeus) Gaertner [Poaceae]; *Gorumara, Goutam & A.P. Das 712*	Grains	Astringent, coolant, purgative; blood disease, small pox, pneumonia
Enydra fluctuans DC. [Asteraceae]; *Helancha; Dhupjhora, Goutam & A.P. Das 164, Gorumara, Goutam & A.P. Das 611*	Young twigs	Eaten as a vegetable; blood purifier
Entada rheedii Sprengel [Fabaceae]; *Gila; Dhupjhora , Goutam & A.P. Das 166*	Seeds	In mumps, body pain, cold; oral contraceptive, astringent, emetic, narcotic
Equisetum debile Roxburgh [Equisetaceae]; *Gorumara , Goutam & A.P. Das 625*	Aerial parts	In nose bleeding, wounds, gonorrhea, bleeding urinary tract; astringent
Eupatorium cannabinum Linnaeus [Asteraceae]; *Kalobanmara*; *Gorumara , Goutam & A.P. Das 657, Murti, Goutam & A.P. Das 353*	Roots, leaves	Emetic, purgative, antiseptic in cuts and burns
Euphorbia hirta Linnaeus [Euphorbiaceae]; *Murti, Goutam & A.P. Das 319*	Whole plant	In asthma, bronchitis and other respiratory disorders
Euphorbia pulcherrima Willdenow [Euphorbiaceae]; *Lalpata*; *Murti, Goutam & A.P. Das 354*	Leaves, flowers	Laxative, anticancerous; skin disease
Euphorbia royleana Boiss [Euphorbiaceae]; *Gorumara, Goutam & A.P. Das 655*	Latex	Anthelmintic, cathartic
Ficus benghalensis Linnaeus [Moraceae]; *Bot*; *Murti, Goutam & A.P. Das 377*	Whole plant	Astringent, tonic; ulcers, vomiting, fever, inflammation, leprosy, piles, diseases of nose, gonorrhea, syphilis, dysentery, liver problems, rheumatism, toothache, diabetes
Ficus benjamina Linnaeus [Moraceae]; *Murti, Goutam & A.P. Das 320, 378*	Leaves, milky juice	Ulcers, complaints of cornea
Ficus religiosa Linnaeus [Moraceae]; *Pankur*; *Gorumara, Goutam & A.P. Das 626, Murti, Goutam & A.P. Das 370*	Whole plant	Blood diseases, leucorrhoea, burning sensation, foul test, ulcers, bone fracture, urine discharge, asthma, inflammation, vomiting, gonorrhea; laxative, astringent, alterative, antibacterial
Ficus semicordata Smith [Moraceae]; *Murti, Goutam & A.P. Das 371*	Milky latex, fruits, roots	Ulcers, colic pain, leprosy, bladder complaints
Glinus oppositifolius A. DC. [Molluginaceae]; *Gima*; *Khunia, Goutam & A.P. Das 069*	Whole plant	Stomachic; juice applied to itch and other such skin troubles; a popular vegetable
Gynocardia odorata R. Brown [Achariaceae]; *Chalmogra*; *Gorumara , Goutam & A.P. Das 653*	Fruits, seeds	Anthelmintic; fever, piles, ulcers, bronchitis, diabetes, skin disease, leprosy, rheumatism
Hedychium coronarium Koenig [Zingiberaceae]; *Dolonchampa*; *Budhiram, Goutam & A.P. Das 1347*	Rhizomes	Carminative, stimulant; applied to sprains
Hedyotis scandens Roxburgh [Rubiaceae]; *Dhupjhora, Goutam & A.P. Das 169*	Roots, whole plants	Eye disease, colic pain, sprains, boils, problems during childbirth

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Holarrhena pubescens (Buchanan- Hamilton) Wallich *ex* DC. [Apocynaceae]; *Kuchila; Gorumara , Goutam & A.P. Das 627*	Bark, stem latex	Dysentery, lung diseases, tumour, skin eruption, irritation
Houttuynia cordata Thunbergh [Saururaceae]; *Ashtani; Murti, Goutam & A.P. Das 357*	Whole plant	Stomach disorder, irregular menstruation, opthalmia, hemorrhoids
Imperata cylindrica (Linnaeus) Rausch [Poaceae]; *Kush*; *Murti, Goutam & A.P. Das 358*	Whole plant	Good in fever, cough, jaundice, kidney problems, internal bleeding, nasal bleeding, lung problems; antiviral, anticancer
Ipomoea aquatica Forsskal [Convolvulaceae]; *Kolmi; Khunia, Goutam & A.P. Das 064*	Young twigs	A good vegetable; used for women suffering from nervous and general debility
Justicia adhatoda Linnaeus [Acanthaceae]; *Basak; Indong, Goutam & A.P. Das 112, Khunia, Goutam & A.P. Das 056*	Leaves	Piles, bronchial asthma, bronchitis, pyorrhea, cough, ulcers, menorrhagia, tuberculosis
Justicia gendarussa Burman *f*. [Acanthaceae]; *Dhupjhora, Goutam & A.P. Das 171,*	Leaves, roots	Chronic rheumatism, facial paralysis, cough, bronchitis, arthritis, intermittent fever
Kalanchoe pinnata Persoon [Crassulaceae]; *Pathorkuchi; Murti, Goutam & A.P. Das 321*	Leaves	Fresh leaves used to treat burns, wounds, impetigo, ulcer and other external applications
Lasia spinosa Thwaites [Araceae]; *Kantakochu; Gorumara, Goutam & A.P. Das 648*	Leaves, inflorescence	Plant recommended for colic, rheumatism, and intestinal diseases
Lepidagathis incurva Buchanon Hamilton *ex* D. Don [Acanthaceae]; *Murti, Goutam & A.P. Das 369*	Leaves and young twig	Leaves and young twig chewed to relieve cough
Leucas indica R. Brown [Lamiaceae]; *Murti, Goutam & A.P. Das 379*	Leaves, young twig	Leaf juice highly recommended in diabetes, useful as nasal drop
Litsea glutinosa Robinson [Lauraceae]; *Pipal; Dhupjhora, Goutam & A.P. Das 173,*	Leaves	Mucilaginous bark used in diarrhea and dysentery, rheumatic gout joints
Mallotus philippensis (Lamarck) Mueller [Euphorbiaceae]; *Sindure; Gorumara, Goutam & A.P. Das 647*	Leaves and fruits	Improving appetite, ulcers, wounds, tumour, bladder stone, bronchitis, enlarged spleen, scabies, ringworm, skin diseases; vermifuge, purgative, anthelmintic, carminative
Manihot esculenta Crantz [Euphorbiaceae]; *Shimultarul; Murti, Goutam & A.P. Das 367*	Root	Ulcers
Melastoma malabathricum Jack [Melastomataceae]; *Dantrangi; Dhupjhora, Goutam & A.P. Das 174*	Bark and leaves	Skin troubles
Mimosa pudica Linnaeus [Fabaceae]; *Lajjabati; Murti, Goutam & A.P. Das 325*	Leaves, roots and seeds	Toothache, leprosy, dysentery, vaginal and uterine complaints, inflammation, leucoderma, fatigue, asthma, blood diseases, bilious fevers, jaundice, leprosy, ulcers, small pox, piles
Momordica charantia Descourt [Cucurbitaceae]; *Uchchhe*; *Dhupjhora, Goutam & A.P. Das 177,*	Fruits	Leprosy and malignant ulcers, stomach worms, fever, hypertension, dysentery, diabetes
Momordica dioica Roxburgh *ex* Willdenow [Cucurbitaceae]; *Kakrol*; *Murti, Goutam & A.P. Das 383*	Roots	Bleeding piles and urinary complaints
Morinda angustifolia Roxburgh [Rubiaceae]; *Haldikath; Murti, Goutam & A.P. Das 391*	Leaves, bark, fruits, roots	Roots cathartic. Leaves febrifuge, tonic; used to cure ulcers, dysentery, diabetes, asthma

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Morus australis Poiret [Moraceae]; *Tut*; *Murti, Goutam & A.P. Das 359*	Leaves, bark, roots, fruits.	Burning sensation, scabies; laxative, aphrodisiac, diuretic, anthelmintic, purgative, astringent
Mucuna pruriens (Linnaeus) DC. [Fabaceae]; *Gorumara, Goutam & A.P. Das 645*	Seeds, roots	Nerve tonic, anthelmintic, purgative; fever, cholera, scorpion stings
Musa balbisiana Colla [Musaceae]; *Kala; Murti, Goutam & A.P. Das 392*	Fruits, stem, roots	Anthelmintic, tonic, astringent; menstrual disorder, blood disease, leprosy, diabetes, dyspepsia, strangury, urinary discharge, bronchitis, inflammation, diabetes, diarrhoea
Mussaenda roxburghii Hooker *f.* [Rubiaceae]; *Dhupjhora, Goutam & A.P. Das 178*	Leaves, flowers, roots	Jaundice, leprosy, asthma, internal fever, dropsy, ulcers; diuretic
Ocimum tenuiflorum Linnaeus [Lamiaceae]; *Tulsi; Dhupjhora, Goutam & A.P. Das 198*	Leaves, seeds and roots	Tonic; gastritis, throat trouble, digestive problems, ring worm, skin disease, malaria fever; leaves insect repellent
Oroxylam indicum (Linnaeus) Ventenat [Bignoniaceae]; *Totala*; *Khunia, Goutam & A.P. Das 63*	Bark, seeds	Diabetes, rheumatic swellings, fever, bronchitis, vomiting, dysentery, leucoderma, asthma, piles, heart trouble, inflammation; anthelmintic, stomachic, tonic, carminative, purgative, appetizer
Oxalis corniculata Linnaeus [Oxalidaceae]; *Ambalisak*; *Dhupjhora, Goutam & A.P. Das 179*	Plants	Dysentery, diarrhea, piles, asthma, skin disease; refrigerant, appetizer
Paederia foetida Linnaeus [Rubiaceae]; *Gondhopata*; *Dhupjhora, Goutam & A.P. Das 199*	Leaf, stem	Tooth decay, digestive problems, inflammation, piles, fever, eye disease; laxative, tonic
Phlogacanthus thyrsiflorus (Roxburgh) Nees [Acanthaceae]; *Rambhang*; *Murti, Goutam & A.P. Das 327*	Leaves, bark, flowers	Cough and cold, leprosy, vomiting, urinary discharge, asthma, bronchitis, piles; astringent, tonic, antipyretic
Phyllanthus emblica Linnaeus [Euphorbiaceae]; *Amlaki*; *Dhupjhora, Goutam & A.P. Das 180*	Fruits, leaves, barks, roots	Indigestion, leprosy, vomiting, constipation, asthma, bronchitis; astringent, tonic, laxative, antipyretic, carminative
Phyllanthus urinaria Linnaeus [Euphorbiaceae]; *Gorumara, Goutam & A.P. Das 644*	Whole plant	Used in constipation; stomachic
Phyllanthus virgatus Forster *f.* [Euphorbiaceae]; *Budhira, Goutam & A.P. Das 1237*	Roots	Fresh roots used to treat viral hepatitis
Physalis minima Linnaeus [Solanaceae]; *Bon Tepari; Murti, Goutam & A.P. Das 362*	Whole plant	Colic, ulcers, cough, bronchitis
Piper betleoides C. DC. [Piperaceae]; *Bhote Pan*; *Gorumara, Goutam & A.P. Das 674*	Leaves, roots	Leaves antibacterial; wounds, burns, eczema; topically applied on chest to cure cough and asthma, and to breasts in arrested lactation. Roots used in rheumatism
Piper longum Linnaeus [Piperaceae]; *Pipul*; *Murti, Goutam & A.P. Das 393*	Fruit	Menstrual disorder, enlarged spleen, tumour, liver problems, gout, jaundice; carminative, anthelmintic, diuretic, digestive
Piper peepuloides Roxburgh [Piperaceae]; *Pipul; Dhupjhora, Goutam & A.P. Das 181,*	Fruit	Cough & cold and, gastralgia, dyspepsia; digestive. tonic, carminative, stimulant
Plantago erosa Wallich [Plantaginaceae]; *Jangli Isabgul; Murti, Goutam & A.P. Das 363*	Plants, leaves, roots	Toothache, fever, dysentery, rheumatism; stimulant, tonic.

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Plumbago zeylanica Linnaeus [Plumbaginaceae]; *Chita*; *Budhiram, Goutam & A.P. Das 1348*	Roots	Ulcers, rheumatism, paralysis, syphilis, leprosy, various skin problems; stimulants
Pouzolzia zeylanica Bennet [Urticaceae]; *Gorumara, Goutam & A.P. Das 675*	Roots	Roots eaten to cure dysentery, cough and asthma
Premna latifolia Roxburgh [Verbenaceae]; *Ginari*; *Murti, Goutam & A.P. Das 395*	Leaves, tender shoot	Eaten in curries as diuretic, blood purifier and in dropsy
Psidium guajava Linnaeus [Myrataceae]; *Peyara*; *Budhira , Goutam & A.P. Das 1238*	Leaves, bark, fruits	Dysentery, ulcers, bronchitis, colic, diarrhea, toothache; astringent, tonic, laxative
Pterospermum acerifolium (Linnaeus) Willdenow [Sterculiaceae]; *Dhuojhora, Goutam & A.P. Das 183*	Leaves, flowers	Ulcers, leprosy, urinary discharge, tumours; tonic, anthelmintic, laxative
Rauvolfia serpentina (Linnaeus) Bentham [Apocynaceae]; *Swarpagandha, Chando*; *Gorumara, Goutam & A.P. Das 638*	Roots	Hypnotic, sedative, snake bite, blood pressure, insomnia, scorpion sting.
Rhus chinensis Miller [Anacardiaceae]; *Bhalay*; *Budhiram, Goutam & A.P. Das 1349*	Fruits	Dysentery, indigestion, diarrhoea, colic, gulls, swelling and wounds, paralysis.
Ricinus communis Linnaeus [Euphorbiaceae]; *Rerhi, Bharenda; Garati, Goutam & A.P. Das 88*	Bark and Seeds	Seed oil is used as a purgative. Bark is used to treat skin inflammations and rashes.
Rungia pectinata Nees [Acanthaceae]; *Dhupjhora, Goutam & A.P. Das 198, Gorumara, Goutam & A.P. Das 1389*	Whole plants	Juice of plants is applied as febrifuge.
Sapindus rarak DC. [Sapindaceae]; *Ritha*; *Budhiram, Goutam & A.P. Das 1257*	Fruits	Fruits saponaceous, used like soapnuts as a detergent to falling of hair.
Sauropus compressus Mueller [Euphorbiaceae]; *Chipti*; *Murti , Goutam & A.P. Das 396, Gorumara, Goutam & A.P. Das 1387*	Leaves	The fresh leaves are used for the treatment of retained Placenta. A mouth-wash made of the juice of fresh leaves and honey and applied to the tongue.
Schima wallichii (DC.) Korthals [Theaceae]; *Chilaoni; Gorumara, Goutam & A.P. Das 1386*	Bark	Anthalmintic, vermicide, gonorrhoea.
Scoparia dulcis Linnaeus [Scrophulariaceae]; *Misti pata; Dhupjhora, Goutam & A.P. Das 184*	Plants	Piles, diuretic, hyperthermia, cough, sore throat, boils, menorrhigia.
Semecarpus anacardium Linnaeus *f.* [Anacardiaceae]; *Budhiram, Goutam & A.P. Das 1350*	Bark, fruits	Skin disease, dysentery, fever, piles, tumour, ulcers, urinary discharge, inflamation, laxative, carminative, paralysis, epilepsy, nervous disease, tonic.
Shorea robusta Gaertner [Dipterocarpaceae]; *Sal; Gorumara, Goutam & A.P. Das 637*	Resin and leaves	Diarrhoea, astringent, dysentery, fumigating, incense.
Sida acuta Burmann *f.* [Malvaceae]; *Jharugachh*; *Khunia, Goutam & A.P. Das 62*	Leaves and Roots	Leaves and roots used in stomachic and antipyretic, used in nervous and urinary disorders.
Sida cordata (Burmann *f.*) Borss. [Malvaceae]; *Dhuojhora, Goutam & A.P. Das 197*	Roota	The roots are useful in fever and arthritis. The leaves are good for diarrhoea.
Sida cordifolia Forskal [Malvaceae]; *Berala*; *Budhira, Goutam & A.P. Das 1239*	Tender shoots	The plants are used for fever, fits, leucorrhoea, colic and nervous discorders.
Sida rhombifolia Linnaeus [Malvaceae]; *Jharugachh*; *Khunia, Goutam & A.P. Das 47*	Leaves and Roots	The roots and leaves are used in rheumatism and colic.

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Solanum americanum Miller [Solanaceae]; *kalabegun*; *Budhira, Goutam & A.P. Das 1243, Gorumara, Goutam & A.P. Das 1376*	Tender shoots	The plant is useful in rheumatalgia, swellings, cough, asthma, bronchitis, wounds, ulcers, vomiting, leprosy, skin diseases and fever.
Stephania glabra (Roxburgh) Miers [Menispermaceae]; *Tamarke*; *Murti, Goutam & A.P. Das 398*	Root tuber	Jaundice, diabetes, asthma, dysentery, tuberculosis, fever.
Stephania japonica Miers [Menispermaceae]; *Tamarke; Murti, Goutam & A.P. Das 359*	Root tuber	Jaundice, diabetes, fever, astringent, dyspepsia, diarrhoea, piles, urinary discharge.
Syzygium cumini Skeels [Myrtaceae]; *Jam*; *Dhupjhora, Goutam & A.P. Das 188, Gorumara, Goutam & A.P. Das 1377*	Bark, leaves and fruits	The bark is carminative, diuretic, digestive. The tender leaves are used for vomiting. The fruits and seeds are used in diabetes.
Terminalia belirica (Gaertner) Roxburgh [Combretaceae]; *Kathbadam*, *Boira*; *Gorumara, Goutam & A.P. Das 1383*	Fruits and bark	One of the ingredients of the triphala of ayurvedic medicine, anaemia, leuco-derma, astringent, pungent, laxative, bronchitis, acrid, anthelmintic, inflamation, disease of eye and nose, problems of bladder and piles.
Terminalia chebula Retzius [Combretaceae]; *Haritaki*; *Murti, Goutam & A.P. Das 360*	Fruits	Used in stomachic, expectorant, carminative, anthelmintic, tonic, alterative, astringent, dysentery, vomitting, anaemia, elephantiasis, disease of eye, hiccups, tonic.
Terminalia myriocarpa Haurck & Mueller [Combretaceae]; *Pucca saj*; *Murti, Goutam & A.P. Das 399*	Bark	Cardiac stimulant and diuretic.
Thysanolaena maxima (Roxburgh) O. Kuntze [Poaceae]; *Jharu*; *Gorumara, Goutam & A.P. Das 636*	Stems and roots	Boils and used in mouth wash.
Tinospora cordifolia (Willdenow) Miers *ex* Hooker *f.* & Thomson [Menispermaceae]; *Gulancga*; *Dhupjhora, Goutam & A.P. Das 189,*	Leaves, stems and aerial roots	Ear pain, infection, fever, jaundice, vomiting, skin disease, piles.
Toona ciliata M. Roemer [Meliaceae]; *Toon*; *Budhiram, Goutam & A.P. Das 1353*	Bark	Dysentery, ulcers, menstrual disorder, astringent.
Trichosanthes cordata Roxburgh [Cucurbitaceae]; *Vitechhara*; *Khunia, Goutam & A.P. Das 51, Gorumara, Goutam & A.P. Das 1379*	Young twig	The young twig is used in burning sensation, dyspepsia, flatulence, intermittent fevers, chronic fevers, Vomiting and skin diseases.
Trichosanthes lepiniana Cognius [Cucurbitaceae]; *Vitechhara*; *Gorumara, Goutam & A.P. Das 633*	Young twig and fruits	The unripe fruit and the tender shoots used as vegetable to improve appetite and digestion.
Tridax procumbens Linnaeus [Asteraceae]; *Gorumara, Goutam & A.P. Das 1378*	Whole plants	Leaf juice is insecticidal, also used to check hemorrhage of wounds.
Typhonium trilobatum Schott [Araceae]; *Khakroni*; *Budhira, Goutam & A.P. Das 1253*	Whole plants	The rhizome is used with effect for treat in sore throat, headache, gastric ulcer, couth asthma.
Urtica dioca Linnaeus [Urticaceae]; *Sisnu*; *Budhira, Goutam & A.P. Das 1250*	Flowers, plants and roots	High blood pressure, anthelmintic, diuretic, jaundice, carminative, complaints of lungs and internal organs, sciatica, heart troubles, cough, rheumatism.
Vallaris solanacea Kuntze [Apocynaceae]; *Dhupjhora, Goutam & A.P. Das 193*	Latex and bark	Latex and bark is applied to wounds and sores.
Vitex negundo Linnaeus [Verbenaceae]; *Nishinda; Budhira, Goutam & A.P. Das 1249*	Leaves, roots and plant	Toothache, asthma, bronchitis, leucoderma, tonic, rheumatism, antidote to venom and scorpion sting, fever, febrifuge, enlargement of spleen, astringent, anthelmintic.
Woodfordia fruticosa (Linnaeus) Kurz [Lythraceae]; *Murti, Goutam & A.P. Das 361*	Flowers and bark	Dysentery, astringent tonic, sores and boils, piles, leprosy, disease of blood, toothache, leucorrhoea, menorrhagia, dysentery.

Scientific Name [Family]; Local name; Exsiccate	Used Parts	Uses
Wrightia arborea (Dennstied) Mabberley [Apocynaceae]; *Khira*; *Gorumara, Goutam & A.P. Das 629, Budhira, Goutam & A.P. Das 1245*	Bark	Dried bark is used in dysentery.
Zanthoxylum acanthopodium DC. [Rutaceae]; *Timbur*; *Khunia, Goutam & A.P. Das 49*	Aerial parts	Used in eye and ear disease, brain disease, purity of blood, fever, dyspepsia, cholera, toothache, stomachache, anthelmintic, carminative, mouth freshener.
Zanthoxylum rhetsa DC. [Rutaceae]; *Timbur; Dhupjhora, Goutam & A.P. Das 194*	Fruits	Fruits used in toothache and mouth freshener.
Zizyphus mauritiana Lamarck [Rhamnaceae]; *Kul; Dhupjhora, Goutam & A.P. Das 195, Budhira, Goutam & A.P. Das 1244*	Leaves, bark, fruits and root	Dysentery, diarrhoea, blood disease, eye disease, ulcers, strangury, fever, antipyretic, headache, boils, leicorrhoea, asthma, wounds.

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