

**Study on Diversity and Ecology of Vascular plants at Medicinal
Plant Conservation Areas (MPCAs) in Terai & Duars,
West Bengal**

*Thesis submitted to the University of North Bengal
for the Award of Doctor of Philosophy in Botany*

Submitted by
Debanshu Mallick

Supervisor
Prof. (Dr.) Monoranjan Chowdhury




Taxonomy of Angiosperms & Biosystematics Laboratory
Department of Botany
University of North Bengal
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Accredited by NAAC with Grade A

Prof. Monoranjan Chowdhury, Ph.D. Ph.D. Ph.D.

Professor & Head

E-mail: mchowdhury@nbu.ac.in

Mobile No. +91 95641 03349

Life Member IAPT, IAAT, MAPAL (IASS), APT



DEPARTMENT OF BOTANY

P.O. NORTH BENGAL UNIVERSITY

Raja Rammohunpur, Dist. Darjeeling

Siliguri-734013, West Bengal, INDIA

Tel. +91 353 2776337

Website: www.nbu.ac.in

Date: 02.03.2022

TO WHOM IT MAY CONCERN

This is to certify that the thesis entitled, "*Study on Diversity and Ecology of Vascular plants at Medicinal Plant Conservation Areas (MPCAs) in Terai & Duars, West Bengal*" submitted by Mr. Debanshu Mallick, IFS, Chief Conservator of Forests, Research & Development, West Bengal for the award of the degree of Doctor of Philosophy in Botany is based on the results of experiments carried out by him. He has worked under my supervision at Taxonomy of Angiosperms & Biosystematics laboratory of Department of Botany, University of North Bengal. I am now forwarding his thesis for the Ph. D. degree (Science) in Botany of the University of North Bengal. He has fulfilled all requirements according to the rules of the University of North Bengal regarding the works embodied in his thesis. This thesis or any part thereof has not been submitted for any other degree/Diploma either to this or other University.

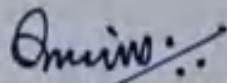
I wish all success in his life.

[Prof. M. Chowdhury]

Dr. Monoranjan Chowdhury
Professor
Department of Botany
University of North Bengal

DECLARATION

I declare that the thesis entitled "**Study on Diversity and Ecology of Vascular plants at Medicinal Plant Conservation Areas (MPCAs) in Terai & Duars, West Bengal**" has been prepared by me under the guidance of Prof. Monoranjan Chowdhury, Taxonomy of Angiosperm and Biosystematics Laboratory, Department of Botany, University of North Bengal. No part of this thesis has formed the basis for the award of any degree or fellowship previously.



[DEBANSHU MALLICK]

Taxonomy of Angiosperm and Biosystematics Laboratory

Department of Botany, University of North Bengal

Rajarammohanpur, Darjeeling-734013

Date:

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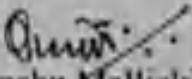
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[Debanshu Mallick]

Department of Botany

University of North Bengal

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ABSTRACT

The plants that utilized for manufacture of Traditional systems of medicine all over the world are termed as “Medicinal plants”. Among all the health centers in the world that use medicinal plants as sources of their medicines, India is one of them. Since ancient times, India has been a land of high depository of medicinal plants and the traditional knowledge of their benefits. Several local communities have formulated their lifestyle with hundreds of traditional therapies and medicinal plant remedies. The Traditional system of medicine has been broadened with the view of their applications based on region and community specific medicinal plants. Some of the specialized fields of health care viz., childcare, traditional birth attendants, antidotes against bites of poisonous organisms, bone setting and mother and postnatal care. Three MPCAs (North Rajabhatkhawa MPCA, Sursuti MPCA and North Sevoke MPCA) of North Bengal (terai and duars) have recorded the occurrence of a rich spermatophytic flora. The undulating *Terai* and *Duars* landforms and temporary or permanent virgin elaborate land systems are forming a mosaic of tall grasslands, savannas, evergreen and deciduous forests. The gentle slope of the Terai and duars is located at 25° 57' to 26° 36' N latitude and 89° 54' to 88° 47' E longitude (Terai) & 26°.16' to 27°.0' N latitude and 88°.4' to 89°.53' E longitude (Duars) with altitudinal range varying from 80 to 100 m above mean sea level. The taxonomic distribution of medicinal plants in these regions is also quite wide. Medicinal Plants Conservation Areas (MPCAs) areas are the virgin broad leaf forest with diverse vegetation. There were representation of primitive taxa like Cyatheaceae, Marattiaceae, Aristolochiaceae, Piperaceae, Lauraceae, Trochodendraceae, Annonaceae, Chloranthaceae, Magnoliaceae etc. in one hand and on other hand progressed taxa like Apiaceae, Araliaceae, Campanulaceae, Asteraceae. Many RET and endemic elements are also living in these MPCAs. The three MPCAs are also the store house for a large number of NTFP resources many of which are of high market potential and also of medicinal importance. Over 35 percent of the resources of Himalayan hotspot are threatened due to various anthropogenic activities. Despite being the store house of medicinal and aromatic plants and the related traditional knowledge, their documentations especially of Terai and Duars region is still lacking. Hence, present work was initiated as the first attempt for the documentation of medicinally important plant and their uses in the traditional system of medicine. Present study shows that the angiosperms are represented by 626 species under 397 genera belonging to 102 families which include Pteridophyte and Angiosperms (monocot and dicot flora). The most

dominating family of three MCPAs are Fabaceae represented by 47 species and 26 genera, followed by Asteraceae 31 species with 27 genera, Rubiaceae 25 species with 19 genera and then Lamiaceae, Lauraceae, Acanthaceae, Malvaceae, Scrophulariaceae, Papaveraceae, Ranunculaceae, Rosaceae, Brassicaceae, Boraginaceae, Primulaceae etc. Around 38 (34 %) of endemic species of monocot and dicot species are acknowledged to be exclusively endemic to the Darjeeling foothills and adjoining area of Terai and Duars region of West Bengal. like *Globba racemosa*, and other endemic elements such as *Carex filicina*, *C. decora*, *Amorphophallus napalensis*, *A. paeoniifolius*, *Calamus latifolius*, *C. erectus*, *C. mahanandensis*, *C. pseudoerectus*, *C. leptospadix*, *Phoenix rupicola*, *Tupistra nutans*, *Carex vesiculosa*, *Dioscorea prazeri*, *Eriocaulon edwardii*, *Molineria crassifolia*, *Zingiber rubens*, *Hedychium densiflorum*, *H. coccineum*, *Curcuma aromatica* and *Bulbophyllum spathulatum* etc are observed from the three MPCAs of North Bengal.

Among the 77 threatened species, 45 are under Least Concern (LC) like *Cryptocarya amygdalina*, *Litsea laeta*, *Machilus duthieii*, *Knema erratica*, *Acorus calamus*, *Calamus tenuis*, *Smilax ovalifolia*, *Murdania japonica*, *Curculigo capitulatae*, *Gloriosa superba*, *Asparagus racemosus*, *Codariocalyx motorius*, *Rauwolfia serpentina*, *Mucuna pruriens* etc. whereas, 12 species are under Near Threatened (NT) like *Actinodaphne sikkimensis*, *Cinnamomum impressinervium*, *Areca triandra*, *Daemonorops jenkinsiana*, *Monochoria hastate*, *Bambusa balcooa*, *Phrynium pubinerve*, *Alpinia calcarata* etc. 10 Vulnerable (VU) species like *Microsorium punctatum*, *Fimbristylis aestivalis*, *Schoenoplectiella juccoides*, *Sccharum arundinaceum*, *Saccharum spontaneum*, *Sporobolus diander*, *Cissus repens*, *Duchesnea indica* *Hoya parasitica* etc. are growing within thr territory of the three MPCAs of North Bengal plains. *Beilschmiedia assamica*, *Leucaena leucocephala*, *Morus indica*, *Drymaria cordata*, *Polycarpon prostratum*, *Justicia diffusa* and *Centella asiatica* are enlisted as Endangered Species (EN). *Piper peepuloides*, *Staria palmifolia* and *Curcuma caesia* are recorded as Critically Endangered species (CR) found in the three MPCAs of North Bengal. Out of the 626 species of recorded flora, 89 species has been enlisted as exotics species mainly found in marginal and road side area of the three MPCAs of North Bengal. Some very common exotic species are *Ageratum conyzoides*, *Ageratum houstonianum*, *Bidens pilosa*, *Digitaria ciliaris*, *Evolvulus nummularius*, *Hyptis suaveolens*, *Mikania micrantha*, *Mimosa pudica*, *Pupalia lappacea*, *Solanum sisymbriifolium*, *Tridax procumbens* etc. are quite common in different forest marginal and forested paths.

The entire area of three MPCAs was surveyed during the years 2017-2021 with the assistance of Wildlife, Silviculture Wing of Forest Department, Govt. of West Bengal. The phytosociological study of the different forested MPCAs, nested quadrates were plotted and minimum of 0.03% areas were covered under quadrate sampling for the better assessment of Biodiversity. For tree layer 10 × 10 m, shrubs and climbers 5 × 5m and herbs 1 × 1 m quadrates were plotted in random methods during three different seasons, namely designated as pre-monsoon [March – April], monsoon [May – July] and post-monsoon [September – November]. The quadrate data are gathered and analyzed through computing for percentage of Frequency, Abundance, Density, Relative Frequency, Relative Density, Relative Abundance and Important Value Index for all the recorded plant species. Using these data, concentration of species (Simpsons Index 1949), Species Richness (Margalef Index 1958 and Menhinick Index 1964), and Species Diversity (Shannon-Weiner Index 1963) etc. has been determined. Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) or Relative Dominance (RDm) [for tree layer only] and Importance Value Index (IVI) were analyzed to understand the importance of diverse species in forest community. The present study shows that the evaluating species diversity and species richness and comparisons of species similarity between different vegetation types, their taxonomic distribution of medicinal plants and endemic, exotic and threatened status of the three MPCAs. The concentration of dominance expresses if there is dominance of one or a few species in the sampled area. Concentration of dominance for tree strata was calculated using Simpson index and the result (ranging from 0.95 – 0.99) showing significant values for all the three MPCAs. Species richness for same vegetation were measured using Menhinick and Margalef Index and calculated values were appeared to be very high for all the studied MCPAs i.e., ranging from 3.27 to 3.76 and 1.49 – 1.63 respectively denoting the high arboreal spermatophytic diversity. The diversity of the plants community of different MCPAs was reflected by Shannon-Weiner index. Its values were found to be high for two MPCAs i.e., North Sevoke and Sursuti whereas it showed extremely low value for NRVK. The present data is indicating a heterogeneous assemblage of herbs, shrubs, climbers and trees in a diverse and stable habitat for North Sevoke, Rajavatkhawa and Sursuti MPCAs. Extensive surveys were conducted during 2017-2021 over the three MPCAs and recorded 626 species of vascular plants and most of the species were traditionally used to cure various ailments the local ethnic communities like *Rajbonshi*, *Rabha*, *Mech*,

Oraon and *Munda* etc. An attempt has been made to record MPCA wise list of indigenous medicinal plants and their ethno-botanical uses of herbal medicines. Total of 364 species of useful medicinal values with NTFPs have been recorded that includes parts of medicinal plants, fruits and tender shoot as edible, religious value, ornamental, fodder, fuel etc.

It is now clear that the medicinal plant diversity is significant, and the ecosystem of West Bengal is somewhat dependent on the wide range of several families. Along with other floristic elements, the medicinal plants of the region at present are under some mild threat of losing their habitat mostly due to anthropogenic reasons like habitat fragmentation, unscientific plant parts extraction and natural causes.

Developmental works, Unscientific collections from wild, Predominance of grey market in the medicinal plant trade, Exploitation of Forest fringe dwellers and forest villagers, Absence of a true data base on our medicinal plant resources etc. and natural threats like Climate change, earthquake, fire etc. Establishment of more such small pieces of dense forested patches need to be declared as MPCAs because these areas provide double layer of protection from various anthropogenic pressure as those areas not even allowed ecotourism.

CHAPTER-1
INTRODUCTION

INTRODUCTION – 1

Among all the health centers in the world that use medicinal plants as sources of their medicines, India is one of them. The plants that are utilized for manufacture of Traditional systems of medicine all over the world are termed as “Medicinal plants”. Owing to effective and chemical free treatment, the Traditional system of medicine has been adopted. Since ancient times, India has been a land of high depository of medicinal plants and the traditional knowledge of their benefits. According to a report, traditional medicine is the only available source of health care for 65% of India’s population. In Ayurveda, around 8000 herbal therapies have been reported and 67, 81, 290, 1100 and 1270 number of medicinal plants species has been recorded in *Rigveda*, *Yajurveda*, *Atharvaveda*, *Charak Samhita* and *Sushrut Samhita* respectively. Out of 17,564 plants, 5200 plants have been recognized for veterinary, human and plant health care in Ayurveda. Ranging from trans-Himalaya down to the coast, the medicinal plants are scattered all over different types of vegetation, forests and a variety of geographical regions. As per the reports of World Health Organization (WHO), 80 % of the world's population depends largely on traditional medicine as their primary health care remedy.

The medicinal plants form an integral part of the biodiversity. Their contribution and therapeutic values to the forestry sector has been realized lately. Forests and wild habitats are home to around 85% of medicinal plant diversity of India. According to Ved and Goraya (2008), 82% of high consumption botanicals in trade originate from wild sources. This fact arouses interest and concern about the medicinal plant resources in the forests. Medicinal plants are the pillar of local poor village people especially for fulfilling their health needs along with Ayurveda, Unani, Siddha and Homoeopathy. A large number of medicinal plant species formulate thousands of home remedies and several classical drugs. Medicinal plants

are of three types basically:

- a. Preventive
- b. Promotive
- c. Curative

It is estimated that of the total medicinal plant diversity, more than two-third are used for promotive and preventive uses and rest for curative purposes. Promotive and

Preventive purposes overrule the curative purposes, which we use in the form of cosmetics, eye care, skin care, dental care, beauty care and many other utilities for all round health care. As household practices, medicinal plants take care of water purification, fumigation and sanitation. During festivals and rituals, some specific medicinal plants serve several purposes to the communities performing them. They too constitute in the season's special diet and preparations pertaining to several occasions and celebrations throughout the year.

Several local communities have formulated their lifestyle with hundreds of traditional therapies and medicinal plant remedies. The Traditional system of medicine has been broadened with the view of their applications based on region and community specific medicinal plants. Some of the specialized fields of health care viz., childcare, traditional birth attendants, antidotes against bites of poisonous organisms, bone setting, and mother and postnatal care.

In India, different clinical and medical streams held a diverse variety of medicinal plants that are listed in Table 1.

Table 1: Medicinal Plants diversity across various medical streams

	Ayurveda	Folk	Homeopath	Modern	Sidha	Tibetan	Unani
Ayurveda	2351	900	189	80	1028	341	880
Folk	900	5137	164	86	971	235	573
Homeopath	189	164	506	100	167	77	173
Modern	80	86	100	204	65	25	75
Sidha	1028	971	167	65	1785	277	641
Tibetan	341	235	77	25	277	350	275
Unani	880	573	173	75	641	275	979

Medicinal plants are marked as a contributor of industrial resources as well. Apart from natural pharmaceuticals, they are well known to us as cosmeceuticals and nutraceuticals too. Podophyllotoxin, Artemisinin, Vincristine, Camptothecin, Paclitaxel, Vinblastine etc. are major plant products and derivatives of drug industries. Around 80% of such products preferred in the pharmaceutical industry are of plant origin (Somashekhar,

2011). Thus, not only they guide us therapy and remedy for several diseases but also displays a huge economic role too on the basis of foreign currency, employment generation, trade turn over, value chains and to all round economy.

The drug industry in the international market as well has high popularity and sound revenue. In 1997, the retail sale of pharmaceutical products globally was calculated as US\$ 80-90 billion approximately. In 2000, the well-known drug Taxol from one plant species *Taxus baccata* was estimated to have a net retail sale of US\$ 2.3 billion. The net annual worth from pharmaceuticals in India is estimated to be rupees 8800 crores and the yearly demand of medicines was calculated to be 319,500 MT, as per the census of the year 2005-2006. And the yearly business value of these drugs are restricted to rupees 1069 crores, as per the census of 2008.

All these facts throw light on how medicinal plants and the pharmaceutical industries rule the world with its high turnovers and huge profits. Some important results have been observed in India considering the medicinal plants involved in the industry and the drugs traded. According to Ved and Goraya (2008a,b), greater than 960 medicinal plant species are utilized for trade in the country and 1289 raw drug forms of these species are in use. Now out of these 960 species, 178 species are introduced to high volume trade and each registering a trade of greater than 100 MT per year.

Medicinal plants which contribute as raw materials to the medicine manufacturing industries are significant members of forests. Industrialization from these industries coupled with urbanization poses a huge threat to the organisms of the forest since it leads to soil erosion and thus the natural habitat losses MAPs biodiversity from the area. Climatic factors and Global warming also are the key factors to this loss. The tropical forests which have been the homeland for plant and animal diversity have been reported to have been lost by about 50%. The annual rate of the disappearance of forest cover in India is estimated to be 1.5mha/yr. Several key medicinal plants are near to the edge of extinction while several others are just a step away from being extinct. Thus, it is advisable to not only develop means to conserve these precious gems but also develop cultivation methods for the increasing demand in industries and household purposes. There is an urgent requirement of transition from collection to cultivation of MAP to ensure authenticity, sustainable supply and purity of raw drugs.

There has been enforcement of several laws and acts regarding environmental protection. Some among them are: Wildlife Protection Act-1972, Environmental (Protection) Act-1986, The Biological Diversity Act-2002 etc. The Govt. of India, with the help of National Medicinal Plant Board, enforced a law of establishment of in-situ and ex-situ conservatory. Apart from performing in-situ and ex-situ conservation and cultivation, these conservatories help in the cultivation of these plants to the cultivars and peasants.

Along with the flourishing drugs and high trade and commerce that these plants produce, they also throw light to the risks that they are in due to their high demand and pressure. Especially the international industries for the sake of export purposes worth millions refer to the forests and medicinal plants as the source of drugs. The topmost pressure of these life saving jewels is their high demand in the market. Thus, the survival of these jewels gets hampered with its huge requirement, thereby supplementing the needs of so many. Owing to high requirements leading to high volume extraction, damaging methods of harvesting are switched to produce within the minimum amount of time. These methods initiate high threat to the plant population and hamper the future plant generations as well, thereby affecting the population's total quantum of raw material.

To make both ends meet, cultivated sources produce less raw drugs. Among 178 medicinal plants that have a record of high-volume trade of greater than 100MT per year, 36 of them are known to be acquired from cultivated sources. Of these 36, Henna, Isabgol (*Plantago ovata*), Aswagandha (*Withania somnifera*), Senna (*Senna* sp) are reported to be cultivated at a high rate in comparison to others. Besides these, Aloe (*Aloe barbadensis*), Sweet flag (*Acorus calamus*), Muskdana (*Abelmoschus moschatus*), *Adhatoda zeylanica* have facilitated their entry in local agricultural systems.

In North India, the cultivation of Amla (Goose berry, *Emblica officinalis*) is done in sizable plantations. According to the Amla growers' association, out of the total production, only 60% finds their usage in the pharmaceutical industry and the remaining 40% are sent for preparation of culinary products like candies, juice, pickles and jam.

Some other species such as Tulsi, Long Pepper, Neem, Guggul and Sweet Basil are known to be present in the same way as Amla that is in sizable plantations. Whereas, Coriander, Black Pepper, Nutmeg, Cinnamon, Cardamom and Clove originated from

the cultivated sources. Besides these examples, owing to supply of raw materials, pharmaceutical industries usually facilitate cultivation in small holdings.

Therefore, it is quite evident that the medicinal plants are attributed to different levels of threat and often affecting their very existence. Some species have become extinct while the population size of some species reduced drastically leading to scarce product availability.

This has been an alarm to us to preserve the base of medicinal plants. There has been an urgent need to set up conservation strategies.

Foundation for Revitalization of Local Health Traditions (FRLHT) initiated exercises for fast threat assessment based on IUCN Red List Categories and Criteria. Based on this methodology, the threatened species were recognized, and their threat status was assessed in 17 different states of the country. Therefore, India's "First list of Threatened species of Medicinal plants" came into being holding a record of 326 threatened species of medicinal plants along with their assigned threat status.

The medicinal plants which are at the verge of extinction are recorded in the Threatened List of Medicinal plants. But the need is to establish a model that would facilitate their conservation. The conservation models of medicinal plants have not been an easy task in comparison to the conservation models of wildlife and biodiversity. For the conservation model to formulate there has been a high requirement of information, such as population size and density of medicinal plant population, the threats to their life, their regeneration ability, propagation techniques, the critical socio-economic elements operating in their habitat, the management issues etc. Thus, it is difficult to construct a conservation model keeping in mind so much information.

1.1. Origin of MPCAs Concept

This rare, endangered and threatened list of valuable medicinal plants offers a list of prioritized medicinal plants in our country, which need conservation and proper utilization. But the challenge is to find a valuable replica that ensures their conservation. While there are experienced conservation models obtainable in respect of wildlife and many other forms of biological diversity. The current understanding of the entire whole scenario is not so comprehensive, and it is rather challenging. Information about natural distribution and size of medicinal and aromatic plant populations, the causes and kinds

of threats, which affect such populations, the issues, related to their regeneration. The critical socio-economic rudiments that operate in a habitat.

However, a compelling model appears in the form of MPCAs. The term MPCA (Medicinal Plants Conservation Area) denotes a forest patch or area of about few hectares selected for conserving distinctive populations or diversity of medicinal plants in their wild natural ecosystem. The MPCAs model is thus an *in-situ* conservation initiative in which the populations are acceptable to flourish, while the conventional forestry administration operations are kept to minimum (FRLHT, 2006).

Govt. of India has reported that for 65% of its population utilizes traditional medicines is the only available source of health care through various herbal modes. Across the various ecosystems, local communities know the use of around 8,000 plant species out of 17,564 species. These medicinal plants are distributed in all bio-geographic regions, vegetation types & landscape in this country. Owing to raising trend in demand of herbal products, there is a possibility of increasing tendency of indiscriminate & unrecorded removal of medicinal plants from the forests. Therefore, the medicinal plants need to be conserved in their natural forests habitat & thus the idea conceived as formation and establishment of MPCA (Medicinal plant conservation Area).

1.2. About MPCAs

At present, this conservation model has been made possible and formulated in the form of MPCA (Medicinal Plants Conservation Area). The term MPCA (Medicinal Plants Conservation Area) refers to a patch of forestland of about 200 ha for the purpose of conservation of diversity of medicinal plant populations in their own natural habitat. This is an *in-situ* practice where the conventional forest practices are minimized, thereby allowing the medicinal plant populations to flourish.

This sound initiative was first established in Karnataka, Kerala and Tamil Nadu in 1993, whose funding aided by DANIDA (Danish International Development Aid, Netherlands). Along with the joint collaboration of the state forest departments of Karnataka, Kerala and Tamil Nadu, FRLHT facilitated the recognition of MPCA's in 34 forest sites across south India from 1993 to 2004.

Some of the salient features of MPCA's are as follows: -

1. The minimum area must be 200 ha. at least.

2. Can nurture different local health traditions of the region.
3. Abundance of medicinal plant diversity along with viable breeding population.
4. Restricted area for human interference and forestry operations.
5. Vegetation profiling, sustainable harvesting, propagation of medicinal plants and other conservation strategies are set up.
6. Species are also conserved that are present in this region.

The idea of establishment of MPCA's been quite magnificent and has been instrumental to meet the conservation outcomes. Among them, the swift transition and change in the forestry operations was quite noteworthy. Looking at the conservation initiative of MPCA in South India, the forest managers all over India started to realize the need of conservation of medicinal plants in the forestry sectors. The timber and wildlife focused conservation strategies gradually extended medicinal plants as well. Therefore, the MPCA program brought in a fresh air of realization and facilitation of newly modified conservation strategies in the forests of India.

With the grand success of the novel initiative of the MPCA program, all forest areas started adopting this strategy in the long run, By the end of 2011, 112 MPCA's were developed across several forest areas in the country.

Moreover, the Initiatives of FRLHT threw light on many areas that were formerly associated with adulterants. The MPCA also widened the view of supply, trade and demand of medicinal plants, variety of folk medicinal therapies and documentation of herbal remedies of the traditional knowledge.

Some of the conservation outcomes of MPCA are as follows: -

- a) Combined the lists of state wise medicinal plants.
- b) Exhibited methodology of CAMP for assessment of threat of medicinal plants
- c) Visualized adoption of IUCN threat categories.
- d) Validation of botanical identity of medicinal plants with the help of making a correlation of the local names in 13 different languages along with their accepted botanical names.

e) A Multi subject database on Medicinal plants of India has been constructed to ascertain the ecology and reproductive biology, images of raw drug, geographical distribution, herbarium and distribution maps, medicinal uses, botanical profile and propagation.

f) The National Herbarium of Medicinal plants recognized Exclusive Herbarium of Medicinal plants of the Country.

g) Different Forestry Training Institutes facilitated Training module capsules pertaining to Conservation of Medicinal plants for the frontline forestry staff and NGOs.

h) Information and Communication products pertaining to Medicinal plants and Medicinal applications.

Some of the challenges awaiting for the MPCA's are as follows: -

- There are still a lot of red listed threatened species that need to be brought under MPCA. Thus, for this purpose, the MPCA network needs to be expanded.
- Facilitation of Open-Air Centre for Conservation education and learning and formulate links to educational and research institutes.
- Setting up population studies of selected Red listed species.
- Taking up reconnaissance surveys of selected Red listed species.
- Initiating Status surveys of selected Red listed species.
- Studying the Harvesting and Collection-Produce Flow-Market links of species that are in high volume trade with the help of small-time market studies.
- Development of small-time field studies to tabulate additional field data on Seed biology of red listed species.
- Undertaking small time field studies to obtain additional field results on Phenology and Reproductive biology.
- Producing substantial examples and case studies to surplus the understanding of medicinal plants.

- Taking up studies to facilitate the propagation of medicinal plants.
- Undertaking species recovery initiatives.
- Encouraging studies to realize the cultural links of medicinal plants.

1.3. MPCAs-Global Scenario

Medicinal plants play an important role in supporting the healthcare system viz Siddha, Ayurveda, Unani, Allopathy and Homeopathy system of medicines. According to the World Health Organization (WHO), 85% of the rural population in developing countries utilizes locally accessible medicinal plants for their major healthcare needs. About 8500 species of medicinal plants are used by the traditional system of medicines, local communities and tribal people all over India. About 92% of the country's medicinal plants are found in medicinal plant conservation areas (MPCAs). *In-situ* conservation sites of medicinal plants are established in other countries also such as Zimbabwe, Sri Lanka, Jordan, Egypt, Ethiopia, Central America and Caribbean.

1.3.1.MPCAs –Indian scenario

In 1993, India led a marvelous initiative through an NGO called Foundation for Revitalization of Local Health Traditions (FRLHT) along with State Forest Departments in India to establish *in-situ* conservation sites for important medicinal plants known as Medicinal Plants Conservation areas (MPCAs). It was important to initiate MPCAs as medicinal plants are allied to health and livelihood protection of ethnic and rural people. Considered as a pioneering *in-situ* conservation effort, currently a network of 106 – 108 MPCAs are operational across 11 – 12 states in India. The MPCAs are established in biological diversity areas such as Himalaya, North-East India and Western Ghats, covering different bio-geographic regions. Apart from biodiversity and natural heritage, few MPCAs have cultural, historical and religious significance also. There are 72 MPCAs already established by NMPB across 13states (Biswas et al., 2017).

Out of 19,530 species of Angiosperms recorded in India (Vatsavaya et al 2010), West Bengal is having 3,691 species (21.36%), spread over 11 Forest Types of the State out of 16 Forest Types found in India, covering Littoral and Swamp Forests the Mangroves of Sundarban to Northern Montane Wet Temperate Forests of Darjeeling. The floral diversity of Bengal exists over four distinct Biogeographic areas ranging from Eastern Coast to Central Himalayas and represents a wide range of rare, endangered, threatened

and endemic flora (Govt. of West Bengal, 2010). On the basis of recommendations of CAMP meeting, considering the Forest Types and Biogeographic Areas seven MPCAs, representing at least one flagship species in the MPCAs, have been created in West Bengal (Fig. 1, Table 2) under the Project. Established MPCAs are Garpanchkot (250 ha) and Bonnie Camp (300 ha) in Silviculture South Division of Sundarban. Tonglu (230 ha), Dhotrey (180 ha) in Silviculture Hills Division; North Sevoke (100 ha), North Rajabhatkhawa (400 ha), Sursuti (100 ha) in Silviculture North Division. MPCAs have been recommended to be managed as “hands off” vital areas with certain interventions to encourage identification, natural regeneration, preservation, monitoring etc. by involving Forest Protection Committee Members (FPCM) through awareness and confidence building exercises.

Table 2: Details of seven MPCAs established in West Bengal

Name of MPCA	Year Established	Forest types	Area (ha)	Latitude	Longitude
Bonnie Camp	2008-09	Littoral and Swamp – Mangrove (4B)	300	21° 83’	88° 63’
Dhotrey	2008-09	Montane wet temperate (11B)	180	27° 05’	88° 07’
Garpanchkot	2008-09	Tropical dry deciduous (5B)	250	23° 63’	86° 77’
North Rajabhatkhawa	2008-09	Tropical moist deciduous (3C)	400	26° 68’	89° 55’
North Sevoke	2008-09	Tropical moist deciduous (3C)	100	26° 87’	88° 45’
Sursuti	2008-09	Tropical moist deciduous (3C)	100	26° 63’	86° 77’
Tonglu	2008-09	Montane wet temperate (11B)	230	27° 03’	88° 08’



Fig. 1: Location map of seven MPCAs in West Bengal (Source: www.google.co.in)

1.4. Importance of MPCAs

The use of plants in order to achieve a medicinal purpose is called alternative medicine (AM). AM has been used in all cultures particularly Asian and western culture. Unfortunately, most people nowadays still believe that the only trusted and effective medicine is the medicine that has a dosage form. Several mostly used pills or capsules consumed daily coming originally from plant compounds such as Aspirin, Paclitaxel, Digoxin, and many more. In the past, our ancient ancestors used plants and herbs to preserve and flavor food, reduce pain, treat headaches, and even prevent diseases including epidemics. The traditional knowledge on healing properties of medicinal

plants has been transmitted over the centuries within and among human societies. Active compounds formed during secondary metabolism are mainly responsible for the important biological properties in plants used in various purposes, including treatment of infectious diseases throughout the globe. Currently, many studies are warning people about the risk and danger of pathogenic microorganisms that have become resistant to discovered antimicrobials. Information on the antimicrobial activity of numerous plants active compounds are scientifically confirmed, hence, still numerous studies are needed to understand the antimicrobials compounds and the mechanisms involved in microbial growth inhibition. Several institutions, including TFRI, ICFRE, the FSI, the BSI, and CIMAP, have conducted medicinal plants surveys revealing continuing losses of the biodiversity resource base (Tiwari and Rani 2004).

The State of West Bengal is a mega Biodiversity State, having 3,580 Species (21.33%) spread over 10 forest types of State out of 16 forest types found in India. It is also well known that Biodiversity and species richness is more in Northern part of Bengal in comparison to Southern part of Bengal. Considering the fact, an assessment was made by the forest department of West Bengal with the help of group of expert Botanists, FRLHT (NGO) and other experts related to this field and on the basis of their recommendation during 2008, Seven MPCAs (Medicinal Plant Conservation Area and Table 2) have been established and 46 medicinal plant species have been identified as flagship species, out of those seven MPCAs, three MPCAs (i.e. North Rajabhatkhawa MPCA, Sursuti MPCA and North Sevoke MPCA, Fig. 1) representing unique biodiversity and very rich medicinal plant resources in Terai & Duars region of West Bengal. The area is also covered under IUCN recognition as Himalaya Hotspot for Conservation (Conservation International 2005). Considering the diversity and species richness, three MPCAs i.e. North Rajabhatkhawa MPCA, Sursuti MPCA and North Sevoke MPCA have been chosen as study area. Preliminary study has been done over the area by North Bengal University, Botany Dept. in collaboration with West Bengal Forest Department, Research Wing and recorded presence of huge number of medicinal plant potential. The study area of all three MPCAs have been chosen in Biodiversity or Conservation working Circle maintained under the management of working plan of West Bengal Forest, so that there will be no manipulation by any management practice in future also. Therefore, the MPCA study area shall remain undisturbed. There are illegal collector and traders are involved for illegal trading of medicinal plant resources.

In order to prevent such huge exploitation of natural resources following conservation strategies have been adopted:

1. *In-situ & ex-situ* conservation of medicinal plants over the areas.
2. Cultivation of economically important medicinal plant with the help of Registered Forest Protection Committee inhabiting the adjoining forest.
3. Forest Protection Committee (FPC) members realized their own wealth available in their adjoining forest. Strategy has been adopted for cultivation of some economically important medicinal plants with by back strategy in consultation with reliable drug industry and cultivation will be done strategically so that FPC members can have ensured income & thus the system in turn will automatically minimize illegal harvesting of medicinal plants from natural habitat. Thus, our target MPCAs resources will be conserved and preserved.
4. Also, to arrange some training facility and installation of storage go-down to facilitate processed or semi-processed medicinal plant products as harvested from cultivation will help them on way to marketing. This strategy will help FPC members to get healthy & ensured economic return and also conserve plant resources in natural habitat (MPCAs).

Many medicinal plants are reported as threatened species and even some of them are on the verge of extinction due to over exploitation. It has also been felt that the threat to species increase as the people become aware of their uses. It is, therefore, vital to protect, conserve and propagate the medicinal plants occurring in the forest areas. It is only the forest areas that can successfully ensure a long term *in-situ* conservation and sustainable availability of the medicinal plants. For this purpose, earlier Medicinal Plants Conservation Area (MPCAs) and presently Medicinal Plants Conservation Development Areas (MPCDAs) have come into the existence for conservation & management of medicinal plants in their natural habitats.

OBJECTIVES OF THE PROPOSED WORK

The principal objectives of the proposed dissertation are listed below:

1. Present status of medicinal plants with complete taxonomic revision at three MPCAs, North Bengal plains.
2. To determine the community and population structure of Medicinal plants within the MPCAs
3. To know the soil quality of MPCAs.
4. Record of traditional knowledge on the utility of different species of medicinal plants
5. Threats and conservation of medicinal plants of MPCAs.

CHAPTER-2
LITERATURE OF REVIEW

LITERATURE REVIEW - 2

A preliminary study has been done over the area by the West Bengal Forest Department, Research Wing in technical collaboration with North Bengal University, Botany Department for assessment of medicinal plant species diversity and richness. Floristic and ecological works were conducted by various authors like Misra 1968; Jain and Rao 1977; Rai 2006; Hooker 1872 - 1897; Prain 1903; Hara 1966, 1971; Ohashi 1975; Hara *et al.* 1997, 1996, 1995; Grierson and Long 1979, 1983, 1984, 1987, 1991, 1999; Noltie 1994, 2000; Pearce and Cribb 2002; Chowdhury 2009; Mondal and Chowdhury 2018; Mondal *et al.* 2019; Mondal, 2020 in various habitats of these areas. Medicinal and aromatic plants of the several floras have been recognized using a number of references including Kirtikar and Basu 1935; Biswas and Chopra 1956; Chopra *et al.* 1956; Khare 2004; Rawat *et al.* 1998. Biswas and Chopra 1956 documented some common medicinal plants of Darjeeling and Sikkim Himalayas. Kirtikar and Basu 1935, reported specific uses of several Indian Medicinal Plants. Tripathi *et al.* 2013, Tripathi and Mishra 1971, reported 10 rare medicinal plant species which are at the risk of extinction of South West Bengal and their need of conservation. Biswas *et al.* 2017 reported 57 ethno-medicinal plants belonging to 39 families in the Kakrajhore forest area and Sarkar *et al.* 2017, documented ecological status of several medicinal plants of Chalsa forest range under Jalpaiguri division, West Bengal. Saha and Biswas (2013) studied the detailed many medicinal plants from the Gorumara National Park, Jalpaiguri, and Datta *et al.* 2014, listed the medicinal plants used by tribal population of Coochbehar district and others author Bose *et al.* 2015, provided a detailed report of 115 plant species belonging to 103 genera and 62 families for treating 69 various physical ailments such as skin diseases, stomach ache, cough and cold etc. used by tribals in Jalpaiguri district. Yonzon *et al.* 2012, documented 218 medicinal plants species of 97 families and 195 genera in Darjeeling district, West Bengal. Floral diversity in sub-tropical forest in North East were explored by Sharma *et al.* 2001, Singh 1980; Khan *et al.* 1987; Rao and Hajra 1986; Rao *et al.* 1990; Barik *et al.* 1992 and Rao 1992. Ganesh *et al.* 1996 recorded the plant diversity in evergreen forest of Western Ghats. Takhtajan 1969; Clarke 1885; Hooker 1907; Chatterjee 1940; Hooker 1904; Singh and Chauhan 1998; Brandis 1978; Das *et al.* 2010, Mallick *et al.* 2020, 2021, presented a detailed report of medicinal plant with weeds species in Duars region of West Bengal.

The dense vegetation of Darjeeling Himalaya, Terai and Duars of North Bengal has attracted several researchers from different parts of the world since last few centuries (Don 1823, 1825). Griffith (1847) explored the vegetation of Terai and Duars areas of North Bengal later followed by Sir J.D. Hooker (1849, 1904). Hooker explored the entire region and recorded of approximately 2500 plant specimens. He published his expedition as the Flora of British India (Hooker 1854, 1872 - 1897, 1904), which is one of the earliest and important comprehensive descriptions of plant resources for this region. Various taxonomist (Cowan and Cowan 1929; Ohashi 1975; Grierson and Long 1979, 1983 – 1991, 1994 – 2000, 1999 – 2001) from different other parts of the world has made considerable contributions to the flora of Terai and Duars of North Bengal.

With the description of 36 plant species along with their local name, locality, altitude, family name, specific uses, and brief notes, Chaurasia *et al.* 1999, performed an ethnobotanical survey of the Nubra Valley of Ladakh. Mohamed Sham Shihabudeen *et al.* 2010 reported the usage of six medicinal plants as traditional medicine. Vaghasiya *et al.* 2011 documented some traditionally rich medicinal plants in the Western region of India. Chhetri *et al.* 2008 reported eight medicinal plants after photochemical analysis in Nepal. Similarly, in Nigeria, Edeoga *et al.* 2005 reported 10 medicinal plants. In Nigeria, Mensah *et al.* 2009 reported the treatment of hypertension and their mode of action with the identification of 12 taxonomic families including 14 local plant species. Kumar *et al.* 2007 listed some Indian medicinal plants with their anti-microbiological activities to counteract the ethnological agents of *Acne vulgaris*. Mallick *et al.* 2021 gave a detailed idea about arboreal spermatophytes in three MPCAs of West Bengal, India.

Phytosociological understanding for the forested vegetation of North Bengal terai duars and hills were studied by Kadir 2001; Rai 2006; and Sarkar 2014 following conventional nested quadrat sampling as suggested by Phillip 1959; Misra 1968; Shimwell 1971; Blanquet 1932; Matuszkiewicz 2002. Nested Quadrat technique is the most generalized techniques to study phytosociology and community structures. Various phytosociological parameter and species diversity for the vegetation of different habitats of North Bengal plains and hills were studied by different authors (Kadir 2001; Rai 2006; Phillips 1959; and Chowdhury 2009).

Traditional utilization from recorded medicinal plants was performed to prepare a list of medicinally important plants growing in these areas in different seasons. The ethnic

communities of forested villages will be interviewed with their Prior intimation about the frequent uses of such wild medicinal plant in their daily healthcare system. To construct a list of good number of plants, the literature like Kirtikar and Basu 1935; CSIR 948-1976; Chopra *et al.* 1956, 1969; Asolkar *et al.* 1992; Biswas and Chopra 1940; Chowdhury 2009 Mondal *et al.* 2017, Mondal 2020, Mallick et al. 2021 will be consulted.

CHAPTER-3

STUDY AREA

STUDY AREA - 3

Sub-Himalayan West Bengal, consisting of Terai and Duars are spreading through the districts of Jalpaiguri, Alipurduar and plains of Darjeeling are taken as study area for the present dissertation. A belt of moist forests passes along the study areas, at the foot of the majestic Himalayas.

The undulating *Terai* and *Duars* landforms and temporary or permanent virgin elaborate wetland systems are forming a mosaic of tall grasslands, savannas, evergreen and deciduous forests. The slope of the study area is gentle from north to south and located at 25° 57' to 26° 36' N latitude and 89° 54' to 88° 47' E longitude (Terai) & 26°.16' to 27°.0' N latitude and 88°.4' to 89°.53' E longitude (Duars) with altitudinal range varying from 80 to 100 m above mean sea level. The entire region is made up of sand, gravel and pebbles laid down by major and minor rivers and/or stream (*Khola* or *Jhora*) systems like *Teesta*, *Torsa*, *Jarda*, *Raidak*, *Jaldhaka*, *Sankosh*, and several other small rivulets coming from the Darjeeling and Sikkim Himalayas and also from the neighboring countries Nepal and Bhutan. The river Teesta has divided this entire area into two parts and the western part is referred as *Terai* whereas the eastern part is named as *Duars* or *Dooars*. Based on forest types and nature of soil formation the *Duars* region can be further subdivided into the small parts, like Siliguri area as *Western Duars*, the middle or Jalpaiguri part as *Central Duars* and the easternmost end part of Alipurduar is referred as *Eastern Duars*.

The word '*Terai*' meaning dampness and the word '*Duar*' has been derived from the word 'doors', Duars or Dooars acts as a gateway to mountain kingdom of Bhutan and the North-Eastern states of India. The *Terai-Duars* area (Fig. 2) is a land with dense tropical evergreen forests interspersed with numerous marshy areas. It represents a transitional belt between lower hills of the Himalayas and plains and the rolling flat plain of North Bengal.

3.1. TERA I

The western bank of river Teesta is generally known as *Terai* with very rich and diversified evergreen-forested system. It is a belt of marshy grassland, savannas and forests at the foot of the Himalayan range stretching southwards to about 38 km. Above the *Terai* belt, a forested belt of rock, gravel, and eroded soil covered Himalayan

areas are referred as *Bhabhar*. The *Terai* zone is composed of alternate layers of clay and sand, with a high water table that created many springs and wetlands.

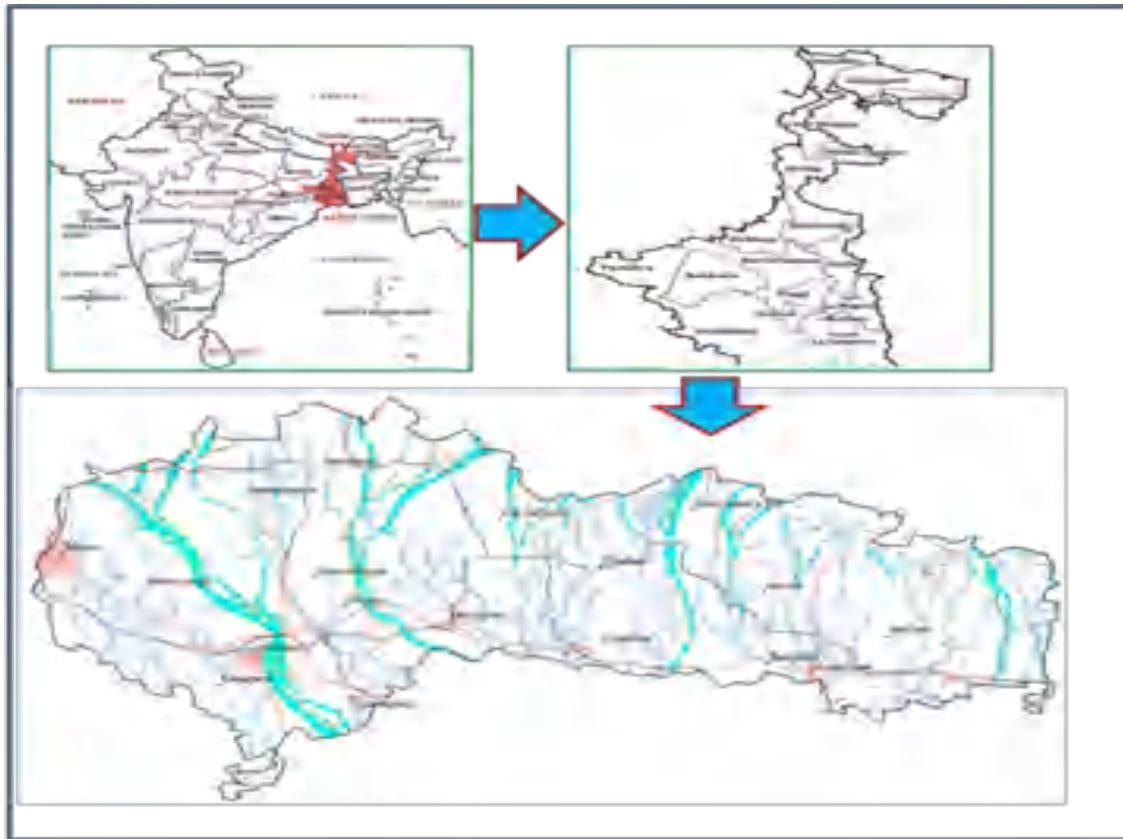


Fig. 2: Map showing the areas of Terai and Duars (www.jalpaiguri.gov.in)

3.2. DUARS

Duars, a land of unending beauty, lies in the sub-Himalayan foothills in Jalpaiguri and Alipurduar districts. The area is starting from the eastern bank of river *Teesta* in the Jalpaiguri district and stretching up to the western bank of the river *Sankosh* in Alipurduar district and is spreading over a span of 130 km of which 40 km area is running along the Himalayan foothills.

Duars with a vast texture of dense forests teeming with wildlife, unending tea gardens, babbling rivers, interspersed with small ethnic settlements, constitute a fascinating tourist destination in this part of the country. *Duars* offers some magical landscape with fascinating view of river valleys and hills and this beautiful landscape is still unknown to the large section of tourists.

The Duars area is specially noted for its Protected Areas in IUCN guideline and includes Gorumara National Park, Buxa Tiger Reserve, Buxa National Park, Jaldapara

National Park, Chapramari wildlife Sanctuary etc. These in-situ conservatories are harbouring a rich and fascinating diversity of flora, fauna and microbes including several endemic rare and threatened species. The vast texture of massive trees sheltering varieties of orchids, other epiphytes and climbers and the forests resounded with songs of birds and call of wild animals make it a veritable paradise for nature lovers and eco-tourism.

3.3. LOCATION

Terai [25° 57' to 26° 36' N latitude and 89° 54' to 88° 47' E longitude] and Duars [26°.16' to 27°.0' N latitude and 88°.4' to 89°.53' E longitude]

3.4. DRAINAGE SYSTEM

The foothills of Terai and Duars are intersecting by a good number of perennial rivers/streams coming down from the Himalayan glaciers. The major such rivers are *Mahananda, Balason, Mechi, Karotoa, Sahu, Panga* etc along with several small streams are continuously proving the life support to greenery of Terai regions. Duars regions are also blessed with several big and small rivers like *Teesta, Torsa, Karala, Jaldhaka* and *Diana* and their rivulets makes the area paradise of biodiversity. All these rivers originated from Himalayan hills, flow from North-east to South-West and are rain fed, except *Teesta* which has its origin from the Jemu glaciers in North Sikkim. Though they are tame, shallow and nearly dry during summer, but generally overflow during monsoon sometime causing heavy floods. The numerous low laying areas holds good volume of rain water and saves terrestrial areas from inundation.

3.5. SOIL

Soil of the study area is basically porous in nature, deep, light textured, highly acidic, with moderate organic matter, low Phosphate, Potassium, and micronutrient contents (Monda et al., 2018); (Anonymous 1993). Soil consists of soft sands of different sizes and is interspersed with humus along with variable sized gravels and boulders. The soils are brought down by rivers coming down from hills and their tributaries those are bringing materials from a height of about 3048 m of Himalayan ranges and are deposited layer by layer in the form of soil all over the study area. The greater part of the region is covered with alluvial soils, ranging from pure sand to clay, but mainly sandy loam in nature. In the upland of the north of the *Duars*, the soil is ferruginous clay and is particularly well-suited to the growth of the tea plants (Sarkar, 2011). The

Western Duars has numerous old and/or dead river beds which have been left over by the streams. Near the hills soils are composed of more stones and boulders while lower down they contain gravel and in the plain they contain more sand with humus.

3.6. CLIMATE

The weather conditions of the study area are more or less remains pleasant throughout the year. Three predominant seasons namely pre-monsoon, monsoon and post-monsoon are quite prominently recognizable in these areas. The pre-monsoon starts from the 1st week of February and extended up to the middle of May, whereas, monsoon starts from the last week of May and extended up to end of September. The post-monsoon season begins from the 3rd week of November and extended up to last week of January. Climatic data for the study area is collected from Central Tobacco Research Institute at Dinhata and Hydromet division, India Meteorological Department, Kolkata.

3.7. FOREST COVER AND VEGETATION TYPES

Total recorded 16831.87 sq. km area belongs to forest land in the West Bengal and it constitutes 18.96 % of the geographical area. This total forested land constitutes 3036.51 sq. km. is Very Dense Forest, 4208.37 sq. km. is Moderate dense forest and rest 9586.99 sq. km. is under Open forest (Annonym., 2021). The forest cover including the forests created outside the recorded forest area is 15.68% of the geographical area. Estuarine water bodies like rivers and creeks in mangrove forest of Sundarban areas and river flowing through the recorded forest land in Jalpaiguri and other districts have been included while computing the forest cover. Similarly large portions of farm forestry plantations, raised outside forest land, having forest like micro-ecosystem, have been enumerated as forest cover. As per classification of satellite imageries, the vegetation cover of the state is more than 27% of the geographical area as in 2006. Part of the world's largest mangrove forest, Sundarbans biosphere reserve and Sundarban Ramsar site located in southern West Bengal. There are six national parks (Neora Valley NP, Jaldapara NP, Buxa NP, Singalila NP, Gorumara NP, Sundarban NP) and 16 Wildlife Sanctuaries (Ballabhpur WLS, Bethuadahari WLS, Bibhutibhushan WLS, Chapramari WLS, Haliday Island WLS, Jorepokhri WLS, Lothian Island WLS, Mahananda WLS, Narendrapur WLS, Raiganj WLS, Ramnabagan WLS, Sajnakhali WLS) and several localized protected areas (Mayurjharna Elephant Reserve, Tilason Forest etc) in West Bengal. According to Champion and Seth (1968), the total forest type of West Bengal can be categorized into following major groups:

3.7.1. Northern tropical wet evergreen forests (1B)

This type of forest patches are located at plain regions of North Bengal with an area of around 167 sq km and spreading over the areas like Bagdogra range of Kurseong division, Khutimari areas of Jalpaiguri division, Damanpur, Cheko, Gadadhar, Rajabhatkhawa, Raidak of Buxa Tiger Reserve at an elevation of 150 metre. The most dominating and common plants of such forest are *Callicarpa arborea* Roxb., *Casearia vareca* Roxb., *Chukrasia tabularis* A. Juss., *Daemonorops jenkinsiana* (Griff.) Mart., *Dalbergia sissoo* DC., *Magnolia champaca* (L.) Baill. ex Pierre, *Shorea robusta* Gaertn., *Tectona grandis* L. f. etc.

3.7.2. Northern sub-tropical semi-evergreen forests (2B)

This type of forest patches are spreading over an area of 25 sq km of North Bengal. The most dominating species of this areas are *Calamus erectus* Roxb., *Chukrasia tabularis* A. Juss., *Commiphora wightii* (Arn.) Bhandari, *Lagerstroemia reginae* Roxb., *Magnolia champaca* (L.) Baill. ex Pierre, *Shorea robusta* Gaertn., *Alstonia scholaris* (L.) R. Br., *Terminalia arjuna* (Roxb. ex DC.) Wright & Arnt. etc.

3.7.3. Tropical Moist Deciduous Forests (3C)

This type of forest patches are mainly located at sub-Himalayan or foothills of Himalaya mostly covering Terai and Duars of North Bengal and also called as sub-Himalayan secondary wet mixed forest and spread over an area of 1757 sq km. The dominating species of the region are *Aporosa octandra* (Buch.-Ham. ex D. Don) Vickery, *Shorea robusta* Gaertn., *Magnolia champaca* (L.) Baill. ex Pierre, *Lagerstroemia parviflora* Roxb., *Terminalia bellirica* (Gaertn.) Roxb., *Acacia nilotica* (L.) Delile, *Tectona grandis* L. f., *Callicarpa arborea* Roxb., *Casearia vareca* Roxb., *Chukrasia tabularis* A. Juss., *Coffea benghalensis* B. Heyne ex Schult. *Carallia brachiata* (Lour.) Merr., *Dalbergia sissoo* DC., *Maesa indica* (Roxb.) A. DC. are found in forest margin mostly at wet localities. The well represented grass species in this region are *Setaria palmifolia* (J. Koenig) Stapf, *Centotheca lappacea* (L.) Desv., *Eragrostis uniolooides* (Retz.) Nees ex Steud., *Pogonatherum paniceum* (Lam.) Hack., *Oplismenus composites* (L.) P. Beauv., *Oplismenus burmanni* (Retz.) P. Beauv. etc.

3.8. MEDICINAL PLANTS CONSERVATION AREAS (MPCAs)

MPCA are the dense forest patches with diversity plant population lies within the in-situ conservatories. The area (MPCA) also has a great significance in the forested areas

of the Sub-Himalayan landscape along the forest and riverine ecosystem.

3.8.1. North Sevoke MPCA (Mahananda Wildlife Sanctuary)

The name of the site 'North Sevoke' covers the forest area consisting of compartment 1 (a) & (b) respectively. The area has been declared as "Mahananda Wildlife Sanctuary" vide Govt. of West Bengal's notification no. 5384-For dated June the 24th, 1976. The sanctuary was under the administrative control of Kurseong Forest Division till 1988. This has been brought under the control of Divisional Forest Officer, Wild Life – I, Vide Principal Chief Conservator of Forests, West Bengal's O.O. No. 8-M/8-88, dated 11/08/1988. The total physical area of block North Sevoke measures over 379.59 ha. as per the 'Mahananda Management plan' of Mahananda Wild Life sanctuary (Fig. 5). And the selected site of MPCA at North Sevoke is 379.59 ha. out of which an area of 100 ha. only is selected at compt 1(a) for the study of MPCA at North Sevoke (Table 3.) The details are shown as follows:

Table 3: Area (Ha) in North Sevoke MPCA

BLOCK – COMPT.	AREA (HA.)
NORTH SEVOKE – 1 (A)	321.32
NORTH SEVOKE – 1 (B)	58.27
TOTAL	379.59

This MPCA demarcated at North Sevoke block of compartment 1 (a) is under the administrative control of 'Wildlife Division – I, Darjeeling' under sub-division of Kurseong. It is under the Forest Range named as '10th, mile under 'Sevoke Beat'.

3.8.1.1. Physical description of the Site

The selected site of North Sevoke MPCA lies within the latitudes of 26°37'27"N & longitudes of 88°12'88.34"E. It is located at the southern part of Darjeeling district on the west bank of river Tista. According to the classification (Rodger & Panwar) of Biogeographic region of India now in use, the selected site falls in zone 7 (Gangetic plains), province 3 (Lower Gangetic plains), sub-division Bengal Duars. The total area of Mahananda Wild Life Sanctuary is 12,903.97 ha.

3.8.1.2. Location

Map of West Bengal showing location of MPCA at North Sevoke Compartment 1 (a) indicating red coloured square shaped mark in Darjeeling District bordering to Jalpaiguri District. (Fig.1)

Another Map of Wild Life – I Division showing location of MPCA at North Sevoke Comptt. 1 (a) under Sevoke Beat of North Range 10th Mile indicating Red star shaped mark on it. (Fig.2). GPS Map of North Sevoke MPCA showing boundary demarcation & way points (Fig.3)

3.8.1.3. Climate

The climate of this MPCA site varies from tropical to sub-tropical with rise of elevation. The highest temp. of about 36°C occur in the lower reaches in the month of May and June. December & January are the coldest month with night temp falling down to 2°C on the hills. Ground frost is not very common in this area.

3.8.1.4. Temperature

North Sevok MPCA lies in the moist tropical climatic zone. The average temperature during day time varies from 10°C to 13°C (October to February), 27°C to 32°C (May to September) and, 24°C to 27°C during March to April (Table 4). The highest recorded temperature was 39°C and the lowest was 2°C (Fig. 3.) (Ref. 5th Working Plan of Buxa Division).

3.8.1.5. Rainfall

The annual rainfall is in the region of 3500 mm. Monthly average being highest in July (900 mm) and lowest in December (40 mm). The humidity level is fairly high (Table 5, Fig.4).

3.8.1.6. Drainage

Tista, a perennial snow fed river, originates from the Kanchanjunga snows and flows down along the eastern boundary of the MPCA. It is the only snow-fed river in the region. Mahanadi and Gulma khola, the two springs fed water courses play major role in the ecology of this forest. The other significant water course in the MPCA is Nandi khola.

Table 4: Annual temperature of North Sevoke MPCA (2009–2020)

Year	Mean min. Ave. temp. (°C)	Mean max. Ave. temp. (°C)
2009	5	11
2010	7	13
2011	8	16
2012	10	18
2013	11	20
2014	13	22
2015	14	19
2016	14	20
2017	15	20
2018	12	19
2019	11	20
2020	4	18
Ave. Annual Tem.	14.9	9.33

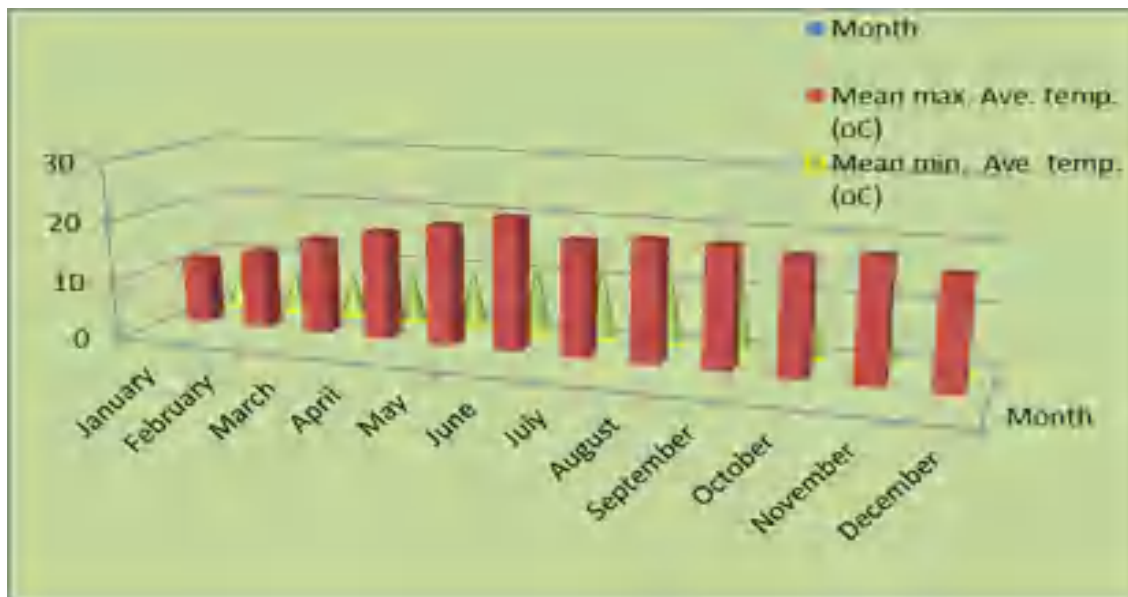


Fig. 3: Annual temperature of North Sevoke MPCA (2009–2020)

Table 5: Annual Rainfall of North Sevoke MPCA (2009–2020)

Year	Average Rainfall (mm)
2009	21.7
2010	23.1
2011	46.7

2012	115.8
2013	187.2
2014	570
2015	791.7
2016	634.3
2017	438.3
2018	124.5
2019	23.5
2020	9
Ave. Annual Rainfall	248.48

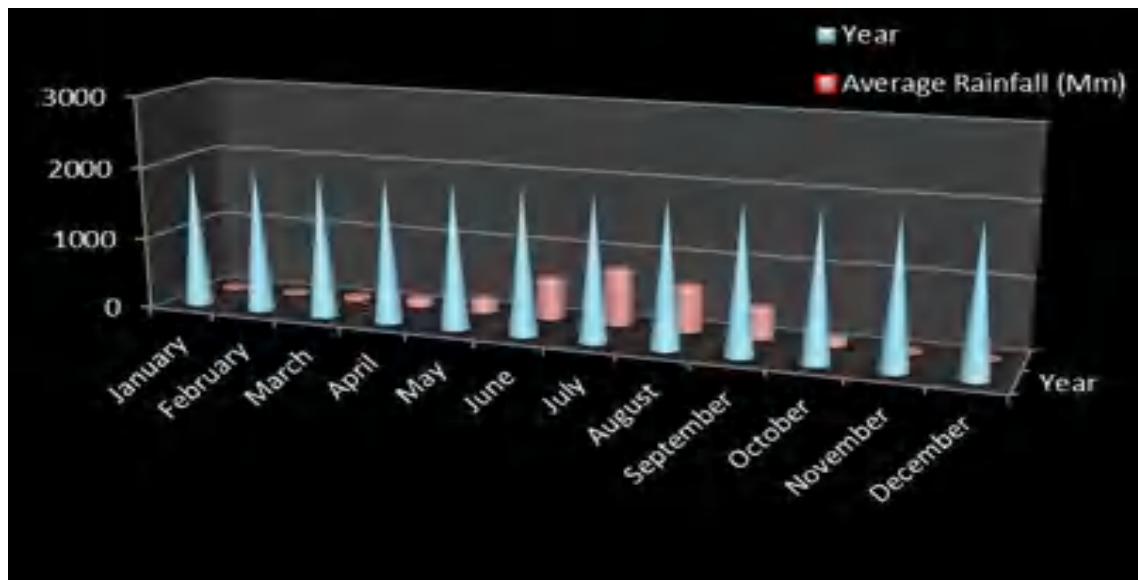


Fig. 4: Rainfall (mm) of North Sevoke MPCA (2009–2020)



Fig. 5: Entry gate of North Sevoke MPCA

3.8.2. North Rajabhatkhawa (NRVK) MPCA (Buxa National Park)

The name of the selected site of MPCA is North Rajabhatkhawa (Fig. 8), constituting of compartment 8 & 9 over the area of 564.15 ha. respectively. But our study area of MPCA is within 400 ha. only. The legal status of this forest goes back to the year 1866 when the forest department undertook the forests of Buxa Tiger Reserve and prior to that these used to be an unoccupied wasteland, subject to indiscriminate felling. Those forests came under British rule in 1865 and the first reservations were made in 1879 according to the IFA (Act VIII of 1878) and the process continued till 1940. Thus most of the forest areas of the Tiger Reserve enjoy the status of Reserved Forests. The forest area of NRVK 8 and 9 comes under the legal status of Reserve Forest which is a part of the buffer zone of the Buxa Tiger Reserve.

This MPCA is under the jurisdiction of BTR (E) Division under sub-division of Alipurduar. It is under the Buxa road beat of Buxaduar Range. It falls under the administrative control of Deputy Field Director, Buxa Tiger Reserve (East), head quarter at Alipurduar Sub-division.

3.8.2.1. Physical description of the site

The MPCA lies between latitudes 26°41'N and longitude 89°33'E. Its altitudes recorded as 158 m from Mean Sea Level. It is the area lying outside sanctuary treated as buffer zone. Gradient is gentle. Land configuration is even & the aspect is flat.

3.8.2.2. Location Map of MPCA

The MAP of Buxa Tiger East Division showing the location of MPCA at NRVK 8 & 9 Compt. under Buxa Road Beat of Buxaduar Range indicating pink coloured star shaped mark. (Fig. 2)

3.8.2.3. Climate

The climate of this MPCA site varies from tropical to sub-tropical with rise of elevation. The highest temperature of about 36°C occur in the lower reaches in the month of May and June. December & January are the coldest month with night temp falling down to 2°C on the hills. Ground frost is not very common in this area.

3.8.2.4. Temperature

The North Rajabhatkhawa MPCA is lies in the moist tropical climatic zone. The average temperature during day time varies from 12°C to 21°C (October to February),

27°C to 32°C (May to September) and, 24°C to 27°C during March to April (Table 6). The highest recorded temperature was 39°C and the lowest was 2°C (Fig. 6.) (Ref. 5th Working Plan of Buxa Division).

3.8.2.5. Rainfall

South-West Monsoon is the main source of rain fall. The location of MPCA receives maximum rainfall from mid June to September. The rain fall is very high during the month of June, July and August. It subsides from the early September and completes by the 1st week of October. December is the driest month with minimum rainfall. March receives maximum of winter rain. Pre monsoon showers accompanied by hail and thunder storm occur in the month of April to May. The maximum rainfall recorded was 577 cm and minimum was 543 cm. The average annual rainfall was recorded 560 cm (Fig. 7 & Table 7).

3.8.2.6. Drainage

The forest tracts of this MPCA is intercepted by numerous rivers, streams and jhoras of varying sizes which usually originated in the hills on the North and flow southwards. They rise and fall with great rapidity and frequently change their course causing damage to the forest. The Principle Rivers that flow nearby this MPCA are Dima, Jainty, Bala river and includes Buxa Jhora, Guenala & Hatinala respectively.

Table 6: Annual temperature in NRVK MPCA (Source: meteorological Department, Jalpaiguri, India)

Year	Mean Min. Ave. Temp. (°C)	Mean Max. Ave. Temp. (°C)
2009	3	20
2010	3	23
2011	9	23
2012	16	26
2013	14	27
2014	11	29
2015	16	28
2016	17	31
2017	16	28

2018	11	29
2019	6	25
2020	5	22
Annual Average	10.58	25.91

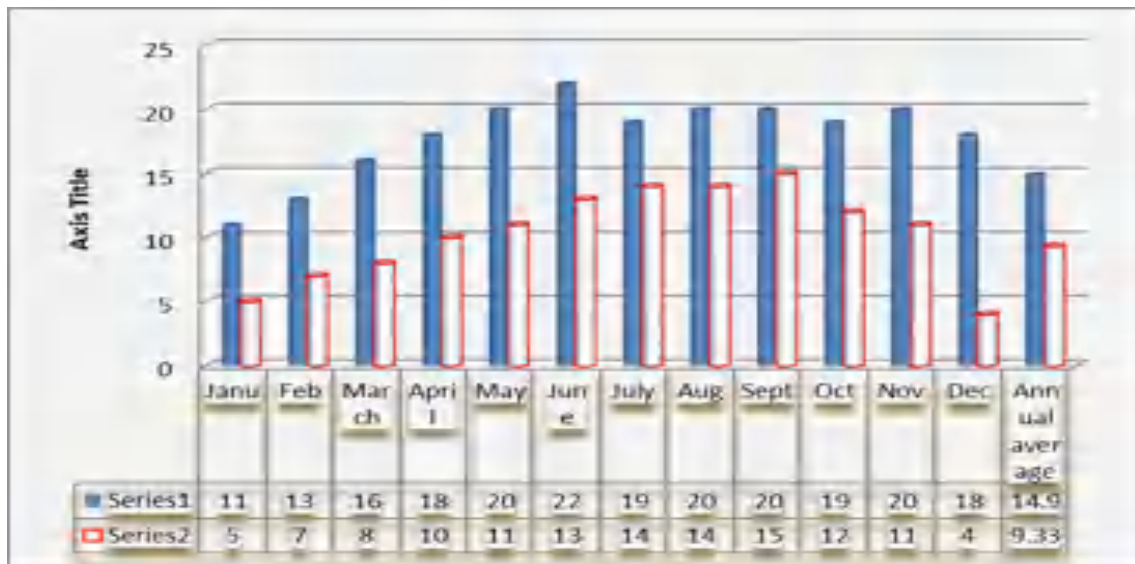


Fig. 6: Annual temperature of NRVK MPCA (2009–2020)

Table 7: Annual rainfall in NRVK MPCA during 2009 – 2020 (Source: Meteorological department, Jalpaiguri, India).

Year	Average Rainfall (mm)
2009	18.7
2010	25.1
2011	46.7
2012	113.8
2013	190.2
2014	560
2015	782.7
2016	641.3
2017	439.3
2018	121.5
2019	23.5
2020	9
Annual rainfall	248.48

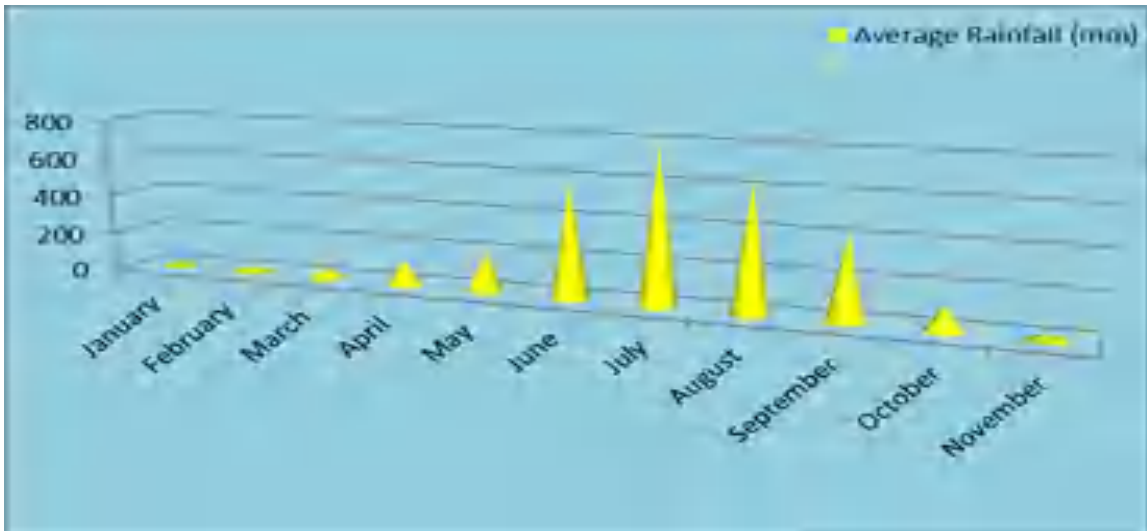


Fig. 7: Annual rainfall in NRVK MPCA (2009–2020)



Fig. 8: Entry gate of North Rajabhatkhawa MPCA

3.8.3. Sursuti MPCA (Gorumara National Park)

The selected site of this MPCA is situated at Sursuti Block (Fig. 12.) under Compartment no. 4 consists of 343.18 ha. forest area. Out of that our study area of MPCA is 100 ha. only. The north boundary of this MPCA is an artificial forest boundary, east is PWD road, south is an artificial boundary and the west is Neora river and an artificial forest boundary. This MPCA is under the forest jurisdiction of Jalpaiguri Forest Division. The MPCA site falls under Lataguri Forest Range under Barodighi beat. It comes under the administrative control of Divisional Forest Officer, Jalpaiguri Forest Division, headquarter at Jalpaiguri. The legal status of this MPCA is a Reserve Forest. The legal position of this Jalpaiguri Division goes back to the period of British Rule. The district of Jalpaiguri came into an administrative unit on 1st January 1869, by the amalgamation of the western duars district with Jalpaiguri Sub-division of Rangpur. The so called western duars was formed in 1964 from land taken from Bhutan. The forest dealt within this Division, before they came under the British Rule in 1865, continued to be open to indiscriminate felling and were described as “Open Forests”. The first reservations were made in 1879 according to the Indian Forest Act (Act VIII of 1878). Right were enquired into by the Forest Settlement Officer during the year 1890 to 1896 and revised notification was issued in the year 1895 (notification no. 3147 – For, dated 02/07/1895). The forests have been reserved from unoccupied waste.

3.8.3.1. Physical Description of the Site

The proposed MPCA, Sursuti lies between latitude 26°48'N and longitudes 88°49'E. Altitude recorded as 165 mtr. This MPCA area is lying outside the Gorumara National Park but adjacent to this park separated by a PWD road (state highway) runs from Chalsa to Jalpaiguri. Land configuration is even. Gradient is gentle with flat aspect.

3.8.3.2. Location Map of MPCA

MAP of West Bengal showing location of MPCA at Sursuti-4 Compartment in northern part of Bengal within the district Jalpaiguri.

3.8.3.3. Climate

The climate of this Sursuti MPCA site varies from tropical to sub-tropical elevation. The highest temperature of about 36°C occurs in the lower reaches in the month of May and June. December & January are the coldest month with night temp falling down to 2°C on the hills. Ground frost is not very common in this area.

3.8.3.4. Temperature

Sursuti MPCAs are lies in the moist tropical climatic zone. The average temperature during day time varies from 7.5°C to 21°C during winter (November to February), 16°C to 32°C (May to October) and, 24°C to 26.5°C during March to April (Table 4). Nights in winter are fairly cold (Fig. 9, 11 & Table 8). Frost is almost rare phenomena; however it occurs in Baradighi which is very close to MPCA.

3.8.3.5. Rainfall

The southwest monsoon starts from the middle of May and lasts until the end of September. The heaviest rainfall occurs during the month of July & August. The average annual rainfall is about 3390.80 mm (table 9 & Fig. 10).

The following table gives total yearly rainfall report in mm during the last ten years (2009 to 2020) near to MPCA proposed site.

3.8.3. 6. Drainage

The chief water sources are the Chel, Neora and Mal rivers join Teesta West of Lataguri Range which is a part of this selected MPCA forest. The other perennial jhoras are Bamoni Jhora, Sursuti Jhora and Monpala Jhora which exists within the MPCA.

Table 8: Annual temperature in Sursuti MPCA during 2009 – 2020 (Source: Meteorological department, Jalpaiguri, India).

Year	Mean Min. Ave. temp. (°C)	Mean Max. Ave. temp. (°C)
2009	5.2	10
2010	6	9
2011	7	12
2012	11	15
2013	12	19
2014	12	20
2015	13	18
2016	14	19
2017	15.5	21
2018	12	19
2019	7.3	22
2020	-4	10
Ave. Annual Temperature	9.25	16.16

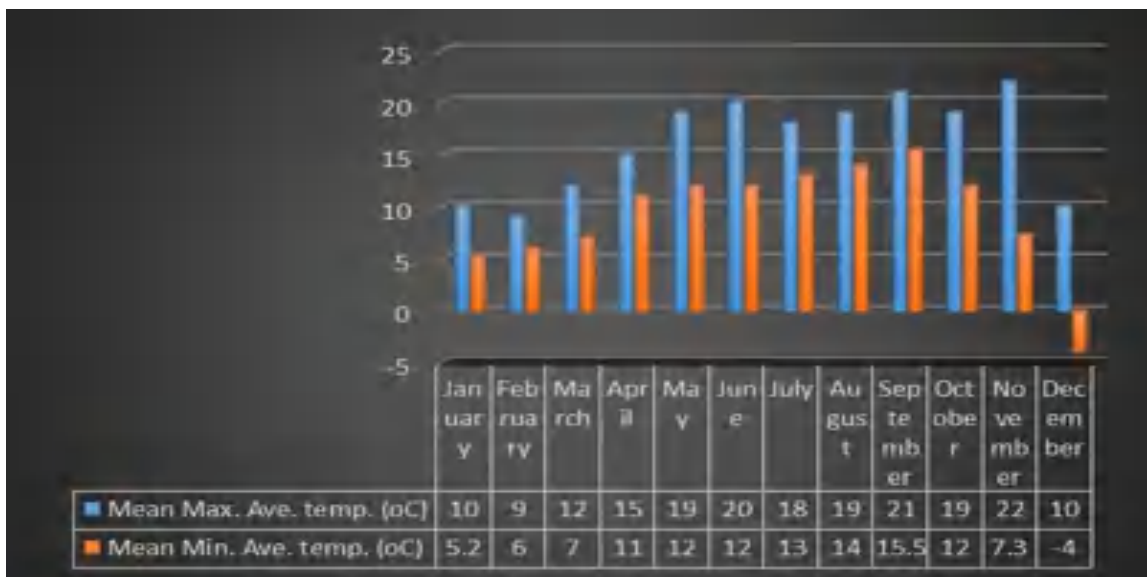


Fig. 9: Annual temperature of Sursuti MPCA (2009–2020)

Table 9: Annual rainfall of Sursuti MPCA during 2009 – 2020 (Source: Metrological department, Jalpaiguri, West Bengal, India)

Year	Average Rainfall (Mm)
2009	18.7
2010	21.1
2011	31.7
2012	111.8
2013	175.2
2014	670
2015	71.7
2016	612.3
2017	425.3
2018	147.5
2019	43.2
2020	7
Annual Rainfall	244.79

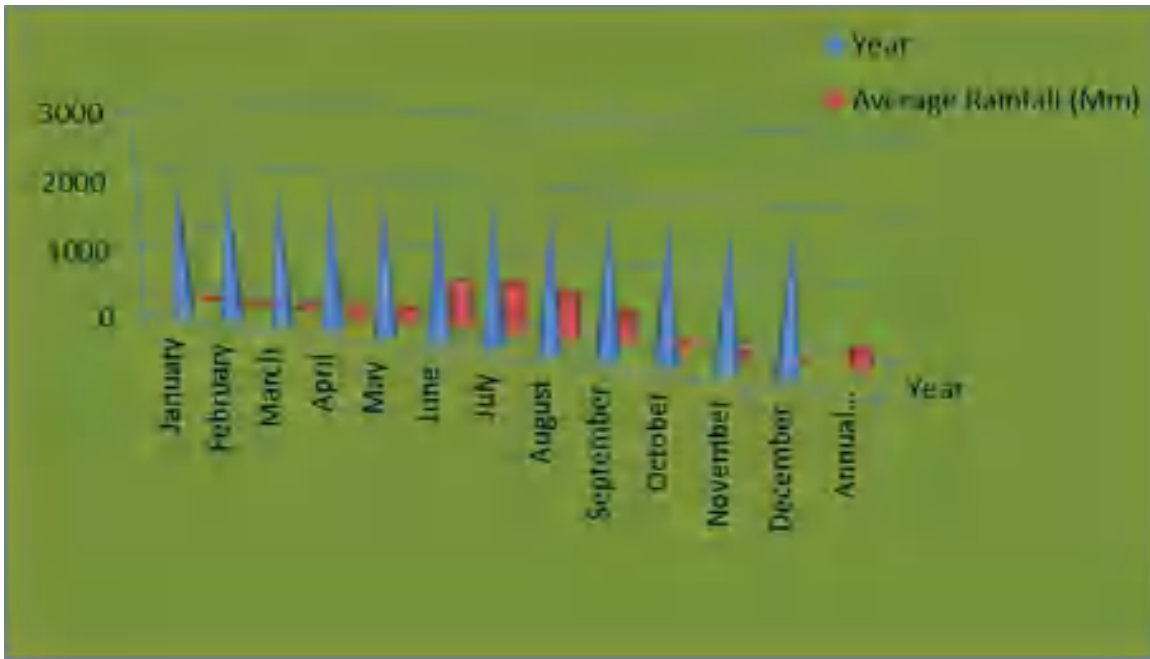


Fig. 10: Annual rainfall of Sursuti MPCA (2009–2020)

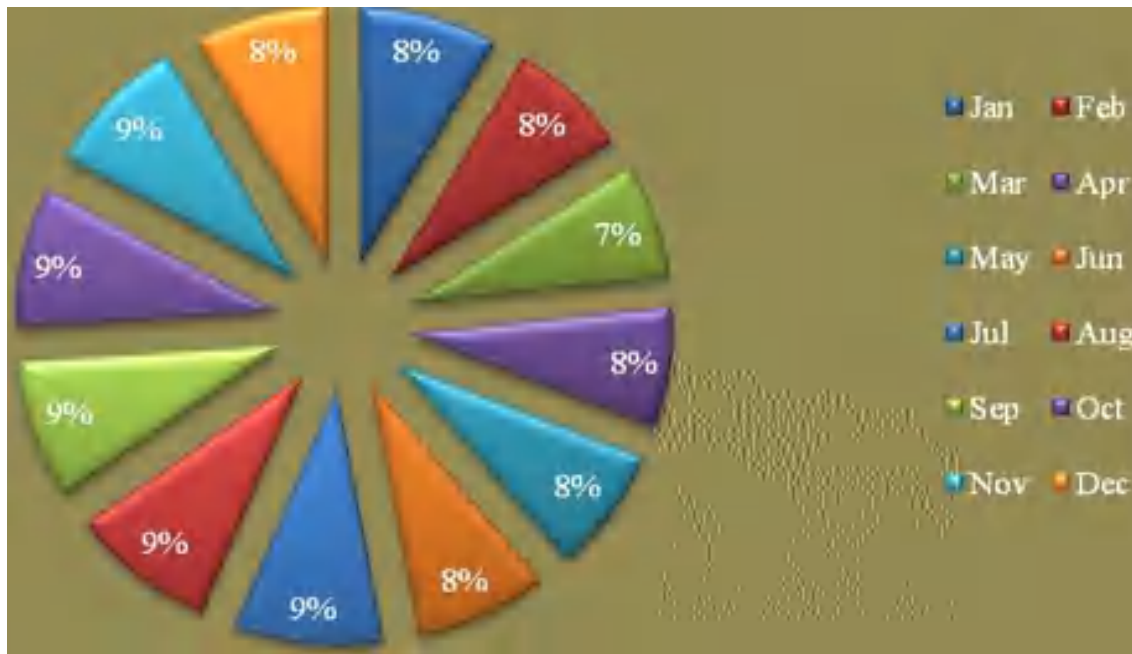


Fig. 11: Humidity of Sursuti MPCA (2009–2020)



Fig. 12: Entry gate of Sursuti MPCA

CHAPTER-4

MATERIALS AND METHODS

MATERIALS AND METHODS – 4

As an approach to the present study, a well-planned intensive field works covering almost all seasons throughout the year during 2014-2020 were conducted. Detail information's on each and plant species of various habitats of three MPCAs have been recorded. The present dissertation is covering a number of aspects using wide array of methodology that has been discussed below:

4.1. FLORISTICS

Extensive field surveys in different agro-climatic zone of the three MPCAs of West Bengal in various pre-dominant seasons were made during last eighty years. All the vascular plant resources including medicinal plants and their population were recorded in detail. The following methodologies were applied using techniques devised by (Jain & Rao, 1977, Mondal & Chowdhury 2018, Paul et al, 2020) with some modifications wherever it was essential.

4.1.1. Sampling Specimens

Plants parts were collected in bulk at random from different habitats from almost all the area of MPCAs. During specimens' collection mostly flowering and fruiting stages were targeted for easy identification and good voucher specimens. For this purpose in many cases repeated visit to the same spot were made sometimes even within a week.

4.1.2. Record of Field Data

During collection, plant specimens were tagged properly and necessary field data like colour on different plant parts including flowers, absence or presence of exudate, scent / aroma, habitat structure, association, population structure, etc. were recorded in the *Field Note-Book*. The ethno botanical uses of plants materials were investigated through direct interview using some standard questionnaires to the local ethnic communities and village peoples and also observation on direct uses, were recorded in the *Field Note-Book*.

4.1.3. Processing and Drying of Specimens

At the field camp or at the laboratory, the collected specimens are cleaned and trimmed suitably, displayed properly on blotters (blotting papers and old newsprints) and then dried in wooden Plant Press. Before pressing, most of the specimens were treated with 6

% formaldehyde (HCHO) solution to avoid fragmentation of specimens and to eliminate chances of decomposition through fungal infestation. Soft plants parts are kept in a separate light-weight Plant Press, where the pressure was increased very slowly and much frequent change of blotters during the first few days of the drying operation. For other plants blotters were changed with regular frequency in a heavy wooden Plant-Press until drying. During moist season for proper drying a Hot Air Oven was used with temperature adjusted at 40–45° C. Generally, specimens were completely dried out within one or two week time.

4.1.4. Poisoning of Specimens

After drying all the plant specimens were poisoned with 6% ethanolic solution of Mercuric Chloride (HgCl₂) and dried again in blotting papers for a day.

4.1.5. Mounting and Labeling

After poisoning, specimens were mounted on standard Herbarium Sheets. Later on a label was attached, in most cases, near the right hand bottom corner of the sheet, which bears the Field No, date and place of collection, scientific name, family, local name, field-characters and the name of the collector. Mounted and labelled specimens were stored temporarily in a steel cabinet for further use during the present dissertation.

4.1.6. Identification

After the mounting, specimens were taken under critical study and identified initially matched with the pre-identified specimens in NBU-Herbarium and also with character matching with the different Taxonomic literature by various authors (Prain, 1903; Noltie, 1994). Further confirmation of identification the specimen, several virtual herbaria (K, TAI) and online floras were also consulted time to time. Some unidentified specimens were taken to CAL for matching with herbarium and experts in plant taxonomist were also consulted for finalization.

4.1.7. Storing the Herbarium Sheets

Among the entire prepared specimens, one set of voucher specimens were be deposited in the NBU-Herbarium against specific Accession numbers and the duplicates will be deposited at CAL Herbarium for future reference for global scientist and as the evidence of the present work.

4.2. PHYTOSOCIOLOGY

For phytosociological works quadrature sampling is the widely accepted method as suggested by Misra, 1968; Shimwell, 1971; Tripathi & Misra, 1971; Phillip, 1959 and Kadir, 2001; Rai, 2006; Chowdhury, 2009. During this dissertation, most of the samples of tree, shrub & herb species were sampled in different season of the year.

4.2.1. Sampling

Quadrature samples were taken randomly in all over each MPCA, which includes marshy and exposed wetland areas wherever it is there within each MPCA. For Phytosociological study nested quadrature will be plotted. For herbaceous species 1m × 1m quadrates will be adopted, for shrubs 5m × 5m and for tree 20m × 20m quadrates (Fig. 13) were adopted. Surveys were conducted in three different seasons and are Pre-monsoon, post-monsoon & winter. During sampling all possible plants species including angiosperms, gymnosperms and pteridophytes will be recorded.

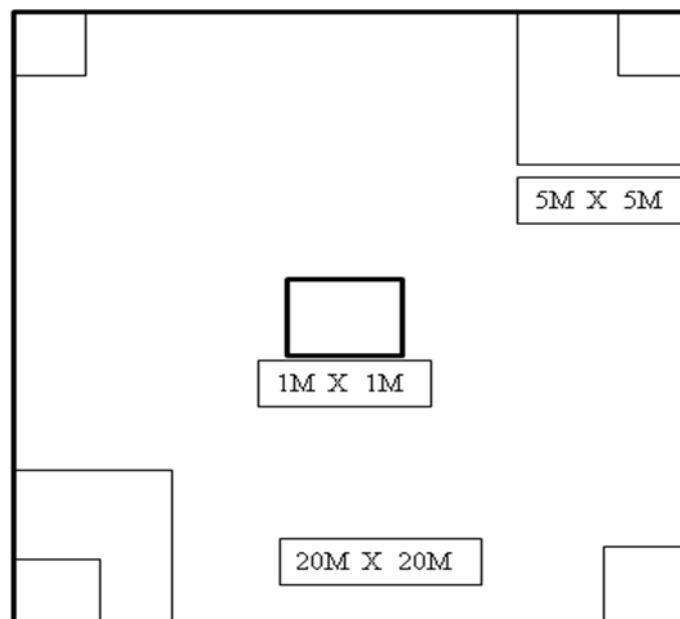


Fig. 13: Sketch of Nested Quadrature Model adopted for phytosociological study

4.2.2. Data processing

Recorded data is transferred to Microsoft Excel worksheet and parameters like Abundance, Density, Frequency and their relativeness along with Important Value Index for each species were determined following the methods as suggested by Phillips (1959), Malhotra (1973), Kadir (2001), Rai (2006) and Chowdhury, (2009).

4.2.3. Biological Diversity Indices

Biological diversity can be quantified in various ways and to determine this, species Richness and Evenness of particular taxa have been measured against unit area. Number of different organisms present in a particular area is a measure as Richness, whereas Evenness can be measure of the relative abundance of the different taxa that makes the richness of an area.

4.2.3.1.1. Simpson's Index (λ)

Simpson's index is a mathematical tool that is used to determine the concentration of dominance of specific species in each MPCA. The value of Simpson's index is varies between 0–1. During measuring the Simpson index both the richness and evenness taken into accounts. The calculating formula for concentration of dominance that is suggested by Simpson (1963) is as follows:

$$\lambda = \sum p_i^2$$

here, 'pi' denotes the proportional abundance of 'ith' species and $p_i = n_i/N$

4.2.3.1.2. Shannon – Weiner Index (H')

Shannon - Weiner index (Shannon–Weiner, 1949) was used to determine species diversity of MPCA:

$$H' = - \sum [(n_i/N) \ln (n_i/N)]$$

Where, 'ni' denotes the number of individuals of each species.

'N' denotes the total number of species studied within the habitat.

4.2.3.2. Species Richness Indices

Species richness can be measurement of number of individual of each species per sample. Species richness can be determined by measuring to species diversity based on the number of species occur per sample plot. For determining the species richness standard indices were adopted:

4.2.3.2.1. Menhinick Indices (D)

Species richness in a community is determined by Menhinick Index (Menhinick, 1964).

$$D = S/\sqrt{N}$$

here, S means total number of species and N denotes total number of individuals that observed.

4.2.3.2.2. Margalef Indices (R1)

Margalef Index (Margalef, 1968) is also used to determine Species richness.

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

Where, s = number of species.

n = number or of individuals of a species.

4.2.3.2.3. Similarity Index (SI)

The similarity index determines the interspecific association between the species of plant communities. Sorensen's species similarity index (SI) between the transects and the two sites was calculated

$$SI = \left(\frac{2C}{(a+b)} \right) \times 100$$

Where, C is the number of species in sites a and b; a and b are the number of species in sites a and b

4.3. ETHNOBOTANY

4.3.1. Economic uses

The indigenous people of the tropical world from the preindustrial period have an intimate relationship with the natural resources of their environment. Wild and

cultivated plants and wild and domesticated animals both provided all the food and others they needed for living. The utility of these three plant families were known to humankind since the ancient time.

MPCAs occupy a very important position among all economic plants, as they are one of the major sources of man's food. Tender leaves, young inflorescence, pith of the stem, fruits and seeds, endosperm of many plants are edible and provide all the nutritive materials for healthy living. Species of wild plants have also local and commercial uses as source of food, sugar, wine, oil, fibers and various other items of uses such as building material, furniture in the form of wood and leaves. Soft young leaves are also useful for making various household items. Due to high nutritive and medicinal values of the edible portion of coconut plant. Few plants they are commercially cultivated. Local, medicinal, commercial and ethnic uses of indigenous plants however are more to be known through extensive survey, wide interaction and document research. Various authors (Jain, 1981, 1987, 1991; Rai *et al.*,1998; Rai & Bhujel, 1999; Rai, 2002; Sarkar, 2011) have been recorded food and medicinal uses of some indigenous plants from this part of India. Now efforts were made to record some more information on different uses of indigenous plants, some are of great interest not earlier known.

Information about the common uses of various semi wild, cultivated and domesticated plants were collected along with their economic values from the existing published works of various authors (Basu 1991, 2012; Basu and Chakraverty 1994; Chowdhury 2009; Basu and Mondal 2013, 2015; Mondal and Chowdhury 2016, 2017, 2018, 2020) or by direct observation on uses of wild plants-based products.

4.3.2. Ethno-botanical Study

The complete methodology for the ethnic uses of plants was primarily based on the interaction with the various ethnic communities of Sub-Himalayan Terai-Duars, plains of Bengal and western plateau. Peoples of various ethnic groups were directly using different parts of plants in their livelihood. During study, entire data in connection to traditional uses of medicinal plants and their mode of utilizations were scientifically documented and properly photographed as evidence. For this part of work conventional methods were followed as suggested by Jain 1981, 1987, 1991; Rai 2002; Sarkar 2011; Chowdhury 2015; Kirtikar and Basu 1935; Chopra *et al.* 1956, 1969; Jain 1991; Shah and Das 2002; Chowdhury 2009; Sarkar 2011; Basu and Mondal 2015; Mondal *et al.*

2017. A set of questionnaire prepared based on the model (Jain 1991; Chowdhury 2009 and Sarkar 2011) for the present study. The extensive fieldwork were carried out in different villages of Terai and Duars region of North Bengal. Enquiries were made on their daily life, food habit, fodder collection, occupation, health practices, medicines, trade, beliefs, rituals, ceremonies, traditions and customs using a pre-designed questionnaire.

4.4. SOIL ANALYSIS

Physical and chemical parameters of soil of each MPCAs have already analyzed to understand the present status of existing soil of each MPCA. Expert soil analyst and technician have analyzed different physical and chemical parameters of soil samples in Salugara soil testing laboratory of Forest Dept. Govt. of West Bengal following standard methodology.

4.5. RET ASSESSMENT

To assess the threatened status of different wild species of MPCAs were evaluated by matching with the red data book published by Botanical Survey of India (1987). For latest information about the status of selected species, IUCN website was also consulted. During the field study, visual observation and calculated abundance value also help us to determine the local level species availability.

CHAPTER-5

FLORISTIC STUDY

5.1. INTRODOCTION

The floristic entities in various natural conservatoties, wetlands and wastelands of terai and duars are quite diversityfied with significant population size. Diverse ecological habitats of this sub-Himalayan North Bengal plains inncompases various groups of plant species. The dense green pathes of natural conservatories allows wide range of wildlife population also. A good number of floristic study were conducted by different authors in recent times (Long and Grierson 1983, 1984, 1987, 1991, 1999, 2001, Chowdhury 2009; Chowdhury 2016; Chowdhury 2017; Mondal and Chowdhury 2018; Mondal et al. 2019, 2020, 2021). The explored entire flora of three MPCAs of North Bengal plains are presented here following the most updated classification APG IV (2016). For nomenclature of each species ICN and online index (www.powo.org, www.plantlist.org, www.ipni.org, www.tropicos.org) has been consulted. In enumeration part genera and species were arranged. The vernacular names of possible species were recorded during survey from the local inhabitants of forested villeges and provided only Nepali and Bengali names. The present status of the species, habitat type, collection date, distribution were given against each species. The present floristic work on three MPCAs was recorded 626 species of vascular plants belonging to 397 genera representing 102 families. Out of total recorded species 460 species are dicotyledons, 152 species are monocotyledons and 14 species are pteridophytes (Table 10 and Fig. 14).

Table 10. Numerical representation of different floristic elements in three MPCAs of North Bengal plains.

Taxa		Family	Genus	Species
Pteridophyte		7	12	14
Angiosperm	Monocotyledons	17	80	152
	Dicotyledons	78	305	460
Total		102	397	626

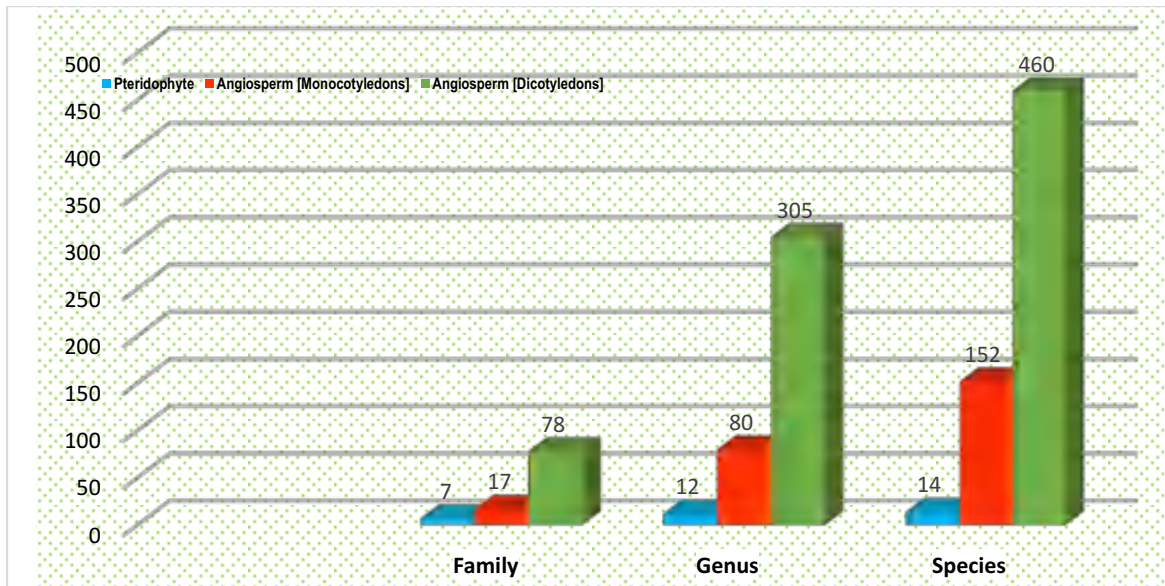


Fig. 14. Total percentage (%) of taxa, genus and family of three MPCAs of North Bengal

5.2. RESULTS

5.2.1. PTERIDOPHYTE

For the systematic arrangement of the recorded Pteridophyte families from the three MPCAs of North Bengal was classified by Pichi-sermollisin 1973.

Cyatheaceae

Marattiaceae

Ophioglossaceae

Polypodiaceae

Pteridaceae

Schizaeaceae

Thelypteridaceae

CYATHEACEAE Kaulf. in Wesen Farrenkr. 119. 1827.

ALSOPHILA R. Br. in Prodr. 158. 1810.

Alsophila spinulosa (Wall. ex Hook.) Tryon in Contr. Gray Herb. 200: 32. 1970.

Cyathea spinulosa Wall. in Numer. List [Wallich] n. 178. 1828. **'Tree Fern'**

Small tree. Trunk 5 – 15 m tall, covered by adventitious roots. Fronds bi-pinnate; stipes persistent, lustrous, greenish, purple – black, 30 – 50 cm, with spines, scales on trunks, stipes dark brown, stiff, narrowly lanceolate, apex, setose, with pale and thin toothed margins, Lamina oblong to obovate, middle pinnae oblong, pinnules 18 – 20 pairs,

middle ones lanceolate, base cuneate, sessile, apex long acuminate, caudate, pinnatisect, basal segments shorter, margin dentate, apex acute; veins pinnate. Lamina papery, abaxial side with scales, indusia globose, thin, membranous.

Fertile: March – April

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar and Nepal.

Status: Common.

Uses: Rhizome and fronds used in chronic disorders.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA)12.05.1019, Mallik, et al. [Field No. 2126]

MARATTIACEAE Kaulf. in Enum. Filic., 31. 1824.

ANGIOPTERIS Adans. in Fam. Pl. 2: 21. 1763.

Angiopteris evecta (Forst.) Hoffm. in Commentat. Soc. Regiae Sci. Gott. 12: 29, t.5. 1794. *Angiopteris evecta* var. *rurutensis* E.D.Br. in Bull. Bernice P. Bishop Mus. 89: 100. 1931.

Fronds 2 – 4 m; stipes smooth. Laminae bipinnate; pinnae 64 – 72 cm, with 15 – 30 pairs of spreading pinnules; pinnules 7 – 20 × 0.9 – 3.5 cm, bases cordate, rounded to cuneate, margins serrate, apices acuminate. Veins obvious, extending to costule. Sori marginal 1 mm from margin.

Fertile: March – April

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Common

Uses: It is used in constipation, dysentery, muscle pain, hemorrhoids, fever.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA)12.03.1019, Mallik, et al. [Field No. 4040]

DRYOPTERIS Adans. in Fam. Pl. 2: 20. 1763.

Dryopteris sikkimensis (Bedd.) Kuntze in Revis. Gen. Pl. 2: 813. 1891.

Plants 76 – 82 cm tall. Rhizome erect, short. Fronds caespitose; stipe dark brown, scaly; scales ovate to lanceolate, usually appressed; lamina ovate, up to 52 × 33 cm, tripinnate,

apex acuminate; pinnae oblique, linear to lanceolate, base symmetrical, rounded, apex caudate to acuminate; pinnules 20 pairs, oblong, sessile, apex rounded; segments ascending, oblong, apex obtuse, with several obtuse teeth. Lamina herbaceous, glabrous; costa clothed broadly lanceolate, scales brown abaxially, rachis stramineous, broadly ovate, rachis broad, adaxially; veins slightly visible, 2. Sori 2 or 3 pairs, 1 sorus on each segment; indusia brownish, membranous, persistent.

Fertile: June – August

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (Sikkim, West Bengal, North East India), Bhutan, Indo-China, Myanmar, Nepal and Thailand.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 14.05.1019, Mallik, et al. [Field No. 4115]

OPHIOGLOSSACEAE Martinov, Tekhno-Bot. Slovar.: 438. 1820.

HELMINTHOSTACHYS Kaulf. in Enum. Filic.: 28. 1824.

Helminthostachys zeylanica (L.) Kaulf. in Gen. Fil. t. 47. 1840. *Helminthostachys zeylanica* var. *brachyspicae* Nampy and Madhus. in J. Econ. Taxon. Bot. 18(1): 189. 1994.

Rhizome 5 – 10 mm diameter. Fronds single, 20 – 50 cm tall; stipe base sheath; stipe fleshy, 10 – 50 cm., glabrous; sterile lamina ternate; pinnules lanceolate, 6 – 20 × 1.2 – 2 cm, base decurrent, margin irregularly toothed, apex acute. Sporophore Spikelike, stalk 4 – 10 cm, spike, branches divided, sporangia pseudowhorl, sterile apical appendages.

Fertile: May – July

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar and Nepal.

Status: Not evaluated (IUCN)

Uses: Rhizome is used in the treatment of malaria, dysentery, catarrh, early stages of phthisis and whooping cough.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1019, Mallik, et al. [Field No. 1596]

PYRROSIA Mirb. in Hist. Nat. Veg. 3: 471. 1803.

Pyrrosia lanceolata (L.) Farw. in Amer. Midl. Naturalist 12: 245. 1930. *Pyrrosia lanceolata* (L.) Farw. in Amer. Midl. Naturalist 12: 245. 1931. *Bolbitis linnaeana* (Fee) Chr. in Index Filic. in Suppl. Tert. 198. 1934.

Plants 5 – 10 cm. Rhizome creeping, 1.2 – 2.5 mm in diameter, central sclerenchyma strand; phyllopodia 1 – 2 cm apart, Scales peltate, 3.4 – 7.5 × 0.3 – 1.5 mm, base entire to ciliate; acumen light brown, ciliate; short, orbicular to ovate scally. Fronds monomorphic, 0.5 – 1 cm stipitate; lamina widest 4 – 13 × 0.5 cm, base attenuate, apex obtuse. Hydathodes present. Indument persistent, monomorphic boat – shaped to acicular rays. Sori sunken. Sporangia stalks 1.5 – 2 mm.

Fertile: Not Evaluated (NE)

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal.

Status: Common.

Uses: Rhizome is used to treat flu, strep throat, inflammatory diseases.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1019, Mallik, et al. [Field No. 2326]

POLYPODIACEAE Presl and Presl in Delic. Prag.: 159. 1822.

DRYNARIA (Bory) Sm. in J. Bot. 4: 60. 1842.

Drynaria quercifolia (L.) Sm. in J. Bot. (Hooker) 3: 398. 1841. *Drynaria quercifolia* var. *normalis* Domin in Biblioth. Bot. 85: 192.1913. *Drynaria quercifolia* var. *sparsisora* (Desv.) Domin in Biblioth. Bot. 85: 192, Textfig. 43. 1913.

Rhizome shortly creeping, 2 – 3 cm in diameter; scales spreading throughout the rhizome, blackish brown, linear, 6 – 20 × 0.5 – 1 mm, pseudopeltate, apex strongly dentate, apex long, acute; fronds dimorphic, sessile, 15 – 50 × 10 – 30 cm, shallowly lobed; foliage fronds stalked, stipe 30 cm; lamina pinnatifid, apex aborted; pinnae broadly lanceolate, 15 – 25 × 2 – 3.5 cm, apex acute. Sori in 2 rows, sunken veins. Spores acuminate spines.

Fertile: November – January

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Near Threatened (IUCN 2019)

Uses: Treated as inflammation, rheumatism, bone fracture, headache, jaundice

Specimen Examined: West Bengal, Jalpaiguri, North Sevoke MPCA, 11.05.1019, Mallik, et al. [Field No. 4015]

MICROSORUM Link in Hort. Berol. 2: 110. 1833.

Microsorium punctatum (L.) Copel. in Univ. Calif. Publ. Bot. 16: 111. 1929.

Rhizome creeping, subcylindrical, waxy beneath scales, scales pseudopeltate, slightly spreading, ovate or triangular, margin entire denticulate to dentate, apex acute, subclathrate, clathrate cells small, isodiametric or cells longitudinally rectangular, hairs multiseptate, glabrous. Fronds slightly dimorphic. Stipe present, lamina decurrent at base. Lamina simple, obovate, elliptic or linear, 10 – 175 × 1.5 – 15 cm, herbaceous to subleathery base decrescent, stipe winged, cuneate – decrescent or truncate to obtuse, auriculate, margin entire, apex acute to rounded. Veins sunken indistinct, or prominent. Sori separate, irregularly scattered, small, up to 8 irregular rows, paraphyses not enlarged.

Fertile: August – October

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Vulnerable species (IUCN 2020)

Uses: It is used in diuretic, purgative, wound healing.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.04.1019, Mallik, et al. [Field No. 4195]

PTERIDACEAE Kirchn. in Schul-Bot.: 109. 1831.

ADIANTUM L. in Sp. Pl. 2: 1094. 1753.

Adiantum caudatum L. in Mant. Pl. Altera 308. 1771. *Adiantum caudatum* var. *rhizophyllum* (Schrad.) Baker in Fl. Bras. (Martius) 1(2): 363.1870. *Adiantum pulverulentum* var. *caudatum* Jenman in Bull. Bot. Dept. Jamaica no. 33: 7. 1892.

Terrestrial or epilithic. Rhizomes erect, short, scaly, lanceolate, margins entire. Fronds in clustered; stipe castaneous, densely dark brown, multicellular hirsute; lamina 1 – pinnate, lanceolate 14 – 31 × 3 – 5 cm, base narrow; rachis sparsely hirsute, glabrescent, apex usually prolonged; pinnules 22 – 44 in pairs, alternate, surfaces sparsely

multicellular hirsute, entire, upper and outer margins deeply divided into lobes, upper side truncate; lobes linear, margins entire, apex truncate, fine segments, few dentate at apex; veins multidichotomous. Sori 5 – 13 per pinna; false indusia brownish, orbicular or oblong, hairy, upper margins flat, entire, persistent. Perispore granular.

Fertile: November – January

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Rare occurrence

Uses: It is used in Styptic, antibacterial, antipyretic fever, skin disease.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 13.04.1019, Mallik, et al. [Field No. 4165]

PTERIS L. in Sp. Pl. 2: 1073. 1753.

Pteris vittata L. in Sp. Pl. 2: 1074. 1753. *P. vittata* Schkuhr in 24. Kl. Linn. Pfl. – Syst. 1: t.89. 1809. *P. vittata subsp. bengalensis* Fraser-Jenk. in New Sp. Syndr. Ind. Pteridol. 231. 1997. *P. vittata ssp. longifolia* (L.) Fraser-Jenk. and Pariyar, Ferns Fern- Allies Nepal 1: 364. 2015.

Plants 100 – 150 cm tall. Rhizome erect, short 2 – 2.5 cm in diameter, woody, apex densely yellow – brown scaly. Fronds clustered; stipe firm, light brown, 12 – 33 cm, densely scaly when juvenile, scales like rhizome, sparse; rachis straw – colored, sparsely scaly; lamina 1 – pinnate, oblanceolate, oblong, 23 – 94 × 6 – 30 cm; lateral pinnae 40 pairs, alternate; lower pinnae sessile, basal pair auriculiform, base slightly expanded or cordate, both sides auriculiform, upper ones larger, pinnae 1 – 1.7 cm apart, sterile margin, evenly serrate, apex acuminate; veins slender, contiguous, oblique, forked; terminal pinna similar to lateral pinnae. Lamina, opaque, thinly leathery, glabrous pale green.

Fertile: April – May

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Common

Uses: Leaves used in illness and Fronds used as cushion for cattle sheds.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1018, Mallik, et al. [Field No. 2190]

Pteris biaurita L. in Sp. Pl. 2: 1076. 1753. *P. biaurita* var. *repandula* Kuhn in Bot. Jahrb. Syst. 24(1): 99. 1897. *P. biaurita* var. *intermittens* Chr. in Contr. U.S. Natl. Herb. 26: 312. 1931. *P. biaurita* var. *krugii* Urb. in Symb. Antill. (Urban). 4(1): 48. 1903. *P. biaurita* var. *quadriaurita* Krug in Bot. Jahrb. Syst. 24(1): 99. 1897. *P. biaurita* subsp. *walkeriana* Fraser-Jenk. and Rajkumar in Taxon. Revis. Ind. Subcontinental Pteridophytes 115-116. 2008.

Rhizome erect, woody, apex with brown scales. Fronds clustered; stipe brown, apically straw – colored, scaly, adaxially narrowly grooved; rachis, glabrous, narrowly grooved adaxially; lamina 2 – 3 pinnatipartite, oblong or ovate in outline, lateral pinnae 8 – 10 pairs, decumbent, opposite, upper ones sessile, broadly lanceolate, base cuneate, apex narrowly lanceolate, caudate, segments 20 – 25 pairs, alternate, subspreading, sinuses obtuse – rounded, falcate, broadly lanceolate, 18 – 35 × 5 – 7 mm, base enlarged, margins entire, apex obtuse; terminal pinna similar to middle, stalked, costae prominent, glabrous, grooved adaxially, short spines on both sides; veins slightly raised, lamina gray – green, thickly papery, glabrous. Indusia light brown, entire, membranous, persistent.

Fertile: November – January

Local Distribution: Throughout the forest area of North Bengal

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo-China, Myanmar, Nepal.

Status: Common

Uses: Rhizome and fronds used in chronic disorders.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1018, Mallik, et al. [Field No. 2121]

Pteris longifolia Cav. in Descr. Pl. 269. 1802. *P. longifolia* L. in Conf. Hieronymus: Hedwigia 54: 284. 1914. *P. longifolia* L. in Conf. Hieronymus: Hedwigia 54: 284.1914. *P. longifolia* var. *angusta* Christ in Enum. Pl. Guatem. 6: 75. 1903. *P. vittata* ssp. *longifolia* (L.) Fraser-Jenk. and Pariyar in Ferns, Fern-Allies Nepal 1: 364. 2015.

Stems slender, short – creeping, sparsely scaly; scales dark brown. Leaves clustered, Petiole green to purple – black 10 – 25 cm, glabrous or sparingly scaly at base, glabrous

at maturity. Blade lanceolate, broadly linear, 1 – pinnate, rachis not winged. Pinnae numerous, mostly green over winter, articulate to rachis, narrowly linear, simple, 1.5 – 9 cm × 1.5 – 5 mm; base rounded, margins obscurely dentate, often entire; apex short – acute to obtuse; pinnae glabrous. Veins free, forked, Sori broad.

Fertile: January - March

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar and Nepal.

Status: Common

Uses: Rhizome and fronds used in chronic disorders.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1018, Mallik, et al. [Field No. 2176]

HAPLOPTERIS Presl in Tent. Pterid.: 141. 1836.

Haplopteris elongata (Sw.) Crane in Syst. Bot. 22: 514 (1997). *Vittaria elongata* Sw. in Syn. Fil. (Swartz) 109: 302. 1806. *V. anguste-elongata* Hayata in Icon. Pl. Formosan. 6: 161 (1916). *V. elongata* var. *angustifolia* Holttum ex Balakr. in Bull. Bot. Surv. India 22(1-4): 137. 1982.

Rhizome long creeping, much branched, roots numerous; scales dark brown, subulate-lanceolate, 4 - 6 mm, 0.5 - 1 mm wide, margin denticulate, apex bristlelike, dark colored. Fronds clustered, drooping; stipe distant; lamina leathery, linear, base narrowed, apex rounded or obtuse; costa slender, veins evident. Sori marginal, open outward, fertile; paraphyses long. Spores monoletе, oblong, surface obscure.

Fertile: May – August

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar and Nepal.

Status: Common.

Uses: Rhizome is used in the treatment of malaria and dysentery.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1019, Mallik, et al. [Field No. 4326]

SCHIZAEACEAE Kaulf. in Wesen Farrenkr. 119. 1827.

LYGODIUM Sw. in J. Bot. (Schrader) 1800(2): 7. 1801.

Lygodium flexuosum (L.) Sw. in J. Bot. (Schrader) 1800 (2): 106. 1801. *L. flexuosum* (L.) Sw. in J. Bot. (Schrader) 1800(2): 106. 1801.

Rhizome creeping, densely covered with roots, stipes close together; rhizome apex covered with dark brown hairs. Juvenile fronds dichotomous, branch bearing single pinna, palmately 3 – 7 – lobed, lobes equal, pinna base cordate, margins serrate, sometimes crenately lobed. Rachis narrowly winged, puberulent on adaxial surface; secondary branches bearing 4 – 6 pinnae on each side, apical and lower pinnae asymmetrical, lowest branches quaternary pinnae at base; sterile pinnae 2 – 9 cm × 8 – 16 mm, margin serrate, lower pinnae stalked, lamina rather thin; costae with scattered long hairs, lamina hairy; fertile pinnae smaller than sterile pinnae, sorophores 2 – 4 mm; indusia glabrous; spores verrucose.

Fertile: March – June

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal), Bhutan, Indo China, Myanmar, Nepal and Thailand.

Status: Common

Uses: Rhizome powder used in skin diseases. Leaves used in rheumatism, sprains, eczema, scabies, cut wounds.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.04.1019, Mallik, et al. [Field No. 4090]

THELYPTERIDACEAE Ching ex Pic. Serm. in Webbia 24: 709. 1970.

CHRISTELLA H. Lev. in Fl. Kouy-Tcheou. 472. 1915.

Christella dentata (Forssk.) Brownsey and Jermy in Brit. Fern Gaz. 10: 338. 1973. *C. dentata* var. *caespitosa* Holttum, Kew Bull. 41(3): 518. 1986. *C. dentata* var. *glabra* Punetha and Kholia in J. Bombay Nat. Hist. Soc. 87(2): 266. 1990. *C. dentata* var. *himalayensis* Punetha and Kholia in J. Bombay Nat. Hist. Soc. 87(2): 266. 1990.

Stems short, creeping. Leaves dimorphic, evergreen, 40 – 140 cm, fertile, petiole long. Petiole purplish brown, 20 – 40 cm, leaves linear to lanceolate, scale hairy. Blade 30 – 90 cm, proximal pairs of pinnae reduced. Pinnae 1 – 3 cm; segments rounded, basal acroscopic segment pinnae auriculate., veins uniform; adaxially veins hairy. Sori round; indusia tan, pubescent, hairy.

Fertile: April – June

Local Distribution: Throughout the forest area of Terai and Duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, Indo China, Myanmar and Nepal.

Status: Not evaluated (IUCN)

Uses: Rhizome is used to treat inflammatory diseases and used as antibacterial agent.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA), 12.05.1019, Mallik, et al. [Field No. 4926]

5.2.2. ANGIOSPERMS

The Botanical Classification of Angiosperms is followed by APG IV, 2016 (Table 11), Orders and families of the recorded vascular plants are arranged as per the APG IV system of classification (2016) for updated information.

Table 11. The Botanical Classification of Angiospermae by APG IV

Basal Angiosperms	<i>Aristolochiaceae</i>
<i>Chloranthales</i>	<i>Piperaceae</i>
<i>Chloranthaceae</i>	Monocots: Monocotyledons
Magnoliids	Non commelinids
<i>Laurales</i>	<i>Acorales</i>
<i>Lauraceae</i>	<i>Acoraceae</i>
<i>Magnoliales</i>	<i>Alismatales</i>
<i>Annonaceae</i>	<i>Araceae</i>
<i>Magnoliaceae</i>	<i>Arecales</i>
<i>Myristicaceae</i>	<i>Areaceae</i>
<i>Piperales</i>	<i>Asparagales</i>
<i>Amaryllidaceae</i>	<i>Cucurbitales</i>
<i>Asparagaceae</i>	<i>Cucurbitaceae</i>
<i>Hypoxidaceae</i>	<i>Begoniaceae</i>
<i>Commelinales</i>	<i>Fabales</i>
<i>Commelinaceae</i>	<i>Fabaceae</i>
<i>Pontederiaceae</i>	<i>Rosales</i>
<i>Dioscoreales</i>	<i>Cannabaceae</i>
<i>Dioscoreaceae</i>	<i>Moraceae</i>

<i>Liliales</i>	<i>Rhamnaceae</i>
<i>Smilacaceae</i>	<i>Rosaceae</i>
<i>Pandanales</i>	<i>Ulmaceae</i>
<i>Pandanaceae</i>	<i>Urticaceae</i>
<i>Poales</i>	<i>Fagaceae</i>
<i>Cyperaceae</i>	Core –eudicot:Rosids:Eurosids
<i>Poaceae [Graminae]</i>	<i>Celastrales</i>
<i>Zingiberales</i>	<i>Celastraceae</i>
<i>Costaceae</i>	<i>Malpighiales</i>
<i>Marantaceae</i>	<i>Achariaceae</i>
<i>Zingiberaceae</i>	<i>Clusiaceae</i>
<i>Orchidaceae</i>	<i>Euphorbiaceae</i>
Eudicots [Eudicotyledon]	<i>Hypericaceae</i>
Peripheral eudicot	<i>Passifloraceae</i>
<i>Ranunculales</i>	<i>Phyllanthaceae</i>
<i>Menispermaceae</i>	<i>Salicaceae</i>
<i>Papaveraceae</i>	<i>Violaceae</i>
<i>Ranunculaceae</i>	<i>Pandanales</i>
<i>Trochodendraceae</i>	<i>Pandanaceae</i>
Core-eudicots:Non rosid: Non asterid	<i>Oxalidales</i>
<i>Dilleniales</i>	<i>Elaeocarpaceae</i>
<i>Dilleniaceae</i>	<i>Oxalidaceae</i>
<i>Vitales</i>	<i>Malvids</i>
<i>Vitaceae</i>	<i>Brassicales</i>
Eudicot: Super-Rosid: Rosid: Fabids	<i>Brassicaceae</i>
<i>Bixaceae</i>	<i>Apocynaceae</i>
<i>Capparaceae</i>	<i>Rubiaceae</i>
<i>Dipterocarpaceae</i>	<i>Solanales</i>
<i>Malvaceae</i>	<i>Convolvulaceae</i>
<i>Sapindales</i>	<i>Solanaceae</i>
<i>Anacardiaceae</i>	<i>Lamiales</i>
<i>Meliaceae</i>	<i>Oleaceae</i>
<i>Rutaceae</i>	<i>Gesneriaceae</i>

Superasterids	<i>Plantaginaceae</i>
<i>Caryophyllales</i>	<i>Scrophulariaceae</i>
<i>Amaranthaceae</i>	<i>Linderniaceae</i>
<i>Caryophyllaceae</i>	<i>Bignoniaceae</i>
<i>Droseraceae</i>	<i>Verbenaceae</i>
<i>Molluginaceae</i>	<i>Lamiaceae</i>
<i>Nyctaginaceae</i>	Lamiales
<i>Plumbaginaceae</i>	<i>Acanthaceae</i>
<i>Polygonaceae</i>	Campanulids
<i>Portulacaceae</i>	Apiales
Saxifragales	<i>Apiaceae</i>
<i>Crassulaceae</i>	<i>Araliaceae</i>
Core-eudicot: Asterids	<i>Campanulaceae</i>
Cornales	Asterales
<i>Cornaceae</i>	<i>Asteraceae</i>
Ericales	
<i>Balsaminaceae</i>	
<i>Boraginaceae</i>	
<i>Ebenaceae</i>	
<i>Icacinaceae</i>	
<i>Lecythidaceae</i>	
<i>Primulaceae</i>	
<i>Sapotaceae</i>	
<i>Theaceae</i>	
Gentianales	

BASAL ANGIOSPERMS

CHLORANTHALES R. Br.

CHLORANTHACEAE R. Br. *ex* Sims

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

Chloranthus erectus Sw. in Hort. Suburb. Lond. 28. 1818. Grierson et Long in Fl. Bhutan 1(2): 351. 1984. *Chloranthus erectus* (Buch.-Ham.) Verdcourt in Kew Bull. 40: 217. 1985.

Subshrubs, up to 2.2 m long. Stems terete, glabrous. Leaves opposite; lamina elliptic or obovate, 10–18.8 × 4.6–7.6 cm, caudate, serrate. Flowers in Spikes, terminal, dichotomous; bracts triangular-ovate. Flowers small, whitish; stamens 3, anther biloculed; ovary ovoid. Fruits white, green when young.

Flowering: January – March

Fruiting: March – September

Local Distribution: Throughout Forest floors of Terai and duars.

General Distribution: E and NE India, Nepal, Bhutan, Myanmar, Thailand, Cambodia, Indonesia, Philippines, Laos, Malaysia, Vietnam.

Status: Not Evaluated (IUCN)

Uses: The bark used to treat fractures.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No. 10105]

MAGNOLIIDS

LAURALES Perleb.

LAURACEAE Juss.

ACTINODAPHNE (Nees) Wallich in Pl. Asiat. Rar. 2: 61, 68. 183.

Actinodaphne obovata (Nees) Bl. in Mus. Bot. 1: 342. 1851; Grierson et Long in Fl. Bhutan 1(2): 280. 1984. *Tetradenia obovata* Nees in Wallich in Pl. Asiat. Rar. 2: 64. 1831. *Actinodaphne obovata* var. *wattii* King, Jard. Malmaison 4: 78. 1940. *Tetradenia obovata* Nees in Wallich, Pl. Asiat. Rar. 2: 64. 1831; Hook. f. in Fl. Brit. Ind. 5: 153. 1886.

Evergreen trees. Branchlets stout, densely ferruginous pubescent. Leaves sub-verticillate, 3–5 clustered branchlet apex; petiole pubescent, 3 – 7 cm long; lamina obovate–oblong, or elliptic–oblong, obovate, shiny adaxially, glabrous adaxially, triplinerved 15 – 50 × 5.5 – 22 cm, ferruginous pubescent or glabrate abaxially when old, 6 or 7 pairs of lateral veins, lowermost pair arising 1 – 2 cm from base, apex acute or acuminate, base rotund or cuneate, tip obtuse. Racemes 5–flowered, composed of umbels; pedicel 3 mm long; perianth segments 6, yellow, ovate; *Male flowers:* fertile stamens 9, filaments villous at base, short, of 3rd whorls each with 2 oblate glands at base, pilose rudimentary ovary; *Female flowers:* ovary villous, subglobose. Fruit ellipsoid or oblong 2.5 – 4.5 × 1 – 2 cm, seated on flat discoid perianth tube.

Flowering: April – May

Fruiting: June – July

Local Distribution: Throughout Forest floors of Terai and duars.

Generation Distribution: India (West Bengal, Assam, Meghalaya, Nagaland, Manipur), Bhutan, Nepal, Thailand and Bangladesh.

Status: Not Evaluated (IUCN)

Uses: Bark used to treat bone fracture.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No. 2708]

Actinodaphne sikkimensis Meisner, Prodr. 15(1): 213. 1864; Hook. f. in Fl. Brit. Ind. 5: 147. 1886; Hara in Fl. E. Him. 2: 99. 1966; Gierson and Long in Fl. Bhutan. 1(2): 281. 1984. '*Sik Siki*'

Evergreen trees up to 6 m high. Twigs slender, smooth, glabrous, mid brown, sometimes reddish. Leaves membranous, falsely whorled; lamina lanceolate, 10 – 13 × 2 – 4 cm, finely acuminate, base cuneate, lateral veins 8 – 11 pairs. Umbels solitary. *Male inflorescences* 2.5–3 cm long; male flowers yellowish white; pedicels 2 – 4 mm; tepals ovate; stamens 9, 5 – 6 mm. *Female inflorescences* 1.5 cm; female flowers 4 mm long; tepals oblong. Fruits ellipsoid.

Flowering: November – February

Fruiting: April – May

Local Distribution: Common in Mahananda wildlife sanctuary and Gorumara National park.

General Distribution: India (West Bengal, Sikkim, Assam, Meghalaya); Nepal, Bhutan, Thailand.

Status: Near Threatened Species (IUCN 2018)

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.2156]

BEILSCHMIEDIA Nees in Wallich, Pl. Asiat. Rar. 2: 61, 69. 1831.

Beilschmiedia assamica Meisn. in Prodr. 15(1): 64. 1864; Hook. f. in Fl. Brit. Ind. 5: 124. 1886; Gierson and Long in Fl. Bhutan 1(2): 256. 1984. '*Tarsing*'

Evergreen trees, up to 20 m high. Twigs glabrous, smooth, initially dark reddish brown or blackish. Terminal buds lanceolate, 8 – 12 × 2 – 3.5mm. Leaves opposite or sub-opposite; petioles 5 – 10 mm long; lamina elliptic or elliptic-oblong, 11 – 18 × 4 – 8 cm, blunt-acuminate, base cuneate. Inflorescence 1 – 2 cm, glabrous; flowers yellow, glabrous outside; tepals ovate; stamens 1 – 2 mm, inner whole long; ovary 1 mm. Fruits ellipsoid, 3.5 – 4.5 cm in diameter.

Flowering: December

Fruiting: February – March

Local Distribution: Common in Gorumara National park.

General Distribution: India (West Bengal, Sikkim, Meghalaya), Nepal, Bhutan and Thailand.

Status: Endangered Species (IUCN 2019)

Specimen Examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 12.05.2018, Mallick et. al. [Field No.5487]

CINNAMOMUM Schaeff., Bot. Exped. 74. 1760; *nom. cons.*

Cinnamomum bejolghota (Buch.-Ham.) Sweet in Hort. Brit. 344. 1826. Grierson et Long in Fl. Bhutan 1(2): 258. 1984. *Laurus bejolghota* Buch.-Ham. in Trans. Linn. Soc. Lond. 13(2): 559. 1822.

Evergreen trees, up to 20m long. Leaves opposite, elliptic, 20 – 40 × 5 – 12 cm, obtuse, base cuneate, glossy above, 3 veined. Flowers usually bisexual in axillary panicles, panicles 12 – 20 cm long, panicle with 1–3 flowers; perianth segments ovate, pubescent, 2 – 3 mm. Fruits ellipsoid.

Flowering: March – April

Fruiting: May – June

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Assam, Sikkim, Kerala, Jharkhand, West Bengal), Bangladesh, Nepal, Bhutan, Myanmar, Laos, Thailand and Vietnam.

Status: Not Evaluated (IUCN)

Uses: Bark is used as essential oil and wood.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.1053]

Cinnamomum glaucescens (Nees) Hand.-Mazz. in Oesterr. Bot. Z. 85: 214. 1936; Grierson et Long in Fl. Bhutan 1(2): 259. 1984. *Cinnamomum cecidodaphne* Meisn. in Prodr. 15(1): 25 1864. *Laurus glaucescens* Buch.-Ham. ex Nees. Pl. Asiat. Rar. 2: 70 183. '*Malagiri*'

Small tree, up to 12 m long. Branches glabrous when young. Leaves alternate, ovate elliptic, base broadly cuneate to rounded. Panicle 4 – 9, tomentose, densely clustered. Fruits globose, fruiting cup broader.

Flowering: January – March

Fruiting: March – April

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (West Bengal, Sikkim, Nagaland, Mizoram), Nepal, Bhutan.

Status: Not Evaluated (IUCN)

Uses: Root is used as medicine.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.1055]

Cinnamomum impressinervium Meisn. in Prodr. 15(1): 21. 1864. Hook. f. in Fl. Brit. Ind. 5: 129. 1886; Gierson and Long in Fl. Bhutan 1(2): 258. 1984. *Cinnamomum albiflorum* Hook. f. and Thomson ex Meisner, Prodr. 15(1): 21. 1864. ‘*Sissi*’

Evergreen trees, up to 15 m high. Twigs dark reddish brown, sericeous when young, soon glabrescent, smooth. Leaves opposite or sub-opposite; petioles 7–11 mm long; lamina elliptic or ovate-elliptic, 8–20 × 3–5 cm, base cuneate, finely acuminate, shiny adaxially with strongly impressed 3 veins. Panicles 6–10 cm, glabrous; flowers whitish yellow, 2–3 mm long; tepals ovate, 2 mm; fertile stamens 9, 1–2 mm long, the innermost whorl slightly longer; staminodes 0.5–1 mm; ovary 1 mm, glabrous; style 1.5 mm, glabrous. Fruits ellipsoid, 10–12 mm long.

Flowering: June – July

Fruiting: December – January

Local distribution: Common in Mahananda Wildlife Sanctuary.

General distribution: India (West Bengal, Assam, Nagaland, Kerala, Sikkim), Nepal, Bhutan; endemic to Eastern Himalaya.

Status: Near Threatened Species (IUCN 2020)

Uses: Bark used as adulterant for *Cinnamomum verum* as substitute.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.3698]

CRYPTOCARYA R. Brown, Prodr. 402. 1810; *nom. cons.*

Cryptocarya amygdalina Nees in Pl. Asiat. Rar. 2: 69. 1831; Hook. f. in Fl. Brit. Ind. 5: 118. 1886; Gierson and Long in Fl. Bhutan 1(2): 253. 1984; Banerjee, Pl. Res. Jal. Rhi. Sanc. 52. 1993. ‘*Patmero*’

Trees up to 25 m high. Twigs light brown, minutely tomentose. Leaves alternate, coriaceous; petioles 8 – 12 mm; lamina elliptic-oblong, 10 – 25 × 5 – 9 cm, bluntly apiculate or shortly acuminate, base broadly cuneate or rounded, lateral veins 7 – 11 pairs. Panicles 15 – 25 cm, tomentose; pedicels 1 – 2 mm; flowers yellow, tomentose

outside; tepals narrowly ovate; stamens 9, 1.5 – 2 mm long, staminodes triangular; ovary 1 mm, glabrous; style glabrous. Fruits ovoid, 2 – 2.5 cm long.

Flowering: April – May

Fruiting: May – June

Local distribution: Found in forests of Tarai and duars.

General distribution: India (West Bengal, Sikkim, Assam, Meghalaya), Nepal, Bhutan, Bangladesh, China.

Status: Least Concern (IUCN)

Uses: Timber is used for construction of village houses.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 15.02.2019, Mallick et. al. [Field No.2598]

LITSEA Lam. in Encycl. 3: 574. 1792; *nom. cons.*

Litsea cubeba (Lour.) Persoon in Syn. Pl. 2: 4. 1807; Grierson et Long in Fl. Bhutan 1(2): 274. 1984. *Litsea cubeba* var. *formosa* (Nakai) Y.C. Yang and P.H. Huang., Acta Phytotax. Sin. 16(4): 46.1978. *Laurus cubeba* Lour. in Fl. ochinch. 1: 252. 1790. *Litsea cubeba* fo. *obtusifolia* Y.C. Yang and P.C. Huang. in Acta Phytotax. Sin. 16(4): 46.1978.

Deciduous shrubs, 8.1 – 10.2 m tall. Branchlets glabrous or sericeous–pubescent. Leaves alternate; petiole glabrous; lamina lanceolate, oblong, 4.1 – 11.1 × 1.2 – 2.3 cm, glabrous on both surfaces or sericeous pubescent abaxially, apex acuminate or acute. Umbels solitary or clustered, 4 – 6 flowered; peduncle 2.1 – 10.2 mm, reflexed or straight, glabrous or sericeous pubescent; *Male flowers:* perianth segments 6, broadly ovate; fertile stamens 9, filaments hairy below middle, of 3rd whorls each with 2 shortly stipitate glands at base; rudimentary pistil glabrous. Fruit subglobose.

Flowering: February–March

Fruiting: July–August.

Local Distribution: All over the forest areas of North Bengal

Distribution: India (West Bengal, Assam, Sikkim, Tripura); China, Indonesia, Taiwan.

Status: Not evaluated (IUCN)

Uses: Active compounds of *Litsea cubeba* is highly affective to cure various ailments as of inherent anticancer, antimicrobial, antiinflammatory, antioxidant, antidiabetic, and anti-HIV properties.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.2509]

Litsea elongata (Nees) Hook. f. in Fl. Brit. Ind. 5: 165. 1886; Grierson and Long in Fl. Bhutan 1(2): 275. 1984. *Daphnidium elongatum* Nees in Wallich in Pl. Asiat. Rar. 2: 63. 1831.

Evergreen trees, upto 18 m tall; branchlets brownish, often tomentose. Leaves alternate; petioles 6–16 mm; lamina elliptic to oblanceolate or obovate, 8 – 18 × 2 – 6 cm, acute or obtuse, rarely acuminate, base cuneate. Umbels solitary, 1 – 1.5 cm long. Male umbels with 6 flowers; peduncles length 4 – 5 mm; male flowers pale yellow, sericeous; tepals ovate or oblong; stamens 8 – 11. Female umbels with 3 – 4 flowers; female flowers 3 mm, sericeous; pedicels 1 mm; tepals narrowly ovate, 2 mm; style glabrous. Fruits with minute apical point.

Flowering: July – September **Fruiting:** October – November

Local distribution: Common in Mahananda Wild Life Sanctuary.

General distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Nepal, Bhutan, Myanmar, China.

Status: Rare occurrence

Uses: Used as fodder for cattle and wood as construction works, making furniture, etc.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No.1456]

Litsea glutinosa (Lour.) C.B. Rob. in Philipp. J. Sci. 6(5): 321.1911; Grierson et Long in Fl. Bhutan1(2): 277. 1984. *Sebifera glutinosa* Lour. in Fl. Cochinch. 638. 1790. *Litsea glutinosa* var. *bideliifolia* (Hayata) Merr. in Lingnaam Agric. Rev. 1: 84. 1923.

Usually a small tree. Stem terete, white, erect and appressed, persistent hairs. Lamina about 7.1 – 28 × 3.1 – 18.5 cm, green on the underside, clothed in white, tortuous, erect hairs which may persist on mature leaves or may be almost entirely shed; Petioles flat or ridged on the upper surface. Oil dots visible with a lens. *Male flowers:* Tepals about 2.5 – 2.7 mm long., glands not attached to the staminal filaments; stamens about 8–20 per flower, filaments usually hairy; *Female flowers:* Tepals 1.8 – 2.8 mm long; ovary glabrous. Fruits globular, about 8.5 – 10.1 × 8.5 – 11.1 mm.

Flowering: May – June **Fruiting:** June – July

Local Distribution: All over the forest areas of North Bengal.

General Distribution: India (West Bengal, Assam, Sikkim, Arunachal Pradesh); Bhutan, Nepal, Myanmar and Philippines.

Status: Not evaluated (IUCN)

Uses: Wood is used for making agricultural tools; root fiber for making ropes and paper pulp; seed oil for making candles, soaps and seed powder for treating skin boils.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No. 99]

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

Evergreen trees, 12m tall. Twigs pale brown, tomentose, slightly ridged. Leaves alternate; petioles 8 – 15 mm; lamina elliptic-obovate, 12 – 26 × 6 – 10 cm, shortly acuminate, base cuneate, pubescent on veins beneath; lateral veins 9 – 15 pairs. Umbels densely pubescent, clustered on shortest branchlets. Male umbels with 5 – 8 flowers; male flowers green, 5 – 6 mm long, sericeous; tepals oblong or obovate; stamens 12, outer stamens 3 mm, inner stamens 1.5 mm. Female umbels with 5 – 8 flowers; female flowers yellow, tomentose outside and glabrous inside; tepals ovate, 2 mm; staminodes 9 – 11; style 2 mm, glabrous. Fruits ellipsoid, 11.5 – 17.3 mm long.

Flowering: May – June

Fruiting: August – September

Local distribution: Common in Mahananda Wildlife Sanctuary and Gorumara National Park.

General distribution: India (West Bengal, Assam, Arunachal Pradesh); Bhutan, Thailand.

Status: Common

Uses: Timber is used for making furniture.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.4521]

Litsea laeta (Nees) Hook. f. in Fl. Brit. Ind. 5: 169. 1886; Gierson and Long in Fl. Bhutan 1 (2): 275. 1984. *Tetranthera laeta* Nees in Wallich in Pl. Asiat. Rar. 2: 67. 1831.

Small trees, up to 8 m high. Twigs dark, often reddish brown, smooth, glabrous. Leaves alternate; lamina oblong-elliptic, 10 – 20 × 3 – 5 cm, acute, base cuneate, glabrous; lateral veins 5 – 7 pairs. Umbels axillary clusters, rarely solitary. Male umbels with 4 – 6 flowers; male flowers yellow, sericeous; tepals oblong; stamens 9 – 13, outer stamens 6 – 8 mm, inner stamens 4 – 5 mm. Female umbels with 2 – 5 flowers; female flowers

pale yellow or white, sericeous; tepals ovate or oblong; staminodes 9 or 10; style glabrous. Fruits obovoid or subglobose.

Flowering: November – January

Fruiting: February – April

Local distribution: Common in forest areas of terai.

General distribution: India (Andhra Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Bhutan, Bangladesh.

Status: Least Concern (IUCN).

Uses: It is used for diarrhea, indigestion, stomachache and gastroenteritis.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.5314]

Litsea monopetala (Roxb.) Persoon in Syn. Pl. 2: 4. 1807; Momiyama in Hara in Fl. E. Him. 1: 102. 1966; Grierson et Long in Fl. Bhutan 1(2): 276. 1984. *Litsea polyantha* Juss. in Ann. Mus. Natl. Hist. Nat. 6: 211. *Tetranthera monopetala* Roxb. in Pl. Corom. 2: 26.t. 1798. 1805; Prain in Bengal Pl. 2: 903. 1903.

Evergreen trees, 18 m tall. Branchlets densely ferruginous pubescent. Leaves alternate; petiole 1.1 – 3.1 cm, densely hairy like branchlets; lamina broadly ovate or obovate to ovate-oblong, 8.2 – 20.1 × 4.2 – 12.2 cm, densely ferruginous pubescent abaxially, along midrib ferruginous pubescent adaxially when young, pinninerved, base rounded or acute, apex obtuse or rounded, rarely acute. Umbels clustered on shortest branchlets, 4 – 6 flowered or more; *Male flowers:* pedicel ferruginous pubescent, perianth segments 5 or 6, yellowish-white, lanceolate; fertile stamens 9, filaments pubescent. Fruit long ovoid, 7.1 × 5.2 mm, seated on shallowly discoid perianth tube.

Flowering: November – May

Fruiting: June – July.

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (West Bengal, Sikkim, Assam, Tripura, Meghalaya), Pakistan, Nepal, Bhutan, Myanmar, Malaysia, Thailand, Vietnam, Cambodia, Laos.

Status: Common

Uses: Leaves are used as a topical medicine for the treatment of arthritis and seed oil also used as medicine.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No. 4301]

Litsea panamanja (Buch.-Ham. ex Nees) Hook. f. in Fl. Brit. Ind. 5: 175. 1886; Prain in Bengal Pl. 2: 903. 1903; Gierson and Long in Fl. Bhutan 1(2): 277.1984; Choudhury et al. in Pleione 8(1): 74. 2014. *Tetranthera panamanja* Buch.-Ham.ex Nees in Wallich in Pl. Asiat. Rar. 2: 67. 1831.

Evergreen trees, up to 25 m high; Twigs whitish, pale brown, smooth, pubescent. Leaves alternate; lamina oblong or lanceolate, 15–32 × 3–7 cm, acuminate or shortly acute, base cuneate, both surfaces glabrous, coriaceous. Flowers in umbels, racemosely arranged, produced after leaves have emerged. Male umbels with 6–8 flowers; male flowers yellow, sericeous; tepals oblong; stamens 11–12. Female umbels with 4–6 flowers; female flowers yellow, 2–3 mm, sericeous; tepals obovate; staminodes 12; style glabrous. Fruits depressed globose.

Flowering: March – April

Fruiting: April – May

Local distribution: Found in forest areas of the Terai and Duars.

General distribution: India (West Bengal, Sikkim, Assam, Arunachal Pradesh, Nagaland, Tripura, Andaman and Nicobar Islands), Nepal, Bhutan, Bangladesh, China, Myanmar, Vietnam, Malay Peninsula.

Status: Least Common

Uses: Wood used for house construction, making furniture and as fire wood.

Specimen examined: West Bengal, Jalpaiguri, North Rajabhatkhowa(MPCA). 14.05.2019, Mallick et. al. [Field No.6547]

Litsea salicifolia (Roxb. ex Nees) Hook. f. in Fl. Brit. Ind. 5: 167. 1886; Prain in Bengal Pl. 2: 903. 1903; Gierson et Long in Fl. Bhutan 1 (2): 275. 1984; Banerjee in Pl. Res. Jal. Rhi. Sanc. 52. 1993. *Litsea salicifolia* fo. *glabra* (H. Liu) C.K. Allen. in Ann. Missouri Bot. Gard. 25: 398. 1938.

Evergreen trees, up to 10 m tall. Branchlets glabrous. Leaves alternate; petiole 1.2–1.4 cm, glabrous; lamina long elliptic, 9.1–19 × 3–5.5 cm, yellow–brown, puberulent, glabrous adaxially, pinninerved, lateral veins 10–15 pairs, base acute, apex acuminate or acute. Umbels axillary; peduncle glabrous or subglabrous; male umbel 4–6 flowered; *Male flowers:* pedicel pubescent; perianth segments 6, ovate or lanceolate; fertile stamens 9; filaments villous at base, of 3rd whorls each with 2 stipitate globose glands at base; rudimentary pistil lacking. Fruit oblong.

Flowering: November–January

Fruiting: February–April.

Local Distribution: Found in forest areas throughout Terai and Duars.

General Distribution: Throughout India; Bangladesh, Bhutan, Myanmar, Nepal, Vietnam

Status: Common

Uses: Used to treat stomachache, indigestion, and gastroenteritis along with diabetes, edema, cold, arthritis, asthma, and traumatic injury.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.1012]

MACHILUS Nees, Pl. Asiat. Rar. (Wallich). 2(8): 70. 1831.

Machilus duthiei King in Hook. f. in Fl. Brit. Ind. 5: 861. 1890; Momiyama in Hara in Fl. E. Him. 1: 102. 1966. *Persea duthiei* (King) Kostermans in Reinwardtia 6(2): 191. 1962; Gierson and Long, Fl. Bhutan 1(2): 266. 1984. '*Mitsu Shing*'

Trees up to 20 m high. Shoots with rings of bud scale scars. Twigs dark reddish brown, smooth, glabrous. Perulate buds present. Leaves coriaceous, minutely silky-pubescent beneath when young; lamina elliptic, 15–25 × 2.5–4 cm, acuminate, base cuneate or attenuate, lateral veins 7–12 pairs. Panicles sericeous; flowers pale greenish-yellow, sericeous outside; tepals oblong or ovate; fertile stamens 3.5–5 mm long; staminodes 1–2 mm; ovary glabrous; style 1 mm, glabrous. Fruits globose.

Flowering: February – March

Fruiting: May – June.

Local distribution: Found in forest areas throughout Terai and Duars.

General distribution: India (West Bengal, Arunachal Pradesh, Meghalaya), Nepal, Bhutan

Status: Least Concern (IUCN).

Uses: Root is used for the treatment of inflammation, asthma, pain, bronchitis and vomiting.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No.3033]

Machilus gamblei King ex Hook. f. in Fl. Brit. Ind. 5: 138. 1886; Kanjilal et al. Fl. Assam. 4: 67. 1940. Prain in Bengal Pl. 2: 900. 1903; Cowan and Cowan, Trs. N. Bengal 107. 1929. *Persea gamblei* (King ex Hooker f.) Kostermans, Reinwardtia. 6(2): 192. 1962; Gierson and Long, Fl. Bhutan 1 (2): 267. 1984. '*Kawla*'

Trees up to 20 m high; young shoots with densely gray-yellow pubescence, becoming dark reddish brown, glabrate and with rings of bud scale scars, sometimes lenticellate.

Leaves thinly coriaceous; lamina oblong or oblanceolate, 7–15 × 3–6 cm, acuminate, base cuneate or attenuate. Panicles sericeous or tomentose; flowers greenish-yellow, sericeous outside; tepals oblong, 5–6 mm; fertile stamens 3–4.5 mm; staminodes 1 mm long; ovary glabrous; style Glabrous. Fruits globose.

Flowering: January – April

Fruiting: June – July

Local distribution: All over the forest areas of North Bengal

General distribution: India (West Bengal, Assam, Meghalaya), Nepal, Bhutan, Bangladesh, China, Myanmar, Thailand, Cambodia and Vietnam.

Status: Least concern (IUCN).

Uses: Leaves and root used as asthma, pain and bronchitis.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No. 7896]

Machilus glaucescens (Nees) Wight, Icon. Pl. Ind. Orient. 5(2): 12. 1852. *Persea glaucescens* (Nees) Long, Notes Roy. Bot. Gard. Edinburgh 41(3): 521. 1984. *Phoebe glaucescens* (Nees) Nees, Syst. Laur. 100. 1836. *Persea villosa* (Roxb.) Kosterm., Reinwardtia 6(2): 194 1962.

Tree grows up to 10 tall and 85.2 cm in trunk diameter. Bark dark grey. Branchlets pubescent. Terminal bud large with many glabrous. Leaves smooth, leathery, elliptic-oblong, 2.5–7.2×7.5–18.2 cm, acute, base shortly acute or rounded. Both surfaces are microscopically pitted. Leaf stalks slender, 1.1–2.1 cm long. flowers Panicles long; flowers yellow 5–10.1 mm across; sepals reflexed, oblong 8.3 mm long; petals oblong-linear, sharp-tipped; stamens short, filaments pilose near the base. Fruit ellipsoid.

Flowering: September–December

Fruiting: June–July

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (West Bengal, Assam, Meghalaya); Bangladesh, Srilanka and Bhutan.

Status: Not evaluated (IUCN)

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et. al. [Field No. 4110]

PERSEA Mill. in Gard. Dict. Abr., ed. 4. 1030.1754.

Persea odoratissima (Nees) Kostermans in J. Sci. Res. (Jakarta) 1: 116. 1942. Gierson and Long in Fl. Bhutan 1 (2): 266. 1984. *Machilus odoratissimus* Nees in Wallich, Pl.

Asiat. Rar. 2:70. 1831; Hook. *f.* in Fl. Brit. Ind. 5: 139. 1886; Cowan and Cowan, Trs. N. Bengal 105. 1929; Kanjilal et al. Fl. Ass. 4: 64. 1940; Matthew, Pl. Kurs. 91. 1981.

'Lali Kawla'

Tree grows up to 16.2m tall and 90.2 cm in trunk diameter. Bark dark grey. Branchlets pubescent. Terminal bud large, glabrous, somewhat fimbriate, bud scales. Leaves smooth, leathery, lanceolate to oblong-obovate to elliptic-oblong, 2.5–7.2 × 7.5–18.2 cm long, acute or acuminate, base shortly acute or rounded. Both surfaces are microscopically pitted. Leaf stalks slender, 1.1–2.1 cm long. flowers Panicles long; Flowers yellow; sepals reflexed, oblong; petals oblong-linear, sharp-tipped; stamens slightly shorter, filaments pilose near the base. Fruits ellipsoid.

Flowering: March – April.

Fruiting: May–June

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (West Bengal, Assam, Meghalaya), Nepal, Bhutan and Bangladesh.

Status: Common

Uses: Leaves are used for silkworm cultivation due to presence of pleasant orange like smell.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et, al. [Field No. 474]

PHOEBE Nees

Phoebe attenuata (Nees) Nees, in Syst. Laur. 104 1836; Grierson et Long in Fl. Bhutan 1(2): 261. 1984. *Ocotea attenuata* Nees in Pl. Asiatic. Rar. 2: 71. 1831. '**Angare**'

Trees up to 20 m long. Leaves clustered, lamina oblanceolate to obovate, pubescent 10–18 × 3–6 cm; perianth tightly pubescent. Fruits ellipsoid.

Flowering: January – March

Fruiting: February – April

Local Distribution: Throughout the Forest floors of Terai and duars.

General Distribution: Pakistan, tropical and subtropical parts of India (West Bengal, Sikkim, Assam, Tripura), Nepal, Bhutan, Myanmar, Thailand, Laos, Malaysia and Vietnam.

Status: Least concern (IUCN).

Uses: Plants part use by local tribal's as medicine to cure skin disease.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.05.2018, Mallick et. al. [Field No. 4110]

MAGNOLIALES Bromhead

ANNONACEAE Juss

ARTABOTRYS Br. *ex* Ker Gawl. in Bot. Reg. 5: 423. 1820.

Artabotrys hexapetalus (L.) Bhandari in Baileya 12: 147. 1964; Sharma et al. in Fl. Ind. 1: 251. 1993; Grierson et Long in Fl. Bhutan 1(2): 243. 1984. *Annona hexapetala* L. f. in Sp. Pl. 270. 1781; Prain in Bengal Pl. 1: 202. 1903. 1790. *Uvaria odoratissima* Roxb. in Fl. Ind. 2: 666. 1832. '**Kat-champa**'

Climbing shrubs 8 – 11 m long. Stem glabrous. Petiole 3.7 – 9.3 mm; lamina oblong to lanceolate, 5.2 – 18.5 × 4.1 – 7.2 cm, apex acute to acuminate, base acute to cuneate, lateral veins 7 – 14 pairs. Inflorescences 1 – 3 flowered. Flowers odorous; sepals greenish yellow, ovate, puberulous; petals reddish to yellowish, lanceolate. Stamens oblong; apex 3 angular. Carpels glabrous, oblong.

Flowering: May – July

Fruiting: July – December.

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (West Bengal, Assam, Bihar, Uttar Pradesh), Myanmar and China.

Status: Least concern

Uses: This plant is used as antimicrobial, hepatoprotective, antioxidant, antileishmanial, mosquito repellent and anthelmintic.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.05.2018, Mallick et. al. [Field No. 1061]

MILIUSA Lesch. *ex* DC. in Mem. Soc. Phys. in Geneve 5: 213. 1832.

Milium sclerocarpa Kurz in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41(4): 291. 1872.

Uvaria sclerocarpa A. DC. in Mem. Soc. Phys. Geneve 5: 203. 1832.

Deciduous tree about 15–22 m tall. Bark grayish brown, inside whitish brown becoming darker when exposed. Lamina obovate or oblong-lanceolate, 12–24 × 5–12 cm across, slightly asymmetrical, petiole canaliculated, gland dotted, about 0.8–0.9 cm long. Flowers bisexual, axillary, leaf opposed or axils of fallen leaves, solitary or 2–5, drooping, gland dotted, greenish when young, yellowish when mature, pedicels pubescent; sepals 3, valvate, linear lanceolate or somewhat triangular, base free; petals 6 in 2 series; stamens many, elliptic, anther ellipsoid, extrorse, connectives apiculate.

Carpels 6–15, ovoid or ellipsoid, pubescent, stigma cylindrical, ovules 6–10, globose.
Seeds kidney shaped.

Flowering: May – June

Fruiting: July – August

Local Distribution: Tropical and subtropical semi evergreen to deciduous forests of Terai and duars.

General Distribution: India (most of the tropical forests), Bhutan and Bangladesh.

Status: Common

Uses: Wood is good timber.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1056]

Miliusa dioeca (Roxb.) Chaowasku and Kessler in Willdenowia 43(1): 104. 2013.

Miliusa Miliusa roxburghiana Hook. f. and Thomson in Fl. Ind. 1: 150. 1855. Grierson et Long in Fl. Bhutan 1(2): 243. 1984; Prain, Bengal Pl. 1: 201. 1903. '*Kalli lahara*'

Dioecious shrubs, up to 7 m tall. Lamina elliptic to oblong, 4.5 – 11.5 × 2.6 – 5.3 cm, acuminate, pubescent on midrib beneath. Sepals ovate; outer and inner petals ovate.,
Carpels subglobose to obovoid.

Flowering: May – July

Fruiting: June – October

Local Distribution: Tropical and subtropical forests of Terai and duars.

General Distribution: Indi (Assam, Sikkim, Bihar, Orisha, west Bengal), Nepal, Bhutan and Myanmar.

Status: Rare occurrence.

Uses: Wood is good timber.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.07.2019, Mallick, et al. [Field No. 1057]

POLYALTHIA Blume in Fl. Javae, Annonaceae 68. 1829.

Polyalthia simiarum (Buch.-Ham. ex Hook.f. and Thomson) Hook. f. and Thomson in Fl. Brit. Ind. 1(1): 63. 1872; Grierson et Long in Fl. Bhutan 1(2): 243. 1984; Prain in Bengal Pl.1: 204. 1903. *Guatteria simiarum* Buch.-Ham. ex Hook. f. and Thomson in Fl. Ind. 142.1855.

Trees up to 25 m tall. Bark grayish white. Branches puberulent, glabrous and sparsely lenticellate. Lamina oblong, ovate, lanceolate, or oblanceolate, 9–28 × 3.5 – 12.5 cm, hyalopunctate, glabrous or puberulent only on midvein, oblique, close-set, parallel, and

prominent on both surfaces, base rounded to broadly cuneate and sometimes oblique. Inflorescences axillary, bracteolate near base to middle. Sepals ovate–triangular, outside pubescent, inside glabrous; petals yellowish green, outer petals longer than inner petals, outside puberulent, inside glabrous; stamens oblong; connectives apically broadly truncate to convex; carpels oblong, pubescent, ovule 1 per carpel, basal, stigmas capitate, puberulent. Fruiting pedicel 2 – 3 cm; monocarp stipes 3 – 3.5 cm, glabrous; monocarps ovoid to ovoid–ellipsoid.

Flowering: April–September

Fruiting: October–November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (throughout), Bhutan, Cambodia, Laos, Myanmar, Thailand and Vietnam.

Status: Common

Uses: The bark fibers are used to make ropes; wood is used to make tea boxes.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No. 4327]

MAGNOLIACEAE Juss.

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

Magnolia champaca (L.) Baill. ex Pierre in Fl. Forest. Cochinch. 1: 3. 1880. *Michelia champaca* L. in Sp. Pl. 1: 536. 1753; Hook. f. et Thom. and Hook. f. in Fl. Brit. Ind. 1: 42. 1872; Grierson et Long in Fl. Bhutan 1(2): 236. 1984; Sharma et al. in Fl. Ind. 1: 175.1993 ; Prain in Bengal Pl. 1: 197. 1903. *Michelia champaca* var. *blumei* Moritzi, Syst. Verz. 36. 1846. ‘*Champak*’

Evergreen shrubs or trees. Stipules 2–valved, membranous, hooded. Spirally arranged leaves; leaf blade leathery, margin entire. Flowers solitary, usually fragrant, bisexual. Peduncle with bract–scar annular; tepals 3 or 6 per whorl; stamens numerous, filaments long or short; gynoecium without or with a gynophore, carpels numerous or few, partly under developed usually, adaxial base inserted on rachis. Fruit woody syncarp or tardily, fleshy and irregularly dehiscent syncarp, basal parts with their suspended seeds remaining attached to torus.

Flowering: November – January

Fruiting: February – March

Local Distribution: All over the forest areas of terai and duars.

General Distribution: Native to India (tropical and subtropical forest of North and North East states), Nepal, Myanmar, Thailand, Malaysia, Indonesia and Vietnam.

Status: Least concern (IUCN)

Uses: This plant is used to quick wound healing, cardiac disorders, gout, dysuria.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 29.06.2019, Mallick, et al. [Field No. 4552]

MYRISTICACEAE R. Br., Prodr. [A. P. de Candolle] 399. 1810; *nom. cons.*

KNEMA Lour., Fl. Cochinch.: 604. 1790.

Knema linifolia (Roxb.) Warb. in Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 68: 558. 1897. *Myristica linifolia* Roxb. in Fl. Ind. 3: 847. 1832. '**Ramgua, Rokta**'
Trees up to 20 m tall; bark rough, grayish brown; branches slightly drooping. Petiole 1-2 cm, with rusty powdery pubescence; lamina obovate-lanceolate 20 – 40 × 6 – 12 cm, papery or subleathery, hairy, glabrescent on surfaces, base rounded, apex acuminate. *Male inflorescences* 0.8-1 cm. long, flowers 3 – 5 fascicled on short peduncle; bracteole inserted at about middle or in lower part of pedicel, buds ovoid or obovoid; perianth lobes 3; staminate disk concave. *Female flowers* 2 – 4-fascicled; ovary broadly ovoid, pubescent; stigma bifid, each lobe again shallowly 2-lobulate. Fruit nearly sessile, ellipsoid or ovoid, with rusty hairs.

Flowering: September – December

Fruiting: February – August

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (West Bengal, Assam, Meghalaya, Arunachal Pradesh), Bangladesh and Myanmar.

Status: Common

Uses: Fruits are used as intoxicating and purgative.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No.1109]

Knema erratica (Hook. f. and Thomson) J. Sinclair in Gard. Bull. Singapore 18(3): 205. 1961; Grierson and Long in Fl. Bhu. 1(2): 246. 1984. *Myristica erratica* Hook. f. and Thomson in Fl. Ind. 1. 156. 1855. *Myristica longifolia* Wall. ex Bl. var. *erratica* (Hook. f. and Thomson) Hook.f. in Fl. Brit. Ind. 5: 110. 1886.

Trees upto 25m tall. Branches glabrous to puberulous, stellate. Petiole puberulousto glabrous, sulcate; lamina lanceolate to narrowly lanceolate, 11–35×3–5.4 cm, coriaceous, base obtuse to cuneate, tip acute to acuminate. *Male inflorescence* 7–8 flowered; pedicels slender to filiform, stellate, bractkeeled, basal to pedicel; bracteole

annular, basal to median at pedicel; bud obovoid; tepals ovate, puberulous; anthers 12–14, obscurely stiped; *Female inflorescence* 2–3 flowered; flowers subsessile, tepals obovate; ovary triangular, pilose, style glabrous, stigma 2 lobed. Fruits 1–3, obovoid, pericarp 2.5–5 mm thick.

Flowering: September – January

Fruiting: March – July

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (North Bengal and NE states), Bangladesh, Myanmar, China, Laos, Vietnam.

Uses: Latex is used to treat mouth sore and gum is used to treat.

Status: Least Concern (IUCN).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10058]

MAESA Forssk. in Fl. Aegypt.-Arab. 66. 1775.

Maesa indica (Roxb.) Trans. in Linn. Soc. London 17(1): 134. 1834; Grierson et Long in Fl. Bhutan 2(2): 507. 1999. *Baeobotrys indica* Roxb. in Fl. Ind. 2: 230. 1824. *Maesa indica* var. *retusa* Mazz. in Symb. Sin. 7(4): 755. 1936.

Shrubs scandent, 0.8–2.8 m tall, early glabrescent, glandular granulose. Petiole 1.2–1.6 cm long, slightly canaliculate; lamina 7.4–16 × 4.5–9 cm, broadly ovate to oblong. Inflorescences axillary, racemose, glandular granulose 3.3–5.5 cm; bracteoles rounded apically, broadly ovate. Flowers light yellow-green. calyx lobes pellucid punctate, broadly ovate, persistent; corolla orange punctuate-lineate, campanulate; stamens inserted at corolla tube, filaments longer than anthers; style short, stigma lobed. Fruit globose.

Flowering: April – May

Fruiting: September – November

Local Distribution: Throughout the forests of Terai and duars.

General Distribution: Throughout India; Bhutan, China and Vietnam.

Status: Least concern (IUCN).

Uses: It is used to treat various diseases.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3546]

Maesa montana A.DC. in Prodr. 8: 79. 1844. *Maesa montana* var. *formosana* (Mez) T. Yamaz. in J. Jap. Bot. 66(1): 59. 1991.

Shrubs/trees 4–7 m tall. Branchlets terete. Petiole canaliculate, 1.3–1.6 cm; leaf blade oblong, elliptic, rarely ovate, 7.6–15 × 3.5–7.4 cm, base cuneate or obtuse, margin coarsely dentate, apex acuminate; glabrescent, submarginal vein absent. Inflorescences racemose, hirsute; bracteoles minute, lanceolate. Flowers 2.4 mm. Pedicel 1.3–2.4 mm; calyx lobes ovate, glabrous, entire, apex obtuse; corolla campanulate; lobes ovate; stamens inserted at corolla, included, anthers orbicular; style persistent, stigma minutely lobed. Fruit globose, white, orange punctate–lineate.

Flowering: February – April

Fruiting: October – December.

Local Distribution: Forests area of terai and duars.

General Distribution: India (North Bengal, North East states), Nepal, Myanmar, Thailand, and China.

Uses: Used as folk medicine.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA).
22.02.2020, Mallick, et al. [Field No. 10078]

PIPERALES Dumort.

ARISTOLOCHIACEAE Juss.

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

Aristolochia indica L. in Sp. Pl. 1: 960. 1753; Prain in Bengal Pl. 2: 891. 1903.

Aristolochia lanceolata Wight in Icon. Pl. Ind. Orient. 5: 1858 1852. *Aristolochia indica* var. *lanceolata* (Wight) Duch. and Prodr. 15(1): 479. 1864. '*Ishwar-mul*'

Shrubby climbers. Terete stem, elongated internodes. Petiole 3.6 cm long; lamina ovate, 5.2 – 11.2 × 4.2 – 8.3 cm, base cordate, acute, glabrescent, palmate veins, 3 – 7 pairs from base. 4 – 7-flowered axillary. Pedicels pendulous, 3.5 – 7.2 cm; bracts ovate; anthers oblong; gynostemium 3 – 5 -lobed. Fruit capsules.

Flowering: April – June

Fruiting: July – August

Local Distribution: Throughout the forests of terai and Duars.

General Distribution: Throughout India; Nepal, Bhutan.

Uses: Roots and rhizome used as gastric stimulant and bitter tonic. Leaves decoction used in cough and seeds used in inflammation.

Status: Least concern (IUCN).

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA).
14.04.2020, Mallick et al. [Field No. 1059]

Aristolochia saccata Wallich in Pl. Asiat. Rar. 2: 2. 1829. *Aristolochia saccata* var. *angustifolia* (Klotzsch) Duch. in Prodr. 15(1): 436. 1864. *Aristolochia saccata* var. *dilatata* Hook. f. in Fl. Brit. Ind. 5(13): 77. 1886

Climbing shrubs. Stems slightly complanate, striate, brown-tomentose. Petiole tomentose to glabrescent; lamina ovate, rounded-cordate, or ovate-lanceolate, 20 – 30 × 15 – 18 cm, leathery, abaxially densely white tomentose, adaxially glabrate, veins palmate, base cordate, apex acute. Racemes on woody stems, 3 – 6 flowered, pedicel 2 – 4 cm, pendulous, brown villous; bractlets subulate; calyx yellow-green with purple veins and blotches, limb dark purple; tube geniculately curved, abaxially villous; basal portion of tube saccate; limb obliquely trumpet-shaped, 3-lobed; lobes unequal, upper 2 distinctly recurved, deltoid, lower one broadly deltoid; anthers oblong; gynostemium 3-lobed. Capsule ovoid, dehiscent basipetally.

Flowering: April – July

Fruiting: June– October

Local Distribution: In the dense forests of terai and duars.

General Distribution: India (West Bengal, North East states), Bhutan, Nepal and Myanmar.

Uses: It has been shown to stimulate WBC activity and healing of wounds.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 14.04.2020, Mallick et al. [Field No. 1060]

Aristolochia tagala Cham., L. in 7: 207. 1832; Hara in Fl. Eastern. Himalaya. 3: 29. 1971; Grierson et Long in Fl. Bhutan 1(2): 354. 1984; Prain in Bengal Pl. 2: 891. 1903. *Aristolochia acuminata* Lam. in Encyc 1.1: 254. 1783.

Shrubby; stems terete, furrowed, glabrous. Petiole glabrous; lamina ovate, oblong, 8.4 – 12.4 × 4.6 – 10.4 cm, acuminate, base cordate, lateral lobes sub-rounded, surfaces glabrous, palmate veins. Inflorescence axils, leafy shoots, 2 – 5 flowered. Pedicels hairy, glabrescent; bractlets lanceolate. Perianth yellowish green; tube curved; limb ligulate, apex obtuse, oblong; anthers ovoid. Fruit capsules, globose, obovoid.

Flowering: April – August

Fruiting: October– December

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam); Nepal, Vietnam, Myanmar, Bhutan, Thailand, Malaysia, Bangladesh, Japan and China.

Status: Common.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA).
14.04.2020, Mallick, et al. [Field No. 1061]

PIPERACEAE C. Agardh in Aphor. Bot. 201. 1824; *nom. cons.*

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

Piper attenuatum Buch.-Ham. ex Wall. in Numer. List. 6642. 1832; Hook. f. in Fl. Brit. Ind. 5: 92. 1886. *P. malabaricus* Roxb. in Fl. Ind. 1: 160. 1832. *Piper attenuatum* Herb. ex Link in Jahrb. Gewachsk. 1(3): 63. 1820. '*Pipal*'

Climbers, stems ridged and furrowed when dry, glabrous. Petiole 3 – 3.5 cm, shortest on leaves toward apex of stem, sparsely hispidulous; lamina ovate–orbicular or ovate 8 – 11 × 5 – 8 cm, membranous, glandular, abaxially sparsely hispidulous, particularly on veins, adaxially glabrous, base rounded to subcordate, usually truncate, rarely shortly tapered on apical leaves, symmetric or slightly oblique, apex cuspidate or mucronate. Flowers monoecious. Spikes leaf–opposed; Male spikes 8 – 14 cm, slender, bracts oblong–obovate, apex rounded 2 × 0.6 – 1 mm, adnate to rachis, margin free, apex rounded; stamens 2 – 4, filaments short, anthers ovoid; Female spikes 7 – 9 cm, rachis sparsely hairy around ovaries, bracts shallowly copular, glabrous, ovary ovoid, distinct, stigmas 4 or 5, linear. Drupe drying black, ovoid to globose.

Flowering: August – November

Fruiting: October – March

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (North Bengal, Sikkim, Assam, Arunachal Pradesh, Meghalaya), Indonesia, Malaysia and Philippines.

Uses: The whole plant is used to cure headache and muscular pain and it has antibacterial and antioxidant effects.

Status: Endangered species (IUCN 2013).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA).
18.04.2020, Mallick, et al. [Field No. 1063]

Piper betle L. in Sp. Pl. 1: 28. 1753; Hook. f. in Fl. Brit. Ind. 5: 85. 1886; Prain in Bengal Pl. 2: 893. 1903. *Chavica betle* (L.) Miq. in Syst. Piperac. 228. 1843. *Chavica densa* Miq. in Syst. Piperac. 252. 1843. '*Jangli paan*'

Dioecious climbers. Stems rooted at nodes, slightly woody. Petiole very finely powdery pubescent; lamina 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.

Flowering: May – July

Fruiting: July – October

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (Sikkim, Assam, West Bengal, Bihar and Tripura), Malaysia, Indonesia, Sri Lanka Philippines, and Africa.

Uses: Leaf sap is used as an antiseptic and applied on wounds and ulcers.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 14.12.2019, Mallick, et al. [Field No. 1047].

Piper chaba Blume, Verh. Batav. Genootsch. Kunst. 11. 168. 1826. Hook. f. in Fl. Brit. Ind. 5: 83. 1886.

Branched, robust shrubby climbers; dense rooting from nodes; stem greenish-brown, terete, warted. Petioles long, auricled, rusty brown; lamina oblong-ovate, entire, acuminate, base unequally cordate, membranous, thinly coriaceous, glabrous above, puberulous and gland dotted below, nerve 5 – 7. Plants dioecious; bracts peltate; spikes axillary, solitary; male spikes 5.0 – 7.0 cm long, peduncle 1.5 – 2.0 cm long, stamens 2 within; female spike 6.7 – 10 cm long. Drupes 0.35 – 0.4 cm.

Flowering: April – August

Fruiting: July – January

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (tropical and subtropical forests); Malaysia.

Uses: It is commonly used to treat constipation, chronic bronchitis and gonorrhoea etc.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 30.04.2019, Mallick, et al. [Field No. 7019].

Piper longum L. in Sp. Pl. 29. 1753; Hook. f. in Hook. f. in Fl. Brit. Ind. 5: 83. 1886; Prain, in Bengal Pl. 2: 893. 1903; Grierson et Long in Fl. Bhutan 1(2): 348. 1984. *Chavica longa* H. Karst. Ill. Repet. Pharm.-Med. Bot. 478. 1886. '*Pipla*'

Large climbers, dioecious; most parts powdery pubescent at young. Petiole 0–9 cm. Stems often flexuous. Leaves sessile sometimes, towards base of stem long petiolate;

lamina ovate to reniform at base, apical lamina ovate–oblong to ovate, papery, densely glandular, 6–12 × 3–12 cm, base cordate, basal lobes equal and rounded, slightly incurved; veins 7, apical pair reaching leaf apex, partly closely parallel to midvein. Spikes recurved, leaf–opposed. Male spikes 4–5 cm × 3 mm; peduncle 2–3 cm; bracts 1.5 mm wide, sometimes slightly cuneate, suborbicular, glabrous, peltate, stalk short; stamens 2, anthers ellipsoid, filaments very short. Female spikes 2–3 cm; bracts 0.9–1 mm in diam; ovary partly connate to rachis, ovoid, stigmas 3, acute. Drupe globose, apex partly connate to rachis.

Flowering: July – October **Fruiting:** November – January

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (Madhya Pradesh, Orissa, West Bengal, Assam, Meghalaya), Sri Lanka and Malaysia.

Status: Common

Uses: Fruits used to treat asthma, chronic bronchitis, constipation, gonorrhoea, diarrhoea, cholera, chronic viral hepatitis, respiratory infections, stomachache.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4116]

Piper mullesua D. Don, Prodr. Fl. Nepal. 20. 1825. *Chavica mullesua* (Buch.-Ham. ex Don) Miq. in Syst. Piperac. 280. 1843. *Piper guigual* Buch.-Ham. ex Don in Prodr. in Fl. Nepal. 20. 1825. *Piper brachystachyum* Wall. ex Hook. f. in Fl. Brit. Ind. 5: 87: 1886.

Slender climbers. Leaves 7.6 × 3.9 cm, elliptic, apex acuminate, base acute 4–8 ribbed from base. Female spike to 6.5 × 3.7 mm, erect, oblong; peduncle 3.7 mm long; male spike 3.2–4.4 cm long; stamens 3 – 5. Fruit berry 1.2–1.7 mm across, red.

Flowering: July – October **Fruiting:** November – March

Local Distribution: Throughout the forests of terai and Darjeeling hills.

General Distribution: India (West Bengal, Assam, Meghalaya, Manipur, Himachal Pradesh); Sri Lanka and Malaysia.

Status: Not Evaluated (IUCN)

Uses: it is used worldwide to treat several diseases like urological problems, liver, skin, and stomach ailments.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No. 4242]

Piper peepuloides Roxburgh. In Hort. Bengal 4, 1814. Fl. Ind. 1: 159. 1820; ed. 2.157.1832; Wall. Cat. 224, n. 6650. 1832; Hook. f. in Fl. Brit. Ind. 5: 83. 1886; Banerjee in Rec. Bot. Surv. Ind. 19(2): 79. 1966. '*Janglipaan*'

Medium sized climbers; stems and branches spreading, terete, old stem warted; lamina entire, linear or oblong-ovate, caudate – acuminate, base sub-cordate oblique, membranous, nerves 3-5 from base, glabrous above, 3 – armed small stellate hairy below towards base; petioles 0.4 – 1.2 cm long, slightly winged, nearly glabrous; plants dioecious; spikes lateral to petiole; male spikes up to 0.5 cm long, peduncles up to 5.5 cm; stamens 3 – 4, bractspeltate; female spikes up to 2.0 cm long, peduncle short ; drupes 1.6 – 1.8 cm, globose, minute.

Flowering: October– December **Fruiting:** November – March

Local Distribution: Throughout the forests of terai and Darjeeling hills.

General Distribution: India (West Bengal, Sikkim, Assam, Meghalaya, Manipur); Nepal, Bhutan, Myanmar and China.

Status: Critically Endangered (IUCN, 2013).

Uses: It is also used to treat severe cough and root is used for skin disease

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1071]

Piper sylvaticum Roxb. in Fl. Ind. 1: 158.1820; Hook. f. in Fl. Brit. Ind. 5: 84. 1886; Grierson et Long in Fl. Bhutan 1(2): 348. 1984; Prain in Bengal Pl. 2: 893. 1903. *Chavica sylvatica* (Roxb.) Miq in Syst. Piperac. 248. 1843.

Climbers herbaceous, dioecious. Stolons present. Stems ridged when dry, very finely pubescent when young. Petiole 1–7 cm, very finely powdery pubescent; prophylls 1/2 as long as petioles or slightly longer; leaf blade usually ovate, those at apex of stem ovate–lanceolate, 8–11 × 4–8.5 cm, papery, densely glandular, glabrous except for densely finely powdery pubescent veins abaxially and adaxially, base cordate, symmetric, apex acuminate; veins 7, apical pair arising 0.7–1.5 cm above base, others basal; reticulate veins large, conspicuous. Male spikes slender, 4–7 cm; bracts orbicular, peltate; stamens 4, filaments short, anthers reniform. Female spikes erect; peduncle 0.5–2.1 cm, very finely powdery pubescent; bracts orbicular, sessile, adaxially pubescent; ovary globose, distinct, stigmas 2 or 3, ovate, apex acuminate. Drupe globose 3 mm in diam.

Flowering: July – October

Fruiting: October – January

Local Distribution: Throughout the forests of terai and Darjeeling hills.

General Distribution: India (West Bengal, Assam, Sikkim, Arunachal Pradesh, Tripura,); Nepal and Bhutan.

Status: Common

Uses: This plant is used to treat asthma, chronic bronchitis, constipation, gonorrhoea, diarrhoea, cholera, chronic viral hepatitis, respiratory infections, stomachache.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3765]

PEPEROMIA Ruiz et Pav. in Fl. Peruv. Prodr. 8: 8. 1794.

Peperomia pellucida (L.) Kunth in Nov. Gen. 1: 64. Grierson et Long in Fl. Bhutan 1(2): 345. 1984; Prain in Bengal Pl. 2: 894. 1903. *Piper. pellucidum* L. in in Sp. Pl. 1. 30. 1753. *Piper exigua* (Bl.) Miq. in Syst. Pip. 77. 1843; Hook. f. in Fl. Brit. Ind. 5: 97. 1886. '*Luchhi-pata*'

Annual herbs, up to 35 cm, glabrous. Stems ascending, branched. Petiole 1.3–3.3 cm; lamina broadly ovate, acute. Spikes terminal, slender, glabrous, slightly embedded in rachis; shield-shaped bracts, suborbicular; anthers subglobose; ellipsoid ovary. Fruit globose.

Flowering: April – June

Fruiting: May – November

Local Distribution: Moist places of forest floor and tree trunk.

General Distribution: India (West Bengal, Assam, Nagaland); Nepal, Bhutan and Bangladesh.

Status: Common.

Uses: The plant is used as food and flavoring agent.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1067]

MONOCOTS - MONOCOTYLEDON

NON COMMELINIDS

ACORALES Reveal

ACORACEAE Agardh

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

Acorus calamus L. in Sp. Pl. 324. 1753; Hook. f. in Fl. Brit. Ind. 6: 555. 1893; Noltie, in Fl. Bhutan 3(1):158. 1994; Cook, in Aqua. Wetl. Pl. Ind. 51, 1996. *Acorus angustatus* Rafinesque in Autik. Bot. 196. 1840. '*Bach/ Bojoo*'

Erect, creeping rhizomes, marshland herbs. Leaves ensiform, unifacial, prominent midrib, apex acute. Flowers bisexual, tetramerous; segments 6; stamens 6; ovary cylindrical with 2–5 locules.

Flowering: May – June

Fruiting: July – August

Local Distribution: Marshy areas of Terai and duars.

General Distribution: India (throughout), Asia, Europe and North America.

Status: Least Concern (IUCN).

Uses: The rhizome is used for gastrointestinal problems including ulcer.

Specimen examined: West Bengal, Darjeeling, North Sevak (MPCA). 22.02.2020, Mallick, et al. [Field No.1071]

ALISMATALES Dumort

ARACEAE Juss

Alocasia Neck. ex Raf.

Alocasia fallax Schott, Bonplandia (Hannover) 7: 28. 1859.

Medium-sized shrub. Leaves few to several in terminal crown; petiole long, sometimes asperate or glandular; *blade* : sometimes pubescent, juvenile blade peltate. Inflorescence 3 or many in each floral sympodium; peduncle, usually shorter than petiole; spathe strongly constricted between 4–10 androus, stamens connate. Sterile male flowers synandrous obpyramidal, compressed, truncate; female flower ovary ovoid or oblong 1-locular or partially 3–5 locular at apex, ovules 6–2, orthotropous, hemiorthotropous, hemianatropous or anatropous, funicle short, placenta basal, style short, stigma depressed-capitate, distinctly 2–4-lobed. Fruit berry generally reddish, ellipsoid or obconic-ellipsoid 1–6-seeded. Seed subglobose to ellipsoid, testa thickish, smooth, embryo broadly conoid, shortly cylindrical, endosperm copious.

Flowering: May – July

Fruiting: August – October

Local Distribution: Ground floor of all the three MPCAs.

General Distribution: India (Throughout); Bhutan, Myanmar, Srilanka and Japan.

Status: Common

Uses: Uses in modern medicine like pharmacological aspects and tribal medicine.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA)18.05.2019.
Mallick et al. [Field No. 1073]

Alocasia macrorrhizos (L.) Don, in Sweet Hort. Brit. India 3: 631. 1839; Noltie in Fl. Bhutan 3(1): 139. 1994. *Arum macrorrhizon* L. in Sp. Pl. 2: 965 . 1753. *Alocasia indica* (Lour.) Spach in Hist. Nat. Vég. 12: 47. 1846; Prain in Bengal Pl. 2: 1111. 1903. *Colocasia indica* (Lour.) Kunth in Enum. Pl. 3: 39. 1841. '**Man Kochu**'

Rootstock stout, erect. Leaves large; lamina undulate, ovate, rounded, greenish in colour. Spathes yellowish green. Male inflorescence fertile.

Flowering: March – April **Fruiting:** May – June

Local Distribution: Dhupjhora forest village.

General Distribution: India (Assam, Sikkim, West Bengal, Bihar), Bangladesh, Nepal, Sri Lanka and S.E. Asia.

Status: Least concern (IUCN).

Uses:It is used as a laxative, leaves as a rubefacient and chopped-up roots

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020,
Mallick, et al. [Field No.1020]

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

Amorphophallus napalensis (Wallich) Bogner and Mayo, Aroideana 8(1): 19. 1985.

Tuber 4 – 5 in. diam., not bulbiferous. Leaf 12 – 18 in. diam. or more; leaflets 3 – 5 in, ovate or oblong–lanceolate, caudate–acuminate; petiole 18 in. and very stout. Peduncle light green blotched with much darker, sheaths pink, Spathe 12 – 18 × 3 – 6 in. diam., oblong–cymbiform, shortly narrowly convolute at the base, erect, green. Spadix 5 – 10 in., exerted, very stout; appendage 3 – 4 inch., cylindric, green changing to yellow, top rounded; anthers 3 – 5, substipitate, compressed, 2–celled, pollen vermiform; ovaries globose, 2–celled, style stout larger than the cells, upcurved, stigma discoid, obscurely lobed, ovule 1, erect, anatropous.

Flowering: March – April **Fruiting:** May – June

Local Distribution: Dhupjhora forest village

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland); Bangladesh, Nepal, Sri Lanka and S.E. Asia

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3865]

Amorphophallus paeoniifolius (Dennst.) Nicolson, Taxon 26 (2/3): 338. 1977. *Amorphophallus paeoniifolius* var. *campanulatus* (Decne.) Sivad. in Taxon 32: 130. 1983. *Amorphophallus campanulatus* D Prain in Bengal Pl. 2: 1109. 1903. '**Elephant Yam**'

Tube dark brown. Leaves 1 or 2; petiole bluish green; leaf blade highly dissected; rachises broadly or narrowly winged; leaflets adaxially ovate; apex acuminate. Inflorescence shortly pedunculate; Spathe broader than campanulate. Spadix 7 – 75 cm sessile, shorter or longer than spathe; female zone 2.6 – 23.7 × 1 – 15 cm cylindrical; ovary large 1.7 – 2.8 mm high 2–or 3–loculed; style slender, stigma large, pale or deep yellow; male zone 2.5 – 16 cm strongly obconic or cylindrical, flowers congested; male flowers bearing 4 – 6 stamens, filaments connate, anthers cylindrical, off-white, subtruncate, pollen psilate. Berries 1.5 – 2 cm × 8 – 10 mm., slightly distant or closely set, elongate, ripening from green through yellow to bright red.

Flowering: October – December

Fruiting: January – May

Local Distribution: Wild in moist deciduous forests.

General Distribution: India (Assam, Kerala, Tamil Nadu, Western Himalayas, Orissa, West Bengal, Sikkim); Sri Lanka, Myanmar.

Status: Abundant

Uses: Used in folk medicine for treatment of acute rheumatism, tumors, lung swelling, asthma, vomiting, and abdominal pain.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10501]

COLOCASIA Schott in Schott et Endl., in Melet. Bot. 18. 1832;

Colocasia esculenta (L.) Schott, Melet. Bot. 18. 1832. *Colocasia nymphaeifolia* (Vent.) Kunth, 3: 37. 1841; Prain in Bengal Pl. 2: 1112. 1903. '**Kachu**'

Rhizome horizontal to vertical 2.9 – 4.8 cm or more in diam, tuberous. Stolons absent or long. Leaves 2 – 3 or more; petiole 24.8 – 79.5 cm, green, sheathing for 0.5 – 2.5 cm length; leaf blade water-shedding and adaxially matte waxy-glaucous, suborbicular to oblong-ovate, 12.8 – 44.9 × 9.7 – 34.7 cm, base shallowly cordate, apex shortly and broadly cuspidate. Peduncle 15.7–25.9 cm, usually solitary. Spathe tube green, limb

cream colored to golden yellow, open proximally, elliptic or lanceolate, acuminate apex. Spadix: female zone conic, stigma narrower than apex of ovary, sessile; sterile zone cylindrical narrowly; sterile flowers elongate; male zone cylindrical; narrowly conic appendix 14.8 – 44.7. 1.8 mm. Berry 4mm, green.

Flowering: May – July

Fruiting: September – October

Local Distribution: Forest floor of all three MPCAs.

General Distribution: India (North and North East states); America,

Status: Least Concerned (IUCN).

Uses: Utilized for treatment of various ailments such as asthma, arthritis, diarrhea, internal hemorrhage, neurological disorders, and skin disorders.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 60]

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

Rhizome globose 4.2 cm in diameter, creeping. Petioles 14 – 23 cm; lamina ovate-oblong, 7.8 – 10.8 × 4.2 – 11.8 cm. Peduncle slender. Female part of spadix 1.6 – 3.3 cm, with 4 – 7 rows; male part scaly, with few rows of sterile male flowers, acute apex. Ovaries green, subglobose to globose.

Flowering: August – October

Fruiting: September – November

Local Distribution: Forest floor of three MPCAs.

General Distribution: India (West Bengal, Sikkim, Maharashtra, Himalayas); Tropical Asia.

Status: Common

Uses: Used as a tribal medicine.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1001]

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

Lasia spinosa (L.) Thwaites in Enum. Pl. Zeyl. 336. 1864; Prain in Bengal Pl. 2: 1016. 1903; Cook, in Aqua. Wetl. Pl. Ind. 64. 1996. *Dracontium spinosum* L. in Sp. Pl. 2: 967. 1753. *Lasia heterophylla* (Roxb.) Schott, in Melet. 1: 21. 1832; Hook.f. in Fl. Brit. Ind. 6: 550. 1893. '*Kantakochu*'

Herbs, 0.4 – 2.5 m tall; stem long stoloniferous 2.6 cm in diam. Petiole prickly 31.4 – 120.6 cm, almost smooth; pulvinus aculeate 12.3 – 36.8 mm; lamina hastate 35.7 – 67.9 × 20.8 – 61.6 cm; anterior lobe acuminate, pedate or entire to near midrib; lateral primary veins strong 2 – 4, secondary lateral veins higher. Peduncle laxly prickly 47.9 cm; spathe black outside to dull orange, dull crimson to dull yellow inside 18.8 – 35.9 cm; spadix 3.3 – 5.9 cm, elongated to 8.5 cm in fruit, cylindrical; tepals oblong, apex keeled; anthers 0.6 × 0.9 mm; filaments 1.2 × 0.9 mm; ovary 1.6 mm high, ovoid. Fruit obpyramidal, sides unarmed, densely wartyculeate, apex truncate, when dry irregularly ribbed.

Flowering: July – September **Fruiting:** August – December

Local distribution: Swamps, riverbanks, moist forests of North Bengal

General distribution: India (Bihar, West Bengal, Assam, Sikkim, Nagaland, Tripura); Nepal, Bhutan and Bangladesh.

Status: Least Concern (IUCN).

Uses: It is used to treat stomach aches, snake and insect bites, injuries, rheumatism.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4202]

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

Pothos scandens L. in Sp. Pl. 2: 968. 1753. *Pothos scandens* fo. *angustior* Engl. Bot. Tidsskr. 24: 272. 1902. *Pothos scandens* var. *cognatus* (Schott.) Engl. Monogr. Phan. 2:84. 1879. *Pothos scandens* var. *helferanus* Engl. in Pflanzenr. IV. 23 (23): 26. 1905.

Stem angled. Lamina lanceolate, 5–9 × 3 cm, apex acuminate; petiole 3.5–6.6 cm long, winged. Inflorescence axillary; peduncle to 0.9 cm long; spathe 5.6 mm across, obtuse, concave, brown; spadix 3.7–6.5 mm globose. Flowers packed; bracts 3–6, orbicular; stamens 7, free; obovoid ovary, stigma 3-toothed.

Flowering: July – September **Fruiting:** August – January

Local distribution: All over the forest of North Bengal

General distribution: India (Sikkim and West Bengal); China, Peninsular Malaysia and Sumatra.

Status: Least Concerned (IUCN).

Uses: Used to treat lymphotuberculosis, lymphonoditis, stomach aches, snake and insect bites, injuries, rheumatism, throat ailments and piles.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4188]

SCINDAPSUS Schott in Schott and Endl. in Melet. Bot. 21. 1832.

Scindapsus officinalis (Roxb.) Schott in Melet. Bot. 21. 1832; Noltie in Fl. Bhutan 3(1): 129. 1994; Prain in Bengal in Pl. 2: 1114. 1903. *Monstera officinalis* (Roxb.) Schott in Kunst 4: 1028. 1830. *Scindapsus annamicus* Gagnep. in Notul. Syst. (Paris) 9: 139. 1941. '*Gachpipul*'.

Climber root; petiole 15 – 28 cm, base imbricate; lamina palegreen abaxiallyoblong-elliptic, 21 – 37 × 10 – 23 cm, entire, shortly acuminate, base subcordate; lateral veins numerous. Spathe involute-tubular, yellow, acuminate. Spadix cylindrical sessile.

Flowering: November – December **Fruiting:** January – March

Local Distribution: Throughout the Forest of Terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam), Bangladesh, Bhutan, China, Thailand and Vietnam.

Status: Common

Uses: It has been ethanobotanically used to treat diarrhea and worm infestation.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10050]

TYPHONIUM Schott in Wiener, Zeitschr. Kunst. 1829: 732. 1829.2: 1108. 1903.

Typhonium roxburghii Thwait. in Enum. Pl. Zeyl. 432. 1864. *Typhonium schottii* Prain in in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67: 303. 1898; Prain in Bengal Pl. 2: 1108. 1903.

Small herbs, rhizome sub-globose. Leaves 4 – 8; lamina simple entire hastate, triangular-hastate deeply 3-lobed or trifoliolate. Spathe ovoid oblong; blade ovate-lanceolate, apex acute. Spadix subequaling spathe; staminodes sub-cylindrical, slightly flat, yellowish in colour; anthers with an opening pore. Berries ovoid.

Flowering: October – December **Fruiting:** January – February

Local Distribution: Throughout Forest floors of Terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam); Bangladesh, China, Sri Lanka, Japan, Thailand, Indonesia, Malaysia, Philippines, S America.

Status: Common

Uses: It is used to treat diarrhea.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1078]

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

Rhizome short, subglobose. Petiole green; lamina ovate, usually 3-lobed 10.5 – 14.2 × 5.6 – 11.2 cm. Inflorescence appearing with leaves. Spathe dark purplish, limb ovate, acuminate. Female zone conical; sterile zone covered with staminodes; male zone 2.3 cm. Stamens pinkish. Ovary greenish yellow; stigma sessile.

Flowering: April – July

Fruiting: June – September

Local Distribution: Throughout Forest floors of terai and duars.

General Distribution: India (West Bengal, Sikkim, Bihar, Kerala, Orissa), Nepal, Myanmar, Sri Lanka and China.

Status: Common

Uses: It is used to heal stomach ailments and also used as anti dandruff and tonic.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 464]

ARECALES Bromhead

ARECACEAE Schultz,

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

Areca triandra Roxb. ex Buch.-Ham., Mem.Wern. Nat. Hist. Soc. 5: 310. 1826; Becc. in Hook. f. in Fl. Brit. Ind. 6: 405. 1892; Prain in Bengal Pl. 2: 1086. 1906. *Areca triandra* var. *bancana* Scheff. in Natuurk. Tijdschr. Ned.-Indie 32: 165.1873. Prain in Bengal Pl. 2: 1097.1903. '**Bon Gua/Triandra palm**'

Cluster forming, 4 m long palm. Leaves pinnate, 2 – 3 m long, leaflets opposite, alternate, linear ensiform, acuminate, prominently nerved on upper side, terminal leaflets broad, deeply partite. Inflorescence infrafoliar 34 – 41 cm long when unopened, flower branches in one to three orders, ultimate flower branches filiform, male flowers in pairs, minute, numerous, sepals 3, minute, ovate, unequal, petals 3, oblong, obtuse, valvate, stamens 3, filaments short, connate at base, female flowers larger than males, proximal, sepals 3, deep green, more or less circular in outline, imbricate, petals

imbricate or rarely twisted, staminodes 6, conspicuous, ovary one loculed, one ovuled, stigma with unequal lobes. Fruits ellipsoid bullet shaped, orange-red when ripe. Seed with ruminant endosperm.

Flowering: February – July

Fruiting: June– November

Local Distribution: Rarely occurs in Forest of terai region.

General Distribution: India (West Bengal, Assam, Meghalaya, Mizoram); Bangladesh, Myanmar, China, Malaysia, Cambodia and Thailand.

Status: Rare occurrence; near threatened (IUCN 2019)

Specimen examined: West Bengal, Lataguri 22. 06. 2016 Mondal, Mallick and Chowdhury, [Field No.1046] and [Acc. No. 6503, NBU]

CALAMUS L., Sp. Pl. 325. 1753.

Calamus tenuis Roxb., in Fl. Ind. 3: 780. 1832. *Calamus amarus* Lour. in Fl. Cochinch. 210. 1790. *Calamus royleanus* Griff. in Cal. J. Nat. Hist. 5: 40. 1845; Prain in Bengal Pl. 2: 1098. 1903; Basu in Rattan in Ind. Monogr. Rev. 84. 1992. '*Jati bet/Pani bet/Sanchi bet*'

Slender, thorny climber rattan. Leaves alternate, 1.5 m long, leaf sheath with prominent knee, armed; petiole well developed, 13 – 16 cm long, rachis armed on upper side, 1.5 – 3 cm long, curved needle like spines, 1.8 – 3 cm long; leaflets linear ensiform to 28 – 34 cm long 14 – 16 mm broad at middle. Male inflorescence flagelliform, slender, rachillae 2–5 cm long with two series of 6 – 12 male flowers, male flowers 3.5 – 4.2 mm long. Female inflorescence flagellate, simply decompound, partial inflorescences 17.5 – 25.5 cm long, 6 – 12 incurved rachillae on both side, female flowers 4 – 5-seriate in young inflorescence. Fruit globose, grey white coloured, shortly beaked, scales 14 – 15 vertical rows. Seed globose.

Flowering: September – October

Fruiting: April – May

Local Distribution: Throughout the Forest of terai and duars.

General Distribution: India (Assam, West Bengal, Sikkim), Bhutan, Bangladesh, and Myanmar.

Status: Rare occurrence; Least Concern (IUCN 2018)

Uses: Stems used for making rough baskets and useful raw material for furniture and handicrafts industry.

Specimen examined: West Bengal, NRVK, 20.08.2017, Mondal and Chowdhury, [Field No.1021] [Acc. No. 10172, NBU].

Calamus viminalis Willd. in Sp. Pl. 2: 203. 1799. *Calamus litoralis* Bl. in Rumphia 3: 43. 1847. *Calamus pseudorotang* Mart. ex Kunth in Enum. Pl. 3: 207. 1841. *Rotang viminalis* (Willd.) Baill. in Hist. Pl. 13: 299. 1895; Prain in Bengal Pl. 2: 1098. 1903; Basu, Rattans in Ind. Monogr. Rev. 117. 1992. '**Boro Bet, Hasali Bet**'

Thorny clustering, medium sized rattans. Stem 12 – 20 m long. Leaves ecirrate, 1 – 1.5m long, leaf sheath green. Inflorescence flagelliform, partial inflorescence about 1.7 – 2 m long, each with 6 – 8 alternate rachillae, primary bract truncate at apex, spines 0.8 cm long, apiculate on outer side, male rachillae filiform, 17 – 22 cm long, female partial inflorescence alternate, zig zag rachillae, 22 – 26 cm long, involucrophorum sub discoid, involucre orbicular; female flowers 4.5 – 6 mm long, calyx 3 lobed; corolla as long as calyx. Fruit pea like, 8.5 – 10 mm in diameter, beak distinct, scale greenish in 17 – 18 longitudinal series. Seed globose, slightly compressed, 5.5 – 6.5 mm wide.

Flowering: November – January **Fruiting:** December – April

Local Distribution: Throughout Forest of terai and duars.

General Distribution: India (Andhra Pradesh, Bihar, Orissa, West Bengal, Assam, Tripura, Mizoram), Bangladesh, Myanmar, Thailand and Java.

Status: Rare occurrence; Least Concern (Renuka 2011)

Specimen examined: West Bengal, Darjeeling, NRVK 20.01.2018 Mondal, Mallick and Chowdhury, 1022 (Acc. No. 10182, NBU).

CARYOTA L. in Sp. Pl. 1189. 1753.

Caryota urens L. in Sp. Pl. 1181. 1753; Noltie in Fl. Bhutan 3(1): 428. 1994; Hajra et al. in Fl. Sikkim 1:182. 1996; Prain in Bengal Pl. 2: 1093. 1903.

Plant about 1 – 20.2 m tall, 30.2 – 50.1 cm diameter., trunk smooth with prominent annular leafscars. Leaves bipinnate 4 – 6 m long; pinnae 5 – 7 pairs, to 1.3 m long; leaflets broadly cuneate, fanshaped, 12.1 – 20.2 x 7.2 – 10.3 cm wide at wider portion, raemorse at apex, many ribbed. Spadix interfoliar, shortly peduncled, much branched, pendulous, 4.2 m long; spathes few. Flowers many, in triads with female flower in the middle. Sepals 3, rounded, imbricate; petals linearoblong, valvate; stamens many; ovary 3 celled. Fruit globose, reddish purple. Seeds planoconvex, subreniform.

Flowering: January – March **Fruiting:** February – April

Local Distribution: All over the forest of North Bengal

General Distribution: India (West Bengal, Assam, Kerala, Odisha, Tamil Nadu); Bangladesh, Nepal and Bhutan.

Status: Not evaluated (IUCN)

Uses: Common

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, Dasgupta, Mondal, Paul and Chowdhury [Field No. 1007]

DAEMONOROPS Bl. in Schultes *f.* and J.H Schultes, Syst. Veg. 7:1333. 1830.

Daemonorops jenkinsiana (Griff.) Mart. in Hist. Nat. Palm. 3: 327. 1850; Becc., Hook. *f.* in Fl. Brit. Ind. 6: 462. 1893. *Daemonorops pierreana* Becc. in Rec. Bot. Surv. Ind. 2: 220. 1902; Prain in Bengal Pl. 2: 1099. 1903; Basu in Rattan in Ind. Monogr. Rev. 40. 1992. '*Golak Bet/ Golla Bet*'

High climbing 4 – 5 cm in diameter, without sheath 2 – 3.5 cm diameter internodes 16 – 22 cm long, striate. Leaves cirrate; knee distinct; petiole 14 – 20 cm long; leaflets ensiform, alternate to sub-opposite 45 – 50 cm long. Inflorescence cymbiform, subaxillary; peduncle 4 – 8 cm long. Male flowers oblong 4.2 × 3.5 mm, calyx cupular, hairy, corolla 3, oblanceolate, stamens 6, anthers subulate, connate, thickened at base; female rachillae 6 – 10 cm long, sinuous, female flowers 5 – 7 on each side, each 6 – 6.5 mm long, calyx cupular, truncate, ovary globose to ovoid, stigmas 3, papillose inside. Fruit globose, fruit 5.2 – 5.5 mm long 1.7 cm in diameter, scales yellowish brown with; seed globose, 9 mm in diameter, endosperms ruminant.

Flowering: July – December **Fruiting:** September – May

Local Distribution: All over the forest of North Bengal

General Distribution: India (West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Manipur); Bangladesh, China and Vietnam.

Status: Less common; Near Threatened (Renuka 2011)

Uses: It is one of the most useful rattan species utilized as raw material for making furnitures and handicrafts. Fruits are eaten by Elephants.

Specimen examined: West Bengal, Darjeeling, North Sevoke 12.01.2018 Mondal, Mallick and Chowdhury, [Field No. 1029] and [Acc. No. 10198, NBU].

ASPARAGALES Bromhead, 1838.

AMARYLLIDACEAE Expos. in Fam Nat 1: 134. 1805.

Crinum amoenum Ker Gawl. ex Roxb. in J. Sci. Arts (London) 3: 106. 1817. *Crinum himalense* Royle. Ill. Bot. Himal. Mts. 374. 1839. '*Nagdaun/Bengal lily*'

Perennial herb, 1.2 m tall. Leaf base forms spherical pseudobulb, upper part of bulb cylindrical, base laterally branched 6.3 – 15.2 cm in diameter. Leaves margin undulate, lanceolate, dark green, apically acuminate with 1 sharp pointed, width 7.5 – 12.4 cm or wider, up to 1.3 m long; leaves 20 – 30 a piece. Inflorescence 10 – 24 flowers, umbel, aromatic, multiple petals. Flower stem solid, erect, as long as the leaf. Spathe membranous, lanceolate, 6.4 – 10.2 cm. Bractlet linear; perianth tube green white, straight and slender; corolla lobe 6, white, spider-like shaped, revolute; stamens reddish 6, filaments 4.5 – 5.4 cm long, anthers attenuate, linear; ovary up to 2.1 cm long, fusiform. Fruit green, an oblate capsule, diameter 3.1 – 4.9 cm.

Flowering: January – February

Fruiting: March – April

Local Distribution: Wet places of West Bengal

General Distribution: India (West Bengal, Assam, Meghalaya, Arunachal Pradesh), native to Central Himalaya to Myanmar.

Status: Common

Uses: Used as Emetic, expectorant, laxative, tonic.

Specimen Examined: West Bengal, Darjeeling, North Sevoke (MPCA). 04.12.2019, Mallick, et al. [Field No. 4520]

ASPARAGACEAE Juss., Gen. Pl. 40. 1789.

Asparagus racemosus Willdenow, Sp. Pl. in ed. 4, 2: 152. 1799. *Asparagopsis abyssinica* Kunth in Enum. Pl. 5: 101. 1850. *Asparagopsis decaisnei* Kunth in Enum. Pl. 5: 103. 1850.

Woody perennial climbers; stem spinescent, green; rootstock with fascicled tuberous roots. Cladodes from the axils of scale leaves in clusters of 2 – 7, 0.8 – 1.5 × 0.1 – 0.3 cm, linear-falcate, slightly triquetrous, base narrow, apex acute. Racemes 2.5 – 5 cm long, slender, axillary, solitary or clustered. Flowers bisexual, 5 – 6 mm across; bracts triangular; pedicel 1 mm long. Perianth 6 lobes, white, oblong, acute; stamens 6, adnate to the perianth lobes, filaments subulate; ovary globose to slightly 3-gonous, 3-celled, ovules 2 per cell, stigma 3, recurved. Berry globose.

Flowering: June – August

Fruiting: July – September

Local Distribution: Lataguri MPCA of North Bengal

General Distribution: Throughout India; Nepal, Bangladesh, Thailand and Australia.

Status: Common

Uses: It is used for constipation, stomach ulcer and dementia.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 2723]

HYPOXIDACEAE R. Br.

CURCULIGO Gaertn. in Fruct. 1. 63. t. 16. 1788.

Curculigo orchioides Gaertn. in Fruct. Sem. Pl. 1: 63, t. 13. 1788; Hook. *f.* in Fl. Brit. Ind. 6: 279. 1894; Prain in Bengal Pl. 2: 1059. 1903; Noltie in Fl. Bhutan 3(1): 69. 1994; Hajra et al. in Fl. Sikkim 1: 139. 1996. *Curculigo malabarica* Wight in Ic. 2043. 1. 1853. *Curculigo orchioides* var. *minor* Benth. in Fl. Hongk. 366. 1861. [Photo Plate -VI]

Small herbs, rhizome to 18 cm long, oblong, perennial. Leaves 10 – 12 × 2.5 cm, lanceolate. Perianth yellow, 1.5 cm; tube 3.5 cm long, sparsely pilose; stamens 6, filaments erect; ovary 3-celled, ovules many, villous. Fruit baccate; seeds subglobose.

Flowering: April – September **Fruiting:** September – January

Local Distribution: All over the forest of North Bengal

General Distribution: India (Sikkim, Assam, Kerala, Jharkhand, West Bengal); Pakistan, Myanmar, Thailand, Cambodia, Indonesia, Japan and Vietnam.

Status: Common

Uses: It is used for the treatment of Limb limpness, impotence and kneejoints.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3854]

Curculigo capitulatea (Lour.) Kuntze in Revis. Gen. Pl. 2: 703.1891; Prain in Bengal Pl. 2: 1059. 1903; Noltie in Fl. Bhutan 3(1): 67.1994.

Herbs 1.5 m tall, leaves often 4 – 7; petiole 30 – 70 cm; lamina oblong-lanceolate to suboblong 40 – 92 × 5 – 15 cm, plicate, papery, sometimes pubescent, margin entire, apex acuminate. Flowering stems 16 – 31 cm, brown villous. Racemes nodding, capitate to subovoid 2.5 – 5.5 cm, densely many flowered; bracts ovate-lanceolate, hairy. Pedicel 7.3 mm. Perianth yellow, segments ovate-oblong, apex obtuse, outer segments adaxially hairy, inner ones adaxially hairy on midvein or at base of midvein; stamens 5 – 6, filament less than 1 mm, anther linear; ovary subglobose to oblong, hairy, style

longer than stamens, slender, stigma subcapitate. Berry white, subglobose. Seeds black with irregular stripes.

Flowering: May – August **Fruiting:** June – September

Local distribution: Forest ground of all the three MPCAs.

General Distribution: India (All over the country); few countries of Asia, Australlia, Ammerica

Status: Least concern (IUCN).

Uses: It is udes for the treatment of asthma, Jaundice and diarrhea.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5078]

COMMELINALES Dumort.,

COMMELINACEAE R. Br.,

AMISCHOTOLYPE Hassk. in Flora 46: 391. 1863.

Amischatolype hookeri (Hassk.) Hara in Fl. East. Himal. 1: 399. 1966; Noltie in Fl. Bhutan 3(1): 223.1994; Hajra et al. in Fl. Sikkim 1: 167. 1996. *Forrestia hookeri* Hassk. in Flora 47: 629. 1864; Prain in Bengal Pl. 2: 1086. 1903.

Herb perennial. Stems erect, branched. Leaf sheaths overlapping; lamina elliptic 25.6 – 30.4 × 5.2 – 10.4 cm, adaxially glabrous, entire, acuminate-caudate. Heads with to 10 – 12 flowers, within leaf sheath, sessile; sepals oblong - ovate, sub-glabrous; petals purple to reddish. Fruit capsule ovoid, rugose.

Flowering: June – August **Fruiting:** July– October

Local Distribution: Marginal lowland areas of Terai and Duars.

General Distribution: India (throughout); Bangladesh, Nepal, Bhutan, Myanmar and Laos, Vietnam.

Status: Common

Uses:Uses in Ethnic/Tribal Medicine

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5079]

COMMELINA Linnaeus, in Sp. Pl. 1: 40. 1753.

Commelina benghalensis L. in Sp. Pl. 1: 41. 1753; Hooker *f.* in Fl. Brit. Ind. 6: 370. 1892; Prain in Bengal Pl. 2: 814. 1903.

Marshland Creeping, glabrous or pubescent herbs, rooting at basal nodes. Lamina ovate or elliptic – ovate, sub-acute to rounded apex, sheath pubescent or villous, margin

oblong ciliate. Spathe 1 – 3 together at the tips or branches, pubescent, turbinate, margin cinnate. Capsules pyriform. Seeds 5, oblong, closely pitted.

Flowering: January – March

Fruiting: September – November

Local Distribution: Marginal lowland areas; common

General Distribution: India (Sikkim, Assam, Nagaland, Arunachal Pradesh and West Bengal) Bangladesh, China, Myanmar, Java and Hong Kong; throughout the Bengal-plains.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1031]

Commelina diffusa Burman *f.* in Fl. Ind. 18. t. 7. f. 2. 1768; Datta and Majumdar, Bull. Bot. Soc. Bengal 20 (2): 39. 1966. *Commelina nudiflora auct. non* L. in Sp. Pl. 1: 41. 1753; Hooker *f.* in Fl. Brit. Ind. 6: 369. 1892; Prain in Bengal Pl. 2: 1082. 1903.

Marshland creeping herbs. Lamina sessile, glabrous or sparsely puberulous, lanceolate, acute, leaf sheath glabrous, margin ciliate. Spathe glabrous or sparsely pubescent, ovate or ovate-lanceolate. Cymes usually 1–3 flowered. Flowers blue; capsule oblong, acuminate or apiculate. Seeds 5, oblong.

Flowering: January – March

Fruiting: September – November

Local Distribution: Marginal lowland areas of North Bengal

General Distribution: Pantropical; throughout the Bengal-plains.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1033]

Commelina erecta L. in Sp. Pl. 1: 41. 1753; Morton, J. Linn. Soc. London 60 (382): 183. 1967.

Marshland erect, stout, annual herbs. Lamina puberulous, lanceolate, acuminate. Spathe 3–5 cm long. Flowers bluish – violet. Capsules 2–3 sepals, ovoid. Seeds oval.

Flowering: January – March

Fruiting: September – November

Local Distribution: Marginal lowland areas

General Distribution: India (Throughout) America, Africa and Australia

Status: Common

Uses: Enrire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specime examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1035]

Commelina paludosa Blume in Enum. Pl. Jav. 1: 2. 1827. Noltie in Fl. Bhutan 3(1): 235.1994. *Commelina obliqua* Buchanan-Hamilton ex D. Don in Prodr. Fl. Nepal. 45. 1825; Prain in Bengal Pl. 2: 1083. 1903.

Marshland perennial herbs. Leaves sessile, leaf sheath densely brown, lamina ovate to lanceolate. Involucral bracts 4–8, terminal heads, sessile, funnel shape. Flowers many; sepals membranous; petals blueish; capsule globose–ovoid, trigonous. Seeds 1 per valve.

Flowering: January – March

Fruiting: April – September

Local Distribution: Marginal lowland areas of terai and duars.

General Distribution: India (Assam, kerala, Jharkhand, Tripura, Nagaland, West bengal), Nepal, Bhutan, Myanmar, China, Thailand, Malaysia, Laos, Vietnam, Cambodia and Indonesia.

Status: Common

Uses: Enrire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1197]

Commelina suffruticosa Blume, Catalogus 35. 1823; Ben. Pl.2: 1082. 1903; *Commelina rugulosa* Clarke in J. Linn. Soc., Bot. 11: 446. 1871.

Herbs perennial. Stems erect or ascending, branched only distally, to more than 32 cm, glabrous. Leaf sheaths sparsely hirsute–ciliate and hirsute in a line on 1 side; petiole obvious, to 0.6 cm; leaf blade lanceolate to ovate 7.8–13.2 × 2.9–4.6. cm, glabrous. Bract open 1.5 × 1.2 cm when folded, sparsely puberulent, apex obtuse. Cincinni 4–flowered; peduncle 7.6 mm; pedicels 2.7 mm, twisted in fruit. Sepals membranous; petals white, 4.1 mm. Capsule subglobose 3.7 – 4.7 mm, 2 valved.

Flowering: June – September

Fruiting: July– November

Local Distribution: Lowland areas; common

General Distribution: India (North East states); Nepal, Bangladesh, China South-Central, East Himalaya Jawa, Malaysia, Myanmar and Thailand.

Status: Common

Uses: While plant applied for abscesses and fever, used for colds, a sore throat and nosebleed.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.06.2018, Mallick, et al. [Field No. 3818]

CYANOTIS D. Don in Prodr. Fl. Nepal. 45.1825.

Cyanotis axillaris (L.) Sweet in Hort. Brit. 430. 1826. *Cyanotis axillaris* (L.) Schult. and Schult.f. in Syst. Veg., ed. 15 bis. 7(2): 1154. 1830. *Cyanotis axillaris* (L.) D. Don ex Sweet in Hort. Brit. 430. 1826. [Photo Plate VI]

Fleshy decumbent, glabrous herbs, rooting at lower nodes, purple–suffused. Leaves 3–6 × 0.3–0.6 cm, linear, apex acute or acuminate; sheath to 7 mm long, mouth ciliate. Inflorescence in axillary cymose clusters, enclosed within the leaf sheath. Bracteoles 1–3 mm long, linear. Flowers 5–7 mm across; calyx connate, pilose; lobes lanceolate; corolla blue, tube to 3.3 mm, lobes ovate; stamens 6, filaments pink with purple pilose hairs; ovary 1.5 mm, woolly, 3–celled, ovules 2 per cell on axile placentae, style pilose, stigma 3–fid. Capsule oblong, apex beaked. Seeds 6, oblong, pitted.

Flowering: March – May

Fruiting: June – July

Local Distribution: Marshy lands of all the three MPCAs.

General Distribution: India (All over the country); Nepal, Bangladesh, Cambodia, China Laos, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam and Australia.

Status: Common

Uses: The plant is used to treat boils and ascites

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4111]

Cyanotis cristata (L.) Don in Prodr. in Fl. Nepal 46. 1825; Hook. f. in Fl. Brit. Ind. 6: 385. 1894; Prain in Bengal Pl. 2: 1085. 1903; Noltie in Fl. Bhutan 3(1): 222. 1994.

Commelina cristata L. in Sp. Pl. 1: 42. 1753. *Cyanotis imbricata* (Roxburgh) Kunth, Enum. in Pl. 4: 103. 1843. *Tradescantia imbricate* Roxb. in Fl. Ind. 2: 120. 1824.

Helophytes; annual herbs. Cauline leaves; lamina oblong, lanceolate, abaxially glabrous or sparsely arachnoid. Cincinni often solitary, terminal or axillary; peduncle long; bracts 1 cm long; sepals basally connate; petals blueish or purple. Fruit capsules, trigonous; seeds brown, pitted.

Flowering: July – October

Fruiting: November – January

Local Distribution: Marginal or road side areas of three MPCAs.

General Distribution: India (Sikkim, Assam, West Bengal); North and South East Asia.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1031]

Cyanotis vaga (Loureiro) J. A. and J. H. Schultes in Roemer and Schultes in Syst. Veg. 7: 1153. 1830; Hara *et al.* in Enum. Fl. Pl. Nepal 1: 82. 1978; Noltie in Fl. Bhutan 3(1): 220. 1994. *C. barbara* Don Prodr. in Fl. Nepal 46. 1825; Hooker *f.* in Fl. Brit. Ind. 6: 385. 1894.

Helophyte; perennial herbs. Bulbs globose. Stem branching from base. Leaves cauline; lamina lanceolate, abaxially glabrous or sparsely pubescent. Peduncle absent or very short; bracts 7 mm, Spathe-bracts many, compact; sepals connate at base, lanceolate; petals blueish; filaments blue. Fruit capsules trigonous, obovoid; seeds finely reticulate.

Flowering: July – March

Fruiting: September – October

Local Distribution: Marginal lowland areas of Bengal plains.

General Distribution: India (throughout); Bhutan, Nepal, Myanmar, Laos, China, Thailand and Vietnam.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1039]

FLOSCOPA Loureiro in Fl. Cochinch. 1: 192. 1790.

Floscopa scandens Loureiro in Fl. Cochinch. 1: 193. 1790; Prain in Bengal Pl. 2: 1086. 1903.

Hyperhydrate; annual, prostrate herbs with glandular multicellular hairs or hairy only on leaf sheaths and inflorescences. Leaves sessile, petiole winged; lamina lanceolate to elliptic. Inflorescences terminal and axillary, broomlike; sepals shallowly boat-shaped; petals blue or purple; fertile stamens 6, filaments glabrous. Capsule ovoid, compressed.

Flowering: July – September **Fruiting:** October – December

Local Distribution: Marginal lowland areas of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Bihar, Tripura and West Bengal); Bhutan, Myanmar, Thailand and China.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2018, Mallick, et al. [Field No. 1041]

MURDANNIA Roye in, Ill. Bot. Himal. Mts. 11: 403. 1840.

Murdannia keisak (Hasskarl) Handel-Mazzetti in Symb. Sin. 7: 1243. 1936. *Aneilema keisak* Hasskarl in Commelin. Ind. 32. 1870; Chowdhury et al. in Pleione 9(2): 53. 2015.

Marshland perennial, decumbent herbs with fibrous roots. Rhizomes elongate, horizontal. Internodes with a line of white hairs. Leaves sessile; sheaths with a line of hairs; lamina spreading or slightly folded, linear-lanceolate or linear-elliptic, acuminate. Flowers terminal or axillary, solitary; sepals narrowly oblong; petals obovate, pink, blue-purple or pale blue; fertile stamens 3, staminodes 3; capsules oblong; seeds 4 per valve and slightly flattened.

Flowering: July – September **Fruiting:** October – December

Local Distribution: Marginal lowland areas of North Bengal

General Distribution: India, China, Japan, Korea.

Status: Less Common.

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1041]

Murdannia nudiflora (L.) Brenan in Kew. Bull. 7: 189. 1952; Guha Bakshi in Fl. Mur. Dist. 329. 1984. *Commelina nudiflora* L. in Sp. Pl. 1: 41.1753. *Aneilema nudiflorum* (L.) R. Brown in Prodr. 271. 1810; Hook. f. in Fl. Brit. Ind. 6: 378. 1892; Prain in Bengal Pl. 2: 816. 1903.

Annual, decumbent herbs; rooting from lower nodes. Lamina glabrous, linear or linear-lanceolate. Inflorescence scorpioid cyme. Ovary 2-celled with two ovules. Capsule 2-seeded, brown, rugose.

Flowering: October – December **Fruiting:** January– April

Local Distribution: Marginal lowland areas of the Bengal-plains.

General Distribution: Pantropical.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1042]

Murdannia spirata (L.) Brueckner in Engler and Prantl, Nat. Pflanzenfam., ed. 2, 15a: 173. 1930; Panda and Das in Fl. Sambalp. 380. 2004. *Commelina spirata* L. in Mant. Alt. 176. 1771. *Aneilema spiratum* (L.) Brown in Prodr. 271. 1810; Hooker f. in Fl. Brit. Ind. 6: 377. 1892; Prain in Bengal Pl. 2: 1084. 1903.

Marshland branched, procumbent herbs. Lamina oblong, almost rounded, glabrous. Flowers on terminal panicle. Flowers bluish-violet, bracts minute, persistent. Capsule oblong. Trigonous, mucronate, 3-celled. Seeds 4 in each cell.

Flowering: July – September **Fruiting:** October – January

Local Distribution: Marginal lowland areas of Bengal-plains.

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland, Tripura), Indo-Malaysia, China, Nepal and Bhutan.

Status: Common

Uses: Plants used as refrigerant, laxative and for the treatment of leprosy and headache.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.01.2018, Mallick, et al. [Field No. 1043]

Murdannia vaginata (L.) Bruckner in Engler and Prantl in Nat. Pflanzenfam., ed. 2. 15a: 173. 1930. *Commelina vaginata* Linnaeus in Mant. Pl. 2: 177. 1771. *Aneilema vaginatum* R. Brown in Prodr. Fl. Nov. Holland. 271. 1810; Prain in Bengal Pl. 2: 1084. 1903.

Perennial herbs. Roots fibrous, lanate. Leaves 2 to several; leaf sheath open; lamina linear. Flowers in fascicles; sepals lanceolate, persistent; petals blue, obovate – orbicular; fertile stamens 2, filaments pubescent, staminodes 3 or 4. Capsule globose.

Flowering: July – September **Fruiting:** October – January

Local Distribution: Marginal lowland areas of Himalayan foot hills.

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland, Tripura), Sri Lanka, Philippines, Thailand and Vietnam.

Status: Common

Uses: Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1046]

Murdannia japonica (Thunberg) Faden, Taxon. 26: 142. 1977. *Commelina japonica* Thunberg, Trans. Linn. Soc. Lon. 2: 332. 1794.

Perennial herbs. Roots fibrous 2.3 mm in diameter; rhizomes absent. Stem undeveloped and very short; fertile stems erect, glabrous. Leaves on main stems several; lamina narrowly elliptic, 8 – 15 × 2 – 4.5 cm, glabrous, margin undulate, apex obtuse, acute. Panicles terminal, consisting several cincinni; cincinni to 3.6 cm, with several flowers; involucre bracts small, membranous; bracts extremely small; pedicels straight, very short at anthesis 7.3 mm in fruit; sepals narrowly elliptic, persistent; petals purple or bluer; fertile stamens 3 or 4; filaments pubescent; staminodes 4; antherodes 4-sect. Fruit broadly ellipsoid, trigonous.

Flowering: May – July **Fruiting:** August – September

Local distribution: Humid forests margins of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Tripura), Bhutan, Indonesia, Japan, Laos, Malaysia, Thailand.

Status: Least Concern (IUCN).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 50321]

PONTEDERIACEAE Kunth,

MONOCHORIA Presl, in Rel. Haenk. 1: 127. 1827.

Monochoria hastata (L.) Solms in Candolle, in Mon. 4: 523. 1883; Prain in Bengal Pl. 2: 1079. 1903; Noltie in Fl. Bhutan 3(1): 175. 1994. *Monochoria hastaefolia* Presl, in Rel. Haenk.1: 128. 1827; Hook. f., in Fl. Brit. Ind. 6: 362. 1882.

Aquatic perennial herbs,. Radical leaves broadened at base; petiole 11 – 53 cm; lamina triangular-ovate, 5.6 – 20.8 × 3.2 – 15.9 cm. Inflorescence racemes short; peduncle shorter leaf petiole. Perianth bluish, ovate; style hairy at apex. Fruit capsule oblong. Seeds oblong.

Flowering: August – October

Fruiting: November – March

Local Distribution: Marginal and road side areas of all three MPCAs area.

General Distribution: India (Sikkim, Assam, West Bengal); Sri Lanka, China, Malaysia.

Status: Near Threatened Species (IUCN 2019).

Uses: Plant is used as a tonic and cooling, rhizomes powdered with charcoal used for scurf.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 12.08.2017, Mallick, et al. [Field No. 3028]

Monochoria vaginalis (Burm.) Presl, in Reliq. Haenk. 1: 128. 1827; Prain in Bengal Pl. 2: 1079. 1903; Noltie in Fl. Bhutan 3(1): 174. 1994; Hook. f. in Fl. Brit. Ind. 6: 363. 1892. *Gomphima vaginalis* (Burm.) Raf. in Fl. Tellur. 2: 10. 1837.

Aquatic herbs. Stems erect with radical leaves and broad sheath; petiole 3.8 – 40 cm; lamina narrowly cordate and lanceolate, 2.6 – 20.2 × 1.5 – 8.9 cm, acuminate. Inflorescences reflexed after anthesis; lanceolate bract. Pedicellate flower; perianth purplish; filaments filiform. Fruit capsules, ovoid. Seeds ellipsoid.

Flowering: August – November

Fruiting: December – March

Local Distribution: Marginal marshy areas of Bengal plains.

General Distribution: India (throughout); Sri Lanka, Bangladesh, China, Malayan Islands, Japan and Java.

Status: Least concern (IUCN 2017).

Uses: It is used as traditional medicine and roots are eaten as vegetables.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 12.08.2017, Mallick, et al. [Field No. 3029]

DIOSCOREALES Hook. *f.* in 1873.

DIOSCOREACEAE R.Br. in Prodr. 1: 294. 1810; *nom. cons.*

Dioscorea bulbifera L. in Sp. Pl. 1: 1033. 1753; Prain in Bengal Pl. 2: 1066. 1903; Noltie in Fl. Bhutan 3(1): 9. 1994. *Dioscorea sativa* Thunb. in Fl. Jap. 151. 1784; Hook. *f.* in Fl. Brit. Ind. 6: 295. 1892. *Dioscorea pulchella* Roxb. in Fl. Ind. 3: 801. 1832. [Photo Plate –VI] ‘*Mathe alu*’

Tuber solitary, ovoid. Stem twining; bulbils purplish, spots orbicular. Leaves alternate, lamina cordate, 9.5 – 17.6 × 4 – 14 cm, entire, base caudate, tip acuminate. Male spikes in cluster. Female flowers: staminodes 6; capsule drooping, oblong-globose.

Local Distribution: All over the forests of North Bengal

General Distribution: India (Assam Tripura, Nagaland, West Bengal); Nepal and Sri Lanka.

Status: Rare occurrence

Uses: The bulbils are used as contraceptives diabetes, leprosy and asthma.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 12.08.2017, Mallick, et al. [Field No. 351]

Dioscorea hispida Dennst. in Schlüssel Hortus Malab.15: 33. 1818. *Dioscorea daemonia* Roxb. in Fl. Ind. ed. 1832. 3: 805. 1832. *Dioscorea daemonia* var. *reticulata* Hook. *f.* in Fl. Brit. Ind. 6: 289. 1892.

Stems twining, glabrous. Leaflets 16 × 12 cm, subequal, obovate, acuminate at apex, base cuneate, petiolulate short, ribs 5, coarsely reticulate, hispid; lateral leaflets base gibbous; petiole long. Flowers in Panicles, axillary, 38– 45 cm long. Racemes fascicled.

Flowering: July – August

Fruiting: September – November

Local Distribution: All over the forest of North Bengal

General Distribution: India (Western Ghat, North East states and west Bengal); native range is from tropical and subtropical Asia to Australia.

Status: Common

Uses: Tubers used to kill worms in wounds.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4123].

Dioscorea pentaphylla L. in Sp. Pl. 1: 1032. 1753; Hook. f. in Fl. Brit. Ind. 6: 289. 1892; Prain in Bengal Pl. 2: 1066. 1903. *Dioscorea jacquemontii* Hook. f. in Fl. Brit. India 6: 290. 1892. '**Panchpata**'

Tubers long-ovoid, irregular; Stem twining, prickly. Leaves palmately 4 – 7 foliolate, alternate; petiole long; leaflets entire, ovate-lanceolate, 7– 20 × 2–8 cm, base attenuate, tip acute. Male spikes in panicles, axillary, lateral branches long. Female spikes puberulent, simple or branched. Capsules ellipsoid, long.

Flowering: September – December

Fruiting: December – February

Local Distribution: Throughout the forests of West Bengal

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

Status: Common

Uses: Plant is used for the treatment of piles, ulcer and cough.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4123]

Dioscorea prazeri Prain et Burkill in J. Asia. Soc. Bengal 73 (2): 2. 1896; Noltie in Fl. Bhutan 3 (1): 7. 1994. *D. sikkimensis* Prain et Burkill in Rec. Bot. Surv. Ind. 4: 77. 84.134. 1910. *D. deltoidea* var. *sikkimensis* Prain in Bengal Pl. 2: 1066. 1903. '**Chupre alu**'

Stem twining, glabrous, bulbils absent. Tuber brownish black, irregular, branched. Lamina triangular-ovate, alternate, 8 – 16 × 5 – 11 cm, coriaceous, glossy, base cordate, tip acuminate. Male flowers in axillary panicles, unbranched, flower minute, pedicel short; lobes 9, similar, ovate, green. Female flower solitary, axillary; ovary oblong. Fruit capsule obovate oblong.

Flowering: September – December

Fruiting: December – February

Local Distribution: All over the forest of North Bengal

General Distribution: Endemic to tropical and subtropical E Himalaya.

Status: Common

Uses: Plant is used to make arrow-poison and Jaundice.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4129]

Dioscorea pubera Bl. in Enum. Pl. Javae 1: 21. 1827; Noltie in Fl. Bhutan 3(1): 14. 1994. *D. anguinea* Roxb. in Fl. Ind. 3: 803. 1832; Hook. f. in Fl. Brit. Ind. 6: 293. 1892; Prain in Bengal Pl. 2: 1066.1903.

Tubers cylindrical 2 – 4. Stem pubescent. Leaves subopposite, alternate; lamina obovate to ovate; base cordate, cartilaginous margins, persistently pubescent.

Flowering: September – December **Fruiting:** November – March

Local Distribution: Throughout the forest areas of North Bengal

General Distribution: India (Himalayas and middle part of North Bengal); Myanmar, Sumatra.

Status: Less common

Uses: Plant is used to make arrow-poison and also given against Jaundice.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4131].

LILIALES Perleb

SMILACACEAE Vent.

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

Smilax lanceifolia Roxb. in Fl. Ind. 3: 792. 1832. *Smilax lanceifolia* var. *elongate* (Warb.) Wang and Tang in Fl. Reipubl. Popularis Sin. 15: 220. 1978. *Smilax lanceifolia* var. *impressinervia* (Wang and Tang) Koyama. in J. Taiwan Mus. 13: 26. 1960.

Climbers; stem branched, terete, 1 – 2 m, woody; branchlets occasionally zigzagged. Leaves 6 – 17 × 2 cm, lanceolate to ovate-oblong, petiole 1–2cm, narrowly winged for 1.5 – 1.4 its length; abscission zone at middle; tendrils usually present. Inflorescence umbels, basally prophyllate; umbels of both sexes densely 20 – 30 flowered, base slightly thickened. Male flowers: tepals yellowish green; stamens 3 – 4 mm. Female flowers: tepals 1.5 – 2 × 0.6 mm; staminodes 6. Berries yellowish red to black, globose.

Flowering: July – September **Fruiting:** September – November

Local Distribution: Forest area of North Bengal plains.

General Distribution: India (Western Ghat, North East states), Nepal, Bangladesh, Borneo, Cambodia, China, Malaysia, Myanmar and Taiwan.

Status: Not Evaluated (IUCN 2020).

Uses: It is used as local food and medicine.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4305]

Smilax ovalifolia Roxb. ex Don, in Hort. Bengal 72; Fl. in Ind. 3. 794. *Smilax ovalifolia* Monogr. in Phan. 1: 199.1878.

Armed or unarmed climber, large. Stem branched upto 10 m in height, woody, branches smooth. Leaves leathery, shining, Petiole 1.6 – 3 cm, narrowly winged, tendrils well developed. Lamina ovate to suborbicular, 12 – 23 × 8 – 14cm. Inflorescence umbels, 1.5 – 4cm, prophyllate. Flowers bracteate, perianth curved. Outer tepals of male flowers 5 – 6 × 1.5 mm and inner one narrower.

Flowering: June – August

Fruiting: August – October

Local Distribution: Forest area of terai and duars of North Bengal

General distribution: India (Assam, Nagaland, Bihar, Sikkim West Bengal), Bhutan, Nepal, Bangladesh and Myanmar.

Status: Least Concern (IUCN 2019).

Uses: It is used in the treatment of ulcers.

Specimen Examined: West Bengal, Jalpaiguri, NRVK 22.09.2018, Mallick et al. [Field No. 8986]

Smilax perfoliata Lour. in Fl. Cochinch. 2: 622.1790. *Smilax perfoliata* Bl. in Enum. Pl. Javae 1: 18. 1827.

Woody climbing. Stem branched. Leaves 20 × 12 cm, ovate, apex obtuse. Petiole 2 – 4 cm, broadly winged, stout, sheathing, tendril coiled. Inflorescence umbel, male and female flowers in whorls of 2 – 4, outer tepal 5 – 6 mm, inner tepal 4 – 5 mm, rachis zigzagged, bracteate, perianth 6 × 2 mm, broadly oblong. Filament 5mm, anthers 2 mm, oblong. Female flower staminodes 6. Ovary 2 mm, globose.

Flowering: March – May

Fruiting: June – August.

Local Distribution: Forest areas of terai and duars, North Bengal

General distribution: India (West Bengal, Assam, Sikkim); Bhutan, Nepal, Bangladesh.

Status: Common

Uses: It is used in antipyretic agent, seed extract used as lotion in leprosy skin diseases.

Specimen Examined: West Bengal, Jalpaiguri, NRVK 22.12.2019, Mallick et al. [Field No. 4986]

Smilax zeylanica L. in Sp. Pl. 1029. 1753. *Smilax ceylanica* Oken. In Allg. Naturgesch. 3(1): 616. 1841. '*Hosti-karna lota*'

Climbing shrubs; prickly stem. Leaves ovate-oblong or ovate-lanceolate, 6.3 – 12.1 × 3.2 – 6.5 cm, acute to shortly cuspidate at apex, base rounded, coriaceous, glossy and glabrous 3 – 5 ribbed from base; petiole arising tendril from either side of petiole 2.3 cm long. Umbels 1 – 3, axillary; peduncles 2.4 – 3.1 cm long. Unisexual Flowers; pedicels 5.2 – 6.1 mm long; oblong bracts. Perianth free 6-partite, greenish, oblong 7.2 mm long. Stamens free, in male flowers 6; flat filaments, apex callose; pistillode 0. Female flowers: ovary 3-celled, ovules per cell 1 or 2, style 3-lobed, staminodes 3 – 6. Berry subglobose, 0.7 – 1.1 × 0.5 – 0.9 cm. Seeds globose.

Flowering: April – September

Fruiting: April – September.

Local Distribution: Semi-evergreen and moist deciduous forests of MPCAs of Terai and duars.

General Distribution: India (Sikkim, West Bengal, Kerala, Orissa, Assam), Bangladesh, East Himalaya, Nepal, Myanmar, Malaysia and Solomon.

Status: Common

Uses: Roots are used as substitute for sarsaparilla and for the treatment of syphilis, gonorrhoea, skin disease.

Specimen Examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, Dasgupta, Mondal, Paul and Chowdhury [Field No. 1103]

PANDANALES Lehb.

PANDANACEAE Rod.

Pandanus unguifer Hook. f. in Bot. Mag. 104: 6347. 1878.

Shrubs evergreen, dioecious. Stems simple / branched, prostrate, often with stiltlike, verrucose prop roots. Leaves simple, terminal. Male inflorescence paniculate with spiciform branches, usually colored, branches covered with numerous stamens; flowers not individually distinguishable. Female inflorescence globose; flowers not independently distinguishable; carpels 2-ovuled; staminodes absent in female flower. Fruit drupe, syncarpous, comprising, fibrous phalanges; mesocarp sometimes hollow; exocarp fleshy; endocarp woody; locules 2 or more; phalanges separating at maturity; stigma persistent. Seed solitary.

Flowering: June – July

Fruiting: August – September

Local Distribution: Road side area of MPCAs of North Bengal plains

General Distribution: India (Sikkim, Assam, Kerala, Nagaland, West Bengal) Nepal, Bhutan, Bangladesh and Myanmar.

Status: Abundant

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 10032]

POALES Small

CYPERACEAE Juss.

BULBOSTYLIS Kunth in Enum. Pl. [Kunth] 2: 205 (1837), *nom. cons.*

Bulbostylis barbata (Rottboell) Clarke in Hook. f. in Fl. Brit. Ind. 6: 651. 1893. *Scirpus barbatus* Rottboell in Descr. Icon. Rar. Pl. 27. 1773.

Helophyte; rhizomes absent. Culms densely tufted. Leaf sheath brownish, membranous, glabrous; lamina filiform. Involucral bracts 2 or 3, setaceous. Inflorescences terminal, capitate; spikelets narrowly ovoid; glumes brownish to yellowish green, ovate; stamens 1 or 2; anther oblong. Fruit brown to yellowish, obovoid – globose.

Flowering: September – December **Fruiting:** January – March

Local Distribution: Road side area of MPCAs of North Bengal plains.

General Distribution: India (Assam, Sikkim, Nagaland, UP, MP, Tripura); N Africa, Atlantic Ocean islands, SE Asia, Australia, Indian Ocean islands; naturalized in N and S America.

Status: Less common

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 1007]

Bulbostylis densa (Wallich) Handl.-Mazzetti in Vegetations bilder 20. 7: 16. 1930. *Scirpus densus* Wallich in Roxb. in Fl. Ind. 1: 231. 1820. *B. capillaries* var. *trifida* (Nees) Clarke in Hook. f. in Fl. Brit. Ind. 6: 652. 1893; Prain in Bengal Pl. 2: 1156. 1903.

Hyperhydrate; slender, marshy, annual sedges. Stems glabrous, triangular. Lamina filiform, glabrous. Umbels simple; bracts short, setaceous; spikelets few, solitary. Glumes ovate-cymbiform, compressed, glabrous. Stamens 2. Achene obovoid, trigonous.

Flowering: September – January **Fruiting:** December – March

Local Distribution: Road side area of all three MPCAs of North Bengal plains.

General Distribution: India (West Bengal, Sikkim, Assam); Bangladesh, Nepal, China and Japan.

Status: Least Concern (IUCN 2020)

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10012]

CAREX L. in Sp. Pl. 2: 972. 1753.

Carex filicina Nees in Contr. Bot. India: 123. 1834.

Rhizome thick, woody. Culms densely tufted, 40 – 90 × 0.2 – 0.25 cm, sharply trigonous, glabrous. Leaves longer and shorter than culms.

Flowering: July – August

Fruiting: August – October

Local Distribution: Hilly slopes of Sevoke, Teesta valley, Darjeeling.

General Distribution: India (Arunachal Pradesh, Meghalaya, Nagaland and West Bengal), Nepal, Sikkim, Bangladesh and Bhutan.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 28.05.2017, Mallick, et al. [Field No. 1778]

Carex indica L. in Mant. Pl. Alt. 2: 574. 1771.

Small, green, tuberous, herbs, up to 20 cm high, monoecious. Stipules lanceolate, glabrous, 2 × 1 mm. Leaves glabrous or sparsely puberulent, ovate to broadly ovate, basifixed, base shallowly cordate or rounded, 3 – 11 × 3–8 cm, slightly asymmetric to symmetric, apex shortly acuminate. Inflorescence cymose, axillary or terminal, few; peduncle glabrous, branching 2 – 3 times. Male flower deep pink to white, glabrous, tepals 4. Female flower white to pink, glabrous, pedicel 4 – 6 mm long, tepals 2 – 4, unequal. Fruit pendulous, ellipsoid, 6 – 12 × 2 – 6 mm, glabrous; wings extending along the pedicel slightly.

Flowering: July – October

Fruiting: August – December

Local Distribution: Hilly slopes of Sevoke, Teesta valley, Darjeeling.

General Distribution: India (Arunachal Pradesh, Meghalaya, Nagaland and West Bengal), Nepal, Sikkim and Bhutan.

Status: Abundant

Uses: None.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA) 28.05.2021, Mallick, et al. [Field No. 4890]

CYPERUS L. in Sp. Pl. 1: 44. 1753.

Cyperus articulatus L. in Sp. Pl. 1: 44. 1753; Clarke in Hook. *f.* in Fl. Brit. Ind. 6: 611. 1893.

Hyperhydrate; rhizomatous, perennial sedges. Culms compressed, occasionally trigonous for apical part. Leaves usually bladeless, blades when present, cross ribs prominent. Spikes 1 – 6, broadly ovoid-umbellate; rays 5 – 7; bracts 2 – 4, erect, longest appearing to be continuation of culm, deltate to lanceolate-linear; rachilla persistent, wings translucent, whitish. Spikelets 3 – 10, linear, compressed; floral scales deciduous, spreading or appressed, laterally 1 – 2ribbed, medially 3-ribbed, oblong-elliptic to ovate; anthers 1.7 – 2.4 mm; styles 1.2 – 3.6 mm; Achenes brown, stipitate, obovoid-ellipsoid.

Flowering: May – July

Fruiting: September – December

Local Distribution: Road side area of all three MPCAs of North Bengal plains.

General Distribution: India (Orissa, Jharkhand, Sikkim, Assam, West Bengal), Mexico, America, Asia and Africa.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1069]

Cyperus compressus L. in Sp. Pl. 46. 1753; Clarke in Hook. *f.* in Fl. Brit. Ind. 6: 605. 1893; Prain in Bengal Pl. 2: 860. 1903. *C. pectiniformis* Roemer and Schultes in Mantissa 2: 128. 1824; Guha Bakshi in Fl. Mur. Dist. 352. 1984.

Annual, erect, glabrous sedges; stems tufted, trigonous. Leaves acuminate. Bracts leafy. Spikelets compressed, digitately clustered; glumes ovate-lanceolate, closely imbricate. Nuts dark- brown, obovate.

Flowering: July– September

Fruiting: October – December

Local Distribution: Road side area of all three MPCAs of North Bengal plains.

General Distribution: India (West Bengal, Sikkim, Nagaland, Tripura); Africa, SE Asia Australia, America, Pacific Ocean islands.

Status: Common

Uses: It is used widely for several siseses like analgesic, antispasmodic, sedative, antimalarial, relieve diarrhoea and stomach disorders.

Specimenexamined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1071]

Cyperus corymbosus Rottboell in Descr. Icon. Rar. Pl. 19. 1772; Clarke in Hooker *f.* in Fl. Brit. Ind. 6: 612. 1893. Prain in Bengal Pl. 2: 1144. 1903.

Tufted, erect, perennial, sedges. Rhizome horizontal. Stem woody, trigonous. Leaves reduced, sheath green or brown. Inflorescence conical, compound, flat, rachis rectangular, Spikes reflexed; fusiform, terete; cymbiform; glumes loosely imbricating, mucronate.

Flowering: July– September

Fruiting: October – December

Local Distribution: Road side area of MPCAs in North Bengal plains.

General Distribution: India (throughout the Benngal-plains, Sikkim, Assam, Kerala) Sri Lanka, Mayanmar, Pakistan Nepal, Bhutan and Bangladesh.

Status: Least concern IUCN)

Specimenexamined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1012]

Cyperus cyperinus (Retzius) Suringar in Cyperus. 154. 1898; Kern in Reinwardita 6: 64. 1961. *Kyllinga cyperina* Retzius in Obs. Bot. 6: 21. 1791.

Perennials, rhizomatous sedges. Leaves shorter than culm; sheath purplish red. Involucral bracts 6 – 10, leaflike. Inflorescence a simple anthela. Spikes oblong – obovoid. Spikelets erect to erect – spreading; broad; stamens 3; anthers broadly linear; style of medium length; stigmas 3. Nuts grayish brown.

Flowering: July– September

Fruiting: October – January

Local Distribution: Road side area of MPCAs in North Bengal plains.

General Distribution: Asia, NE Australia, Indian Ocean islands, Pacific islands; throughout the Bengal-plains.

Status: Common

Specimenexamined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1051]

Cyperus cyperoides (L) Kuntze in Revis. Gen. Pl. 3 (2): 333. 1898; *Scirpus cyperoides* L. in Mantissa Pl. 181. 1771. *Mariscus sieberianus* Nees ex Steudel in Syn. Pl. Glum. 2: 61. 1855; Prain in Bengal Pl. 2: 1147. 1903.

Slender, tall sedges. Leaves equaling or exceeding stem. Spikelets closely and spirally arranged in cylindric pedunculate spikes in a simple terminal umbel. Spikelets erect, linear-subulate, in fruit, spreading at right angles to the rachis, semi-fusiform. Nuts brown, curved-oblong, triquetrous.

Flowering: April – July

Fruiting: August – September

Local Distribution: Road side area of MPCAs in North Bengal plains.

General Distribution: India (Sikkim, Assam, Nagaland, Tripura and West Bengal), Nepal, Bhutan and Bangladesh.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1053]

Cyperus difformis L. in Sp. Pl. 46. 1753; Clarke in Hooker f. in Fl. Brit. Ind. 6: 605. 1893; Prain in Bengal Pl. 2: 859. 1903. '*Jawna*'

Hyperhydrate; annual, tufted sedges; roots filiform. Leaves much shorter than stem, acuminate. Umbel compound or contracted into a head. Spikelets many, brown, 10 – many flowered; glumes closely imbricate, obovate, concave. Achenes elliptical or obovoid, yellow or pale brown.

Flowering: September – March

Fruiting: January – September

Local Distribution: Road side area of MPCAs in North Bengal plains.

General Distribution: Asia, NE Australia, Indian Ocean islands, Pacific islands.

Status: Common

Uses: It is traditionally used for clinical conditions at home like diabetes, diarrhea, pyresis, inflammation, malaria, stomach and bowel disorders.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.04.2018, Mallick, et al. [Field No. 1056]

Cyperus digitatus Roxb. in Fl. Ind. 1: 205. 1820; Clarke in Hooker f. in Fl. Brit. India 6: 618. 1893; Prain in Bengal Pl. 2: 862. 1903.

Hyperhydrate; tall, annual, rhizomatous, marshland sedges. Spikelets sub-terete, yellowish brown; wings of rachilla deciduous; glumes linear, apicular; stigmas 3. Nuts ellipsoid, trigonous.

Flowering: August – October

Fruiting: November – January.

Local Distribution: Road side area of MPCAs; throughout the Bengal-plains

General Distribution: Tropical parts of the World.

Status: Common

Uses: Rhizomes are used for astringent, diuretic, diaphoretic, analgesic, antispasmodic, aromatic, antitussive, carminative, emmenagogue.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.04.2018, Mallick, et al. [Field No. 1054]

Cyperus distans L. *f.* in Suppl. P1.103.1781; Clarke in Hooker *f.* in Fl. Brit. Ind. 6: 607. 1893; Prain in Bengal Pl. 2: 1143. 1903; Noltie in Fl. Bhutan 3 (1): 314. 1994.

Erect, rhizomatous, perennial sedges. Stems solitary or tufted. Spikelets spicate in umbel, 10 – 20 flowered, narrowly linear; rachilla scarcely winged; glumes redish-brown, elliptic – oblong; stamens 3. Achenes trigonous.

Flowering: August – December

Fruiting: Sempember – January

Local Distribution: Marshy areas of MPCAs of terai and duars.

General Distribution: Tropical parts of the World.

Status: Abundant

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.04.2018, Mallick, et al. [Field No. 1061]

Cyperus haspan L. in Sp. Pl. 1: 45. 1753; Clarke in Hooker *f.* in Fl. Brit. Ind. 6: 600. 1892; Prain in Bengal Pl. 2: 860. 1903.

Erect, perennial, sedges. Stems compressed-trigonous. Lamina spreading. Spikelets lanceolate to linear, glumes long; stamen 1. Nuts shortly apiculate.

Flowering: May – August

Fruiting: September – January.

Local Distribution: In all the MPCAs of study area.

General Distribution: India, Tropical to temperate partss of old world.

Status: Common

Uses: It is used for astringent, diuretic, diaphoretic, antispasmodic, aromatic, antitussive

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.04.2018, Mallick, et al. [Field No. 1069]

Cyperus rotundus L. in Sp. Pl. 45. 1753. *Chlorocyperus rotundus* (L.) Palla. in Allg. Bot. Z. Syst. 6: 61. 1900. '**Motha**'

Perennials. Stolons with ellipsoidal tubers. Culms rarely 2 laxly tufted, solitary 4.5 cm tall, 15.5–90, triquetrous, slightly slender. Leaves shorter than culm; leaf blade 2.3b – 5.6 mm wide, bluish green, flat. Involucral bracts longer shorter than inflorescence, 2 or 3. Inflorescence compound; rays mostly 12.3 cm, 3–10, spreading, unequal in length. Spikes with 3–11 laxly arranged spikelets, obdeltoid. Spikelets linear, obliquely spreading 8–28-flowered 1.4–3.3 cm × 1.6–2.1 mm; rachilla wings slightly broad, white. Glumes subdensely imbricate, on both surfaces purplish brown to blood-red on both surfaces but middle green 3.3 mm, ovate to oblong-ovate 5–7 veined, apex obtuse to acute and mucous. Stamens 3; linear anthers; connective prominent beyond anthers. Stigma 3, exserted from glume, longer than style; style long. Nutlet obovoid-oblong, 3-sided 1–2 as long as subtending glume, punctulate.

Flowering: May – November **Fruiting:** May – November

Local Distribution: Road side area of three MPCAs of North Bengal

General Distribution: Worldwide distribution in temperate and tropical regions

Status: Least Concerned (IUCN).

Uses: Used to treat fevers, digestive system disorders, dysmenorrhea, and other maladies.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4105]

Cyperus iria L. in Sp. Pl. 1: 45. 1753; Clarke in Hook. f. in Fl. Brit. Ind. 6: 606. 1893; Prain in Bengal Pl. 2: 860. 1903.

Annual sedges with fibrous roots; stem erect, trigonous. Umbels decomposed of many primary rays bearing fascicled umbellous of many interrupted spikes of 5 – 20 spikelets, compressed, 6 – flowered; glumes loosely or scarcely imbricate, obovate, mucronate. Nuts brown, ovate triquetrous, apex mucronate.

Flowering: August – November **Fruiting:** December – January

Local Distribution: Throughout the Bengal-plains.

General Distribution: Throughout India, Tropical Africa, SW and SE Asia, Australia, Indian Ocean islands, Madagascar, Pacific islands.

Status: Least Concern (IUCN).

Uses:Used to treat fevers, digestive system disorders and dysmenorrhea.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4109]

Cyperus pilosus Vahl in Enum. 2: 354. 1805; Clarke in Hook. f. in Fl. Brit. Ind. 6: 609. 1893; Noltie in Fl. Bhutan 3 (1): 315. 1994.

Stoloniferous, rhizomatous, perennial sedges. Stems triquetrous. Leaves shorter. Spikelets in umbel, 10 – 20 flowered, linear-lanceolate; rachilla not winged; glumes ovate, obtuse and apiculate with sharp keel pale or reddish-brown; stamens 3. Achenes obovate – elliptic, trigonous.

Flowering: August – November

Fruiting: December – February

Local Distribution: Throughout the Bengal-plains

General Distribution: Throughout India, Tropical Africa, Asia and Australia.

Status: Least Concern (IUCN).

Uses: Used to treat fevers, digestive system disorders and dysmenorrhea.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 41010]

PYCREUS P. Beauvois in Flore d'Oware 2. 1816.

Pycrus flavidus (Retzius) Koyama in J. Jap. Bot. 51(10): 316. 1976. *Cyperus flavidus* Retzius in Obs. fasc. 5: 13. 1789; Clarke in Hook.f. in Fl. Brit. Ind. 6: 600. 1893; Prain in Bengal Pl. 2: 859. 1903; *Cyperus haspan* var. *indicus* Boeckeler in Linnaea 35: 574. 1868.

Hyperhydrate; annual, tufted sedges, roots fibrous. Leaves shorter than stem, linear, broad. Inflorescence compound or decompound; spikelets linear – lanceolate. Nuts globose, trigonous, rounded.

Flowering: July – August

Fruiting: October– November

Local Distribution: Throughout the Bengal-plains

General Distribution: S. Europe, Algeria, Israel, Iraq, Turkey, Pakistan, throughout India, Japan, Taiwan, Malaysia and Australia.

Status: Least Concerned (IUCN 2017)

Uses: used to treat fevers, digestive system disorders, dysmenorrhea, and other maladies.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 41017]

ELEOCHARIS R. Br. in Prodr.: 224. 1810.

Eleocharis congesta Don in Prodr, Fl. Nepal 41.1825; Clarke in Hooker *f.* in Fl. Brit. India 6: 630. 1893; Prain in Bengal Pl. 2: 1149. 1903. Noltie in Fl. Bhutan 3 (1): 286. 1994.

Annual or perennial, marshy sedges; stems ridged, triangular. Spikelets terete, oblong, sub – acute, purplish; glumes imbricate, oblong; stigmas 3. Nuts triangular, greenish yellow.

Flowering: July – September

Fruiting: October– February

Local Distribution: Throughout the Bengal-plains

General Distribution: Throughout India; SE Asia and N Australia.

Status: Least Concerned (IUCN 2017)

Uses: Used to treat fevers, digestive system disorders, dysmenorrhea, and other maladies.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 41021]

FIMBRISTYLIS Vahl in Enum. Pl. 2: 285. 1805.

Fimbristylis aestivalis (Retzius) Vahl in Enum. Pl. 2: 288. 1806; Clarke in Hooker *f.* in Fl. Brit. India 6: 637. 1893; Prain in Bengal Pl. 2: 1151. 1903; Mooney, Suppl. Bot. Bihar and Orissa 149. 1950. *Scirpus aestivalis* Retzius, Obs. Bot. 4: 12. 1786.

Hyperhydrate; annual, erect sedges. Stems angular. Leaves setaceous, broad, eligulate; sheath usually villous to hairy, rarely glabrous. Spikelets solitary, oblong – lanceolate, acute; keel 3- nerved, glabrous; stamen 1; stigmas 2. Nuts elliptic or obovate, biconvex, smooth.

Flowering: August – October

Fruiting September – February

Local Distribution: Low land marshy area of MPCAs of North Bengal

General Distribution: SE Asia, Russia, Australia, Pacific islands.

Status: Vulnerable (IUCN 2017).

Uses: Plant is used as a poultice on inflammations.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 41001]

Fimbristylis dichotoma (L.) Vahl in Enum. Pl. 2: 287. 1805. *Fimbristylis diphylla* (Retzius) Vahl in Enum. Pl. 2: 289. 1806; Clarke in Hook.f. in Fl. Brit. Ind. 6: 636. 1893; Prain in Bengal Pl. 2: 1153. 1903.

Perennial, erect, marshy sedge. Rhizome short. Leaves flat, broad. Spikelets ovate, tip acute, terete; glumes ovate; stamens 5. Nuts elliptical, whitish.

Flowering: March – April

Fruiting: February – June

Local Distribution: Throughout the Bengal-plains.

General Distribution: Throughout India; Africa, SW and SE Asia, Australia.

Status: Abundant

Uses: Plant is used as a poultice on inflammations.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 41]

Fimbristylis dipsacea (Rottboell) Clarke in Hook.f. in Fl. Brit. Ind. 6: 635. 1893. *Scirpus dipsaceus* Rottboell in Descr. Icon. Rar. Pl. 56 (12). 1773. *Echinolytrum dipsaceum* (Rottboell) Desvauz in J. Bot. 1: 21. t. 1: 1808.

Tufted annual sedges. Stem slender. Leaves long as stem, filiform. Inflorescence simple or compound dense umbel, terminal. Bracts filiform, several. Spikelets subglobose, greenish, echinate; glumes aristate, lanceolate, pale; stamen 3. Achene linear – oblong, faintly striolate.

Flowering: August – September

Fruiting: September – December

Local Distribution: Low land and road side marshy area of West Bengal

General Distribution: Throughout India; Africa, Asia, N Australia, S America.

Uses: Plant is used as a poultice on inflammations

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 39]

Fimbristylis littoralis Gaudichaud in Voy. Bot. 413. 1826; Blake in J. Arn. Arbor. 35: 217. 1954. *F. miliacea sensu* Benth. in Al. Aus. 316. 1878; Clarke in Hooker f. in Fl. Brit. Ind. 6: 644. 1893.

Helophyte; tufted, erect, annual sedges. Stems up to 50 cm high. Leaves sheaths subdisitichous, strait with scarious margins. Inflorescence a decompound umbel,

filiform. Spikelets subglobose, reddish – brown; glumes ovate; stamens 1 – 3. Achene narrowly obovate, trigonous.

Flowering: January – August

Fruiting: September

Local distribution: Throughout West Bengal

General Distribution: Throughout India; Africa, SW and SE Asia, America, Australia.

Status: Abundant

Uses: Plant is used as a tribals medicine

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2019, Mallick, et al. [Field No. 29]

Fimbristylis ovata (N.L. Burman) Kern in Blumea 15: 126. 1967. *Carex ovata* N. L. Burman in Fl. Ind. 194. 1768. ‘*Marmar*’

Helophyte; perennials. Rhizomes short. Lamina apex acute. Involucral bracts 2 – 4, glumelike. Inflorescences reduced to a single and terminal spikelet, ovoid, ellipsoid or oblong-ovoid; glumes yellowish black, shiny, leathery; stamens 4; style 4-sided, stigmas 4. Nutlets shortly stipitate.

Flowering: January – March

Fruiting: February – September

Local distribution: Throughout the Bengal-plains.

General Distribution: Throughout India; Africa, SW and SE Asia, Pacific islands, America.

Status: Abundant

Uses: Plant is used as a tribal’s medicine.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2019, Mallick, et al. [Field No. 101]

FUIRENA Rottb. in Descr. Icon. Rar. Pl. 70. t. 19. 1773.

Fuirena ciliaris (L.) Roxb. in Fl. India 1: 184. 1820. *Scirpus ciliaris* L. in Mant. Ail. 182. 1771. *F. glomerata* Lamarck in Encyl. 1: 150. 1791; Clarke in Hooker f. in Fl. Brit. India 6: 666. 1893; Noltie in Fl. Bhutan 3(1): 282. 1994.

Erect, marshy annual sedges. Stems tufted, striate, sparsely hairy. Lamina linear-lanceolate, acuminate, hairy; sheaths striate, hispid. Spikelets in clusters of 3 – 10; glumes obovate or oblong; keel green, bristles 6, inner 3 quadrate, strongly 3-ribbed, hastate or cordate at base, claw straight. Achenes triquetrons, obovoid.

Flowering: October – January.

Fruiting: January – March

Local distribution: Throughout West Bengal

General Distribution: Throughout India, Africa, Asia and Australia.

Status: Common

Uses: Plant is used as a tribal's medicine.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2019, Mallick, et al. [Field No. 103]

Fuirena umbellata Rottb. in Descr. Icon. Rar. Pl. 70, t. 19. f. 3. 1773; Clarke in Hook. f. in Fl. Brit. India 6: 666. 1893.

Rhizomatous, perennial, erect sedge. Lamina pale green, lanceolate to linear-lanceolate, flat, rigid, usually glabrous but sometimes basally pubescent. Involucral bracts leaf-like; bractlets setaceous, sheathless. Inflorescence paniculiform, spikelets brownish green to dark brownish green, ovoid to ovoid-ellipsoid, with woolly hairs; glumes brown, broadly elliptic to oblong; stamens 3; anthers oblong; stigmas 3. Nutlets brown at maturity.

Flowering: September – November.

Fruiting: October – January

Local Distribution: Throughout the Terai and Duars of North Bengal

General Distribution: Throughout India; Africa, Australia, Asia, Pacific islands.

Status: Common

Uses: Plant is used as a tribal's medicine.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2019, Mallick, et al. [Field No. 129]

KYLINGA Roemer and Schultes in Sys. Veg., 15 bis. 2: 236. 1817.

Kyllinga brevifolia Rottb. in Descr. Icon. Rar. Pl. 13. t. 4. f. 3. 1773; Clarke in Hook. f. in Fl. Brit. Ind. 6: 588. 1893. *Cyperus brevifolius* (Rottb.) Hasskarl in Cat. Hort. Bogor. 24. 1844.

Prostrate, annual, marshy sedges; rhizome slender, creeping, brown, scaly. Leaves radical, linear. Inflorescence a single globose terminal head, white. Spikelets ovate-lanceolate. Stamens 2. Nuts ellipsoid, obtuse.

Flowering: June – November

Fruiting: October – January

Local Distribution: Throughout the Terai and Duars of North Bengal

General Distribution: Throughout India; Asia, Russia, Atlantic Ocean islands, Australia, Indian Ocean islands, Pacific islands.

Status: Common

Uses: Plant is used as a tribal's medicine.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 19.02.2019, Mallick, et al. [Field No. 1291]

Kyllinga nemoralis (Forst. and Forst.) Dandy ex Hutch. and Dalziel in Fl. W. Trop. Afr. 2: 487. 1936; Noltie in Fl. Bhutan 3(1): 325. 1994. Prain in Bengal Pl. 2: 1141. 1903. *Thryocephala lonnemorale* Forst. and Forst. in Char. Gen. Pl. 65. 1775.

Perennials sedges. Culms tufted, compressed. Leaves shorter than culm. Lamina long, flat. Bracts 3-4, longer than inflorescence. Spikes globose, spikelets numerous. Compressed, 1-flowered; scales apex recurved, mucronate; stamens 3. Achenes obovoid-oblong, brown.

Flowering: May – June

Fruiting: July – September

Local Distribution: Throughout the open forests.

General Distribution: Africa, throughout India, SE Asia and Australia.

Status: Least concerned (IUCN 2011)

Uses: Leaves are used for antiseptics.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick et al. [Field No. 2018]

SCHOENOPLECTIELLA Lye in Lidia 6 (1): 20. 2003.

Schoenoplectiella articulata (L.) Lye in Lidia 6(1): 20. 2003. *Schoenoplectus articulatus* (L.) Palla in Bot. Jahrb. 10: 229. 1888. *Scirpus articulatus* L. in Sp. Pl. 47.1753; Hooker f. in Fl. Brit. Ind. 6: 656. 1893; Prain in Bengal Pl. 2: 1160. 1903.

'Chircheri'

Annual, tufted robust sedges. Stem erect, spongy. Leaves sheathed. Spikelets many, sessile, capitate. Spikelets cylindrical-oblong. Glumes concave, ovate, acute. Achene triquetrous, black, smooth.

Flowering: October – January

Fruiting: July – September

Local Distribution: Throughout the open forests.

General Distribution: India (Throughout); Indonesia, Philippines, Nepal, Sri Lanka, Vietnam, Thailand, Papua New Guinea, Australia, Africa, Indian Ocean islands.

Status: Common

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick et al. [Field No. 2010]

Schoenoplectiella juncooides (Roxb.) Lye in Lidia 6(1): 25. 2003. *Schoenoplectus juncooides* (Roxb.) Palla in Bot. Jahrb. 10: 299. 1888; *Scirpus juncooides* Roxb. in Hort. Bengal 81. 1814., *nom. inval.* Prain in Bengal Pl. 2: 1160. 1903. '**Cheechur**'
Annual, tufted sedges. Stems rigid. Spikelets sessile, ovoid; glumes concave, acute, keeled; style 2, linear. Achene obovoid, unequally biconvex, brown to blackish.

Flowering: July – September **Fruiting:** August – February

Local Distribution: In open areas, over the forests.

General Distribution: India (Sikkim, Assam, Tripura Nagaland and West Bengal);
Nepal, Bhutan and Australia.

Status: Vulnerable (IUCN)

Uses: Leaves are used for antiseptics

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick et al. [Field No. 2322]

Schoenoplectiella mucronata (L.) J. Jung and H. K. Choi in J. Pl. Biol. 53(3): 230.
2010. *Schoenoplectus mucronatus* (L.) Palla in Bot. Jahrb. Syst. 10(4): 299. 1888.
Scirpus mucronatus L. in Sp. Pl. 1: 50. 1753; Prain in Bengal Pl. 2: 874. 1903.
Tall, annual, sedges. Stem stout, acutely triquetrous. Leaf blade absent. Spikelets single lateral cluster nearer to the top. Glumes obovoid. Nut shining black.

Flowering: August – December **Fruiting:** July – September

Local Distribution: Over the open land of the forests.

General Distribution: Throughout India; Asia, and S Europe.

Status: Common

Uses: It is used medicinally to clear the eyes and to relieve coughing

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick et al. [Field No. 20214]

POACEAE Branhart

[**GRAMINEAE** A. Jussieu]

AXONOPUS Beauv. in Ess. Agrostogr. 12. 1812.

Axonopus compressus (Sw.) P. Beauv. in Ess. Agrost. 12: 154, 167. 1812; Noltie in Fl. Bhutan 3(2): 717.2000. *Milium compressus* Sw. in Prodr. Veg. India Occ. 24. 1788.

Ascending, tufted, perennial grass with culms slender. Lamina linear–lanceolate; sheath keeled; ligules fimbriate. Spikelets in raceme. Upper glumes elliptic, hairy. Lemma acute, ovate.

Flowering: August – January **Fruiting:** December – March

Local Distribution: Open forests of terai and duars.

General Distribution: India (West Bengal, Arunachal Pradesh, Assam, Nocobar Islands); Bangladesh, Nepal, Bhutan.

Uses: It is known nearly worldwide as a common weed.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3013]

BRACHIARIA (Trin.) Griseb. in Ledeb., Fl. Ross. 4: 469. 1853.

Brachiaria distachya (L.) Stapf in Prain in Fl. Trop. Afr. 9: 565. 919. *Panicum distachyum* L. in Mant. 1: 138. 1767; Prain in Bengal Pl. 2: 1178. 1903.

Annual, decumbent grass. Lamina linear-lanceolate, margin hispid; ligule hairy. Spikelets elliptic-obovate. Caryopsis oblong.

Local Distribution: Found in three MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Darjeeling, West Bengal, Bihar); Myanmar, Malaysia, China and Australia.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3013]

Brachiaria reptans (L.) C.A.Gardner and Hubb. in Hooker's Icon. Pl. 34: sub t. 3363. 1938; *Panicum reptans* L. in Syst. Nat. 10: 870. 1759. *Panicum prostratum* Lam. in Tab. Morais in Encycl. Meth. Bot. 1: 171. 1791; Hook. f. in Fl. Brit. Ind. 7:33. 1896; Prain in Bengal Pl. 2: 1177. 1903.

Branched, annual grass. Culms long, creeping below. Lamina ovate–lanceolate, amplexicauled, hairy. Racemes spreading, rachis hairy. Spikelets ellipsoid, glabrous.

Flowering: October – January **Fruiting:** December – March

Local Distribution: Found in three MPCAs of North Bengal

General Distribution: Pantropical.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3013]

BAMBUSA Schreber in Gen. Pl. 236. 1789.

Bambusa balcooa Roxb. in Hort. Bengal 25. 1814; Hook. f. in Fl. Brit. Ind. 7: 39.1896; Noltie in Fl. Bhutan 3(2): 488. 2000; Prain in Bengal Pl. 2: 1233. 1903. '*Lathi Bash*' Culms 18 – 27 m long, to 19 cm in diameter, pale grayish-green on maturity; sheaths without auricles; nodes swollen, whitish ring above, hairy below; internodes 09 – 11 cm. Lamina lanceolate, rounded, glabrous above; leafsheaths dense, hairs.

Flowering: October – January

Fruiting: November – March.

Local Distribution: Found in three MPCAs of North Bengal

General Distribution: India (throughout); Bangladesh, Indonesia.

Uses: Young shoot used as vegetable.

Status: Near Threatened (IUCN).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3013]

CHLORIS Sw.

Chloris inflata Link, in Enum. Pl. 1: 105. 1821. *Andropogon barbatum sensu* L. in Mantissa 2: 302.1771. *C. barbata sensu* Sw. in Prodr. 1: 200. 1797; Hook. f. in Fl. Brit. Ind. 7: 292. 1897; Prain in Bengal Pl. 2: 1228. 1903.

Erect, perennial grass; nodes soft tuft of leaves; sheath ciliate; lamina flat, ligules membranous ring. Inflorescence 5 – 17 spikes, rachis scabrid.

Flowering: March – June

Fruiting: April – August

Local Distribution: Found in three MPCAs of North Bengal

General Distribution: India (Assam, West Bengal, Bihar, Tripura); Bangladesh, Nepal, Bhutan, Thailand and Vietnam.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1209]

COIX L. in Sp. Pl. 2: 972. 1753.

Coix lachrymal L. in Sp. Pl. 2: 972. 1753; Hook. f. in Fl. Brit. Ind.7: 100. 1897; Noltie in Fl. Bhutan 3(2): 839. 2000. *C. arundinacea* Lam. In Encycl. Meth. Bot. 3: 422. 1791. Prain in Bengal Pl. 2: 1210. 1903.

Tall branched grass; rooting starts at lower nodes, spongy, glabrous, robust, polish leafy; lamina acuminate, flat. Falsespikes inflorescence, peduncles long, sub erect.

Flowering: March – April **Fruiting:** May – June

Local Distribution: Marginal to lowland areas of MPCAs in North Bengal

General Distribution: India; Tropical Asia, Africa, America.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1091]

CYMBOPOGON Spreng. in Pl. Min. Cogn. Pug. 2: 14. 1815.

Cymbopogon jwarancusa (Jones) Schult in Mant. 2: 458. 1824. *Andropogon jwarancusa* Jones in Asiat. Res. 4: 109. 1798.

Rhizomatous perennial; old basal sheaths papery. Leaf sheaths smooth, glabrous; leaf blades glaucous, involute or flat, 22–48 × 0.2–0.6 cm, glabrous, apex filiform; ligule 0.5–5 mm. Spathate compound panicle narrow, 08–40 cm; spatheoles in dense woolly clusters, straw-colored or becoming purplish 1–3 cm; racemes 1–2.1 cm; rachis internodes and pedicels 2 mm, densely white-villous, hairs long; pedicel of homogamous. Sessile spikelet narrowly lanceolate 4.2–5.3 mm; lower glume thin, concave, glabrous, sharply 2-keeled, keels scabrid upward, 3-veined between keels; upper lemma 2 lobed; awn almost straight, column and limb weakly different.

Flowering: March –May **Fruiting:** July –August

Local Distribution: In open areas, over the forests of three MPCAs of North Bengal

General Distribution: Throughout India; Africa, Madagascar, South East Asia, Malaysia, and Australia.

Status: Abudant

Uses: The roots are usefull in feaver and skin diseases.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick et al. [Field No. 4542]

CYNODON Rich. in Pers. in Syn. Pl. 1: 85. 1805.

Cynodon dactylon (L.) Pers. In Syn. Pl. 1: 85. 1805; Hook. f. in Fl. Brit. Ind. 7: 288. 1896; Noltie in Fl. Bhutan 3(2): 678. 2000; Prain in Bengal Pl. 2: 1227. 1903. '**Durba-ghass**'

Perennial creeping prostrate; rooting at nodes; lamina lanceolate-linear, sparsely hairy; ligule membranous; peduncle erect; pedicellate spikelets, 2 – 5 flowered; lower sterile; upper florets bisexual, glumes 4 – 7 nerved.

Flowering: June – September **Fruiting:** August – December

Local Distribution: Forests and road side open areas of terai and duars of North Bengal

Status: Abundant

General Distribution: India and S.E. Asia.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 0921]

DESMOSTACHYA (Stapf) Stapf in Dyer in Fl. Cap. 7: 316. 1898.

Desmostachya bipinnata (L.) Stapf in Fl. Cap. 7: 632. 1900. *Eragrostis cynosuroides* Beauv. in Agrost. 71: 162. 1812. *Briza bipinnata* L. in Syst. Nat.(ed. 10) 2: 875. 1759. *Uniola bipinnata* L. in Sp. Pl. (ed. 2) 104. 1762; Hook. f. in Fl. Brit.Ind. 7: 324. 1896; Prain in Bengal Pl. 2: 1223. 1903.

Perennial grass. Root stock stout; stolons shiny sheath. Stems sub-erect, tufted. Leaves basal, many, rigid; lamina with filiform apex; margin hispid; ligule ciliate, sheath with long hairs, ridged. Panicles strict or erect; rachis puberulous. Spikelets sessile, jointed.

Flowering: June – September **Fruiting:** August – December

Local Distribution: Marshy areas of North Bengal forest.

General Distribution: India (Assam, Nagaland, Tripura and West Bengal); Persia, Arabia, North Africa to Tropical Africa.

Status: Least concern (IUCN 2013).

Uses: It is an Ayurvedic herb used to treat for skin diseases, diarrhea and dysmenorrhea.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10928]

DACTYLOCTENIUM Willd. in Enum. Pl. 2: 1029. 1809.

Dactyloctenium aegyptium (L.) Willd. in Enum. Pl. Horti. Berol. 1029. 1809, *Cynosurus aegyptius* L. in Sp. Pl. 1: 72. 1753. *Panicum dactylon* L. in Sp. Pl. 1: 58.

1753. *Eleusine aegyptiaca* (L.) Desf. in Fl. Atlant. 1: 85. 1798; Prain in Bengal Pl. 2:1230. 1903; Hook. f. in Fl. Brit. Ind. 7: 295. 1896.

Annual bushy herbs. Leaves with distichous; lamina flat, lanceolate, ciliate on margin; ligule deeply membranous. Panicle 3 – 9 digitate, spikes horizontal, long, compressed, densely crowded, sessile; glumes unequal. Stamens 4.

Flowering: June – September **Fruiting:** August– December

Local Distribution: Forests and road side areas of North Bengal

General Distribution: India (throughout) Tropical parts of the world.

Status: Common

Uses: Seeds used to relieve pains of the kidney

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1018]

DIGITARIA Haller in Hist. Stirp. Helv. 2:244. 1768.

Digitaria bicornis (Lam.) Roem. et Schult. in Syst. 2: 470. 1817. *Paspalum bicornis* Lam. in Encycl. 1: 176. 1791. *D. biformis* Willd. in Enum. Pl. Hort. Berol. 1: 92. 1809. Prain in Bengal Pl. 2: 1181. 1903.

Erect, annual herbs. Lamina linear, sparsely soft-hairy; sheath glabrous to pilose. Spikelets binate, slightly hairy, glabrous, spikelet pubescent; stamens 5. Fruit caryopsis elliptic, 0.38 cm long.

Flowering: July – August **Fruiting:** September – November

Local Distribution: All over the forests areas in the three MPCAs of North Bengal

General Distribution: India (Bihar, Orissa, Assam, West Bengal, Nagaland); Tropical and Sub-tropical Asia and Africa.

Status: Abundant

Uses: The seeds are edible.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1038]

Digitaria ciliaris (Retz.) Koeler in Descr. Gram. 27. 1802; Noltie in Fl. Bhutan 3(2): 728. 2000; Prain in Bengal Pl. 2: 1181. 1903.

Erect annual grass. Lamina linear-lanceolate, glabrous, truncate ligule. Inflorescence in racemes 2 – 9, spikelets in pairs, oblong, acute, awnless. Stamens 6. Fruit caryopsis 0.8 cm long.

Flowering: May – August **Fruiting:** July – December

Local Distribution: marshy areas of North Bengal forest.

General Distribution: Throughout India; Nepal, Bhutan, Bangladesh.

Status: Less Common

Uses: It is used in the treatment of gonorrhoea.

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 1089]

Digitaria fuscescens (Presl and Presl) Moore in Bull. Bernice P. Bishop Mus. 102: 19. 1933. *D. fuscescens* (Presl) Henrard in Meded. Rijks-Herb. 61: 8. 1930.

Annual, creeping base; culms 4–32 cm. high. Leaf-blades 1–5 cm. long, 1–4 mm. wide. Inflorescence of 2–4 digitate racemes; racemes 1–7 cm. long, the spikelets ternate on a ribbon-like winged rachis with low rounded midrib. Spikelets narrowly ovate-elliptic 1.2–1.6 mm. long; lower glume a minute hyaline rim or absent; upper glume as long as the spikelet 5-nerved, glabrous; lower lemma as long as the spikelet 7-nerved, glabrous; fruit ellipsoid, pallid to light brown.

Flowering: April – June

Fruiting: May – July

Local distribution: All over the forest of North Bengal

General Distribution: Throughout India; Central America, the Caribbean, South America, Africa, Asia and Oceania.

Uses: It is known nearly worldwide as a common weed.

Status: Abundant

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 3018]

ECHINOCHLOA Beauv. in Ess. Agrostogr. 53. 1812.

Echinochloa crus-galli (L.) Beauv. in Ess. Agrost. 53: 161. 1812; Noltie in Fl. Bhutan 3(2): 703. 2000; *Panicum crusgalli* L. in Sp. Pl. 1: 56. 1753; Hook. f. in Fl. Brit. Ind. 7: 30. 1896; Prain in Bengal Pl. 2: 1177. 1903.

Aquatic floating, glabrous, annual, grasses. Lamina linear, margin finely cartilaginous, subflaccid. Inflorescence erect, branched; pedicles very short fascicled; Inflorescence ovate elliptic, crowded, cuspidate. Fruit caryopsis broadly elliptic.

Flowering: April – September

Fruiting: August – December.

Local Distribution: Marshy lands on the three MPCAs of North Bengal .

General Distribution: India; Myanmar, Sri Lanka and Africa.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1090]

Echinochloa colona (L.) Link in Enum. Hort. Berol. 2: 209. 1833; Noltie in Fl. Bhutan 3(2): 702. 2000; *Panicum colonum* L. in Syst. 870. 1759; Hook. f. in Fl. Brit. Ind. 7: 295. 1896; Prain in Bengal Pl. 2: 1177. 1903.

Annual, slender, prostrate, grass; branched with lower parts, glabrous, smooth. Lamina linear, glabrous, narrow; sheath smooth, loose, compressed. Panicles branches 8 – 15 many; spikelet elliptic, glabrous, crowded, nearly sessile, 4-ranked. Fruit caryopsis elliptic.

Flowering: July – September

Fruiting: August – January.

Local Distribution: Common in all MPCAs

General Distribution: India (Bihar, West Bengal, Assam, Nagaland); Asia and Australia.

Uses: Local tribe leaf juice used for blood purification

Status: Least Concern (IUCN 2019).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1096]

ELEUSINE Gaertn. in Fruct. Sem. Pl. 1: 7. 1788.

Eleusine indica (L.) Gaertn. in Fruct. 1: 8. 1788; Hook. f. in Fl. Brit. Ind. 7: 293. 1896; Noltie in Fl. Bhutan 3(2): 667. 2000; Prain in Bengal Pl. 2: 1229. 1903. *Cynosurus indicus* L. in Sp. Pl. 1: 72. 1753.

Annual herbs. rooted at nodes. Lamina folded, 5 – 12.5 × 0.5 – 0.9 cm, glabrous. Inflorescence digitate, 3 – 7 linear ascending racemes; inflorescence elliptic, florets 3 – 9; lemmas acute; ovate, palea winged. Grain ovate to oblong, blackish.

Flowering: July– October

Fruiting: September – February.

Local Distribution: All over the MPCAs.

General Distribution: India (Assam, Bihar, Goa, west Bengal); Nepal, Bhutan, Bangladesh and Pakistan

Uses: Local tribe leaf juice used for blood purification

Status: Least Concern (IUCN 2013).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1044]

ERAGROSTIS Wolf in Gen. Pl. 23. 1776.

Eragrostis pilosa (L.) Beauv. in Ess. Agrost. 71. 162. 175. 1812; Hook. *f.* in Fl. Brit. Ind. 7: 323. 1896; Noltie in Fl. Bhutan 3(2): 665. 2000; Prain in Bengal Pl. 2: 1223. Annual grass, tufted. Lamina acuminate; sheath glabrous, hairy ligule. Long panicles, spikelets linear, purplish, pyramidal; rachilla persistent; glumes ovate unequal; stamens 3 – 5. Fruit ellipsoid, caryopsis.

Flowersing: April– July

Fruiting: October – March

Local Distribution: All over the marshy lands of MPCAs of North Bengal

General Distribution: Throughout India; tropical and warmer regions of world.

Uses: The plant is used as food and medicine.

Status: Abundant

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1085]

Eragrostis tenella (L.) Beauv. *ex* Schult. in Syst. Veg. 2: 576. 1817; Noltie in Fl. Bhutan 3(2):657. 2000; Prain in Bengal Pl. 2: 1221. 1903;

Annual, tufted, erect grass. Lamina linear; ciliate ligule and sheath. Panicles loose, plumose; Inflorescence oblong. Fruit glumes oblong ovate. Fruit ovoid, caryopsis.

Local Distribution: All over the marshy lands and margin places in MPCAs.

General Distribution: India (Jharkhand, Kerala, Lakshadweep (UT), Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland and Orissa); tropical parts of world.

Uses: It is used as fodder.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1021]

Eragrostis uniolooides (Retz.) Nees *ex* Steud. in Syn. Pl. Glum. 1: 264. 1854. *Eragrostis amabelis* Wight *et.* Arn. in Hook. *f.* in Fl. Brit. Ind. 317.1896; Prain in Bengal Pl. 2: 1220. 1903.

Tufted annual, erect, grass. Flat lamina; sheath striate; membranous ligules. Spikelets oblong–ovate, white yellowish obtuse; fruit pointed caryopsis.

Flowersing: April– July **Fruiting:** October – March

Local Distribution: Moist areas.

General Distribution: Throughout India; Myanmar, Sri Lanka, S.E. Asia.

Uses: Mainly as animal fodder and house roof shade.

Status: Least concern (IUCN 2011).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1080]

IMPERATA Cirillo in Pl. Rar. Neapol. 2: 26. 1792.

Imperata cylindrica (L.) Raeusch. in Nom. Bot. ed. 3: 10. 1797. *Lagurus cylindricus* L. in Syst. Nat. ed. 10, 2: 878. 1759. *Imperata arundinacea* Cirillo in Pl. Rar. Neap. 2: 26. 1792; Hook. f. in Fl. Brit. Ind. 7: 106. 1896; Prain in Bengal Pl. 2: 1188. 1903. Perennial, long grass, erect, tufted. Roots tock creeping, rigid. Lamina lanceolate, linear scabrid margin; membranous. Inflorescence panicle compact; lanceolate spikelets, densely white. Stamens 3. Stigmas 3. Fruit oblong, caryopsis.

Flowersing: May – August **Fruiting:** September – October

Local Distribution: All over the marshy lands of North Bengal

General Distribution: Throughout India; Asia, Australia, S. E. Africa.

Uses: The plant is used as a fibre in ornamental purposes and mainly used in constructions

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 18545]

ISACHNER.Br. in Prodr. 196. 1810.

Isachne globosa (Thunb.) Kuntze in Revis. Gen. Pl. 2: 778. 1891. *Milium globosum* Thunb. in Fl. Japan 49 1784. *Isachne miliacea* Roth in Syst. Veg. 2: 476. 1817; Prain in Bengal Pl. 2: 1172. 1903.

Herbs, perennial with slender, erect to decumbent clums. Lamina lanceolate, 6 – 10 × 6 – 2 cm, acute, rounded, glabrous. Spikelets in open panicle; branches and pedicels filiform. Spikelets elliptic-globose; uppers florets female, lower male.

Flowersing: October – January **Fruiting:** December – March

Local Distribution: Marshy lands of the MPCAs.

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal), Australia, Bangladesh, Bhutan, Indonesia, Malaysia, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam.

Uses: Mainly as fodder.

Status: Least Concern (IUCN 2012).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1585]

LEERSIA Solander *ex* Sw. in Prodr. 21. 1788; *nom. cons.*

Leersia hexandra Sw. in Prodr. 1: 21. 1788; Hook. *f.* in Fl. Brit. Ind. 7: 94. 1896; Prain in Bengal Plants 2:1184. 1903; Bora et. Kumar in Flor. Div. Ass. 412. 2003. *L. australis* R.Br. in Prodr. 210. 1810.

Aquatic, erect, Annual grass. Branches creeping, rooting at base. Lamina linear, acuminate, flat; sheath loose; ligules glaucous, truncate. Panicles, oblong, contracted; Spikelets closely imbricate, pale brown, hispidous, keels ciliate. Caryopsis oblong.

Flowersing: October – January

Fruiting: December – March.

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (Lower Himalaya), tropical Africa, Australia, Myanmar.

Uses: Used for the treatment of hemoptysis.

Status: Least Concern (IUCN 2018).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 15525]

LEPTOCHLOA P. Beauv. in Ess. Agro. 71. 1812.

Leptochloa panicea (Retz.) Ohwi in Bot. Mag. Tokyo 55: 311. 1941; Bor in Grass. Burma, Ceyl., India and Pak. 517.1960. *Poa panicea* Retz. in Obs. 3: 11. 1783. *L. filiformis* Roem. et Schult. in Syst. 2:580.1870; Hook. *f.* in Fl. Brit. Ind. 7: 298. 1896; Prain, Bengal Pl. 2: 924. 1903.

Annual, slender, marshland grass. Lamina finely tapering; sheath pilose, lacerate. Panicle brached, diffuse; spikelets 5– 6 fid, sub-sessile, unilateral, alternate.

Flowersing: february – May

Fruiting: June – August

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (throughout), Sri Lanka; Asia, Tropical Africa and America.

Uses: Used for fodder, and as a famine food in Eastern African Countries.

Status: Least Concern(IUCN 2011)

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 15495]

OPLISMENUS Beauv. in Fl. Oware 2: 14. 1810;*nom. cons.*

Oplismenus burmannii (Retz.) Beauv. in Ess. Agrost. 54: 168 – 169. 1812; Hook. f. in Fl. Brit. India 7: 68.1896; Prain in Bengal Pl. 2: 1173. 1903. *Panicum burmannii* Retzius in Obs. Bot. 3: 10. 1783.

Prostrate, annual grass; rooting at nodes. Lamina ovate-elliptic, pubescent; sheath ciliate. Panicle with 5 – 6 racemes; spikelets elliptic-lanceolate. Caryopsis oval, convex.

Flowersing: March – June

Fruiting: April – August.

Local Distribution: Abundant in forests floors of terai-duars.

General Distribution: India, Sri Lanka, Bangladesh, China.

Uses: Used in guinea-worm sores and snake-bite. Its also used in treatment for earache.

Status: Abudant

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 45751]

Oplismenus compositus (L.) Beauv. in Ess. Agrost. 54: 168. 1812; Noltie in Fl. Bhutan 3(2): 684. 2000; Prain in Bengal Pl. 2: 1173. 1903. *Panicum compositum* L. in Sp. Pl. 1: 57. 1753.

Annual, prostrate grass; rooting at nodes. Lamina lanceolate, pubescent; sheath ciliate. Panicle with 6 – 12 racemes, long. Spikelets lanceolate- elliptic. Caryopsis convex.

Flowersing: October – January

Fruiting: December – March.

Local Distribution: Abundant on forest margins.

General Distribution: India (Arunachal Pradesh, Assam, Bihar, Chandigarh Chhattisgarh, Delhi, Goa, Gujarat, Karnataka, Haryana, West Bengal); Nepal, Bhutan, Bangladesh

Uses: It is mainly used for modern medicine.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 14758]

PANICUM L. in Sp. Pl. 1: 55. 1753.

Panicum repens L. in Sp. Pl. 2: 87. 1762; Hook. f. in Fl. Brit. Ind. 7: 49. 1896; Prain in Bengal Pl. 2: 1179.1903.

Erect, perennial, tufted grass. Rooting at nodes. Lamina linear-lanceolate; sheaths ciliate at throat. Spikelets elliptic-lanceolate. Caryopsis ovate-oblong.

Flowering: March – July **Fruiting:** August – October

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (Arunachal Pradesh, Assam, Bihar, Gujarat, Karnataka, Haryana West Bengal), West Indies to Brazil.

Uses: Used medicine for wound places.

Status: Least concern (IUCN 2019).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1157]

PASPALUM L. in Syst. Nat., 10, 2: 855. 1759.

Paspalum conjugatum Berg. in Acta Helv. Phys. – Math. 7: 129. 1772; Hook. f. in Fl. Brit. India 7: 11.1897; Prain in Bengal Pl. 2: 1182. 1903.

Perennial, tufted, compressed grass. Leaf sheaths glabrous or pilose, blade junction hairy; lamina lanceolate-linear, acute. Panicle with 4 racemes; spikelets single; upper glume hyaline, margins hairy; lower lemma not ciliate; upper lemma ovate, crustaceous.

Flowering: June – August **Fruiting:** October – January

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (Sikkim, Darjeeling, Assam, Mizoram, Arunachal Pradesh); tropics and subtropics of the world.

Uses: Occasionally used as a lawn grass and is also an important weed in rice and plantation crops.

Status: Least Concern (IUCN 2010).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1158]

Paspalidium punctatum (Burm.f.) Camus in Lecomte in Fl. Gen. Del. Indo-China 7: 419. 1922; Sukla, Grass. North East. Ind. 344. 1996; Bora et Kumar, Flor. Div. Ass. 421. 2003. *Panicum punctatum* Burm. f. in Obs. Bot. 4: 15. 1786; Prain in Bengal Pl. 2: 1177. 1903.

Annual, perennial grass. Culms spongy, floating, rooting at base. Lamina linear, acute, margin scabrid; sheaths glabrous; ligule hairy. spikelets ovate-oblong, imbricate, sessile; glumes membranous. Caryopsis compressed.

Flowering: June – September **Fruiting:** August – December

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India; tropical Asia, North Africa.

Uses: The plant is used as mainly fodder purposes.

Status: Least Concern (IUCN 2010).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1245]

PENNISETUM Rich. ex Pers. in Pers. Syn. 1: 72. 1805.

Pennisetum glaucum (L.) R. Br. in Prodr. Fl. Nov. Holl. 195. 1810. *Panicum glaucum* L. in Sp. Pl. 56. 1753. *Setaria glauca* (L.) Beauv. in Ess. Agrost. 51: 178. 1812; Hook. f. in Fl. Brit. Ind. 7: 78. 1896; Panda et Das in Fl. Sambalp. 439. 2004.

Culms erect, prostrate below, annual grass.. Leaves linear; sheaths keeled; ligules ciliate. Spike cylindrical; spikelets elliptic; upper lemma rugose, boat-shaped. Caryopsis elliptic-rounded.

Flowering: July – August **Fruiting:** September – October.

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand, West Bengal); Sikkim, Assam, Nagaland.

Status: Least Concern (IUCN 2019).

Uses: The plant is milled, decorticated, germinated, cooked and extruded to obtain products such as flours, biscuits, snacks.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10057]

Pennisetum pauperum Steud. in Syn. Pl. Glumac. 1: 102. 1854. *Pennisetum purpureum* Schum. In Beskr. Guin. Pl. 44. 1827; Gierson et Long in Fl. Bhutan 3(2): 741 – 742.2000. '*Hati-ghash*'

Erect, perennials grass. Ligules ciliated. Panicle cylindrical; spikelets sessile; glumes deltoid; lower lemma lanceolate, minutely hispidous, palea absent; upper lemma lanceolate.

Flowering: November – January

Fruiting: February – April

Local Distribution: All over the marshy lands of West Bengal

General Distribution: Tropical Africa to Ind.

Status: Abundant.

Uses: Used for grazing livestock in African countries.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10157]

Pennisetum polystachion (L.) Schult. in Syst. Veg. Mant. 2: 146. 1824; Noltie in Fl. Bhutan 3(2): 741. 2000. *Panicum polystachion* L. in Syst. Nat. 10, 2: 870. 1759.

Annual grass, culms tall. Leaves glabrous or pubescent, linear, acuminate. Sheath glabrous. Ligule line soft hairy. Panicle purplish brown; rachis glabrous. Spikelet solitary; upper glumes oblong; lemma oblong, truncate; palea oblong, tip toothed or ciliate.

Flowering: June – September

Fruiting: August – November

Local Distribution: All over the marshy lands of West Bengal

General Distribution: India (Andhra Pradesh, Goa, Himachal Pradesh, Orissa, Uttar Pradesh, Uttarakhand, West Bengal); Pakistan, Nepal, China.

Status: Least Concern (IUCN 2014).

Uses: Used as grazing stock.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10147]

SACCHARUM L. in Sp. Pl. 1: 54. 175

Saccharum arundinaceum Retz. in Obs. Bot. 4: 14. 1786; Hook. f., Fl. Brit. Ind 7: 119. 1897; Prain in Bengal Pl. 2: 1189. 1903.

Tufted, perennial grass. Culms 6–9 m high, erect. Leaf sheath beaded at mouth; ligule hairy. Panicle diffuse, white villous. Spikelets lanceolate. Lower lemma empty, oblanceolate; palea ovate.

Flowering: March – June **Fruiting:** August – November

Local Distribution: Throughout the open land of North Bengal

General Distribution: India (coastal area with West Bengal), E. Australia, S. Europe, Sri Lanka.

Status: Vulnerable (IUCN 2017).

Uses: It is used for treatment for vitiated blood, erysipelas, leucorrhoea and piles

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10528]

Saccharum spontaneum L. in Mant. Alt. 183. 1771; Hook. f. in Fl. Brit. Ind 7: 118. 1896; Prain in Bengal Pl. 2: 1188. 1903. *Imperata spontanea* (L.) Beauv. in Ess. Agro. 8. 1812.

Tall, perennial grass; Culms hollow, softly pilose below inflorescence. Leaf-sheath pilose at mouth and margin; lamina 54 – 155 × 0.8 – 1 cm, glaucous; ligule blue. Panicle up to 42 cm long; spikelets 4–5mm; lower glume acuminate, papery; lower lemma ovate-lanceolate. Lodicules ciliate.

Flowering: March – June **Fruiting:** July – August.

Local Distribution: Marginal lowland areas of North Bengal

General Distribution: India (Karnataka, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala and west Bengal); Afghanistan, India, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines, Turkmenistan and Vietnam.

Status: Vulnerable (IUCN 2018).

Uses: The plant is used as a astringent, emollient, refrigerant, diuretic and lithotriptic

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10868]

SETARIA P. Beauv. in Ess. Agrostogr. 51. 1812; *nom. cons.*

Setaria palmifolia (Koen.) Stapf in J. Lin. Soc. Bot. 42: 186. 1914; Noltie in Fl. Bhutan 3(2): 723. 2000; Hajra et al. in Fl. Sikkim 1: 273. 1996. *Panicum palmaefolium* Koenig in Naturf. 22: 208. 1788.

Rhizomatous, perennial grass. Culms decumbent. Lamina linear-lanceolate, margins ciliate, acuminate, glabrous or sparsely hairy. Panicles partially distant, loose. Spikelets solitary.

Flowering: January – March

Fruiting: April – June.

Local Distribution: Marginal lowland areas of North Bengal

General Distribution: India (Andhra Pradesh, West Bengal, Punjab, Himachal Pradesh, Manipur); Tropics of the World.

Status: Critically Endangered (IUCN 2019).

Uses: The plant is mainly used as fodder, forage and medicinal, pharmaceutical · Ornamental.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 103548]

Setaria glauca (L.) Beauv. in Ess. Agro. 51: 178. 1812; Hook. *f.* in Fl. Brit. Ind. 7: 78. 1896. *Panicum glaucum* L. in Sp. Pl. 56. 1753; Prain in Bengal Pl. 2: 1170. 1903.

Erect, annual grass. Culms light. Lamina linear; sheaths keeled; ligules ciliate. Panicle with dense spike; spikelets long, elliptic; upper lemma coarsely rugose. Caryopsis rounded-elliptic.

Flowering: January – May

Fruiting: June – August

Local Distribution: Forested marshland of North Bengal

General Distribution: India, warm and temperate parts of the World.

Status: Common

Uses: Plant seeds are used to treat emollient, febrifuge, diuretic, refrigerant and tonic

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3024]

SPOROBOLUS R.Br. in Prodr. 169. 1810.

Sporobolus diander (Retz.) Beauv. in Ess. Agro. 26: 147 – 178. 1812; Hook. *f.* in Fl. Brit. India 7: 247. 1896; Prain in Bengal Pl. 2: 1213. 1903. *Agrostis diandra* Retz. in Obs. Bot. 5: 19. 1789.

Slender, branched, perennial grass. Culms tufted. Lamina narrowly lanceolate, 2 – 8 × 0.5 – 0.50 cm. Panicle spikelike, long; spikelets lanceolate-oblong; upper glume oblong, lower glume lanceolate; lemma oblong, acute. Anthers 3. Grains brownish, elliptic.

Flowering: June – September

Fruiting: August– October

Local Distribution: Forest floor of North Bengal plains.

General Distribution: India (Orissa, West Bengal, Assam); Sri Lanka, Australia.

Status: Vulnerable (IUCN 2018).

Uses: It is mainly used as weed.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 3025]

ORDER: ZINGIBERALES

COSTACEAE Nakai in J. Jap. Bot. 17: 203. 1941.

Cheilocostus speciosus (Konig) Specht in Taxon 55:159. 2006. *Costus speciosus* (J.Koenig) Sm. in Linn. Soc. London 1: 249. 1791. '*Spiral ginger, Wild ginger*'

Stem 1.2 – 2.4 m, base slightly woody, apex branched and spirally twisted when old. Petiole 4.8 – 6.9 mm; leaf blade oblong or lanceolate 14.7 – 19.6 × 5.9 – 10.1 cm, abaxially densely sericeous, base sub rounded, apex acuminate or caudate–acuminate. Inflorescences terminal, ellipsoid or ovoid, 4.5 – 14.8 cm; bracts bright red, ovate, 1.8 cm, leathery, pubescent, apex sharply pointed; bracteoles pale red 1.1 – 1.4 cm. Calyx red 1.7 – 1.9 cm, leathery, apex 3lobed; lobes reddish black, rigid, and densely sericeous at apex. Corolla tube 0.7 cm; lobes oblong–elliptic 4.3 cm, apex white or red. Labellum white, trumpet–shaped 6.6 – 9.1 cm, apex toothed and crisped, with edges overlapping. Stamen petaloid, white with orange–yellow base, urceolate 4.4 × 1.3 cm, pubescent. Capsule red, globose 1.8 cm, slightly woody. Seeds black, glossy 3.2 mm.

Flowering: August – December **Fruiting:** October – March

Local Distribution: Forest margins, moist places in valleys, roadsides of three MPCAs of north Bengal

General Distribution: Tropical America, India: Assam, Odisha, Bihar, Meghalaya

Status: Least Concern (IUCN 2020)

Uses: Rhizome has been used to treat fever, asthma, bronchitis, and intestinal worms.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3511]

MARANTACEAE Lindl. in Nat. Syst. 267. 1830; *nom. cons*

PHRYNIUM Willd. in Sp. Pl., ed. 4, 1(1): 1, 17. 1797; *nom. cons*.

Phrynium pubinerve Bl. in Enum. Pl. Javae 1: 38. 1827; Noltie in Fl. Bhutan 3(1): 214. 1994. *P. malaccense* Ridl. in J. Asia. Soc. Straits 32: 180. 1899.

Plants up to 1.5 m long with tuberous rhizome. Petiole 65 cm long, pulvinus glabrous; lamina ovate-oblong, 30 – 45 × 7 – 14 cm, glabrous, shortly acuminate, acute. Inflorescence capitate; bracts purple-red, oblong-lanceolate. Flower sessile. Sepals linear, sericeous; corolla tube violet; outer staminodes light red, obovate; ovary sericeous. Fruit dark red, shiny, pyriform.

Flowering: June – July

Fruiting: September – November

Local Distribution: Dhupjhora and Gorumara lowland areas.

General Distribution: India (Andhra Pradesh, West Bengal, Punjab, Himachal Pradesh, Manipur, Eastern Himalaya); South East Asia.

Status: Near threatened (IUCN2019)

Uses: Its rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.82018, Mallick, et al. [Field No. 3524]

ZINGIBERACEAE Lindl. in Nat. Syst. ed. 2. 322. 1836; *nom. cons*

ALPINIA Roxb. in Asia. Res. 11: 350. 1810; *nom. cons*.

Alpinia calcarata (Haw.) Roscoe in Trans. Linn. Soc. London 8: 347. 1807; Prain in Bengal Pl. 2:1047. 1903; Noltie in Fl. Bhutan 3(1): 206. 1994. *A. calcarata* var. *compacta* Gagnep. in Bull. Soc. Bot. France 48: 85. 1902. '**Purondi**'.

Pseudostems up to 1 m long. Lamina linear-lanceolate, 20–42 × 2–4 cm, glabrous, acuminate, base attenuate. Panicles terminal; rachis slightly velvety. Corolla tube lobes oblong. white; lateral staminodes red; labellum white with red and purple streaks, filament 1.5 cm long. Capsule globose, reddish.

Flowering: January – April

Fruiting: March – May.

Local Distribution: Common along the margins of three MPCAs in North Bengal

General Distribution: Indo Malesian region

Status: Near threatened (IUCN 2019).

Uses: The rhizomes are used in treatment for antibacterial and antifungal activities

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.82018, Mallick, et al. [Field No. 3523]

Alpinia nigra (Gaertner) Burt in Notes Roy. Bot. Gard. Edinburgh 35: 213. 1977. *A. allughas* (Retz.) Roscoe in Trans. Linn. Soc. London 8: 346. 1807. *Amomum bifidum* Stokes in Bot. Comm. 163. 1830.

Leafy stem loosely clumped, 1.5–2 m high; rhizome horizontal to 2 cm thick, dull cream inside. Leaves 30–55 × 10 cm, oblong–lanceolate, acuminate. Panicle branched, to 13–17 cm long, slightly oblique to the stem, densely tomentose; bracts spathaceous. Flowers solitary; bracteoles tubular; calyx 1–1.5 cm long, hairy, split on one side; corolla yellowish, lobes 1.5 cm long, oblong, pubescent outside; lip 2.5 cm, obscurely 3-lobed; ovary densely pubescent. Capsule 2 cm across, glabrescent.

Flowering: June – July

Fruiting: September – November

Local Distribution: Lowland areas of three MPCAs in North Bengal

General Distribution: India (throughout); South East Asia.

Status: Least Concern (IUCN 2018)

Uses: Its rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.82018, Mallick, et al. [Field No. 2478]

CURCUMA L. in Sp. Pl. 1: 2. 1753; *nom. cons.*

Curcuma aromatica Salisb. in Parad. Lond. 96. 1808; Ben. Pl. 2: 1042. 1903. *C. wenyujin* Chen and Ling in Acta Pharm. Sin.16: 387. 1981. '*Wild turmeric, ban halud*' Plants 0.8 m tall. Rhizomes fleshy, aromatic, yellow inside; roots bearing fusiform tubers. Petiole equaling lamina; lamina oblong, adaxially glabrous, adaxially pubescent 29.7–60.2 × 9.5–19.9 cm, apex narrowly caudate, base attenuate. Inflorescences usually appearing before leaves, on separate shoots arising from rhizomes; spike 15.3 × 7.7 cm, cylindrical; fertile bracts ovate, pale green 4.1–4.9 cm; coma bracts tinged with red, white, pubescent, apex mucronate, narrowly oblong. Calyx 0.9–1.4 cm, sparsely hairy; corolla tube funnellform, villous at throat 2.2–2.6 cm, lobes oblong, pinkish white 1.4 cm; lateral staminodes obovate–oblong, yellowish, 1.7 cm; labellum, obovate, yellow, apex emarginated 2.3 cm; Ovary villous.

Flowering: May – August

Fruiting: June – September

Local Distribution: Forest floor of all three MPCAs.

General Distribution: India (Kerala, Assam); Sri Lanka, China, Nepal.

Status: Common

Uses: Improves digestion and stimulates the gall bladder and circulatory system.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3856]

Curcuma caesia Roxb. in Asiat. Res. 11: 334. 1810. *C. kucchoor* Royle in Ill. Bot. Himal. Mts. 357 1839. '**Kaloo Halud**'

Aromatic, perennial herbs with Rhizome, upto 15 cm long. Rhizome fleshy, bluish inside. Leaves rosette-like; lamina oblong-lanceolate, glabrous above and beneath, dark purple on mid-vein, acuminate. Spike terminal, cylindrical; fertile bracts green, gradually flushed with pink towards apex, ovate; coma bracts obtuse, oblong, not widely spreading, red or much deep pink. Flowers yellowish green.

Flowering: May – July

Fruiting: June – September:

Local Distribution: Three MPCAs of North Bengal

General Distribution: India (Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Sikkim, Tripura, Uttar Pradesh, Uttarakhand, West Bengal), Nepal, Bangladesh, Sri Lanka, Myanmar,

Status: Critically endangered (Saikia 2019)

Uses: Rhizomes medicinally important, used in sprains and bruises.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3891]

GLOBBA L. in Mant. Pl. 2: 143, 170. 1771.

Globba racemosa Sm. in Exot. Bot. 2: 115. 1806; Noltie in Fl. Bhutan 3(1): 191. 1994. *G. orixensis* var. *racemosa* (Sm.) Gagnep. in Bull. Soc. Bot. France 48: 201. 1901; Prain in Bengal Pl. 2: 1037. 1903.

Pseudostems up to 95 cm long. Leaves sub-sessile; lamina glabrous, oblong to ovate, 10–19 × 4–5 cm, caudate, base acute. Flowers on terminal thyrses, yellow with orange, glandular spots. Calyx turbinate; corolla reflexed; labellum reflexed, obcuneate; anther without appendages; capsule ellipsoid.

Flowering: June – October

Fruiting: July – November

Local Distribution: Hilly forest floor of three MPCAs of North Bengal

General Distribution: India (throughout), Nepal, Bhutan, Myanmar, Thailand.

Status: Least Concern (2018)

Uses: It is traditionally used in treatment of mouth ulcer and post partum and food poisoning

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3896]

Globba clarkei Baker in Fl. Brit. Ind. 6: 210. 1890; Noltie in Fl. Bhu. 3 (1): 190. 1994. *G. hookeri* Clarke ex Baker in Fl. Brit. Ind. 6: 202. 1890. *G. racemosa* var. *hookeri* (Clarke ex Baker) S. Kumar in Fl. Sikkim 1: 127. 1996.

Rhizomatous, perennial herbs. Leaves sessile, alternate; ligule membranous, bilobed; lamina lanceolate, 11–30 × 4–8 cm. Bracts purplish, 3–4 flowered. Flowers yellow; calyx tubular, shortly 3-lobed, greenish; corolla tube ovate; lateral staminodes ovate; lip reflexed. Capsule globose.

Flowering: June – October **Fruiting:** July – November

Local Distribution: Forest floor of all three MPCAs.

General Distribution: Endemic to Himalaya and North East Ind.

Status: Not Evaluated (IUCN 2022)

Uses: It is traditionally used in treatment of mouth ulcer and food poisoning

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3891]

HEDYCHIUM Konig in Retzius in Observ. Bot. 3: 61 [73]. 1783.

Hedychium coccineum Buch.-Ham. ex Smith in Rees in Cycl. 17: 5.1811; Noltie in Fl. Bhu. 3 (1): 204. 1994. *H. squarrosum* Buch.-Ham. ex Wall. in Hook. f. in Kew. J. Bot. 5: 372. 1853. *H. coccineum* var. *angustifolium* (Roxb.) Baker in Fl. Brit. Ind. 6: 231.1890; Prain in Bengal Pl. 2: 1040. 1903. '**Dolan Champa**'

Rhizomatous, perennial, terrestrial herbs. Leaves alternate, sessile; ligule entire, obtuse; lamina narrowly linear-lanceolate, 22–40 × 3.4–5 cm, glabrous above, attenuate minutely pubescent beneath. Inflorescence cylindric, spike, moderately dense; bracts glabrous, oblong, usually 3flowered, obtuse. Flowers deep red to deep orange; calyx apically 3 lobed; corolla tube equalling; petals linear. Capsule globose.

Flowering: June – September **Fruiting:** July – November

Local Distribution: Riverine and hilly grasslands to forest understorey of North Bengal

General Distribution: India (Myanmar, Nagaland Orissa, Puducherry, Punjab, Rajasthan, Sikkim, , Uttar Pradesh, Uttarakhand, West Bengal); Sri Lanka, China, Thailand.

Status: Rare occurrence, Not Evaluated (IUCN 2022)

Uses: It is traditionally used in treatment of stomach ulcer and food poisoning.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3895]

Hedychium thyrsiforme Smith in Rees in Cycl. 17: 5.1811; Hook f. in Fl. Brit. Ind. 6: 230. 1892; Prain in Bengal Pl. 2: 1033. 1903; Noltie in Fl. Bhutan 3 (1): 201. 1994. *Gandasulium thyrsiforme* (Wall.) Kuntze in Revis. Gen. Pl. 2: 690. 1891. '**Dolon Champa**'

Terrestrial, perennial herbs. Pseudostems up to 2.6 m. Leaves alternate, shortly petiolate; ligule entire, emerginate; lamina elliptic, 15–30×6 – 11.5 cm, acuminate. Spike densely flowered. Bracts lanceolate. Flowers white; corolla tube white, petals linear, inrolled; lateral staminodes linear; lip clawed, oblong.

Flowering: August – December **Fruiting:** September – December

Local Distribution: Shaded or semi-shaded areas of three MPCAs of North Bengal

General Distribution: India (throughout); Afghanistan, Pakistan, India, Sri Lanka.

Status: Common

Uses: It is traditionally used in treatment food poisoning.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3898]

ZINGIBER Mill. in Gard. Dict. Abr., ed. 4, [1545]. 1754;*nom. cons.*

Zingiber montanum (Konig) Link ex Dietrich in Sp. Pl. 1: 52. 1831. *Amomum montanum* Konig in Obs. Bot. 3: 51. 1783. *Z. purpureum* Roscoe, Trans. Linn. Soc. London 8: 348. 1807; Noltie in Fl. Bhutan 3(1): 188. 1994. *Z. cassumunar* Roxb., Asiat. Res. 11: 347. t. 5. 1810; Roxb. in Fl. Ind. 1: 48. 1820; Hook. f. in Fl. Brit. India 6: 248. 1892; Prain in Bengal Pl. 2: 1045. 1903. '**Ban aada**'

Perennial, fleshy with aromatic rhizome, yellow inside. Leaves subsessile; ligule short, pubescent, bilobed; lamina linear-lanceolate, acute. Spike ovate, ovate; red. Calyx white, membranous. Capsules ovoid; seeds purple.

Flowering: June – September

Fruiting: August – October

Local Distribution: All over the forests are of three MPCAs of North Bengal .

General Distribution: Native of India; Sri Lanka, Malaysia.

Status: Not Evaluated (IUCN).

Uses: It is traditionally used as tribals medicine.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4532]

Zingiber zerumbet (L.) Roscoe ex Smith in Exot. Bot.2:105.t.112.1804; Hook. f. in Fl. Brit. Ind. 6:247. 1892; Prain in Bengal Pl. 2: 1045. 1903; Noltie in Fl. Bhutan 3(1): 188. 1994. '*Soti*'

Rhizomatous, perennial herbs. Rhizomes tuberous, fleshy, aromatic, yellowish inside. Pseudostems leafy through out. Leaves sessile, alternate; ligule membranous; lamina lanceolate 20 – 30 × 5 – 7.5 cm, glabrous or minutely pubescent beneath, acuminate. Peduncle erect, 15 – 22.5 cm, bracteate. Inflorescences terminal, oblong-elliptic, 7 – 10.2 × 2 – 3.5 cm, brownish-yellow; bracts tightly packed and glabrous, singly flowered, minutely mucronate.

Flowering: June – July

Fruiting: July – August

Local Distribution: Tropical forest area of three MPCAs of North Bengal .

General Distribution: India (Manipur, Meghalaya, Mizoram, Nagaland Orissa); Sri Lanka, Myanmar, Thailand, Laos, Vietnam, Malaysia and Cambodia.

Status: Data Deficient (IUCN 2018)

Uses: Rhizomes used against bacterial diseases and as stimulant, carminative.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4598]

ORCHIDACEAE Juss. in Gen. P1. 64. 1789.

ACAMPE Lind. in Fol. Orchid. 4(Acampe): 1. 1853; *nom. cons.*

Acampe praemorsa (Roxb.) Blatt. et McCann in J. Bomb. Nat. Hist. Soc. 35: 495. 1932.

Epidendrum praemorsum Roxb. in Pl. Corom. 1: 34 1795. *A. papillosa* (Lindl.) Lindl. in Fol. Orchid. Acampe 4: 2, no. 5. 1853; Pears et Cribb in Fl. Bhutan 3(3): 491. 2002. *Gastrochilus papillosum* (Lindl.) Kuntze in Revis. General Pl. 2: 661. 1891.

Evergreen epiphyte. Stem erect or decumbent; stem 4 – 6 mm thick, covered by leaf sheaths, rooting from nodes. Leaves alternate or opposite; lamina linear-oblong, 10 – 16 × 1 – 2 cm, coriaceous. Inflorescence racemose. Peduncle sheathed with dry

overlapping sheath base. Flowers odorant, sepals and petals sub-equal, petals slightly narrower, pale yellow to greenish cream with brown transverse stripes; lip fleshy, warty, white, obscurely lobbed along margins and decurved apically; column short.

Flowering: April – August

Fruiting: October – March.

Local Distribution: All over the forest area of three MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal); Myanmar, China, Thailand and Vietnam.

Status: Common

Uses: The plant is traditionally used to treatment of wounds, neuralgia, rheumatism, eye diseases, sciatica, cough and fracture.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1081]

AERIDES Lour. in Fl. Cochinch. 2: 525. 1790.

Aerides multiflora Roxb. in Pl. Corom. 3: 68, t. 217. 1820; Hook.f. in Fl. Brit. Ind. 6:44. 1890; Prain in Bengal Pl. 2: 1020. 1903; Pears and Cribb in Fl. Bhutan 3(3): 493. 2002.

Pendent, epiphyte. Stem densely covered with old leaf sheaths. Leaves distichous, oblong-linear, fleshy, apex bilobed, 13–26 × 1.3–2 cm. Raceme 1–3, axillary from leafy portion of stem, many flowered, unbranched; peduncle 6–11 cm long, glabrous; floral bracts triangular-lanceolate. Flowers pink, showy, fragrant. Capsule ovoid.

Flowering: January – June

Fruiting: March – August

Local Distribution: On large trees trunks of the forest area of MPCAs in West Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal), Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam.

Status: Common

Uses: The plant is used to treat vahic disorders.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1085]

ARUNDINA Blume, Bijdr. 401. 1825.

Arundina graminifolia (Don) Hochr. in Bull. New York Bot. Gard. 6: 270. 1910; Pears et Cribb in Fl. Bhutan 3(3): 319. 2002. *Bletia graminifolia* D. Don in Prodr. Fl. Nepal. 29. 1825.

Terrestrial, reed-like orchids, 2.5 – 3.5 m tall. Stem rigid, woody. Leaves distichous, alternate, linear lanceolate, acuminate, 10 – 19 × 1 – 2 cm. Raceme terminal; bracts ovate-triangular, base sheathing. Flowers pink, showy; sepals similar, narrowly elliptic-lanceolate, acuminate; petals broadly ovate elliptic, acute to acuminate; lip simple, apex 2-lobed; column angular. Fruits ellipsoid.

Flowering: March – June

Fruiting: June – August

Local Distribution: On large trees trunks of the three MPCAs of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal); Myanmar, China, Sri Lanka, Thailand, Vietnam, Malaysia.

Status: Near Threatened Species (IUCN 2019).

Uses: Rhizomes are used as antidote, diuretic and demulcent.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 10845]

BULBOPHYLLUM Thouars in Hist. Orchid., Tabl. Esp. 3. 1822; *nom. cons.*

Bulbophyllum crassipes Hook. f. in Fl. Brit. India 5: 760. 1890; Pears et Cribb in Fl. Bhutan 3(3): 451.2002. *Phyllorchis crassipes* (Lindl.) Kuntze in Revis. General Pl. 2: 677. 1891.

Rhizomatous, epiphytic, creeping orchids. Pseudobulbs conical, 3 – 5 cm long. Leaf single, terminal; lamina oblong, obtuse, fleshy or thickly leathery. Raceme cylindrical, 5–16 cm; densely many flowered; peduncle stout, base with 3 to 4, swollen. Fruit column 2.5–3 mm.

Flowering: October – December

Fruiting: June – August

Local Distribution: All over the forest area of three MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal); China, Thailand, Malaysia.

Status: Not Evaluated (IUCN 2022).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1085]

Bulbophyllum spathulatum (Rolfe) Seiden f. in Bot. Tidsskr. 65: 347. 1970; Pears et Cribb in Fl. Bhutan 3(3): 476. 2002. *Cirrhopetalum spathulatum* Rolfe ex Cooper,

Orchid Rev. 37: 106. 1929. *Cirrhopetalum bootanense* sensu Hook. f. in Fl. Brit. India 5: 775. 1890.

Rhizomatous creeping, stout, Epiphyte. Pseudobulbs narrowly cylindrical-ovoid. Leaf 1, terminal; lamina oblong, obtuse 4–10 × 1.5–3 cm, fleshy. Pseudobulb 3–4.5 cm long. Umbel more than 20 flowered; floral bracts oblong ovate. Flowers purplish red; dorsal sepal sub-obovate, 8–10 × 2–4 mm; petals narrowly oblong lanceolate; lip recurved at a right angle, lanceolate, obtuse, glabrous, conduplicate in basal half; column 1–2 mm.

Flowering: March – August **Fruiting:** July – December

Local Distribution: All over the MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerela, Goa, Maharashtra, Karnataka); Myanmar, Thailand, Laos and Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: Unknown

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1065]

COELOGYNE Lindl. in Coll. Bot. ad t. 33. 1821.

Coelogyne cristata Lindl. in Coll. Bot. 33. 1821; Hook. f. in Fl. Brit. Ind. 5: 829. 1890; Pears et. Cribb in Fl. Bhutan 3(3): 332. 2002.

Rhizome branched, stiff, scaly sheaths, leathery. Pseudobulbs oblong. Lamina lanceolate, linear 9 – 19 × 1.7 – 4.3 cm, papery, inconspicuous petiole, apex acuminate, long. Inflorescence 7 – 12 cm, heteranthous; raceme 3.4 – 7.2 cm; floral bracts lanceolate, ovate. Flowers large, white.; sepals lanceolate, acute apex; petals 9.2 – 11.3 mm wide; column 21.5 – 29.7 mm, winged.

Flowering: March – June **Fruiting:** May – August

Local Distribution: On large tree trunks in the MPCAs of North Bengal

General Distribution: India (Nagar Haveli, Delhi, Goa, Gujarat, Karnataka, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya and West Bengal); Nepal to Bhutan, China and Bangladesh.

Status: Common

Uses: The plant used for the treatment of fractured bones in folk-tradition of Kumaon.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1465]

CYMBIDIUM Swartz in Nova Acta Regiae Soc. Upsal. 2, 6: 70. 1799.

Cymbidium aloifolium (L.) Sw. in Nova Acta Regiae Soc. Upsal. 6: 73. 1799; Hook. f. in Fl. Brit. Ind. 6: 10. 1890; Hara et al. in Fl. Sikkim 1: 51. 1996; Pears et Cribb in Fl. Bhutan 3(3):259. 2002. *Epidendrum aloifolium* L. in Sp. Pl. 2: 953. 1753.

Epiphytic dense tuft orchid. Pseudobulbs bilaterally slightly compressed, ovoid, enclosed in leaf bases, 5 – 10 × 3.8 – 6.9 cm. Leaves 6 – 9, jointed, lanceolate, oblong 32 – 81 × 1.7 – 3.9 cm, apex obtuse, thickly leathery. Inflorescence 20 – 40-flowered. Flowers 4 – 5 cm across, slightly fragrant; lip creamy white. Capsule ellipsoid oblong.

Flowering: April – August

Fruiting: July– March.

Local Distribution: On large tree trunks of three MPCAs in West Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); Bhutan, Nepal, Bangladesh, Myanmar, Sri Lanka, Thailand, Laos, Vietnam, Malaysia and Cambodia.

Status: Common

Uses: The plant is used for the treatment of Anti-inflammatory, paralysis, joining fractured bones, fever, weakness of eyes, chronic illness, burns, sores.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 8595]

Cymbidium bicolor Lindl. in Gen. Sp. Orchid. 164. 1833; Hajra et al. in Fl. Sikkim 1: 52. 1996; Pears et Cribb in Fl. Bhutan 3(3): 260. 2002. *C. crassifolium* Lindl. in Gen. Sp. Orchid. Pl. 165. 1833. *C. mannii* Rchb. f. in Flora 55: 274. 1872. *C. pendulum sensu* King et. Pantl. in Ann. Roy. Bot. Cal. 8: 188, t. 251. 1898.

Epiphytic pseudobulbs bearing orchid, bilaterally compressed, 3 – 7 × 2.3 – 3.7 cm. Leaves 4 – 9, leathery, acute, thickly, oblong, 33 – 68 × 1.3 – 4.2 cm. Inflorescence pendulous, with base of pseudobulb; rachis 9 – 21 flowered; bracts triangular, 2.1– 3.8 mm. ovary 1.2 – 3.9 cm. Flowers fragrant; sepals and petals pale whitish to yellowish; lip and sepals spotted, cream yellow with maroon, striped; spreading, narrowly oblong, obtuse to acute; petals narrowly oblong-elliptic, obtuse.

Flowering: March – June.

Fruiting: May – August.

Local Distribution: Low to high elevation, hills, deciduous forests of three MPCAs of North Bengal

General Distribution: India (Andhra Pradesh, Manipur, Meghalaya, Mizoram, Nagaland

West Bengal, Punjab, Sikkim, Jharkhand, Kerala); Nepal to Bhutan Bangladesh, Myanmar, China, Thailand, Laos, Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: The plant is used for the treatment of anti-inflammatory, paralysis.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4575]

DENDROBIUM Sw. in Nova Acta Regiae Soc. Sci. Upsal. 2, 6: 82. 1799.

Dendrobium aduncum Wall. ex Lindl. in Bot. Reg. 28: misc. 58: 62. 1842; Hook. f. in Fl. Brit. Ind. 5: 730. 1890; Yonzon et al. in Asian J. Pharm. Lif. Sci., 1(4): 457. 2011. *Callista adunca* (Wall. ex Lindl.) Kuntze in Revis. Gen. Pl. 2: 654. 1891. *Dendrobium faulhaberianum* Schltr. in Orchis 5: 58, 5. 1911.1951.

Plant epiphytic herb, 27 – 45 cm long. Stems 2.6 – 4.7 mm wide, branched, grooved, sheathed. Leaves 6 – 10, oblong–lanceolate, 5.6 – 8.9 × 0.7 – 1.6 cm, acute, emarginated, sessile. Inflorescence lateral, 3 or 4 flowered; rachis slender, zigzag. Flowers 2 – 2.4 cm across, pale–purple; floral bracts elliptic–ovate; dorsal sepal ovate, acute to acuminate; lateral pair triangular to sub rhombic, adnate at base to form a mentum; petals ovate, acute to acuminate, lip shortly clawed, broadly elliptic, apex acuminate, margins entire; disc with a hairy transversal wall separating hypochile and epichile. Column with beaked, rounded appendages apically. Anther dome shaped; pollinia 4.

Flowering: May – August

Fruiting: July – August

Local Distribution: Throughout the forest area of three MPCAs of North Bengal

General distribution: India (Assam, Sikkim, West Bengal); Bhutan, Nepal, Bangladesh.

Status: Not Evaluated (IUCN 2022).

Uses: It is used in fever, thirst, lassitude and malaise.

Specimen Examined: West Bengal, Jalpaiguri, sevoke, 12.05.1019, Mallik, et al. [Field No. 7325]

Dendrobium amoenum Wall. ex Lindl. in Gen. Sp. Orchid. Pl. 78. 1830; Hook. f. in Fl. Brit. Ind. 5: 738. 1890; King et. Pantl. in Ann. Roy. Bot. Gard. 8: 49. t 69. 1898; Hara et al. in Enum. Fl. Pl. Nepal 1: 38. 1978.

Lithophytic or epiphytic orchid, 27 – 52 cm tall. Stem tufted erect, grooved, slender, blackish white; internodes 2.5 – 6.3 cm, with dry, papery, tubular old leaf sheath. Leaves 5 – 10, arising alternate from nodes, sessile; lamina elliptic, lanceolate, acute, 5 – 12 × 0.7 – 3.2 cm. Inflorescence arising from nodes, 2 – 7 flowered; rachis short, peduncle to 1.7 cm; floral bracts ovate, small. Flowers scented; petals ovate, sepals similar; lip 3-lobed, densely hairy patches, white, margins undulate.

Flowering: April – June

Fruiting: May – August

Local Distribution: All over the Forest area of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerela, Goa, Maharastra); Bangladesh, Nepal, Bhutan, Myanmar.

Status: Not Evaluated (IUCN 2022).

Uses: The plant is traditional used for treating dermatological disorders.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4576]

Dendrobium anceps Sw. in Kongl. Vetensk. Acad. Nya. Handl. 21: 246. 1800; Hook. f. in Fl. Brit. Ind. 5: 724. 1890; King and Pantl. in Ann. Roy. Bot. Gard. 8: 41. 54. 1898. *Aporum anceps* (Sw.) Lindl. in Gen. Sp. Orchid. Pl.: 71. 1830. *Callista anceps* (Sw.) Kuntze in Revis. Gen. Pl. 2: 654. 1891.

Plant epiphytic herb, 13 – 36 cm tall. Stem laterally compressed, sheathed, branched. Leaves many, 2.5 – 5 × 0.6 – 1.3 cm, distichous, overlapping, equitant, fleshy, lanceolate, acute, sessile. Inflorescence lateral, 1-flowered; peduncle attenuate; pedicellate–ovary 0.4 – 0.5 cm long. Flowers 1.2 – 1.5 cm across, yellowish–green; floral bracts minute, oblong. Dorsal sepal elliptic, subacute; lateral pair elliptic, obtuse, falcate, adnate at base to form a mentum; mentum obtuse; petals broadly elliptic, obtuse, lip wedge shaped to oblong, obscurely 3 – lobed, apex 2 – lobed, margins entire. Column 1 – 1.5 mm long; foot short; anther white; pollinia 2.

Flowering: March – June

Fruiting: May – July

Local Distribution: Throughout the forest of North Bengal

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not Evaluated (IUCN 2022).

Uses: It is used to treat rheumatism.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.05.1019, Mallik, et al. [Field No. 4325]

Dendrobium aphyllum (Roxb.) C.E.C. Fischer, Gamble, Fl. Madras 3: 1416. 1928; Chowdhery and Agrawala, A Century W.H. Orch. 154. 2013. *Dendrobium cucullatum* R. Br., Bot. Reg. 7: t. 548. 1821. *D. pierardii* Roxb. ex Hook., Exot. Fl. 1: t.9. 1822; Hook. f., Fl. Brit. Ind. 5: 738. 1890.

Plant epiphytic herb, 25 – 64 cm long. Stem pendent, slender, expanded at nodes. Leaves many, 5 – 10 × 2.5 – 3 cm, linear–lanceolate, acuminate, sessile, distichous. Inflorescence lateral, 1 to 3–flowered; peduncle attenuate. Flower purplish–white; floral bract ovate; sepals subequal, oblong–lanceolate, subacute; dorsal sepal 2.5 – 2.8 × 0.8 – 1.1 cm, lateral pair 2.6 – 2.9 × 0.8 – 1 cm, adnate at base to form a mentum; petals ovate–lanceolate, obtuse, lip shortly clawed, pale yellow with purple lines at base, suborbicular, convolute over the column. Column 6–7 mm long, white. Anther truncate; pollinia 4.

Flowering: March – June

Fruiting: May – July

Local Distribution: Throughout the forest of North Bengal

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Least Concern (IUCN 2009)

Uses: It is used in stomach treatment, improve eyesight and relieve throat inflammation.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA).12.05.1019, Mallik, et al. [Field No. 4322]

Dendrobium chrysanthum Wall. ex Lindl. in Bot. Reg. 15:1299. 1830; Gen. Sp. Orchid 80 1830; Hook. f. in Fl. Brit. Ind. 5: 747. 1890; Chowdhery and Agrawala, A Century W.H. Orch. 158. 2013. *D. paxtonii* sensu Lindl. in Bot. Reg. 25: 56. 1839. *Callista chrysantha* (Wall. ex Lindl.) Kuntze in Revis. Gen. Pl. 2: 654. 1891.

Plant epiphytic herb, 34 – 66 cm long. Stem pendent, straight to wavy, sheathed. Leaves many, 7.5 – 20 × 1.8 – 4.3 cm, distichous, elliptic–lanceolate, acuminate, sessile. Inflorescence lateral, leaf opposed, 2 to 4–flowered; peduncle attenuate; pedicellate ovary 4.2 – 5.5 × 0.2 – 0.3 cm, slender. Flowers yellow; floral bracts ovate; sepals

subequal, dorsal sepal oblong–elliptic to ovate, subacute, concave; lateral pair slightly falcate, adnate to the foot of column to form short mentum; petals elliptic to ovate orbicular, obtuse; lip simple, lip with two separate dark blotches, clawed at base and enclosing the column, margins fimbriate. Column 0.6 – 0.8 × 0.4 – 0.5 cm, foot short; anther dome shaped; pollinia 4.

Flowering: July – October

Fruiting: September – November.

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not Evaluated (IUCN 2022).

Uses: It is used in diabetes, obesity, rheumatoid arthritis.

Specimen Examined: West Bengal, Jalpaiguri, sevoke, 12.05.1019, Mallik, et al. [Field No. 4092]

Dendrobium densiflorum Lindl. in Gen. Sp. Orchid. 90. 1830; Hook. f. in Fl. Brit. Ind. 5: 748. 1890. *D. clavatum* Roxb. in Hort. Bengal 63 1814. *Callista densiflora* (Wall. ex Lindl.) Kuntze in Revis. Gen. Pl. 2: 654. 1891.

Plant epiphytic herb, 25 – 48 cm tall. Stems clavate, obscurely 4 angled, expanding to a swollen node. Leaves 3 or 4, 11 – 15 × 3 – 5.8 cm, oblong–lanceolate, acute, shortly petiolate, jointed. Inflorescence pendent, densely many–flowered; peduncle 3–4 cm long. Flowers yellow; floral bracts oblong, revolute; dorsal sepal ovate elliptic, rounded, lateral pair elliptic, acute, adnate at base to form a mentum; petals ovate–orbicular, clawed, lip simple, clawed at base, orbicular–rhombic, convolute basally, surface glandular– hairy, margins lacerate. Column 5–6 mm long, broad; anther conical; pollinia 4.

Flowering: March – April

Fruiting: June – August.

Local Distribution: Throughout the forest area of Terai and duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not Evaluated (IUCN 2022).

Uses: It is used to increases the production of body fluids.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA).12.05.1019, Mallik, et al. [Field No. 2192]

Dendrobium fimbriatum Hook. in Exot. Fl. 1: 71. 1823; Hook. f. in, Fl. Brit. Ind. 5: 745. 1890. *D. paxtonii* Paxt. in Paxt.'s Mag. Bot. 6: 169. 1839. *D. normale* Falconer in Ann. Nat. Hist. 3: 196. 1839; Proc. In Linn. Soc. Lond. 1: 14. 1839. *Callista oculata* (Hook.) Kuntze in Revis. Gen. Pl. 2: 653. 1891. *C. normalis* (Falconer) Kuntze in op. cit. 655. 1891.

Plant epiphytic herb, 72 – 109 cm long. Stems erect, arching to pendent, jointed, many-leaved, sheathed. Leaves many, 9 – 14.5 × 1.5 – 2.8 cm, narrowly elliptic lanceolate, acuminate, sessile. Inflorescence lateral, arising from nodes, pendent, 5 to 13-flowered; peduncle 2.5 – 3 cm long, glabrous; rachis glabrous; pedicellate-ovary, 2 – 2.8 cm long, slender. Flowers yellow; floral bracts triangular; dorsal sepal oblong-elliptic, obtuse; petals oblong elliptic, rounded, clawed, lip dark yellow, clawed, suborbicular, densely hairy, margins plumose-fimbriate. Column 2.5 – 3 mm long, foot short; anther dome shaped; pollinia 4.

Flowering: March – April

Fruiting: May – July.

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not Evaluated (IUCN 2022).

Uses: It is used to treat night sweats, stomach, to strengthen the kidneys and to cure impotence and as tonic.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA).12.05.1019, Mallik, et al. [Field No. 4392]

Dendrobium jenkinsii Wall. ex Lindl. in Bot. Reg. 25: 37. 1839; Reichb. f., Walp. in Ann. 6: 307. 1861; Pearce and Cribb in Fl. Bhutan, 3(3): 404. 2002; *D. marseillei* Gagnep. in Bull. Mus. Natl. Hist. Nat. ser.2, 6(1): 119. 1934.

Plant epiphytic herb, 5 – 7.5 cm tall. Stem 2– 5 cm long, aggregated, appressed to substrate, ovoid, 4-angled, compressed, ridged. Leaf solitary, 1.8 – 3 × 0.6 – 0.9 cm, apical from pseudobulb, oblong-ovate, obtuse, petiolate. Inflorescence lateral from pseudobulb, 1 or 3-flowered; peduncle 1.4 cm long, glabrous; pedicellate-ovary 4 – 5 cm long, slender. Flower yellow; floral bract lanceolate; dorsal sepal oblong-elliptic, obtuse, lateral pair adnate at base to form a mentum, narrowly ovate-elliptic, obtuse; petals elliptic-ovate to orbicular, lip simple, transversely, obcordate, margins erose, hairy centrally. Column 3 – 5 mm long; anther yellow; pollinia 2.

Flowering: April – June

Fruiting: May – July.

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not evaluated (IUCN)

Uses: It is used to treat eye, digestive, urinary ailments, diabetes.

Specimen Examined: West Bengal, Jalpaiguri, sevoke, 12.05.1019, Mallik, et al. [Field No. 1292]

Dendrobium nobile Lindl. in Gen. Sp. Orchid. Pl.: 24. 1830; Hook. f. in Fl. Brit. Ind. 5: 740. 1890; Hedge in Orch. Arun. Pradh. 64. 1984. *D. coeruleescens* Wall. in Lindl. Sert. Orchid. 3: t.18. 1838. *Callista nobilis* (Lindl.) Kuntze in Revis. Gen. Pl. 2: 655. 1891. *D. formosanum* (Rchb. f.) Masamune in Trop. Hort. 3: 32. 1933. *D. friedericksianum sensu* Brix in Bull. Soc. Roy. Sci. Nat. Laos 5: 8. 1962.

Plant epiphytic herb, 30 – 55 cm tall. Stems clustered, sheathed. Leaves 5 – 11, 6.5 – 11 × 2.3 – 3 cm, oblong to spatulate, emarginated, sessile, distichous. Inflorescences lateral, 2 to 4-flowered; peduncle 0.8 – 1.5 cm long, attenuated, bracteate at base; rachis 2 – 3 cm; pedicellate-ovary 3.5 – 4.8 cm long, glabrous. Flowers whitish-purple; floral bracts scarious, tubular. Sepal oblong-lanceolate, obtuse; dorsal sepal 3.5 – 4.5 × 1 – 1.5 cm; lateral pair 3.6 – 4.6 × 1 – 1.2 cm, united at base to form a mentum; petals ovate-oblong, obtuse, margins slightly undulate, lip simple, central blotch of pale-yellow a white, clawed, convolute at base, ovate-oblong in outline, margins entire. Column foot short; anther white; pollinia 4.

Flowering: March – June

Fruiting: May – August.

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (North East India, Sikkim, West Bengal); Bhutan, China, Myanmar, Nepal and Thailand.

Status: Not evaluated (IUCN 2022)

Uses: It is used nourishes the stomach, lungs, and kidneys.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.05.1019, Mallik, et al. [Field No. 1265]

ERIA Lindley in Bot. Reg. 11: 904. 1825.

Eria lasiopetala (Willd.) Ormerod in Opera Bot. 124: 22. 1995; Pears in Fl. Bhutan 3(3): 376. 2002. *Aerides lasiopetala* Willd. in Sp. Pl. 4(1): 130. 1805. *Dendrobium albidotomentosum* Blume in Bijdr.: 345. 1825. *Octomeria flava* Wall. ex Lindl. in Gen. Sp. Orchid. Pl. 65. 1830. *Eria flava* Lindl. in Gen. Sp. Orchid. Pl. 65. 1830; Hook.f. in Fl. Brit. Ind. 5: 8011. 1890; Prain in Bengal Pl. 2: 1013.1903.

Lithophytic or epiphytic orchid, black turning. Pseudobulbs tufted, cylindrical, contiguous, 7 – 19 × 0.7 – 1.2 cm. 4.2 – 5.5 cm, coriaceous, thick. Inflorescence arising pseudobulb, laxly 2 – 8 flowered; floral bracts linear, 2.9 – 6.3 mm. Flowers 3.5 – 4.1 cm white; pedicel and ovary 4 – 11.3 mm; sepals sub-similar, lip 3 lobed, lateral lobes erect, divaricate, rounded, mid-lobe acute, subsquare; column 4.7 mm. Fruit obovoid, cylindrical, capsule.

Flowering: February – May

Fruiting: March – September.

Local Distribution: Throughout the forest area of three MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); China, Myanmar, Thailand, Laos, Vietnam, Cambodia.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4255]

GOODYERA Br. in Aiton, Hortus Kew. 5: 197. 1813.

Goodyera procera (Ker Gawl.) Hook. f. in Exot. Fl. 1(3): 39. 1823 and in Fl. Brit. Ind. 6: 111. 1890; Prain in Bengal Pl. 2: 1027. 1903; Hara et al. in Fl. Sikkim 1: 76. 1996; Pears et Cribb in Fl. Bhutan 3(3): 92. 2002. *Neottia procera* Ker Gawl. in Bot. Reg. 8: 639. 1822. *Orchiodes procerum* (Ker Gawl.) Kuntze in Revis. General Pl. 2: 675. 1891. Plant 72 – 88 cm long; leaves 8 – 12, 09 – 17 × 3.3 – 4.9 cm, acute, petiolate; petioles upper longer, lower shorter, to 3.6 cm base tubular. Inflorescence dense, 18 – 22 cm, successively, flowering upwards to down, lowest ovary; floral bracts ciliate and hairy; ovary, acute, 9.2 – 11.3 mm; flowers 4.6 mm across; column 3.4 mm; anther red at maturity. Fruit green, to 2.1 cm, globose.

Flowering : April – June

Fruiting: May – August

Local Distribution: Throughout the forest of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); Bangladesh, Myanmar, Sri Lanka, Japan, Philippines.

Status: Not Evaluated (IUCN 2022).

Uses: Unknown

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.08.2019, Mallick, et al. [Field No. 4745]

PAPILIONANTHE Schlechter in *Orchis* 9: 78. 1915.

Papilionanthe teres (Roxb.) Schltr. in *Orchis* 9:78. 12.1915; Hara et al. in *Fl. Sikkim* 1: 98. 1996; Pears et Cribb in *Fl. Bhutan* 3(3): 536. 2002. *Dendrobium teres* Roxb. in *Fl. Ind.* 3: 485. 1832. *Vanda teres* sensu Lindl. in *Gen. Sp. Orchid. Pl.* 217. 1833. Hook. *f.* in *Fl. Brit. Ind.* 6:49. 1890; Prain in *Bengal Pl.* 2: 1021. 1903.

Scrambling orchid. Stems stout, erect, branched, 0.7 – 4.2 m, terete, 4.2 – 4.6 mm wide. Leaves 6 – 14 cm, obliquely borne, curved, linear, jointed, obtuse. Inflorescence laxly 4 – 6 flowered; peduncle 5 – 10 cm, sub-erect, woody; floral bracts obtuse, ovate. Flowers large 5.3 – 8.9 cm across; lateral lobes erect, rounded, sub-obovate; 3.3 – 3.7 cm, deeply bilobed at apex, spreading; spur conical, 3.4 cm long; column 7 – 8 mm erect. Fruits cylindrical, ridged.

Flowering: May – July

Fruiting: July – August

Local Distribution: On dead trees of the three MPCAs of North Bengal

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

Status: Common

Uses: The plant is used for treatment of fever and heavy menstruation.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.08.2019, Mallick, et al. [Field No. 4245]

PHAIUS Loureiro in *Fl. Cochinch.* 2: 529. 1790.

Phaius tankervilleae (Banks) Bl. in *Mus. Bot.* 2: 177. 1856; Hara et al. in *Fl. Sikkim* 1: 101. 1996; Pears et Cribb in *Fl. Bhutan* 3(3): 305. 2002. *Limnodorum tankervilleae* Banks ex Heritier in *Sert. Angl.* 28. 1789. *Phaius veratifolius* Wall. ex Lindl. in *Gen. Sp. Orchid. Pl.* 127. 1831.

Pseudobulbus orchid, 7 – 12 × 3.1 – 6.4 cm. Leaves 5 – 8; petiolate to 11 – 22 cm, acuminate, 24 – 72 × 5 – 17 cm. Inflorescences arising from highest of pseudobulb overhead leaves, laxly 8 – 19 flowered. Flowers opening, showy and large, 8 – 15 cm; ovary pedicel and glabrous, 3.5 – 3.8 cm; petals and sepals less alike. Fruit ellipsoid.

Flowering: February March

Fruiting: March – April.

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); Nepal, India, Sri Lanka, Pacific Islands, Australia.

Status: Not Evaluated (IUCN 2022).

Uses: The pseudobulbs contains drugs that promote blood circulation and help to stop bleedings.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 05.03.2019, Mallick, et al. [Field No. 1204]

PHOLIDOTA Lindl. ex Hook. *f* in Exot. Fl. 2: 138. 1825.

Pholidota articulata Lindl. in Gen. Sp. Orchid. Pl. 38. 1830; Hook. *f*. in Fl. Brit. Ind. 5: 844. 1890; Hara et al. in Fl. Sikkim 1: 102. 1996; Pears et Cribb in Fl. Bhutan 3(3): 349. 2002. *P.khasyana* Rchb. *f*. in Bonplandia 4: 329. 1856. *Coelogyne articulata* (Lindl.) Rchb. *f* in Walpers, Ann. Bot. Syst. 6: 238. 1861. *P griffithii* Hook. *f*. in Icon. 1881. 1889 and in Fl. Brit. Ind. 5: 842. 1890. *P. obovata* Hook. *f*. in Fl. Brit. Ind. 5: 845. 1890. Plant epiphytic, sheathed, 3 – 7 × 4.6 – 7.2 cm. Leaves 2, petiolate, sheathes; lamina obovate, elliptic. Inflorescence borne at apex of new pseudobulb, cyananthus; flowered; 9 – 23; rachis zigzag slightly; floral bracts deciduous, papery, narrowly ovate oblong. Flowers white to greenish, widely opening; sepals uniformly creamy white, concave, obtuse; oblong lanceolate, petals creamy white, obtuse, smaller than sepals; column winged, stout. Fruit ellipsoid.

Flowering: April – May

Fruiting: April – June

Local Distribution: All over the forest of three MPCAs of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); Nepal, Bhutan, Myanmar, Thailand, Cambodia, Malaysia, Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: The plant is used for antitumor, antiinflammatory, anticancer and anticonvulsive.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 28.04.2019, Mallick, et al. [Field No. 1404]

RHYNCHOSTYLIS Bl. in Bijdr. 285, 434. 1825.

Rhynchostylis retusa Bl. in Bijdr. 286, 49. 1825; Hook. *f*. in Fl. Brit. Ind. 6: 32. 1890; Prain in Bengal Pl.2: 1020. 1903; Hara et al. in Fl. Sikkim 1: 109. 1996; Pears et Cribb in Fl. Bhutan 3(3): 552. 2002. *Epidendrum retisum* L. in Sp. Pl. 2. 953. 1753. *Aerides*

undulatum Sm. in Rees, Cycl. 39: 12. 1819. *Sarcanthus guttatus* Lindl. in Bot. Reg. 17: 1443. 1831.

Epiphytic orchid. Stems 7 – 12.5 cm, 2.2 – 3.5 cm across. Leaves lorate, 21 – 36 × 3.3 – 5.2 cm,. Inflorescences 1 to 4, densely many flowered, pendulous; rachis 15 – 32 cm, thick; floral bracts broadly ovate, reflexed, 3.3 – 5.4 mm. Flowers scentless, sepals and petals white with pinkish yellow, lip purplish red, spur white, apex white; ovary and pedicel 8.7 – 13.3 mm, obtuse, elliptic; lateral sepals obtuse, oblong, base adnate; petals narrowly obtuse, oblong; lip often oblong-spatulate, conduplicate, apiculate, rounded; spur laterally rounded, compressed; column 4.4 – 5.5 mm, foot 1.8 – 3.2 mm. Fruit obovoid.

Flowering : May – June

Fruiting: July – August

Local Distribution: Throughout the forest of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerela, Goa, Maharastra); Nepal, Bhutan, Laos, Malaysia, Indonesia, Philippines, Vietnam.

Uses: The plant is used in Assam to treat wounds, cuts and bruises.

Status: Not Evaluated (IUCN 2022).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 08.07.2019, Mallick, et al. [Field No. 12605]

VANDA Jones ex Br. in Bot. Reg. 6: ad t. 506. 1820.

Vanda cristata Lindl. in Gen. Sp. Orchid. 216.1831; Hook. *f.* in Fl. Brit. Ind. 6: 53. 1890; Hajra et al. in Fl. Sikkim 1: 118. 1996; Pears et Cribb in Fl. Bhutan 3(3): 574. 2002. *Aerides cristata* (Wall. ex Lindl.) Wall. ex Hook. *f.* in Fl. Brit. Ind. 6: 53. 1890. Orchid epiphytic. Stems covered by leaf sheaths, 14 – 22 cm. Leaves overlapping; lamina coriaceous thickly, apex dentate, 2/5, 6.9 – 17 × 0.7 – 3.3 cm. Inflorescences 2–5, flowered 2 – 7; rachis zigzag weakly; floral bracts obtuse to acute, ovate. Flowers widely opening, thickly textured, 4.9 – 7.2 cm across; ovary and pedicel 2.7 – 4.3 cm, greenish yellow; sepals and petals both pale yellowish green, uniformly. Fruit obovoid cylindrical.

Flowering: March – July

Fruiting: July – September

Local Distribution: Throughout the forest of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerela, Goa, Maharastra), China, Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: The roots and leaves are used to cure hepatitis, dyspepsia, bronchitis, piles, rheumatism and diseases of nervous system.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 12.08.2019, Mallick, et al. [Field No. 8565]

ZEUXINE Lindl. in Orchid. Scelet. 9. 1826; *nom. cons.*

Zeuxine nervosa (Wall. ex Lindl.) Benth. ex Clarke, J. Linn. Soc. Bot, 25: 73. 1889; Pears et Cribb in Fl. Bhutan 3(3): 111. 2002. *Monochilus nervosus* Wall. ex Lindl. in Gen. Sp. Orchid. Pl. 487.1840. *Haplochilus nervosus* (Wall. ex Lindl.) Dietrich in Syn. Pl. 5: 172. 1852. *Zeuxine formosana* Rolfe in Ann. Bot. (Oxford) 9: 258. 1895.

Terrestrial orchid, 12 – 28 cm. Rhizome prostrate, stem-like. Stem glabrous erect. Leaves scattered, 7 – 9; lamina elliptic, acute, ovate, 3.8 – 7 × 4.9 – 2.9 cm, coriaceous, slightly fleshy, midrib whitish, green. Inflorescence terminal, 12 – 24 flowered. only lip open, green, white; ovary and pedicel 7.9 – 11 mm, pubescent; sepals pubescent outside, green, lateral sepals oblong-ovate, dorsal sepal ovate, petals green, ovate, oblique, glabrous, obtuse; lip Y-shaped, white, 5.6 – 7.4 mm; epichile broad, 2-lobed.

Flowering: November – March.

Fruiting: February – April.

Local Distribution: Throughout the forest of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Kerala, Goa, Maharashtra); Sri Lanka, Bangladesh, Cambodia, Taiwan, Japan, Thailand, Vietnam and Philippines.

Status: Not Evaluated (IUCN 2022).

Uses: The plant is used to treat stomachache.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.08.2019, Mallick, et al. [Field No. 1015]

EUDICOTS - Eudicotyledon

UNASSIGNED TO ORDER

RANUNCULALES Dumort. in 1829.

MENISPERMACEAE Juss. in Gen. Pl. 284. 1789; *nom. cons.*

CISSAMPELOS L. in Sp. Pl. 2: 1031. 1753.

Cissampelos pareira L. in Sp. Pl. 1031. 1753; Grierson et Long in Fl. Bhutan 1(2): 336. 1984; Prain in Bengal Pl. 1: 208. 1903. *Cissampelos argentea* Kunth in Nov. Gen. Sp.

5: 67. 1821. *Cissampelos pareira* L. var. *hirsuta* (Buch.–Ham. ex DC.) Forman in Kew Bull. 22: 356. 1968.

Woody, branches usually densely pubescent, striate, slender. Lamina rotunded-cordate to rotunded, 3.3 – 7.5 cm long and papery, wide, densely pubescent abaxially, sparsely pubescent adaxially, base sometimes subtruncate, rarely rounded, often cordate, apex emarginate, acumen, palmately 3 – 9 veined. Male inflorescences fascicled or solitary, cymes, pubescent, axillary. Female inflorescences narrow, thyrsoïd, up to 19 cm, usually less than 12.6 cm; bracts suborbicular, densely pubescent, overlapping along rachis. Female flowers: sepals obovate broadly; minute petals. Fruits pubescent, drupes; endocarp obovate broadly.

Flowering: August – January

Fruiting: December – February

Local Distribution: All over the forests of North Bengal

General Distribution: India (Andhra Pradesh, Jharkhand, Kerala, West Bengal, Punjab, Sikkim, Manipur, Meghalaya, Mizoram, Nagaland) Nepal, Bhutan and Bangladesh

Status: Not Evaluated (IUCN 2022)

Uses: Traditionally used for treating numerous diseases like ulcer, wound, rheumatism, asthma, cholera, fever and diarrhoea.

Specimen examined: West Bengal, Jalpaiguri, North Sevak (MPCA). 22.02.2020, Mallick, et al. [Field No. 3107]

Cocculus DC., Syst. Nat. 1: 515.1817.

Cocculus laurifolius DC., Syst. Nat. 1: 520. 1817.

Plant 4.2 – 6.2 m tall. Stem angled, branchlets glabrous. Leaves simple, alternate, lamina lanceolate, 7.2 – 15.3 × 2.2 – 6.2 cm across, margin entire, apex acute, chartaceous, dark green, petiole stout, wider near the base, glabrous. Inflorescence axillary or terminal, bracts filiform. Male flowers axillary, solitary or thyrsoïd, yellow, glabrous, bracts subulate; sepals 6 in 2 series, outer series subelliptic, inner series sepals, ovate; petals 6, subcordate, apex emarginate; stamens 6. Female flowers pedicels 5 mm long, staminodes 6, very small or minute; carpels 3, styles reflexed, glabrous. Fruits drupes.

Flowering: October – February

Fruiting: March – July

Local Distribution: All over the forests of North Bengal

General Distribution: India (Assam, Himachal Pradesh, Jammu and Kashmir, Kerala, Punjab, Tamil Nadu, Uttar Pradesh); Taiwan, Thailand.

Status: Not evaluated (IUCN 2022).

Uses: Used as medicine for hair loss.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3218]

PERICAMPYLUS Miers in Ann. Mag. Nat. Hist., ser. 2, 7: 36, 40. 1851; *nom. cons.*

Pericampylus glaucus (Lam.) Merr. in Interpr. Herb. Amboin. 219. 1917.

Menispermum glaucum Lam. in Encycl. 4: 100. 1797. '*Pipalpati*'

Woody vines, 10.3 m longer or more. Young stems often long and pendulous; old stems glabrescent, yellowish, striate. Petiole 3.3 – 7.2cm, tomentose; lamina both surfaces rarely glabrous, base cordate to subtruncate, broadly cuneate rarely, subentire or margin crenate, apex rounded or obtuse, apiculate, rarely mucronate, palmately 5–veined, reticulation. Inflorescences tomentose, corymbose cymes. Male flowers: sepals 9, pubescent abaxially. outer 3 narrow, middle 3 oblanceolate, inner 3 slightly broad 1.1 – 1.5 mm; petals 6, 0.4 – 0.9 mm; stamens 6, filaments free or adnate. Female flowers: petals and sepals like male flowers; 6 staminodes; ovary 0.4 – 0.6 mm, 2–lobed stigma. Drupes purple or red.

Flowering: April – June

Fruiting: September – October.

Local Distribution: Primary and Secondary mixed forests of North Bengal

General Distribution: India (Assam, Central India and Assam); Bangladesh, Cambodia, China, Myanmar, Nepal, New Guinea, Taiwan, Thailand and Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: Used as eye–drops for treating conjunctivitis and as an antidote for snakebites.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3648]

STEPHANIA Lour. in Fl. Cochinch. 2: 598, 608. 1790.

Stephania rotunda Lour. in Fl. Cochinch. 2: 608. 1790. *Stephania glabra* (Roxb.)

Miers in Ann. Mag. Nat. Hist., ser. 3 18: 14. 1866; Grierson et Long in Fl. Bhutan 1(2): 336. 1984; Sharma et al. in Fl. Ind. 1: 334. 1993. *Cissampelos glabra* Roxb. in Fl. Ind. 3: 840. 1832. *Stephania rotunda* Lour. in Fl. Cochinch. 608. 1790. '*Bhuin Kumra*'

Rootstock tuberous. Lamina ovate, acute, base glabrous, rounded. Inflorescence axillary; pedunculate cymes or discoid heads, umbel-like; Perianth in female flowers asymmetric. Fruits reddish on ripening, suborbicular.

Flowering: April – July **Fruiting:** August – October.

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Arunachal Pradesh, Manipur, Assam, Tropical Himalayas); Nepal, Cambodia, Myanmar, Bangladesh, Thailand and Vietnam.

Status: Not Evaluated (IUCN 2022).

Uses: The leaves, stems and tubers used to treat fever, asthma, headache, and diarrhoea.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2017, Mallick, et al. [Field No. 3648]

Stephania japonica (Thunb. ex Murray) Miers in Ann. Mag. Nat. Hist. ser. 3, 18: 14. 1866; Kanai in Hara in Fl. E. Himal. 1: 95. 1966; Hook. f. in Fl. Brit. Ind. 1: 103. 1872; Grierson et Long in Fl. Bhutan 1(2): 337. 1984; Sharma et al. in Fl. Ind. 1: 335. 1993; *Menispermum japonicum* Thunb. ex Murray in Syst. Veg., ed. 14: 892. 1784. '**Chhoto Bhuin kumra**'

Slender twiner climber. Lamina deltoid, rounded, acuminate, sparsely pubescent beneath, entire. Umbels axillary; male flowers sessile, capitate clusters; petals obovate sepals oblanceolate; female inflorescence umbel-like cyme, discoid heads, often in compound umbels, female and male flowers similar; symmetric perianth in female flowers. Fruits red on ripening, suborbicular.

Flowering: March – July **Fruiting:** June – November.

Local Distribution: forest areas of three MPCAs of North Bengal

General Distribution: India (throughout); Tropical to temperate regions of Asia and Africa.

Status: Not Evaluated (IUCN 2022).

Uses: Traditionally, this plant used to treat pain, rheumatism, bone fracture, cancer and fever

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3637]

TINOSPORA Miers. in 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. in Sp. Pl. 4: 826. 1806. *Tinospora cordifolia* (Willd.)

Hook. *f.* et Thom. in Fl. Ind. 184. 1855; Hook. *f.* in Fl. Brit. Ind. 1: 97. 1872; Grierson et Long in Fl. Bhutan 1(2): 335. 1984; Sharma et al. in Fl. Ind. 1: 347. 1993. '*Gulancha*' Long slender arial roots climber. Lamina acuminate, ovate, base cordate, otherwise glabrous. Male flowers clusters, female flowers borne singly. sepals ovate outer, inner elliptic; petals obovate. sepals and petals similar to male in Female flowers; carpels ellipsoid, staminodes linear. Fruit drupes.

Flowering: December – February

Fruiting: January – May

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andhra Pradesh, Punjab, Jharkhand, Sikkim, West Bengal, Manipur, Meghalaya, Mizoram, Nagaland); Sri Lanka, Bangladesh and Myanmar.

Status: Not Evaluated (IUCN 2022).

Uses: Stem is used for the treatment of diabetes, high cholesterol, fever and upset stomach.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3215]

Tinospora sinensis (Lour.) Merr. in Sunyatsenia 1(4): 193. 1934. *Tinospora cordifolia* (Willd.) Miers. in Ann. Mag. Nat. Hist., ser. 2 7: 35-38. 1851; Prain in Bengal Pl. 1: 209. 1903. '*Gulancha*'

Large climber. Lamina broadly ovate, 11.2 – 14.1 × 9.3 – 11.1 cm, base cordate, acuminate, scabrous above, 5–7 ribbed, densely white tomentose below. Male flowers pedicelled 3–5 together; sepals 6 in 2 whorls, inner 2.3 × 1.4 mm, outer smaller, obovate; petals smaller 6; stamens free 6, orbicular anthers. Female flowers: petals and sepals like male flowers; 3 carpels, bilobed stigma, staminodes clavate 6. Drupe red, ovoid, glabrous, 8.1 mm long, 1 or 2 together.

Flowering: February – June

Fruiting: February – June

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Throughout); Nepal, Bangladesh, Sri Lanka, Cambodia, China, Myanmar, Thailand and Vietnam .

Status: Common

Uses: Plant are used for the treatment of rheumatism and other ailments.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2017, Mallick, et al. [Field No. 2477]

PAPAVERACEAE Juss. in Gen. Pl. 235. 1789; *nom. cons.*

ARGEMONE L. in Sp. Pl. 1: 508. 1753.

Argemone mexicana L. in Sp. Pl. 1: 508. 1753; Hara in Fl. E. Himal. 1: 103. 1966; Hook. f. in Fl. Brit. Ind. 1: 117.1872; Prain in Bengal Pl. 1: 215.1903; Sharma et al. in Fl. Ind. 2: 2. 1993; Hajra et al. in Fl. West Bengal 1: 405, 1997. '**Shiyal Kanta**'.

Annuals succulent herbs, 40 – 92 cm spinescent, high, latex yellow. Leaves cordate, sessile, pinnatifid, elliptic obovate, 3.8 – 14 × 1.7 – 5.3 cm; segments dentate, glaucous green, spiny along margins, prickly on lower surface, smooth above. Flowers bright yellow, terminal cluster, sessile, 2.9 – 5.8 cm in diameter; sepals 7 – 13.7 × 7 – 10 mm, elliptic, prickly out side; petals 3– 8 obovate, imbricate,; stamens many, 11.2 – 14.3 mm long, anthers 3.4 mm, yellow; ovary ovoid; seeds many, deeply reticulate, blackish brown.

Flowering: February – June **Fruiting:** May – July.

Local Distribution: In open areas of North Bengal

General Distribution: Throughout India (West Bengal, Assam, Sikkim, Bihar), native of tropical America.

Status: Not Evaluated (IUCN 2022).

Uses: Plants are used for the treatment of rheumatism and other deases.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2017, Mallick, et al. [Field No. 2408]

FUMARIA L. in Sp. Pl. 2: 699. 1753; Gen. Pl. ed. 5, 314, 1754.

Fumaria indica (Hassk.) Pugsley in J. L. Soc. Bot. 44: 313. 1919; Grierson et Long in Fl. Bhutan 1(2): 384. 1984. *Fumaria parviflora sensu* Wight et Arn. in Prodr. 1: 18. 1834; Prain in Bengal Pl. 1: 143. 1963; Sharma et al. in Fl.Ind. 2: 34. *Fumaria parviflora var. indica* (Haussk) Parsa in Fl. Iran 2: 490. 1986. *Fumaria vaillantii* Loisel. in Desv. in Jour. de Bot. 2: 358. 1809; Hara in Fl. E. Himal. 1: 104. 1966.

Erect small, herbs. Stem much branched, glabrous, grooved. Leaves multifid, decomounds, 3.7 × 2.3 cm; ultimate lobes flat, narrowly linear – lanceolate to linear, entire, mucronate, acute. Flowers pink in a 17 – 27 flowered racemes; lanceolate bracts, acuminate, membranous, equal; sepal caduceus, lanceolate; filament connate; ovary glabrous; style slender.

Flowering: December – January **Fruiting:** February – April.

Local Distribution: Moist places of the MPCAs on North Bengal

General Distribution: India (Bihar, West Bengal, Assam, Orissa, Haryana, Maharashtra, Punjab, Karnataka); Nepal, Bangladesh, West Asia.

Status: Not Evaluated (IUCN 2022).

Uses: It is used as a blood purifier in skin diseases.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2017, Mallick, et al. [Field No. 2489]

RANUNCULACEAE Juss. in Gen. Pl. 231. 1789; *nom. cons.*

NARAVELIA Adanson in Fam. Pl. 2: 460, 581. 1763, *nom. et orth. cons.*

Naravelia zeylanica (L.) DC. in Syst 1: 167, 1817; Hara in Fl. E. Himal. 1: 89. 1966; Hajra et al. 1: 127, 1997; Prain in Bengal Pl. 1: 124, 1963; Grierson et Long in Fl. Bhutan 1(2): 291. 1984. *Naravelia pilulifera var. yunnanensis* Y. Fei in Acta Bot. Yunnan. 19(4): 406. 1997. '*Chhagalbanti*'.

Shrubs climbing. Leaves alternate, leaflets ovate to lanceolate, 7 – 11 × 4.3 – 7.5 cm, base cordate, acuminate, glabrous. Flowers panicles, numerous; sepals densely appressed pubescent, elliptic; petals greenish yellow, spatulate. Achenes stalked hairy.

Flowering: February – June **Fruiting:** March – July

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andhra Pradesh, Jharkhand, Kerala, West Bengal); Bangladesh, Bhutan, Nepal, Myanmar, China.

Status: Not Evaluated (IUCN 2022).

Uses: Plants are used for the treatment of rheumatism and other ailments.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2017, Mallick, et al. [Field No. 1970]

RANUNCULUS L. in Sp. Pl. 1: 548. 1753.

Ranunculus sceleratus L. in Sp. Pl. 1: 551. 1753; Hook. *f.* in Fl. Brit. Ind. 1:19.1872; Grierson et Long in Fl. Bhutan 1(2): 303. 1984; Sharma et al. in Fl. Ind. 1:128.1993; Bora et Kumar in Flor. Div. Ass. 38. 2003. *Ranunculus holophyllus* Hance in Ann. Sci. Nat. in Bot. in ser. 4 5: 220. 1861. *Ranunculus oryzetorum* Bunge in Enum. Pl. China Bor. 2. 1833.

Annual rosette herbs. Roots fibrous. Stems glabrous leaves 7 – 13; petiole 3.1 – 11.7 cm; blade, pentagonal, 3-partite, reniform, base broadly cordate, broadly ovate, central

lobe rhombic; lateral lobes obliquely cuneate. Compound terminal, corymbose; leaflike bracts. Receptacle glabrous. Sepals ovate, 5; petals obovate, 5, apex rounded, yellow. Stamens 11 – 20; anthers ellipsoid. Fruit cylindrical, Aggregate; carpels numerous.

Flowering: May – August **Fruiting:** June – November

Local Distribution: In open and moist places North Bengal

General Distribution: India (Jharkhand, Sikkim, West Bengal, Kerala, Punjab); Afghanistan, Nepal.

Status: Least Concern (IUCN 2015).

Uses: The whole plant is acrid, anodyne, diaphoretic, emmenagogue and antispasmodic,.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2017, Mallick, et al. [Field No. 19097]

TROCHODENDRACEAE Eichler in Flora 48: 14. 1865.

TETRACENTRON Oliv. in Hooker's Icon. Pl. 18: pl. 1892. 1889.

Tetracentron sinense Oliv. in Hooker's Icon. Pl. 19(4). 1889.

Trees 36 – 41 m tall, 1 – 1.5 m. Branchlets grayish brown. Stipule narrowly oblong, 1.6 cm; Inflorescences 6.6 – 17 cm, short pedunculate, 78 – 112 flowered but some aborted by anthesis. Floral subtending bracts 0.3 – 0.7 × 0.4 – 0.9 mm. Flowers yellowish green; sepals ovate-orbicular, margin entire, apex rounded; stamens exerted, filaments subterete to slightly flattened, anthers 0.6 – 0.9 mm, locules lateral; carpels 1.7 mm at anthesis, styles erect, connivent, becoming recurved at anthesis, subulate, stigma along the ventral surface of the style. Fruit brown, follicles. Seeds 4 – 7 per follicle, spindle-shaped, short winged.

Flowering: April – July **Fruiting:** July – October

Local Distribution: In open and road side area of three MPCAs of North Bengal

General Distribution: India (Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland Orissa); Nepal, Bhutan, China.

Status: Not Evaluated (IUCN 2022).

Uses: The whole plant is diaphoretic, emmenagogue and antispasmodic,.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.03.2019, Mallick, et al. [Field No. 11427]

CORE-EUDICOTS, NON-ROSID, NON-ASTERID

UNASSIGNED TO ORDER - KEINE ORDNUNGSEINTEILUNG

DILLENIALES DC. ex Bercht. and J. Presl, *Prir. Rostlin*: 223. 1820.

DILLENIALES Salisb. in W. Hooker *Parad. Lond.* 2(1): t. 73. 1807.

DILLENIA L., *Sp. Pl.* 1: 535. 1753.

Dillenia indica L. in *Sp. Pl.* 1: 535. 1753. *Dillenia indica* var. *aurea* (Sm.) Kuntze *Revis. in Gen. Pl.* 1: 44. 1891. *Dillenia indica* fo. *elongata* (Miq.) Miq. in *Ann. Mus. Bot. Lugduno-Batavi* 4: 79. 1868.

Trees about 30–71 ft tall. Bark reddish brown. Lamina oblanceolate, elliptic 16.1 – 40.2 × 5.9 – 15.1 cm across, more or less ‘V’ shaped in transverse section, apex acute, chartaceous, strigose mainly on the veins beneath. Flowers solitary, lanceolate; calyx 5 toothed, sepals ovate, elliptic, apex obtuse or acute; corolla 5 lobed, obovate, yellow, apex obtuse or rounded; stamens free, numerous, outer stamens inwardly curved, inner stamens outwardly curved, anthers linear; carpels 14 – 19, around the conical receptacle 40–80 ovules on adaxial double placentas, styles flattened, linear lanceolate or oblanceolate. Fruits pseudocarps indehiscent, subglobose.

Flowering: June – September

Fruiting: October – November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, West Bengal); Bangladesh, China, Myanmar, Nepal, Philippines, Sri Lanka, Sumatera, Thailand and Vietnam.

Status: Least Concern (2020)

Uses: Mucilage found in the fruit. It is used to wash hair as shampoo and considered good for hair growth.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 19.07.2019, Mallick, et al. [Field No. 6871]

Dillenia pentagyna Roxb. in *Pl. Corom.* 1: 21. t. 20. 1795; Hook. *f.* in *Fl. Brit. Ind.* 1: 38. 1872; FI 1: 156. 1993. *Colbertia augusta* Wall. *Ex Don, Gen. Hist.* 1: 77. 1831. *Colbertia coromandelina* DC. in *Syst. Nat.* 1: 435. 1817. *Dillenia augusta* Roxb. in *Fl. Ind.* 2: 652. 1832. *Dillenia hainanensis* Merr. in *Lingnan Sci. J.* 13: 64. 1934. ‘*Tertiary*’ Deciduous tree, 18 – 22 m. Leaves alternate, exstipulate, simple; lamina obovate, 29 – 44 × 11 – 21 cm, obtuse, base cuneate, serrate. Flowers bisexual, actinomorphic, 2–9 in fascicles; buds less than 5.3 cm in diameter; sepals 5, persistent, imbricate, ovate, acute,

reddish; petals free, rounded at apex, imbricate, obovate, deciduous, yellow; stamens in 2 series, numerous; carpels oblong, 5. Fruits small; seed 1 – 3.

Flowering: March – April

Fruiting: April – June

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal); Myanmar, China, Vietnam.

Status: Not evaluated (IUCN 2022).

Uses: Mucilage found in the fruit. It is used to wash hair as shampoo and considered good for hair growth.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 19.07.2019, Mallick, et al. [Field No. 6838]

TETRACERA L. in Sp. Pl. 1: 533. 1753.

Tetracera sarmentosa (L.) Vahl. in Symb. Bot. 3: 70 1794. *Tetracera sarmentosa* ssp. *andamanica* Hoogland in Blumea 9: 588. 1959.

Scabrous branchlet, hairy when young but become glabrous later. Leaves leathery, very scabrous, some 4.1–12.2 × 2.3–5.2 cm in size; the abaxial surface glabrous, or only the veins pubescent; carpels and sepals are glabrous; petals are white 4.1–5.2 mm long. Fruit around 1.2 cm, thin and leathery pericarp, slightly bright when dry, black seed, fringed, enclosing the base.

Flowering: April – July

Fruiting: June – September

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (throughout); Vietnam, China, Myanmar, and Sri Lanka, Bangladesh.

Status: Not evaluated (IUCN 2022).

Uses: The root extract is used for treatment of rheumatism by the tribal people. The leaf extracts that have potential medical effects.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et. al. [Field No. 4697]

ORDER: VITALES

VITACEAE Juss. in Gen. Pl. 267. 1789 ('Vites').

AMPELOCISSUS Planch. in Vigne Amer. Vitic. Eur. 8: 371. 1884; *nom. cons.*

Ampelocissus sikkimensis (Lawson) Planch. in J. Vigne Amer. Vitic. Eur. 8: 375. 1884; Singh et al. Fl. Ind. 5: 317. 2000. *Vitis sikkimensis* Lawson in Hook. f. in Fl. Brit. Ind. 1(3): 650. 1875.

Woody lianas with terete branchlets, Stem glabrous, longitudinal ridges. Leaves simple; petiole glabrous, 6.3 cm; leaflets oval, cordate, 22 × 17 cm, basal veins 5, glabrous, veinlets inconspicuous adaxially, slightly prominent abaxially, base cordate, apex mucronate, margin finely toothed. Pedicel nearly glabrous 2.5 – 6.2 mm. Fruit berry globose, red, 2 seeded. Seeds oblong, apex subrounded, base rostrate.

Flowering: November – January

Fruiting: December – March

Local Distribution: Three MPCAs forest areas of North Bengal

General Distribution: India (Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa West Bengal); Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines and Turkmenistan.

Status: Not evaluated (IUCN 2022).

Uses: It is used as cooking materials.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 8456]

CAYRATIA Juss. in Cuvier, Dict. Sci. Nat. 10: 103. 1818; *nom. cons.*

Cayratia japonica (Thunb.) Raf. in Sylva Tellur. 87. 1838. *Cayratia japonica* (Thunb.) Gagnep. in Notul. Syst. (Paris) 1: 349. 1911. *Causonis japonica* Raf. in Med. Fl. 2: 122. 1830.

Herbaceous terete plant, ridges longitudinal; tendrils 2- or 7-furcate. Leaves pedately 7-8-foliolate; caducous stipules; leaflets with lateral veins 5–9 pairs; base cuneate, central leaflet elliptic-lanceolate to elliptic, acute to acuminate, dentate; lateral leaflets elliptic. Inflorescence axillary; calyx margin entire, cupular; petals triangular; anthers oval shaped. Fruit globose, berry .

Flowering: March – May

Fruiting: April – August

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal); Asia, Vietnam, China, Laos, Myanmar, and Sri Lanka, Bangladesh, Ind.

Status: Not evaluated (IUCN 2022).

Uses: The leaf extracts that have potential medical effects.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3698]

CISSUS L. in Sp. Pl. 1: 117. 1753.

Cissus quadrangularis L. in Syst. Nat. ed. 12(2): 124. 1767. *Cissus quadrangula* L. in Mant. Pl. 1: 39. 1767; Fl. Ind. 5: 288. 2000; Prain in Bengal Pl. 1: 338. 1963. *Cissus tetraptera* Hook. f. in Niger Fl. 263. 1849. '*Harjora*'.

Climber stem quadrangular, succulent; simple, tendrils stout. Leaves ovate, sometimes reniform, 4 – 9 lobed, apex acute-obtuse, base, truncate; margins denticulate, glabrous; stipules obtuse, broadly ovate. Flowers glabrous; petals ovate. Berries apiculate, globose, 1 – 3 seeded.

Flowering: June – November

Fruiting: July – January

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar and West Bengal); China, Bhutan, Bangladesh, Myanmar, Sri Lanka and Africa.

Status: Rare occurrence

Uses: It is mainly used for bone health and weight loss.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3498]

Cissus repens Lam. in Encycl. 1: 31. 1783; Grierson et Long in Fl. Bhutan 2(1): 159. 1991. *Cissus cordata* Roxb. in Fl. Ind. 1: 425. 1820. *Cissus glauca* Roxb. in Fl. Ind. 1: 406. 1820. *Vitis repens* (Lam.) Wight et Arnott in Prodr. Fl. Ind. Orient. 1: 125-126. 1834; Prain in Bengal Pl. 1: 338. 1963.

Woody terete Branchlet. Leaves undivided to slightly, simple, 3-lobed; petiole 7.8 cm; stipules oval, ovate-elliptic; lamina orbicular to ovate, 5.7 – 16.5 × 3.4 – 7.8 cm, basal veins 5 to 9, base margin with irregular teeth, cordate, undulate, apex acute to acuminate. Pedicel up to 9 mm. Buds apex rounded, oval. Calyx teeth inconspicuous; petals oval; anthers oval shaped. Disk undulately 5 lobed; ovary adnate, style conical, stigma slightly expanded, base slightly thick. Fruit berry.

Flowering: July – September

Fruiting: August – May

Local Distribution: Forest areas of North Bengal

General Distribution: India (Orissa, Maharashtra, West Bengal, Assam); Nepal, Bhutan, Laos, Cambodia and Malaysia.

Status: Vulnerable (IUCN 2017).

Uses: It is used for snake bites, rheumatic pain, and carbuncles in folk medicine

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3497]

LEE A D. Royen ex L. in Syst. Nat., ed. 12, 2: 608, 627; Mant. Pl. 1: 17, 124. 1767; *nom. cons.*

Leea asiatica (L.) Ridsdale in Bot. Hist. Hort. Malab. 189. 1980; Grierson et Long in Fl. Bhutan 2(1): 163. 1991. **Leea crispa** L. in Mant. Pl. 1: 124. 1767. **Leea herbacea** Buch.-Ham. in Trans. Linn. Soc. London 14(1):228-229. 1823; Prain in Bengal Pl. 1: 340. 1963. **Phytolacca asiatica** L. in Sp. Pl. 1: 441. 1753.

Erect shrubs. Branchlets with longitudinal ridges. Leaves pinnate; stipules large, obovate; lamina ovate-oblong, 45 – 60 × 32 – 50 cm, acuminate, margin dentate, base rounded. Flowers in compound corymbose-dichasial; bracts triangular; calyx tube cupulate; petals elliptic; stamens 5; ovary nearly globose. Berry oblate.

Flowering: June – August **Fruiting:** June – November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Eastern parts), Bhutan, China, Nepal, Myanmar, Thailand.

Status: Not evaluated (IUCN 2022)

Uses: The leaf extracts that have potential medical effects.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3639]

Leea aequata L. in Syst. Nat. (ed. 12) 2: 627. 1767; Grierson et Long in Fl. Bhutan 2(1): 149. 1991; Prain in Bengal Pl. 1: 340. 1963.

Trees, up to 5m long. Leaves 1 to 2 pinnate; stipules cuneate-lanceolate; leaflets elliptic-lanceolate, 6 – 24 × 3 – 7 cm, caudate acuminate, margin with irregular teeth. Inflorescence densely ferruginous, pubescent. Calyx tube cupulate, sepals triangular, glandular; petals elliptic, glabrous; stamens 5, anthers elliptic; ovary globose, stigma capitate. Berry oblate.

Flowering: April – June **Fruiting:** May – November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar and West Bengal); Bhutan, Nepal, Bangladesh, Malaysia, Myanmar,

Status: Abundant

Uses: The plants are used to treat dandruff hair shampoo.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3619]

Leea guineensis G. Don in Gen. Hist. 1: 712. 1831; Grierson et Long in Fl. Bhutan 2(1):163. 1991.

Small trees, glabrous. Leaves 2 to 3-pinnate; leaflets oval-elliptic, 6 – 18 × 2 – 7.5 cm, base cuneate, margin with acute teeth, apex acuminate. Flowers in compound dichasium. Calyx tube cupulate, glabrous, sepal triangular; Petals 5, elliptic; stamens 5; Berry subglobose.

Flowering: April – June

Fruiting: May – November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Nagar Haveli, Daman and Diu, Delhi, Goa, Gujarat, Karnataka, Haryana, Himachal Pradesh, Jammu and Kashmir, West Bengal); Bhutan, Nepal, Bangladesh, Malaysia and Myanmar,

Status: Common

Uses: It is used to wash hair as shampoo and considered good for hair growth.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3613]

Leea indica (Burm.) Merrill in Philipp. J. Sci. 14: 245. 1919; Grierson et Long, in Fl. Bhutan 2(1): 164. 1991. *Staphylea indica* Burm. in Fl. Ind. 75. 1768.

Small trees to shrubs, branches with longitudinal ridges, glabrous. Leaves 2 to 3-pinnate, glabrous; stipules obovate, apex rounded, glabrous; leaflets elliptic-lanceolate, 6 – 32 × 3 – 8.4 cm, base rounded, margin toothed. Flowers in compound dichasial or umbelliform. Involucre elliptic-lanceolate; petals elliptic; stamens 5, anthers elliptic; ovary globose.

Flowering: April – June

Fruiting: May – November

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Delhi, Goa, Gujarat, Karnataka, Haryana, Himachal Pradesh, West Bengal); Bhutan, Cambodia, Indonesia, Laos, Malaysia, Nepal, New Guinea.

Status: Least Concern (IUCN 2018)

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3928]

Leea macrophylla Roxb. ex Horn. in Hort. Bot. Hafn. 1: 231. 1813; Prain in Bengal Pl. 1: 341. 1963. *Leea robusta* Roxb. in Fl. Ind., ed. 1820. 2: 468. 1824.

Erect small trees, up to 4m long. Leaves 3 foliolate; stipules large and obovate; leaflets ovate, 32 – 60 × 28 – 50 cm, acuminate, margin dentate, base rounded. Inflorescences corymbose-ichasial. Calyx tube cupulate, petals elliptic; stamens 5, anthers elliptic; ovary globose, stigma capitate. Berry oblate.

Flowering: October – December

Fruiting: November – December

Local Distribution: Forest areas of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand and West Bengal); Bhutan, Nepal, Cambodia, Laos, Myanmar and Thailand.

Status: Not evaluated (IUCN 2022)

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 4879]

TETRASTIGMA (Miq.) Planch. in Candolle et Candolle in Monogr. Phan. 5: 320, 423. 1887.

Tetrastigma campylocarpum (Kurz) Planchon in Candolle et Candolle in Monogr. Phan. 5: 437. 1887; Grierson et Long in Fl. Bhutan 2(1): 156. 1991. *Vitis campylocarpa* Kurz in J. Asia. Soc. Bengal Pt. 2, Nat. Hist. 41: 302. 1872.

Woody lianas. Branchlets with longitudinal ridges; tendrils unbranched. Leaves palmately, 3-5 foliolate; leaflets obovate – elliptic, 8 – 16.4 × 5 – 8 cm, base cuneate; lateral leaflets rhombic-ovate. Flowers in compound dichasium, axillary. Calyx teeth inconspicuous, pubescent; petals galeate, pubescent; anthers ovoid; disk well developed; ovary cylindrical, stigma truncate. Berry elliptic, black.

Flowering: October – January

Fruiting: December – April.

Local Distribution: Forests of Terai and Duars.

General Distribution: India (Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland Orissa and West Bengal); Bhutan, China, Myanmar and Thailand.

Status: Rare occurrence

Uses: Uses in Ethnic / Tribal Medicine.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 78965]

Tetrastigma planicaule (Hook. f.) Gagnep. in Notul. Syst. (Paris) 1: 319. 1910; Grierson in Fl. Bhutan 2(1): 156. 1991. *Vitis planicaulis* Hook. f. in Bot. Mag. 94: t. 5685. 1868.

Robust woody lianas. Branchlets flat, with longitudinal ridges, glabrous; tendrils unbranched. Leaves 5-foliolate; leaflets elliptic-lanceolate, 9.5 – 15 × 2 – 6 cm, glabrous, base cuneate, teeth inconspicuous to fine. Inflorescence umbelliform, axillary. Calyx saucer-shaped; petals ovate-triangular, sparsely papillose; filaments filiform; disk well developed, 4-lobed; ovary coniform, stigma 4-lobed. Berry globose.

Flowering: April – June

Fruiting: May – July

Local Distribution: Forests of Terai and Duars

General Distribution: India (Sikkim, Assam, Arunachal Pradesh and West Bengal); Laos, Sri Lanka, Vietnam.

Status: Rare occurrence

Uses: Uses in Ethnic / Tribal Medicine.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 08.02.2019, Mallick, et al. [Field No. 1593]

Tetrastigma serrulatum (Roxb.) Planch. in DC. in Monogr. Phan. 5: 432. 1887; Hara et al. Enum. in Fl. Pl. Nepal 2: 95. 1979; Long et Ray in Grierson in Fl. Bhutan 2(1): 155. 1991. *Cissus serrulata* Roxb. in Fl. Ind. ed. Carey, 1: 432. 1820.

Slender, robust lianas. Branchlets with longitudinal ridges; tendrils biforked. Lateral leaflets base asymmetric, margin undulate with fine teeth, acuminate. Inflorescence umbelliform, axillary. Calyx minute, teeth inconspicuous; petals ovate-elliptic, glabrous; filaments filiform, oval; disk developed. Maturity berry purple-black, spheroid.

Flowering: March – August

Fruiting: May – November.

Local Distribution: Forest areas of North Bengal

General Distribution: Eastern India, Bhutan, Nepal, Myanmar and Thailand.

Status: Rare occurrence

Uses: Uses in Ethnic / Tribal Medicine.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 11.2.2018, Mallick, et al. [Field No. 1519]

EUDICOTS: Superrosids: Rosids: Fabids

CUCURBITALES Juss. in ex Bercht. and J. Presl, Prir. Rostlin: 236. 1820.

CUCURBITACEAE Juss. in Gen. Pl.: 393. 1789.

HODGSONIA Hook. f. in et Thom., Proc. Linn. Soc. London 2: 257. 1854.

Hodgsonia heteroclita (Roxb.) Hook.f. in et Thoms., Proc. Linn. Soc. London 2: 257. 1854; Grierson et Long in Fl. Bhut, 2(1): 263. 1991; Prain in Bengal Pl. 2: 516. 1903. *Trichosanthes heteroclita* Roxburgh in Fl. India, ed. 1832, 3: 705. 1832.

Climber, up to 29 m. Stem branches, glabrous. Petiole robust; lamina 17–27× 13–22 cm, both surfaces glabrous, leathery, mostly 5 – 7 lobed; base acuminate, truncate. Male peduncle glabrous, thick; bracts oblong-lanceolate, fleshy; thick, pedicels short, puberulent; calyx tube yellowish; segments lanceolate; corolla white inside, outside yellow, Female pedicels short, robust; ovary subglobose. Fruit reddish greenish.

Flowering: March – October

Fruiting: June – December

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal); Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines, Turkmenistan and Vietnam.

Status: Common

Uses: The fruit pulp of this plant traditionally used as antidiabetic.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 103751]

COCCINIA Wight et Arn. in Prodr. Fl. Ind. Orient. 1: 347. 1834.

Coccinia grandis (L.) Voigt in Hort. Suburb. Calcutt. 59. 1845; Hara et al. in Enn. Fl. Pl. Nep. 2: 177. 1979. *Bryonia grandis* L. in Mant. Pl. 126. 1767. *Coccinia cordifolia* Cogn. in Monogr. Phan. 3: 529. 1881. *Cephalandra grandis* Kurz in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2): 103. 1877.

Climbing herbs. Stem branched, slightly woody, slender. Tendrils simple, glabrous, filiform. Lamina broadly cordate, Petiolesslender; 7 – 11 × 4.3 – 11 cm, usually 5 lobed, obtuse, base with several glands. Flowers solitary, dioecious. Male pedicel slender; segments linearlanceolate, calyx-tube broadly campanulate; corolla white yellow, glabrous outside, pubescent inside, segments ovate; stamens 3, filaments and anthers connate, anthers subglobose. Female pedicel slender; ovary fusiform, stigmas 3. Staminodes 3, base villous. Fruits fusiform. Seeds oblong, yellow.

Flowering: January – December

Fruiting: December – February

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Rajasthan, Sikkim, Uttar Pradesh, Tripura, Uttarakhand, West Bengal); Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, Thailand, Philippines, Turkmenistan, Vietnam

Status: Not Evaluated

Uses: This plant used to treat leprosy, asthma, jaundice, bronchitis, burns, tongue sores, earache, indigestion, nausea, insect bites, and fever.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 103901]

DIPLOCYCLOS (Endl.) Post et Kuntze in Lex. Gen. Phan. 178. 1903.

Diplocyclos palmatus (L.) Jeffrey in Kew Bull. 15: 352. 1962 ; Grierson et Long in Fl. Bhu. 2(1): 255. 1991. *Bryonia palmata* L. in Sp. Pl. 1012. 1753, excl. syn. *Bryonia laciniosa* L. in Sp. Pl. 1013. 1753. *Ilocania pedata* Merr. in Philipp. J. Sci. 13(1): 65-66. 1918.

Monoecious climbing herbs, tuberous; stems tendrils 2 – fid, slender. Lamina deeply 7 lobed, denticulate, scabrous upper surface, smooth lower. In male flowers corolla greenish-yellow, shortly papillose, campanulate,. Female flowers fasciculate, ovary subglobose. Fruits green spherical.

Flowering: August – November

Fruiting: February – March

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Assam, Bihar Sikkim, Tripura, West Bengal); Nepal, Bhutan.

Uses: Used against heart, blood and liver disorders.

Status: Least Concern (IUCN).

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 189889]

LUFFA Mill. in Gard. Dict. Abr., ed. 4, [806]. 1754

Luffa cylindrica (L.) Roem. in Fam. Nat. Syn. Monogr. 2: 63. 1846. *Momordica cylindrica* L. in Sp. Pl. 2: 1009. 1753. *Momordica luffa* L. in Sp. Pl. 1009. 1753. *Luffa pentandra* Roxb. in Fl. Ind. Ed. 1832, 3: 712. 1832; Dyer in Hook. f. in Fl. Brit. Ind. 2:614. 1879; Grierson et Long in Fl. Bhu. 2(1): 256. 1991; Prainin Bengal Pl. 2: 520.1903.

Annual climber; stem sulcate-angular, puberulent, scabrous. Tendrils usually 2 to 4 fid, rather robust. Lamina suborbicular/triangular, 11 – 19 × 11– 17 cm, often palmately 4 – 8 lobed, dentate, acute, base cordate lobes, triangular. Male flowers raceme, calyx campanulate, segments acuminate, lanceolate to ovate, 3 nerved; corolla rotate, segments oblong, yellow; stamens usually 5, later free. Female flowers solitary; ovary cylindrical, stigmas 3. Fruit cylindrical.

Local Distribution: Throughout the forests of North Bengal

General Distribution: India (West Bengal; Darjeeling, Sikkim, Uttar Pradesh, Assam, Bihar); Nepal, Bhutan, Sri Lanka, Malaysia.

Flowering: January – June

Fruiting: August – December

Status: Not evaluated

Uses: Used for treating sores and swelling.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 117889]

Luffa acutangula (L.) Roxb. in Fl. Ind. ed. 1832 3: 713. 1832; Grierson et Long in Fl. Bhutan 2 (1): 256. 1991. *Cucumis longus* var. *indicus* Grew in Mus. Reg. Soc. 229. 1681. *Luffa foetida* Cavanilles in Icon. 1: 7. 1791. *Momordica tubiflora* Wallich in List 6749. 1832. *Luffa acutangula* (L.) Roxburgh in Hort. Bengal 70. 1814. *Cucumis acutangulus* L. in Sp. Pl. ed. 1: 1001.1753.

Annual climber herb; stem pubescent, angular, sulcate. Lamina membranous, 14 – 21 × 14 – 22 cm, palmately 4 – 9 lobed, acute, triangular, dentate. Male flowers raceme; calyx campanulate, acuminate, segments lanceolate, slightly reflexed; corolla rotate, yellow, subglabrous, segments obcordate; stamens free, 3, anthers puberulent. Female flowers solitary; style short, ovary terete, stigmas 3. Fruits ribbed, cylindrical.

Flowering: February – July

Fruiting: September – November

Local Distribution: Forests of the MPCAs.

General Distribution: India (West Bengal, Sikkim, Assam, Bihar); Nepal, Bhutan, Myanmar and Sri Lanka.

Status: Common

Uses: Luffa is taken for treating and preventing colds

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 107689]

MOMORDICA L. in Sp. Pl. 2: 1009. 1753.

Momordica charantia L. in Sp. Pl. 1: 1009. 1753; Dyer in Hook. *f.* in Fl. Brit. Ind. 2: 616.1879; Grierson et Long in Fl. Bhutan 2(1): 252. 1991; Prain in Bengal Pl. 2: 522. 1903. *Momordica indica* L. in Herb. Amb. 24. 1754.

Annual branched climber. Tendrils 18 – 24 cm, simple. Petiole slender. Lamina ovate, membranous, suborbicular, 5 – 11 × 5 – 10 cm, lobes oblong, margin acute, irregularlylobed, nerves palmate. Male flowers solitary, pedicel slender; calyx acute, ovate-lanceolate; corolla obovate, yellow; stamens 3. Female flowers solitary; stigmas expanded, bifid, ovary fusiform. Fruits cylindrical, orange. Seeds oblong, numerous.

Flowering: January – December **Fruiting:** February – December

Local Distribution: Marginal area of three MPCAs of North Bengal

General Distribution: India (Arunachal Pradesh, Assam, Chhattisgarh, Delhi, Gujarat, Karnataka, Himachal Pradesh, West Bengal); Tropical and sub-tropical parts of the world.

Uses : Treating gastro-intestinal disorders.

Status: Common

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 103099]

Momordica cochinchinensis (Lour.) Spreng. in Syst. Veg. 3: 14. 1826. *Momordica macrophylla* Gage in Rec. Bot. Surv. India iii. 61. *Momordica mixta* Roxb. in Hort. Ben. 70. 1814. *Momordica ovata* Cogn. in Handl. Fl. Ned. Ind. i. ii. 595. 1890.

Climber, up to 15 m tall, perennial, robust; stem and branches glabrous or puberulent, sometimes tomentose at nodes. Leaves simple, alternate, spiral; petiole 5 – 10 cm, robust, slightly yellow–brown pubescent or glabrescent; lamina 10 – 20 × 10 – 20 cm.

Male flowers solitary; pedicels 3 – 5 cm, robust; bracteate at apex; bract 3 – 5 × 5 – 8 cm, orbicular–reniform; calyx tube funnellform; segments 1.2 – 2 × 0.6 – 0.8 cm, broadly lanceolate or oblong; segments 5 – 6 × 2 – 3 cm, ovate–oblong. Female flower solitary; pedicel 5 – 10 cm, bracteate at middle; bract 0.2 cm; calyx and corolla as in male flowers; ovary ovoid–oblong 1.5 cm, densely spinescent. Fruit red, ovoid, densely spinescent, apex rostellate. Seeds numerous.

Flowering: July – September

Fruiting: September – December

Local distribution: Throughout the forest area of terai and duars.

General distribution: India (Assam, Sikkim, West Bengal, Bihar, UP, MP, Nagaland); Nepal, Bhutan, Bangladesh and Sri Lanka.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4152]

MUKIA Arn. in Madras Jour. Lit. Sci. 12: 50. 1840.

Mukia maderaspatana (L.) Roem. in Fam. Nat. Syn. Monogr. 2: 47. 1846; Grierson et Long in Fl. Bhutan 2(1): 258. 1991. *Cucumis maderaspatana* L. in Sp. Pl. 1012. 1753. *Bryonia scabrella* L. f. in Suppl. Pl. 424. 1781. *Mukia scabrella* (L. f.) Arn. in Jour. Bot. (Hook.) 3: 276. 1841.

Annual climber, densely yellow. Stems branched. Tendrils simple. Lamina ovate to cordate, usually 4 – 6 lobed, 6 – 11 × 6 – 9 cm, slightly obtuse, base cordate, irregularly denticulate. Male flowers pedicels short, fascicled; calyx campanulate, reflexed, segments subulate; corolla yellow, apex obtuse, segments ovate; stamens 3, filaments short, anthers oblong, ciliate, connective distinct, slightly pilose; ovary globose. Female flowers solitary. Fruit globose dark brown.

Flowering: June – December.

Fruiting: February – March

Local Distribution: Throughout the forests of North Bengal

General Distribution: India (West Bengal, Sikkim, Arunachal Pradesh, Assam, Bihar); Nepal, Myanmar, Bhutan, Sri Lanka.

Uses: Treating anaemia and joint problems.

Status: Common

Specimen Examine: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 109]

TRICHOSANTHES L. in Sp. Pl. 2: 1008. 1753.

Trichosanthes cordata Roxb. in Fl. Ind. 3: 703. 1832; Grierson et Long in Fl. Bhutan 2 (1):265. 1991. *Involucraria cordata* (Roxb.) Roem. in Fam. Nat. Syn. Monogr. 2: 97. 1846. *Trichosanthes microsiphon* Kurz in J. Asiat. Soc. Bengal in Pt. 2, Nat. Hist. 308. 1872.

Stem angular. Lamina broadly cordate, ovate, 7 – 22 × 8 – 19 cm, denticulate, apex acute to acuminate, base cordate. Male flowered raceme, 5 to 9; peduncle striate, stout, sparsely puberulent; bracts oblong, pedicels thick; sepals linear. Female flower solitary, puberulent. Fruit globose, red, smooth.

Flowering: April – October

Fruiting: August – December

Local Distribution: Three MPCA's of North Bengal

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Malaysia, Myanmar and Singapore.

Uses: Immunity booster and weight loss.

Status: Common

Specimen Examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 103909]

Trichosanthes lepiniana (Naudin) Cogn. in DC. in Monogr. Phan. 3:377. 1881; Ohashi in Hara in Fl. E.Himal. 1: 325. 1966; Grierson et Long in Fl. Bhu. 2(1): 266. 1991. *Involucraria lepiniana* Naudin in Cat. 2. 1868. *Trichosanthes palmata* Roxb. in Fl. Ind. 3: 704. 1832; Dyer in Hook. f. in Fl. Brit. Ind. 1: 606. 1879.

Stem branched, glabrous, robust. Lamina suborbicular, 8 – 16 cm, shortly 4 – 6 lobed, adaxially rough, deep green, acute to shortly acuminate, base cordate, denticulate. Male flower raceme 11 – 15 cm; peduncle striate; bracts suborbicular; calyx puberulent; sepals ovate. Female flowers solitary; bracts ovate; ovary glabrous, ovate. Fruit ovoid, red.

Flowering: February – July

Fruiting: August – October

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa and Gujarat); Bhutan, Nepal and Bangladesh.

Status: Common

Uses: Treating Boils and Piles.

Specimen Examined : West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 103679]

Trichosanthes tricuspidata L. in Fl. Cochinch. 529. 1790. *Anguina angulata* (Lam.) Kuntze. In Revis. Gen. Pl. 1: 254. 1891.

Climbers; stems robust, branched, angular–striate, grooved, glabrous; branches sulcate. Leaves simple, alternate, spiral; petioles 3–10 cm long; lamina 5–25 × 6–17 cm, palmately 3–5–lobed, suborbicular, base cordate, acuminate at apex, margin denticulate; tendrils 2–3–fid. Inflorescences in racemes; Flowers 5–10; Male flower: peduncles ca. 15–30 cm long; bracts villous; calyx tube 4.5 cm long, attenuated; corolla 5–lobed, papillose; staminal filaments 0.1–0.2 cm long. Female flowers axillary, solitary; bracts fimbriate. Berries 5–7 cm, red with 10 longitudinal orange streaks, globose. Seeds 1.2 × 0.6 cm, ovate–oblong, smooth on both surfaces.

Flowering: April – July

Fruiting: June – August

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: Throughout India; Nepal, Bhutan, Bangladesh, Sri Lanka and Myanmar.

Uses: Plants is used to treat Boils and Piles.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3776]

ZANONIA L. in Sp. Pl. 2: 1028. 1753.

Zanonia indica L. in Syst. Nat. ed. 10, 2: 1292. 1759. *Zanonia indica* var. *angustifolia* Cogn. in Monogr. Phan. 3: 927. 1881. *Zanonia indica* var. *pubescens* Cogn. in Monogr. Phan. 3:927. 1881.

Stem robust, branched, sulcate, glabrous. Leaves glabrous; leaf blade ovate–oblong 8 – 14 × 5 – 12 cm, leathery, abaxially with distinct reticulate veins, lateral veins 3 or 4 pairs, margin entire, apex acute; petiole 1.5 – 3.5 cm, glabrous. Male peduncle slender; rachis 16.5 cm, much branched; pedicel robust, 4.2 – 5 mm, with articulation; calyx segments ovate–triangular 2 mm, glabrous, apex acute; corolla pale yellow–brown; segments oblong, 3 – 3.5 × 1 – 1.5 mm, apex obtuse. Female peduncle 10–30 cm, sparsely 5 – 10–flowered; pedicels thick; calyx segments 4 mm, apex obtuse; corolla

segments 6–8 mm; ovary obconic–cylindric, 10 – 12 mm. Fruit brownish, finely granulate, base obtuse, apex truncate. Seeds oblong.

Flowering: April – May

Fruiting: June – October

Local Distribution: Inside the core forest area of Terai and duars.

General distribution: India (Assam, Nagaland, West Bengal, Tripura); Nepal, Bhutan and Bangladesh.

Status: Common

Uses: Ayurvedic plant helpful to treat cuts and wounds.

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al [Field No. 4312]

BEGONIACEAE Agardh in Aphor. Bot. 200 (1824), *nom. cons.*

BEGONIA L. in Sp. Pl. 2: 1056. 1753.

Begonia ovatifolia A. DC. in Ann. Sci. Nat., Bot., ser. 4, 11: 132. 1859. *Begonia subovata* Wall. in Numer. List 129: no. 3683. 1831.

Small, green, tuberous, herbs, up to 20 cm high, monoecious. Stipules lanceolate, glabrous, deciduous, ca 2 × 1 mm. Leaves glabrous or sparsely puberulent, ovate to broadly ovate, basifixed, base shallowly cordate or rounded, 3–11 × 3–8 cm, slightly asymmetric to symmetric, apex shortly acuminate. Inflorescence cymose, axillary or terminal, few; peduncle glabrous, branching 2–3 times. Male flower deep pink to white, glabrous, tepals 4. Female flower white to pink, glabrous, pedicel 4–6 mm long, tepals 2–4, unequal. Fruit pendulous, ellipsoid, 6–12 × 2–6 mm, glabrous; wings extending along the pedicel slightly.

Flowering: June – August

Fruiting: July – October

Local Distribution: Hilly slopes of Sevoke, Teesta valley, Darjeeling.

General Distribution: India (Arunachal Pradesh, Meghalaya, Nagaland and West Bengal); Nepal, Sikkim, Bhutan.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 11.06.2019, Mallick, et al. [Field No.6667]

FABALES Bromhead, 1838.

FABACEAE Rchb. *f.* in Consp. Regni Veg. 149. 1828.

ABRUS Adanson in Fam. Pl. 2: 327, 511. 1763.

Abrus pulchellus Wall. ex Thwaites in Enum. Pl. Zeyl. 91. 1859. Grierson et Long in Fl. Bhu. 1(3): 665. 1987; Prain in Bengal Pl. 1: 369. 1903. “**Kuch**”

Slender climbing lianas. Leaves alternate, paripinnate; leaflets 7 – 11 paired, opposite; blades suboblong to oblong, 0.5 – 3.5 × 0.3 – 1 cm, base subcordate, truncate. inflorescence axillary. Flowers dense; campanulate calyx, 5 toothed; corolla; stamens 11. Legumes oblong, Fruit, dehiscent 4 – 9 seeds. Seeds greenish brown.

Flowering: April – August **Fruiting:** June – November

Local Distribution: Subtropical forests of three MPCAs of North Bengal

General Distribution: India (Bihar, Arunachal Pradesh, Sikkim, West Bengal), Bhutan, Bangladesh, Sri Lanka, Nepal, Myanmar, Malaysia, Philippines Vietnam.

Status: Not Evaluated (IUCN)

Uses: Juice extracted from the stem is applied to treat coughs.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.8975]

Abrus precatorius L. in Syst. Nat., ed. 12, 2: 472. 1767; Grierson et Long in Fl. Bhu. 1(3): 665. 1987; Prain in Bengal Pl. 1: 369. 1903. *Glycine abrus* L. in Sp. Pl. 2: 753. 1753. ‘**Lalkunch**’

Large, slender, climbing, lianas. Leaves with paripinnate; leaflets 10 – 14 paired, opposite; blades oblong, 1.5 – 2.5 × 0.4 – 0.7 cm, base truncate, rounded. Inflorescence axillary, racemes. Flowers small; calyx campanulate, sepals 5; corolla purple; wings narrower; stamens 11. Fruit oblong, legumes, 2 – 7 seeded.

Flowering: March – July **Fruiting:** June – August

Local Distribution: MPCAs grass land area of North Benagl plains.

General Distribution: Widespread in the tropical India; tropical Asia and Africa.

Status: Common

Uses: Plant is used for traditional medicine to treat wounds caused by dogs, cats and mice.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.3218]

ACACIA Mill. in Gard. Dict. Abr., ed. 4, [25]. 1754; *nom. cons.*

Acacia catechu (L. f.) Willd. in Sp. Pl. 4: 1079. 1806. Grierson et Long in Fl. Bhutan 1(2): 642. 1984; Prain in Bengal Pl. 1: 458.1903. *Mimosa catechu* L. f. in Suppl. Pl. 439. 1782. '*Khayer*'

Deciduous, small trees, 8 – 11 m. hooked spines with stipules; pinnae 17 – 29 pairs; leaflets 32 – 49 pairs, linear, 2 – 7 × 1 – 1.7 mm. Spikes axillary, 1 – 5. Flowers white to greenish; calyx campanulate; petals lanceolate; ovary glabrous. Legume broad, dehiscent, apex rostrate. Seeds 3 – 12.

Flowering: April – July **Fruiting:** June – August

Local Distribution: All over the forest areas of North Bengal

General Distribution: Throughout India; Bhutan, Bangladesh, Pakistan, Sri Lanka, Myanmar.

Status: Rare Occurrence

Uses: This plant used to treat throats infection and diarrhoea.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.9874]

Acacia pennata (L.) Willd. in Sp. Pl. 4: 1090. 1806; Grierson et Long in Fl. Bhutan 1(2): 641. 1984; Prain in Bengal Pl. 1: 458.1903. *Mimosa pennata* L. in Sp. Pl. 1: 522. 1753.

Large climbers, scattered prickles; stipules cuspidate, lanceolate; petiolar glands subpulvinate; pinnae 12 – 19 pairs; leaflets 40 – 55 pairs, linear, crowded, 5 – 11 × 0.7–1.7m, ciliate, base truncate, asymmetric, sharply acute. Inflorescence globose, solitary fasciculate, arranged in axillary panicles; calyx campanulate. Ovary puberulent. Legume 13 – 17 × 2 – 5.2 cm. Seeds black, elliptic, 8 – 17.

Flowering: March – June **Fruiting:** April – July

Local Distribution: All over the forest areas of North Bengal

General Distribution: Throughout India; Bhutan, Sri Lanka, Cambodia, Myanmar, Thailand and Vietnam.

Status: Rare Occurrence

Uses: This plant used to treat as throats and diarrhoea

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.1489]

ALBIZIA Durazz. in Mag. Tosc. 3(4): 13. 1772.

Albizia chinensis (Osbeck) Merr. in Amer. J. Bot. 3: 575. 1916. Grierson et Long in Fl. Bhutan 1(2): 646. 1984; Prain in Bengal Pl. 1: 461.1903. *Mimosa chinensis* Osbeck, Dagb. in Ost. Ind. Resa, 233. 1757. '**Kalo-seeris**'

Large deciduous, trees, 25 – 32 m. Stipules large, cordate, deciduous;; pinnae 5 – 14 pairs; leaflets 27 – 32 pairs, sessile, linear, oblong, base ciliate, subtruncate, apex acuminate. Heads 12 – 21 flowered. Flowers greenish white, dimorphic; calyx tube shaped, 5 toothed; stamens longer than corolla; ovary yellowish reddish, Legume indehiscent. Seeds flat, elliptic.

Flowering: March – April **Fruiting:** June – December

Local Distribution: Forests area of three MPCAs lower hills of Darjeeling.

General Distribution: Throughout India (Bihar, Assam, West Bengal, Sikkim) ; South and Southeast Asia.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.8792]

Albizia lebbeck (L.) Benth. in London J. Bot. 3: 87. 1844. Grierson et Long in Fl. Bhutan1(2): 646. 1984; Prain in Bengal Pl. 1: 461.1903. *Mimosa lebbeck* L. in Sp. Pl. 1: 516. 1753.

Small, deciduous, trees, 12 – 17 m; pinnae 2 – 7 pairs; leaflets 4 – 11 pairs, elliptic to slightly oblong, 2 – 7 × 1 – 3.2 cm, base oblique, retuse. Corymbs 27 – 43 flowered. Flowers fragrant, dimorphic; calyx funnel, short teeth; corolla yellowish green; lobes ovate; stamens white yellow; tube short; ovary sessile, glabrous. Legume straw yellow colored,

Flowering: March – June **Fruiting:** April – December

Local Distribution: All over the forest areas of North Bengal

General Distribution: Throughout India; native to tropical Africa.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.8796]

Albizia odoratissima (L. f.) Benth. in London J. Bot. 3: 88. 1844. Grierson et Long in Fl. Bhutan 1(2):644. 1984; Prain in Bengal Pl. 1: 461.1903. *Mimosa odoratissima* L. f. in Suppl. Pl. 437. 1782. '**Sada Siris**'

Evergreen small trees, 18 – 24 m. Leaf glands 3.4 cm above base of petiole; pinnae 3 – 5 pairs; leaflets sessile, 7 – 17 pairs, obtuse, sometimes mucronate, oblong. Inflorescence panicles. Flowers dimorphic, yellowish green; calyx cupslike; corolla tube-like; lobes lanceolate; staminal tube long. Ovary tomentose, superior. Legume compressed, oblong. Seeds 8 – 16.

Flowering: May – August **Fruiting:** June – September

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Assam, Bihar, Tripura, Sikkim, West Bengal) Bangladesh, Nepal, Thailand, Laos, Sri Lanka, Vietnam.

Status: Common

Uses: It is used as folk medicine to treat various inflammatory pathologies.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.8798]

Albizia procera (Roxb.) Benth. in London J. Bot. 3: 89. 1844. Grierson et Long in Fl. Bhutan 1(2): 645.1984; Prain in Bengal Pl. 1: 461.1903. *Mimosa procera* Roxb. in Pl. Corom. 2: 12. 1799. '*Kalosiris*'

Deciduous small trees, 12 – 17 m. Leaf petiole oblong 1 – 2.2 cm above base; pinnae 4 – 7 pairs; leaflets 5 – 13 pairs, ovate, 3 – 7 × 1 – 3 cm, base oblique, obtuse. Heads 24 flowered, axillary. Flowers uniform; calyx 2.3 – 3.4 mm; corolla yellow, lobes lanceolate; staminal tube long; ovary subsessile and glabrous. Fruits legum. Seeds minute, countable.

Flowering: May – June **Fruiting:** July – August

Local Distribution: Forests of the MPCAs.

General Distribution: India (Bihar, Orissa, Jharkhand, West Bengal); Bangladesh, Laos, Nepal, Sri Lanka, Thailand and Vietnam.

Status: Common

Uses: It is used as folk medicine to treat various inflammatory pathologies.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No.8798]

BAUHINIA L. in Sp. Pl. 1: 374. 1753.

Bauhinia scandens L. in ILDIS, record 43567. 2010; *Bauhinia anguina* Roxb. in ILDIS, record 43567. 2010; Ben. Pl. 1: 441. 1903. '*Ganda Gila*'

Lianas, woody, large. Branches ap-planate, cylindrical when young, puberulent later glabrous; tendrils puberulent, in pairs. Stipules caducous; petiole slender; leaf blade broadly ovate to ovate 5.3 – 9.1 × 4.2 – 8.3 cm, both surfaces glabrous, base truncate to shallowly cordate, apex bifid to more than 1 – 2 in sterile or juvenile branches, entire on flowering branches. Inflorescence many flowered, raceme elongated, 10.3 – 15.1 cm, or several joined in a panicle, terminal 15.1–25.3 cm, puberulent; linear bracts and bracteoles. Pedicel slender 3.1 – 4.3 mm. Flower buds apex open, ovoid; calyx lobes triangular 5, out-side pubescent; petals subequal, white, oblanceolate to obovate, shortly clawed 3 mm; fertile stamens 3, glabrous filaments, staminodes 2. Floral disk swollen, fleshy; ovary oblique, shortly stalked, glabrous; stout style; stigma small. Legume oblong to rhombic. Seeds 1 or 2, ellipsoid to obovoid–orbicular.

Flowering: October – November **Fruiting:** December – January

Local Distribution: Subtropical forests area throughout the North Bengal

General Distribution: Throughout India; Bangladesh, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam.

Status: Common

Uses: Juice extracted from the stem is applied to treat coughs.

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 5873]

Bauhinia vahlii Wight and Arn. in ILDIS, record 43567. 2010; Prain in Ben. Pl. 1: 441. 1903. '*Chihurlata*'

Evergreen gigantic climber; height of 10–30 m, branchlets terminating often in a pair of revolute tendrils; branches young, petioles and leaves present beneath, along the nerves especially, grey–velvety or densely rusty. Lamina deeply cordate, often up to 18.2 inches across, very variable in size, cleft through about a third of the length 11 – 15 nerved, sub–coriaceous, glabrescent and dark–green above, downy beneath more or less; lobes rounded, obtuse; petiole stout 3.2 – 6.3 in. long. Flowers white in corymbose racemes or terminal corymbs; pedicels slender 1.2 – 2.4 cm. long, with a pair of small bracteoles above the middle and a lanceolate caduceous bract at the base, all densely woolly. Flowers when old turn yellow 7 staminodes and 3 fertile stamens. Pod woody and flat with rusty hairs.

Flowering: March – May **Fruiting:** June – July

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Jammu and Kashmir, Punjab, Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal Pradesh, Bihar, Assam and Madhya Pradesh); Nepal, Bhutan.

Status: Common

Uses: Tonic and aphrodisiac seeds and demulcent and mucilaginous leaves.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 02.08.2018, Mallick, et al. [Field No. 3707]

Bauhinia racemosa Lam. in Encycl. 1(2): 390. 1785; Vahl. in Symb. Bot. 3: 56, Pl. 62. 1794; Prain in Ben. Pl. 1:441. 1903. '**Banraji, Banraj**'

Large deciduous trees. Bark rough, blackish; branches spreading or pendulous, slender, glabrous, zigzag. Stipules caducous; petiole 0.7 – 1.3 cm; lamina leathery, broadly orbic-ular, 7 – 9-veined 1.4 – 4.2 × 2.1 – 6.2 cm, adaxially glabrous, abaxially glabrous or pubescent, apex bifid to 1/3, base cordate, lobes rounded at apex. Inflorescence 20-flowered, a terminal or lateral raceme; peduncle short; linear bracts and bracteoles. Flower buds puberulent, obovoid, apex protruding. Hypanthium short, turbinate; calyx split spathaceously at anthesis; petals subequal, yellowish 8.2 – 10.4 mm, oblanceolate, subsessile. Fertile stamens unequal 10; anthers 3.2 mm, small; filaments 6.3 – 7.1 mm.; ovary glabrous, stalked; stigma small, peltate, subsessile. Legume linear-cylindric, valves glabrous, woody. Seeds ellipsoid.

Flowering: April – May

Fruiting: June – August

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Throughout); Myanmar, China, Cambodia, Vietnam.

Status: Common

Uses: Used in the treatment of headache, fever, skin diseases, blood diseases, dysentery and diarrhea.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3578]

Bauhinia purpurea L. in Sp. Pl. 1: 375. 1753; Prain in Ben. Pl. 1: 442. 1903. *Bauhinia purpurea* var. *violacea* (Corner) de Wit. in *Reinwardtia* 3: 409. 1956. '**Dev Kanchan**'

Erect shrubs or trees. Bark thick, dark to grayish brownish, smooth; branches when young puberulent, later glabrous. Petiole 3.2 – 4.5 cm; lamina 10.3 – 15.2 × 9.4 – 14.2 cm, suborbicular, abaxially almost glabrous, stiffly papery, primary veins 9 – 11,

adaxially glabrous, higher order and secondary veins protruding, apex bifid to 3 – 2, base shallowly cordate, lobes rarely rounded or slightly acute at apex. Inflorescence a panicle with up to 20 flowers or a raceme with few flowers, terminal or axillary. Flower buds 4 – 5–ridged, fusiform, with an obtuse apex. Pedicel 7.1 – 12.3 mm.; calyx one with 3 teeth and other 2–toothed, open as a spathe into 2 lobes; petals clawed, light pink 4.2 – 5.4 cm, oblanceolate; fertile stamens 3, filaments of same length as petals; staminodes 5 or 6, 7 – 10 mm; ovary velvety, stalked, stigma slightly peltate, enlarged; style curved. Legume flat, linear.

Flowering: September – November

Fruiting: February – March

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Pakistan, Bangladesh, Nepal, Myanmar.

Status: Least Concern (IUCN).

Uses: This plant stem is used internally and externally for fractured bones.

Specimen Examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 3797]

Bauhinia malabaricum Roxb. in Hort. Ben. 31. 1814. *Bauhinia malabarica* var. *reniformis* Royle ex Baker in Fl. Brit. Ind. 2: 277. 1878.

Plant deciduous trees, to 15.7 m high, bark 10.1 – 15.4 mm thick, brown, rough, fibrous, Leaves simple, bilobed, alternate; stipules small, free, lateral, caudicous; petiole 25.3 – 30.5 mm long, slender, glabrous, swollen at tip and base; lamina 5.1 – 10 × 7.3 – 12.7 cm, base cordate, apex obtuse, margin entire, glabrous above, coriaceous; 9 – 11 nerves from the base, palmate. Flowers bisexual 6.1 – 8.3 mm across, cream coloured; pedicels slender, 2.6 cm; calyx tube long, thin, pubescent with 5 short lobes; petals 5, oblong; stamens 10, all fertile, anthers versatile; ovary inferior, stipitate; ovules many; style filiform; stigma peltate. Fruit 25.4 – 30.1 × 1.5 – 2.6 cm.

Flowering: September – December

Fruiting: January – March

Local Distribution: All over the forest area of North Bengal

General Distribution: Pakistan, India (Assam, Madhya Pradesh, Orissa, Maharashtra); Bangladesh, Nepal, Myanmar, Cambodia, Philippines, Thailand, Vietnam and Australia.

Status: Common

Uses: Fruits are edible and commonly used for cough, glandular swellings and goitre.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 4893]

Bauhinia variegata L. in Sp. Pl. 1: 375. 1753. *Bauhinia variegata* var. *alboflavade* Wit in Reinwardtia 3(4): 412–413. 1956. *Bauhinia variegata* var. *candida* Buch.-Ham. in Trans. Lin. Soc. London 13(2): 497. 1822. *Bauhinia variegata* var. *candida* Voigt in Hort. Suburb. Cal. 253. 1845.

Medium sized, deciduous trees. The leaves 10 – 20 cm obcordate shaped, long and broad, rounded, and bilobed at the base and apex. Flowers conspicuous, bright pink or white 8 – 12 cm diameter, with five petals. Pollens elongated, approximately 75 microns in length. Fruit is a seedpod 15 – 30 cm long, containing several seeds.

Flowering: January – March

Fruiting: March – May

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal); China, Bhutan, Nepal, Myanmar, Vietnam and Thailand.

Status: Common

Uses: The bark and roots are reported to be an astringent and tonic, and it used for the treatment of diarrhoea.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 78924]

BUTEA Roxb. ex Willd. in Sp. Pl. 3: 857, 917. 1802, nom. cons.

Butea monosperma Kuntze in Revis. Gen. Pl. 1: 202. 1891. *Butea monosperma* (Lam.) Taub. in Nat. Pflanzenfam. 3(3): 366. 1894.

Perennial, small trees. Stem erect. Petioles robust, 9–19 cm; leaflets broadly ovate to elliptic, 19 – 40 × 9 – 40 cm, secondary veins 10 – 12 pairs, veins distinct abaxially, truncate, acute. Racemes robust, much flowered. Calyx green, 6 – 9 mm long. Corolla orange-red. Legumes narrowly elliptic, 5 – 11 × 2 – 3 cm, brownish tomentose.

Flowering: January – March

Fruiting: February – May

Local Distribution: All over the forest

General Distribution: India (Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, West Bengal); China, Bhutan, Nepal and Pakistan, Myanmar, Vietnam and Thailand.

Status: Common

Uses: The bark and roots are reported to be an astringent and tonic, and it used for the treatment of diarrhoea.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3587]

CAESALPINIA L. in Sp. Pl. 1: 380. 1753..

Caesalpinia cucullata Roxb. in Fl. Ind., ed. 1832, 2: 358. 1832. Hook. f. in Fl. Brit. Ind. 2(4): 274.1878; Grierson et Long in Fl. Bhutan 1(3): 623. 1987; Prain in Bengal Pl. 1: 447.1903. '*Bhainse Kanta*'

Climbers, spiny, up to 5 m. Lamina 3 – 6 pairs, petiolate; estipulate. Leaflets 4 – 8 pairs, ovate 3 – 7.7 × 2.7 – 4.4 cm, leathery, base cuneate, acuminate, rounded. Inflorescence racemes. Receptacle deeply discoid; sepals 5, unequal; petals yellowish red, oblong, glabrous; stamens 12, exserted; stigma truncate, style slender. Fruit reddish yellow, elliptic, winged ventral.

Flowering: January – August

Fruiting: March – December

Local Distribution: All over the forest

General Distribution: India (throughout); Bhutan, Indonesia, Malaysia, Myanmar, Thailand and Vietnam.

Status: Common

Uses: The bark and roots are reported to be an astringent and tonic, and also used for the treatment of diarrhoea.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 9635]

CASSIA L., Sp. Pl. 1: 376. 1753; *nom. cons.*

Cassia fistula L. in Sp. Pl. 1: 377-378. 1753; Prain in Ben. Pl. 1: 437. 1903. *Cassia fistuloides* Collad. in Hist. Nat. Med. Casses 87, t. 1816. '*Bandar Lathi*'

Deciduous trees. Leaves with 3 or 4 pairs of leaflets, 30.3–40.1 cm; leaflets broadly ovate or ovate–oblong, adaxially shiny, leathery, 8.4–13.2 × 4.3–8.1 cm, both surfaces when young puberulent, glabrous when mature, apex acute, base broadly cuneate. Racemes axillary, lax, many flowered, pendent; flowers 3.4–4.2 cm in diam. Pedicels slender; sepals narrowly ovate, reflexed at anthesis; petals subequal, broadly ovate, golden yellow, shortly clawed; stamens 10, anthers exceeding petals, reduced stamens with minute anthers, 4 short with straight filaments; ovary strigulose, stalked;

stigma small. Legume blackish brown, pendulous, sausage-shaped, terete. Seeds elliptic, numerous, glossy brown.

Flowering: April – June

Fruiting: July – December

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Andhra Pradesh, Assam, Kerala, Bihar, Madhya Pradesh, odisha, Maharastra, Uttar Pradesh); Bangladesh, Myanmar, Nepal, Sri Lanka.

Status: Least Concern (IUCN).

Uses: Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2019, Mallick, et al. [Field No. 3301]

Cassia javanica ssp. *nodosa* (Buch.-Ham. ex Roxb.) K. Larsen and Larsen in Nat. Hist. Bull. Siam Soc. 25(3–4): 205. 1975; Grierson et Long in Fl. Bhutan 1(2): 629. 1984. *Cassia nodosa* Buch.-Ham. ex Roxb. in Fl. Ind. 2: 336. 1824; Prain in Bengal Pl. 1: 437. 1903. '*Radha chunda*'

Deciduous small trees. Leaves 15 – 25 cm; leaflets 6 – 14 pairs, 2 – 4.1 × 1.47 – 2.3 cm, base asymmetric, subleathery, obtuse. Racemes short, side branches; inflorescence slender; sepals ovate; petals ovate, yellow; stamens 12; ovary linear, pubescent. Fruit blackish brown, legume.

Flowering: April – June

Fruiting: May – December

Local Distribution: All over the forest area of North Bengal

General Distribution: India (throughout); Bhutan, Indonesia, Thailand.

Status: Common

Uses: Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2019, Mallick, et al. [Field No. 6987]

CROTALARIA L. in Sp. Pl. 2: 714. 1753; *nom. cons.*

Crotalaria alata Buch.-Ham. ex Don in Prodr. Fl. Nepal. 241. 1825; Grierson et Long in Fl. Bhutan 1(3): 735. 1987; Prain in Bengal Pl. 1: 373. 1963.

Erect small, up to 91 cm. Stipules decurren. Leaves nearly sessile, simple; lamina elliptic 3 – 11 × 1.7– 7.7 cm, obtuse, mucronate. Racemes terminal 3 to 5 flowered;

bracts ovate; lobes lanceolate, calyx 2 lipped; corolla yellow; obovate; Ovary glabrous. Fruit oblong, 3 – 7.3 cm, 30 – 37.9.

Flowering: June – August **Fruiting:** July – November

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Jharkhand, Assam, Tripura, Orissa, West Bengal), Bhutan, Bangladesh, Nepal, Cambodia, Indonesia, Malaysia, Myanmar and Vietnam.

Status: Common

Uses: Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2019, Mallick, et al. [Field No. 4568]

DALBERGIA L.f. in Suppl. Pl. 52, 316. 1782; *nom. cons.*

Dalbergia pinnata (Lour.) Prain. in Ann. Roy. Bot. Gard. (Cal.) 10(1): 48–49. 1904.
Dalbergia pinnata var. *acaciifolia* (Dalzell) Thoth. in Bull. Bot. Surv. Ind. 25(1–4): 170. 1983.

Trees or sometimes shrubby and climbers. Branches long, flexuose; young branchlets puberulent. Leaves 12 – 16 cm long, blade hastate; rachis and petioles densely puberulent as short petiolules; stipules are lanceolate. Flowers small, 6 mm. across; calyx campanulate, outside puberulent or glabrescent; teeth ovate, upper 2 are subconnate. Corolla white, petals long clawed; standard reflexed, ovate; wings with sagittate base; stamens 9 or 10, monadelphous; ovary glabrous, ovules 2 or 3. Legume is brown and shiny when dry, oblong–ligulate.

Flowering: January–April **Fruiting:** May–July.

Local Distribution: Open forest area of three MPCAs.

General Distribution: India (Assam, Bihar, Madhya Pradesh, Maharashtra, Uttar Pradesh, Gujarat); native to tropical Asia.

Status: Least Concern (IUCN 2017)

Uses: In folk medicine and homeopathy.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4398]

Dalbergia sissoo Roxb. ex Candolle in Prodr. 2: 416. 1825; Grierson et Long in Fl. Bhutan 1(3): 652. 1987; Prain in Bengal Pl. 1: 411. 1963. '*Sisu*'

Trees, 18 – 20 m. Leaves 13 – 17 cm; leaflets 4 – 7; lamina rounded, obovate, shortly caudate. Panicles axillary. Flowers fragrant, sessile; bracts lanceolate, caducous. Calyx campanulate, ovate, 5 toothed. Corolla yellowish to reddish, obovate; wings/keel oblanceolate; stamens monadelphous, 9; ovary oblong, ovuled, 3 – 7; style short; stigma capitate. Fruit oblong to linear. Seeds reniform.

Flowering: march – August **Fruiting:** July – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Native to India; widely cultivated in the tropical country.

Status: Common

Uses: It is a folk rmedicinefor gonorrhoea and skin ailments.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.05.2019, Mallick, et al. [Field No. 3578]

CAREYA Roxb. in Pl. Coromandel 3: 13. 1811.

Careya arborea Roxb. in Fl. Ind. 3: 233. 1832; Ben. in Pl. 1: 410. 1903. *Dalbergia stipulacea* var. *mogkokensis* Thoth. in Bull. Bot. Surv. Ind. 17: 68. 1975. *Dalbergia stipulacea* var. *puberula* Thoth. in Bull. Bot. Surv. Ind. 17: 68. 1975.

Small trees or large woody climbers. Leaves 15.3 – 20.1 cm; stipules membranous, early caducous, lanceolate to ovate–lanceolate, membranous; leaflets 17 – 21; petiolules 1.3–1.8 mm; blades obovate–oblong to oblong, lowest sometimes elliptic, 2.7 – 3.6 × 1.1 – 1.3 cm, 1.1 – 1.4 × 1.2 cm, thinly papery, rachis, peduncle branches, and bracts pubescent appressed brown, lower part of inflorescence ovate, with many scattered, empty bracts, membranous. Flower bracts smaller than inflorescence bracts; obovate bracteoles, enclosing 2/3 of calyx. Calyx puberulent, campanulate; corolla pale purplish red or pale blue, standard orbicular, emarginate slightly, wings on upper side below with downward auricles; stamens diadelphous 10; ovary glabrous except for long pubescent, stipe 1 ovuled, style slender. Legume ovoid or elliptic to broadly ligulate. Seeds reniform.

Flowering: April – May **Fruiting:** August – January

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Assam, Meghalaya); Asia.

Status: Not Evaluated (IUCN)

Uses: Used to treat gonorrhoea, syphilis, mouth ulcer, etc.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al.[Field No.18]

DELONIX Raf. in Fl. Tellur. 2: 92. 1837.

Delonix regia (Bojer) Raf. in Fl. Tellur. 2: 92. 1837; Grierson et Long in Fl. Bhutan 1(3): 622. 1987. *Poinciana regia* Bojer in Bot. Mag. 56: t. 2884. 1829; Prain in Bengal Pl. 1: 446. 1963. '*Krishna chura*'

Deciduous large trees, 15 – 21 m. Leaves 22 – 60 cm; petiole 6 – 17 cm; petiolules short; pinnae 15 – 21 pairs, 5 – 11.3cm; leaflets 31 pairs, oblong, opposite, 5.9 – 11.4 × 4.7 – 5.3 mm, base oblique, obtuse, entire. Inflorescence racemes terminal. Flowers bright yellow. Receptacle discoid; sepals reddish, margin pale greenish; stamens upward; stigma very short. Fruit reddish green. Seeds 24– 47.

Flowering: June – August

Fruiting: August – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Assam, Meghalaya); Asia.

Status: Common

Uses: Plant is used as inflammation, constipation, diabetes, rheumatoid arthritis, pneumonia, and malaria.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.895]

DESMODIUM Desv. in Jour. Bot. Agric. 1: 122. 1813, nom. cons.

Desmodium laxiflorum Candolle in Ann. Sci. Nat. 4: 100. 1825; Grierson et Long in Fl. Bhutan 1(3): 678. 1987; Prain in Bengal Pl. 1: 425. 1963.

Erect, shrubs, 84 – 100 cm. Leaves 4 – 5 foliolate; terminal leaflet ovate, elliptic, 09 – 19 × 4 – 8 cm, acuminate. Racemes terminal, axillary, 3 – 9 flowered, fascicled. Calyx villous; upper lobes entire. Corolla white, obovate with auriculate wings. Legume undeviating.

Flowering: June – August

Fruiting: August – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Nagaland, Sikkim, Tripura, West Bengal), Indonesia, Malaysia, Myanmar, Nepal, Vietnam.

Status: Common

Uses: Plant is used as inflammation, constipation, diabetes, rheumatoid arthritis, pneumonia, and malaria.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al.[Field No.8756]

Desmodium gangeticum (L.) Candolle in Prodr. 2: 327. 1825; Grierson et Long in Fl. Bhutan 1(3): 672. 1987; Prain in Bengal Pl. 1: 425. 1963. *Hedysarum gangeticum* L. in Sp. Pl. 2: 746.1753. [Photo Plate -I]

Erect, shrubs, branched, up to 1 – 2 m. Leaves 1 – 2 foliolate; lamina narrowly ovate, 4 – 11 × 4 – 8 cm, base rounded. Racemes axillary, terminal, 11 – 32 cm, 2 – 9 flowered. Calyx 5 lobed; corolla green, wings oblong; keel obovate; ovary hairy. Legume linear.

Flowering: April – June

Fruiting: May – October

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (throughout), Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Thailand and Vietnam.

Status: Common

Uses: Plant is used as a febrifuge, tonic, digestive, anticatarrhal, antiemetic.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al.[Field No.8745]

Desmodium triflorum (L.) Candolle in Prodr. 2: 334. 1825; Grierson et Long in Fl. Bhutan 1(3): 673. 1987; Prain in Bengal Pl. 1: 424. 1963. *Hedysarum triflorum* L. in Sp. Pl. 2: 749. 1753.

Perennial, herbs, prostrate, 47 – 55 cm. Leaves 3 foliolate; terminal leaflet obovate, 5 – 11 × 3.3 – 8.7 mm, base cuneate, slightly emarginate. Flowers solitary. Calyx 5 parted; lobes lanceolate; corolla purple yellow, wings elliptic, standard obcordate, curved, keel longer than wings.

Flowering: June – August

Fruiting: July – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Uttarpradesh, bihar West Bengal), Nepal, Sri Lanka, Myanmar, Thailand.

Status: Common

Uses: Roots is used for stomachach infection.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al.[Field No.8745]

ERYTHRINA L. in Sp. Pl. 2: 706. 1753.

Erythrina stricta Roxb. in Fl. Ind. 3: 251–252. 1832. *Coralloidendron strictum* Kuntze in Revis. Gen. Pl. 1: 173. 1891. *Erythrina yunnanensis* Tsai and Yu ex Lee in Guihaia 13 (2): 101. 1993. *Erythrina stricta* var. *yunnanensis* (Tsai and Yu ex Lee) Sha in Novon 16(2): 267. 2006.

Trees, to 15 m high, bark 10–20 mm thick, surface yellowish, armed with bossed prickles; outer bark corky. Leaves trifoliate, alternate; stipules small, lateral; rachis 10.1 – 13.3 cm long, slender, glabrous, pulvinate, prickled or not; stipels gland like. Flowers bisexual, red, clustered on the browntomentose rachis, in terminal racemes; bracts ovate; bracteole 3.1 mm; pedicel 3 in a cluster, to 8.1 mm; calyx spathaceous 1.1 – 1.5 cm, split half way down, glabrous, erect; corolla deep red; petals 5, standard 5 × 2.5 cm, oblong-glabrate, wings 5.5 × 3.1 mm, obovate, keel 2.1 × 0.7 cm, ovate; stamens 10, monadelphous, vexillary filament free; staminal sheath 2.3 cm; filaments 1 and 1.5 cm long; anthers uniform; ovary inferior, stipitate, 2 cm, pubescent; style 1.5 cm, suberect; stigma capitate. Fruit a pod, 5.1 – 10.2 cm long; seeds 3 – 6, black.

Flowering: January – February

Fruiting: March – May

Local Distribution: Throughout the forests area of terai and duars.

Global Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); China, Nepal, Thailand and Vietnam

Status: Common

Uses: In anti-inflammatory activity, cardio protective activity, anti cataract activity, anti microbial activity, anti urolithic activity.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4462]

Erythrina variegata L. in Herb. Amboin. 10. 1754; Grierson et Long in Fl. Bhutan 1(3): 684. 1987. '*Mandar*'

Trees, 18 – 21 m. Branches straight. Leaves pinnately 4 – 7 foliolate, clustered; stipules lanceolate; leaflets ovate to rhomboid 17 – 29.7 × 15 – 30.8 cm, membranous, surfaces glabrous, basal veins 9, base cuneate, acuminate to obtuse. Raceme terminal; flowers

harmonising; calyx spathe-like; corolla yellow, elliptic, shortly clawed; wings and keels subequal; ovary macro-villous.

Flowering: March – July

Fruiting: May– August

Local Distribution: Throughout the forests area of terai and duars.

Global Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, West Bengal); China, Nepal, Japan, Laos, Malaysia, Myanmar, Philippines.

Status: Not evaluated (IUCN)

Uses: Different parts of the plant is used for traditional medicine as nervine sedative, antiasthmatic, collyrium in ophthalmia, antiseptic, antiepileptic, and astringent.

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 4462]

FLEMINGIA W. Hunter in J. Straits Branch Roy. Asiat. Soc. 53: 83.1909.

Flemingia strobilifera (L.) Aiton in Hort. Kew. 4: 350. 1812. *Flemingia strobilifera* var. *bracteata* (Roxb.) Baker in Fl. Brit. Ind. 4: 227. 1876. *Flemingia strobilifera* var. *fluminalis* (Clarke ex Prain) Thuan in Fl. Cambodge, Laos and Vietnam 17: 143. 1979.

'Kanphuti'

Climbing shrubs, 1 – 4 m tall. Leaves green, simple, stipulate; stipules, persistent lanceolate, 1–1.7 cm long; petiole 0.6 – 1.6 cm, densely hispid. Inflorescence branched thyrse; axis densely densely villous; bracts papery to almost leathery, 1 – 3 × 2 – 5 cm. Flowers pediceled, small; pedicels 1.6 – 3.2 mm; calyx pubescent; lobes ovate, longer than tube. Seeds dark brown, suborbicular.

Flowering: February – August

Fruiting: April – November

Local Distribution: Deciduous and semi-evergreen forests.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa); Afghanistan, Pakistan, India, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines, Turkmenistan, Vietnam.

Status: Common

Uses: Plant root is used for various diseases like insomnia, ulcer, epilepsy, inflammation and microbial infection

Specimen examined: West Bengal, Jalpaiguri, North Sevoke (MPCA). 22.02.2020, Mallick, et al. [Field No. 8974]

LEUCAENA Benth. in Jour. Bot. (Hook.) 4: 416. 1842; *nom. cons.*

Leucaena leucocephala (Lam.) Wit in Taxon 10: 54. 1961; Grierson et Long in Fl. Bhutan 1(3): 640. 1987. *Mimosa leucocephala* Lam. in Encycl. 1: 12. 1783.

Trees small, up to 8 m tall. Leaves stipulate; leaflets 6 – 12 pairs, linear-oblong, 8 – 12 × 1.5 – 3 mm, cuneate, ciliate, acute. Flowering heads axillary, 1 or 2. Calyx 5 toothed. Petals white, narrowly oblanceolate. Stamens 10. Ovary stipitate. Legume narrowly ovoid, flat.

Flowering: June – July

Fruiting: August – October

Local Distribution: Throughout the forests area of terai and duars.

Global Distribution: India (Bihar, Jharkhand, Sikkim, West Bengal), tropical America

Status: Endangered Species (IUCN 2021).

Uses This plant has huge medicinal properties that control stomach diseases, facilitate abortion and provide contraception. Some times it is used as alternative medicine as Sugar patient.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3694]

MELILOTUS (L.) Mill. in Gard. Dict. Abr., ed. 4. 1754.

Melilotus indica (L.) Allioni in Fl. Pedem. 1: 308. 1785. *Melilotus parviflorus* Desf. in Fl. Atlant. 2: 192. 1800.

Annual herbs, slightly pubescent to glabrescent. Stems erect or ascending, 20–50 cm, terete, or branching from base. Stipules lanceolate, 4 – 6 mm, base auriculate, with 2 or 3 tiny teeth, margin membranous; leaflets obovate–cuneate to narrowly oblong, appressed hairy abaxially, glabrous adaxially, lateral veins 7 – 9 pair, base cuneate, margins serrulate toward apex, apex obtuse or truncate, sometimes retuse. Racemes slender, dense, 1.5 – 4 cm; peduncle long; flowers 15 – 25; bracts filiform; Corolla yellow, 2.2 – 2.8 mm; standard broadly ovate, retuse; ovary ovate; ovules 2. Legume olive–green, becoming red–brown when ripe, globose. Seed 1, dark brown.

Flowering: May – June

Fruiting: July – September

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland Orissa, Punjab, Rajasthan, West Bengal); Afghanistan, Pakistan, India, Sri Lanka, Bhutan, Japan,

Status: Common

Uses: Leaves are used for antiseptics.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick et al. [Field No. 3598]

MIMOSA L. in Sp. Pl. 1: 516. 1753.

Mimosa invisa Colla in Fl. oder Allgem. Botanische Zeitung 20. 1837. *Mimosa diplotricha* Wright ex Sauvalle in Anales Acad. Ci. Med. Habana 5: 405. 1868. '**Sada lajjabati**'.

Armed, prostrate sub-shrubs; stems 4 – 5 angular, hirsute, unarmed along angles. Leaves petiolate, lamina 12 – 15 cm; pinnae 5 to 10 pairs; leaflets 20 – 30 pairs per pinna, linear-oblong, 3 – 4 × 1 – 2.5 mm. Heads axillary, 1 or 2. Flowers bisexual; calyx minute; corolla funnel-shaped, 4-lobed. Stamens 8. Fruits in clusters, oblong. Seeds yellow.

Flowering: March – July **Fruiting:** June – October

Local Distribution: Grasslands of MPCAs.

Global Distribution: India (Bihar, Jharkhand, Sikkim, West Bengal), tropical America.

Status: Least Concern (IUCN 2017).

Uses: Plant is used as treatment of urogenital disorders, piles, sinus, and applied on wounds.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3694]

Mimosa pudica L. in Sp. Pl. 1: 518. 1753; Grierson et Long in Fl. Bhutan 1(3): 639.1987; Prain in Bengal Pl. 1: 456. 1963. '**Lajjabati**'.

Armed herbs. Stipules acute; leaflets sensitive; usually 2 – 3 pairs. Heads solitary or 2, globose bracts linear. Flowers whitish/pinkish, numerous; calyx minute very short; corolla campanulate; stamens 4, exserted; ovary shortly stipitate; ovules 3 – 4; style filiform. Fruits slightly recurved, flat, oblong. Seeds light yellowish, ovoid.

Flowering: March – July **Fruiting:** June – November

Local Distribution: Throughout the forests area of terai and duars.

Global Distribution: Throughout India; Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan.

Status: Least Concern (IUCN 2017).

Uses: Plant is used as treatment of urogenital disorders, and applied on wounds.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3690]

MUCUNA Adanson in Fam. Pl. 2: 325, 579. 1763; *nom. cons.*

Mucuna pruriens (L.) Candolle in Prodr. 2: 405. 1825; Grierson et Long in Fl. Bhutan 1(3): 671. 1987; Prain in Bengal Pl. 1: 400. 1963. '**Bandar chulkani**'

Woody climbers. Leaves compound, up to 46 cm long; stipels present, robust; leaflets papery; terminal leaflet elliptic to ovate-rhombic, 8 – 16.4 × 7 – 10.5 cm, broadly cuneate to rounded, acute to acuminate. Inflorescence axillary; bracts and bracteoles linear-lanceolate. Calyx tube triangular 2-lobed. Fruits linear-oblong. Pods 3 – 6.

Flowering: September – June

Fruiting: July – November

Local Distribution: Widely distributed in the forests Grasslands area.

Global Distribution: Throughout India; Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, regions

Status: Least Concern (IUCN 2017).

Uses: Plant is used as treatment of nervous disorders and male sterility.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3687]

PTEROCARPUS L. in Herb. Amboin. 10.1754.

Pterocarpus marsupium Roxb. in Pl. Coromandel 2(1): 116. 1799.

Deciduous trees, 29 m high, bark surface grey, rough, fibrous; blaze pink; exudation red. Leaves imparipinnate, alternate; leaflets 5 – 7, alternate, estipulate; petiolule 6–10 mm, slender, glabrous. Flowers bisexual, yellow, in terminal and axillary panicles; bracts small, dioecious; bracteoles 2, cauducous; calyx tube campanulate, lobes short; corolla exserted; petals 5, standard orbicular, wings oblique, obovate, auricled, keel petals oblique, small, slightly connate; stamens 10, monadelphous; filaments subequal; ovary shortly stalked, inferior, tomentose, 1celled, ovules 2; style filiform, stigma capitate. Fruit a pod, orbicular–reniform.,

Flowering: September–October

Fruiting: November–December

Local Distribution: North Sevoke MPCA.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Nepal, Bhutan, Sri Lanka.

Status: Common.

Uses: Leaves used to treat fractures, constipation, depurative, hemorrhages skin diseases, ophthalmology.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4172]

PUERARIA Candolle in Ann. Sci. Nat. (Paris) 4: 97. 1825.

Pueraria phaseoloides (Roxb.) Benth. in J. Linn. Soc., Bot. 9: 125. 1865; Grierson et Long in Fl. Bhutan 1(3): 693. 1987; Prain in Bengal Pl. 1: 396. 1963. *Dolichos phaseoloides* Roxb. in Fl. Ind., ed. 1832, 3: 316. 1832.

Climbing herbs. Stipules ovate-lanceolate, basifixed; stipels linear; leaflets broadly ovate, 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 pedicels, clustered nodes. Calyx pilose; corolla bluish; wings obovate or oblong. Ovary linear. Fruit oblong-cylindric. Seeds oblong.

Flowering: August – September

Fruiting: October – November.

Local Distribution: Widely distributed in the forests Grasslands area.

General Distribution: India (Karnataka, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Madhya, West Bengal); Bhutan, Nepal, Cambodia, Malaysia, Myanmar and Thailand.

Status: Threatened Plants (IUCN 2017).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3578]

SAMANEA (Benth.) Merrill in J. Wash. Acad. Sci. 6: 46. 1916.

Samanea saman (Jacq.) Merrill in J. Wash. Acad. Sci. 6: 47. 1916; Grierson et Long in Fl. Bhutan 1(3): 647. 1987. *Mimosa saman* Jacq. in Fragm. Bot. 15. 1800.

Trees, up to 24 m. Pinnae 2 – 11 pairs, to 18.6 cm; leaflets 5 – 17 pairs per pinna, symmetrically oblong, Flower 2.6 – 5.2 × 1 – 3.4 cm, rounded to obtuse, base half rounded, emarginated. Heads 2 – 7, axillary. Flowers long pedicellate; calyx campanulate, valvate aestivation; corolla yellowish red, sympetalous; stamens yellowish red. Fruit oblong, blackish yellow.

Flowering: March – August

Fruiting: June – September

Local Distribution: Widely distributed in the forests area.

General Distribution: Throughout India; Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines, Turkmenistan and Vietnam

Status: Threatened Plants (IUCN 2017).

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1597]

SENNA Mill. in Gard. Dict. Abr., ed. 4. 1754.

Senna alata (L.) Roxb. in Fl. Ind., ed. 1832, 2: 349. 1832. *Cassia alata* L. in Sp. Pl. 1: 378. 1753. Hook.f. in Fl. Brit. Ind. 2(4): 278. 1878; Prain in Bengal Pl. 1: 434. 1903.

'Dadmari'

Small shrubs, 3 – 5 m. Leaves 32 – 53cm; stipules triangular, persistent; petiolar glands absent; lamina 7 – 18 pairs, oblong, obovate, 6 – 18 × 3 – 9 cm, base truncate, obtusely rounded. Inflorescence axillary, few racemes forming terminal panicle. Sepals red-yellow, oblong. Petals yellow, ovate. Stamens 12, fertile stamens 9; ovary puberulent, ovules many. Fruit winged.

Flowering: August – October

Fruiting: September – December

Local Distribution: Throughout Forest margin of MPCAs.

General Distribution: Throughout India; Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines and Vietnam.

Status: Threatened Plants (IUCN 2017).

Uses: The plant is traditionally used for typhoid, diabetes, asthma, malaria, ringworms, tinea infections, blotch, herpes and eczem

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5873]

Senna occidentalis (L.) Link in Handb. 2: 140. 1831. *Cassia occidentalis* L. in Sp. Pl. 1: 377. 1753; Hook. f. in Fl. Brit. Ind. 2(4): 279. 1878; Grierson et Long in Fl. Bhutan 1(3): 631. 1987; Prain in Bengal Pl.1: 437.1903. **'Kalokasunda'**

Small shrubs, erect, up to 3.2 m. Leaves 17 – 27 cm; stipules lanceolate, caducous; lamina 3 –7 pairs, ovate to oblong, 4 – 12 × 2 – 5 cm, base acuminate, rounded. Inflorescence corymbose racemes, axillary. Sepals unequal; petals reddish yellow, fertile stamens 9, reduced stamens 5; ovary tomentose. Legume falcate, compressed. Seeds 30 – 40, uniform.

Flowering and Fruiting: Round the year.

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (throughout); widely introduced in the tropics and subtropics.

Status: Threatened Plants (IUCN 2017).

Uses: It is an Ayurvedic medicinal plant used for traditional medicine and treatment of various diseases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6875]

Senna siamea (Lam.) Irwin et Barneby in Mem. New York Bot. Gard. 35: 98. 1982.

Cassia siamea Lam. in Encycl. 1: 648. 1785; Prain in Bengal Pl. 1: 438. 1903.

Small trees, up to 17.3 m. Leaves 24 – 33 cm; leaflets 9 – 15 pairs, oblong-oblong, 3 – 9 × 2 – 8 cm, leathery, base obtusely rounded. Racemes in axils, a large terminal panicle; bracts linear. Sepal anterior. Petals yellowish green. Stamens 13, among them 9 fertile. Ovary sessile oblong. Legume crushed, purple. Seeds 12 – 33 ovoid.

Flowering: May – June **Fruiting:** May – October.

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Karnataka, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Manipur, West Bengal); Myanmar, Thailand.

Status: Common

Uses: It is traditionally used for the treatment of jaundice, typhoid fever, menstrual pain abdominal pain.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 8971]

Senna sophora (L.) Roxb. in Fl. Ind., ed. 2: 347. 1832. *Cassia sophora* L. in Sp. Pl.

379. 1753; Hook. f. in Fl. Brit. Ind. 2: 262. 1878; Prain in Bengal Pl. 1: 438. 1903.

Cassia purpurea Roxb. in Hort. Bengal 31. 1814, *nom. nud.* *Senna exculenta* Roxb. in Fl. Ind. Ed. Carey 2: 346. 1832. '**Chakanda**'

Under shrubs, 1 – 3 m. Leaves 9 – 19 cm; petiole 3 – 7 cm, narrow clavate petiole joint; lamina 4 – 12 pairs, lanceolate to elliptic, 3 – 5 × 2 – 3 cm, base acute to shortly acuminate, rounded. Inflorescence corymbs axillary with flowered; bracts ovate. Sepals

orbicular; petals yellowish green. stamens 12, 7 or 9 fertile; ovary pubescent. Legume straight. Seeds 35– 47, ovoid.

Flowering: May – August **Fruiting:** June – October.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh, West Bengal); Bhutan, Japan, Myanmar, Thailand, Philippines.

Status: Abundant

Uses: It is traditionally used for treat fever, malaria and abdominal pain.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3158]

Senna tora (L.) Roxb. in Fl. Ind., ed. 2: 340. 1832. *Cassia tora* L. in Sp. Pl. 376. 1753; Hook. f. in Fl. Brit. Ind., 2: 265. 1878; Prain in Bengal Pl. 1: 438. 1903. *Cassia obtusifolia* L. in Sp. Pl. 377. 1753. '**Jhun jhuni**'

Annual, suffrutescent herbs, 1 – 3 m. Leaves 5 – 12 cm; stipules linear; leaflets 5 pairs, obovate-oblong to obovate, 3 – 7 × 3 – 5 cm, basecuneate to rounded, rounded. Racemes short, axillary, 2 to 5 flowered; bracts acute, linear; sepals ovate oblong; petals unequal, greenish yellow, obovate; fertile stamens 9; style glabrous; ovary sessile. Legume slender, terete. Seeds 22 – 33.

Flowering: June – July **Fruiting:** July – October.

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh, West Bengal); Afghanistan, Pakistan, Sri Lanka, Bhutan, Japan, Myanmar, Thailand, Philippines, Turkmenistan and Vietnam

Status: Common

Uses: It is traditionally used for treat fever, malaria and abdominal pain.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3139]

TAMARINDUS L. in Sp. Pl. 1: 34. 1753.

Tamarindus indica L. in Sp. Pl. 1: 34. 1753; Hook. f. in Fl. Brit. Ind. 2: 273. 1878; Grierson et Long in Fl. Bhutan 1(3): 636. 1987. '**Tetul**'

Trees. Leaflets oblong, glabrous, base and apex rounded. Flowers many, yellowish red; petals obovate, subequal with calyx lobes, curled; ovaries incurved, terete. Pods greenish, straight.

Flowering: May – August

Fruiting: July – December.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar and West bengal); Tropical and sub-tropical parts of the world.

Status: Common

Uses: Traditionally it has huge uses for daily life and several treatments.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3698]

TEPHROSIA Pers., Syn. Pl. 2: 328. 1807; *nom. cons.*

Tephrosia candida DC. in Prodr. 2: 249. 1825; Grierson et Long in Fl. Bhutan 1(2): 659. 1984; Prain in Bengal Pl. 1: 405.1903.

Perennial plant. Leaf blades oblong. Inflorescence racemes, terminal; calyx teeth unequal; corolla white yellow; ovary tomentose, numerous ovules. Fruit tomentose, straight, linear.

Flowering: October – February

Fruiting: December – March

Local Distribution: Throughout riverine forest margins of MPCAs.

General Distribution: India (Sikkim, Nagaland, Tripura, Assam, West Bengal); Nepal, Bhutan and Bangladesh.

Status: Common

Uses: Traditionally it uses for daily life and several treatments like typhoid fever, menstrual pain abdominal pain.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1248]

Tephrosia candida D.C. in Prodr. 2: 249 .1825.

Plant an erect shrub up to 3.4–5.1m tall, Stems ridged, greyish white, tomentose, trichomes about 1.1 mm across. Leaves are spirally arranged, imparipinnate, with stipules 5–11 mm × 0.8–1.5 mm. Rachis 15.1–25.2 cm. the petiole 1–3 cm long .Inflorescences are terminal, axillary .Few basal bracts, leaflike . Flowers fascicles

white. calyx campanulate, ovate to obovate, apex rounded to emarginate, acuminate, wings. Pods linear, straight, green to olive brown. Seeds are broadly ovoid.

Flowering: August – September

Fruiting: October – February

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh, West Bengal, Andaman and Nicobar); Africa, Bangladesh, Bhutan, China.

Status: Common

Uses: It is used as green manure and in extended fallows, contour hedgerows.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3548]

URARIA Desv. in J. Bot. Agric. 1: 122. 1813.

Uraría picta (Jacq.) Desv. ex Candolle in Prodr. 2: 324. 1825; Grierson et Long in Fl. Bhutan 1(3): 678. 1987. *Hedysarum pictum* Jacq. in Collectanea 2: 262. 1788.

Erect shrubs, 1.5 – 2.7 m. Leaves 5–9 foliolate; leaflet linear-oblong, terminal leaflet 6.2–13.5 × 1.5–2.8 cm, base rounded, tip acute. Flowers in racemes, terminal; calyx 5, ciliate; corolla pale blue to pink; keel wings; ovary glabrous.

Flowering: April – July

Fruiting: June – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Throughout India; Nepal, Bhutan, Bangladesh, Sri Lanka, Cambodia,

Status: Common

Uses: Traditionally it has huge uses for daily life and several treatments.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1248]

ZORNIA J.F.Gmel. in Syst. Nat. in ed. 13. 2: 1076, 1096. 1792.

Zornia gibbosa Span. in Linnaea 15: 192. 1841. *Zornia diphylla* subsp. *gibbosa* (Span.) Panigrahi and Murti in Fl. Bilaspur District 1: 223. 1989. '**Zornia**'

Diffuse annual herbs. Leaves bifoliate; leaflets 8–26 × 2–8 mm, ovate or lanceolate, base rounded, apex acute, punctate; stipules 5–8 mm long, lanceolate, acuminate at both ends. Inflorescence terminal or axillary, bracteate racemes 4–6 cm long; bracts peltate 5–12 × 3 mm long; lobes subequal, membranous. Petals yellow, sometimes with red stripes; standard orbicular–cordate; wings obovate–btuse; keels curved, oblong–obtuse,

connate at base. Stamens monadelphous; anthers dimorphic. Ovary pubescent. Pods with 4–6 articulate, strongly reticulate with retrorsely barbed bristles.

Flowering: August – October

Fruiting: September – November

Local Distribution: Common in the plains as well as degraded forest areas

General Distribution: India (Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland Orissa, Punjab, Rajasthan and Sikkim); Malaysia to Australia and China.

Status: Not threatened (IUCN).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4102]

ORDER: ROSALES Bercht. and J.Presl. 1820

CANNABACEAE Mill. in Gard. Dict. Abr., ed. 4. 1754.

CANNABIS L. in Sp. Pl. 2: 1027. 1753.

Cannabis sativa L. in Sp. Pl. ed. 1. 1027. 1753; Hook. *f.* in Fl. Brit. Ind. 5: 487. 1888; Ohashi in Hara in Fl.E. Himal. 1: 53. 1966; Grierson et Long in Fl. Bhutan 1(1): 134. 1983; Prain in Bengal Pl. 2: 960.1903. *Cannabis erratica* Sievers in Neueste Nord. in Beytr. Phys. Geogr. Erd- Volkerbeschreib. 7: 174. 1793. '**Bhang**'.

Annual herbs, 1.5 – 2.5 m. Branchlets white pubescent. Leaves alternate; petiole 2.3 cm; leaf abaxially green; segments lanceolate to linear, 3.3 – 6.3 × 1 – 2.6 cm with longest in middle, tip acuminate, margin serrate. Male inflorescences 24 – 27 cm. Male flowers green; pedicel 3.3 mm, thin; sepals lanceolate, membranous. Female inflorescences leaflike. Female flowers green; calyx pubescent; ovary globose. Fruit ovoid.

Flowering: May – June

Fruiting: June – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Native to Asia and naturalized in tropical world.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, Dasgupta, Mondal, Paul and Chowdhury [Field No. 3215]

MORACEAE Gaudich. in Gen. Pl. 13. 1835; *nom. cons.*

ARTOCARPUS Forst. et Forst. in Char. Gen. Pl. 51. 1775; *nom. cons.*

Artocarpus chama Buch.-Ham. in Mem. Wern. Nat. Hist. Soc. 5: 331. 1826.
Artocarpus chaplasha Roxb. in Fl. Ind. ed. 1832 3: 525. 1832; Prain in Bengal Pl. 2:
971. 1903. [Photo Plate -V] '*Ban Katha, Lator*'

Trees deciduous 40.5 m tall. Bark coarse, black, brown or gray. Branchlets 3.8 – 7.9 mm thick, furrowed when dry, hairs spreading to bent and long. Amplexicaul stipules. Leaves spirally arranged, densely pubescent, brown; lamina oblong, elliptic or ovate, 13.5 – 37.2 × 6.2 – 21.4 cm, pubescent, adaxially with sparse bent hairs or glabrous, apically curved, tertiary veins reticulate with glandular dark brown points. Inflorescences solitary, axillary. Male inflorescences ovoid or ellipsoid; bracts shield-shaped; pedicel shortly pubescent. Female inflorescences ellipsoid; peltate bracts; style exerted. Male flowers: calyx lobes margin ciliate; anthers ellipsoid; filaments short. Fruiting syncarp, globose, persistent calyx with several persistent bracts. Fruit drupes, ellipsoid.

Flowering: March – April

Fruiting: June–August

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Sikkim, West Bengal); Bangladesh, Bhutan and China.

Status: Common

Uses: It has anti-diabetic, anti-inflammatory and antioxidant properties and useful in the treatment of stomach ulcers and constipation.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 4296]

Artocarpus lacucha Buch.-Ham. ex Don in Prodr. Fl. Nepal.: 333. 1825.

Deciduous tree, 11 – 16 m tall. Branchlets 3 – 7 mm thick, densely covered with yellow velvety hairs. Stipules ovate-lance shaped. Leaves 2 – 3 cm long, stalks densely covered with yellow bristles, margin entire or with small teeth. Male flower spike pickled. Flowers tiny, yellowish. Fruits nearly round or irregular, 2 to 5 inches wide.

Flowering: April – July

Fruiting: May – November

Local Distribution: Throughout the forests area of North Bengal

General Distribution: India (Arunachal Pradesh, Meghalaya, Sikkim, West Bengal); Bangladesh and Bhutan.

Status: Common

Uses: Reported to have anti-diabetic, and antioxidant properties and useful in the treatment of stomach ulcers and constipation.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 4870]

FICUS L. in Sp. Pl. 2: 1059. 1753.

Ficus benghalensis L. in Sp. Pl. 2: 1059.1753. *Ficus benghalensis* var. *Krishnae* (DC.) Corner. Gard. Bull. Singapore 21(1): 14. 1965.

Plant large, evergreen to deciduous tree, up to 20 m tall, with wide leafy crown and branches spreading up to 100 m or more with pillar-like prop roots and accessory trunks. Leaves with stout, 2.2 – 6.1 cm long, ventrally compressed hairy petiole; lamina coriaceous, ovate or obovate to elliptic, 10.1 – 20.2 cm long, 8.1 – 15.1 cm broad. Hypanthodia sessile, in axillary pairs on young depressed-globose, 1.5 – 2.2 cm in diameter, green, hairy, subtended by 3, reniform 3.1 – 4.2 mm long, 6.1 – 7.2 mm wide, minutely hairy basal bracts. Male flowers: numerous ostiolar, shortly pedicellate; sepals 2.1–3.2; stamen solitary, with shortly mucronate anther.

Flowering: November – December **Fruiting:** January – February

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Asia, Myanmar, Thailand, southern China.

Status: Common

Uses: It is used for erysipelas, vomiting, fever, inflammations and leprosy.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4115]

Ficus hispida L. in f. Suppl. Pl. 442. 1782; Ben. Pl. 2: 981. 1903. *Covellia assamica* Miq. London in J. Bot. 7: 464. 1848. '**Dumur**'

Shrubs or small trees, coarsely hairy; dioecious. Stipules decussate on leafless fruiting branchlets and usually 4, ovate-lanceolate. Leaves opposite; petiole with short thick hairs, 1.3–4.4 cm; leaf blade ovate, oblong, or obovate-oblong 10.3–25.4 × 5.2–10.3 cm, thickly papery, abaxially with coarse gray hairs, adaxially rough and with short thick hairs, apex mucronate to acute, base cuneate to rounded, margin bluntly toothed or entire. Male flowers: near apical pore, many; calyx lobes thinly membranous 3; stamen 1. Gall flowers; style thick, short, subapical. Female flowers: style hairy, lateral.

Flowering: June – July

Fruiting: August – October

Local Distribution: Semi-evergreen and moist deciduous forests

General Distribution: Throughout India; China, Malaysia and Sri Lanka.

Status: Least Concern (IUCN).

Uses: Used to treat fever and provides nourishment to the body.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3533]

Ficus racemosa L. in Sp. Pl. 2: 1060. 1753. *Ficus racemosa* var. *elongata*, (King) M.F. Barrett in Bull. Torrey Bot. Club 73: 323. 1946.

Trees, 30.1 m high; bole buttressed. Leaves simple, alternate, stipules 12.1–18.2 mm long, lanceolate, linear–lanceolate, pubescent, often persistent on young shoots; petiole 10.2 – 50.2 mm long; lamina 6–15 × 3.5–6.2 cm, ovate; 3-ribbed from base, 4–8 pairs, slender, pinnate, prominent beneath. Flowers unisexual; inflorescence a syconia; flowers of unisexual, 4 kinds; male flowers near the mouth of receptacles, in 2–3 rings, sessile, much compressed; tepals 3–4, jointed below, red, glabrous; stamens 2, exserted; filaments 1.7 mm, connate below; anthers oblong, parallel; female flowers sessile or very shortly stalked among gall flowers; tepals 3–4, dentate–lacerate, lobes jointed below, red, glabrous, sessile or substipitate, red spotted; style glabrous, simple; stigma clavate; gall flowers long stalked; ovary dark red, rough; style short.

Fruiting: March – May **Fruiting:** June – July

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: China, India, Indonesia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Australia.

Status: Common

Uses: The plant is used for ulcers, psoriasis, anemia, piles jaundice.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4237]

Ficus religiosa L. in Sp. Pl. 2: 1059 .1753. *Ficus religiosa* Forssk. in Fl. Aegypt. Arab. 180 .1775. *Ficus religiosa* var. *cordata*. Miq. in Ann. Mus. Bot. Lugduno-Batavi 3: 287. 1867.

Plant is Deciduous trees, to 25.1 m high; aerial roots absent; stipules 1.2–1.3 cm long, lateral, ovatelanceolate, puberulous; petiole 60.2–120.1 mm long, stout, glabrous, articulated, a gland at the apex below; lamina 5.1–13.2× 4.2–12.1 cm, broadly ovate.

Flowers unisexual; inflorescence a syconia, sessile, axillary, in pairs; basal bracts 3, ovate–obtuse, silkypuberulous, persistent, orifice, closed by 3 apical bracts in a disc 2–3 mm wide; internal bristles none; flowers of 4 kinds; male flowers ostiolar, sessile, in one ring; tepals 2, ovate–lanceolate, free, reddish; stamen 1, filaments 0.2 mm; anther oblong, parallel; female flowers sessile; tepals 3–4, 1.1 mm, redbrown, style 1.5 mm, lateral, stigma rounded; gall flowers similar to female. Syconium 4.1–8.2 mm across, ripening pink, purple or black; achenes smooth.

Flowering: November – December

Fruiting: April – May

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Jharkhand, Sikkim, West Bengal), Nepal, Bangladesh and Malayasia

Status: Common

Uses: It is used traditionally as antiulcer, antibacterial, antidiabetic, in the treatment of gonorrhoea and skin diseases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4559]

Ficus semicordata Buch.-Ham. ex Sm. in Cycl. 14: no. 71. 1810; *Ficus semicordata* Miq. in Ann. Mus. Bot. Lugduno-Batavi 3: 226. 1867. *Ficus semicordata* var. *montana* Amaty. in Novon 6(4): 32. 1996.

Plant up to 15.5 m tall. Bark rough darkgrey. Leaves lamina variable, ellipticlanceolate, base highly unequal-sided. Apex acuminate or acute, midrib often pink below with 9–17 pairs of bulging prominent lateral nerves, intercostals distinct, petiole 1.3 – 1.7cm long, stipules linear lanceolate 2.6–2.5 cm long, brownishhairy. Male flowers sessile, ostiolar, sepsis 3, stamens 1 with obovate anther. Female flowers subsessile, dispersed among gall flowers sepals 3, lobes lanceolate; ovary ovoid; style long, lateral, bifid. Fruitsyconus pink or reddish brown with white spots.

Flowering: May – October

Fruiting: November – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, China, Malaysia, Myanmar, Nepal, Thailand and Vietnam.

Status: Common

Uses: Leaves used as fodder. Wood used as firewood. Fruits are edible.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4146]

Ficus sarmentosa Buch.-Ham. ex Wall. in Numer. List 4533. 1831. *Ficus sarmentosa* Buch.-Ham. ex Sm. in Cycl. (Rees) 14: *Ficus* n. 45. 1810. *Ficus sarmentosa* var. *oleiformis* (King) Singh and Singh in J. Econ. Taxon. Bot. 15(3): 705. 1992.

Shrubs or woody climbers. Branches grayish brown, rugose, glabrous, subglabrous. Leaves distichous, ovate, elliptic–lanceolate or oblong, leathery, margin entire, apex acuminate, Petiole 1.4 cm. Male flowers pedicillate; stamens 2. Gall flowers pedicellate; ovary elliptic style short. Female flowers pedicellate, ovary obovate. Achenes ovoid-ellipsoid with adherent liquid. Fruit syconus.

Flowering: February – April

Fruiting: May – July

Local Distribution: Forests, evergreen broad-leaved forests, scrub jungles.

General Distribution: Throughout India; Nepal, Bhutan, Meyanmer and Thailand.

Status: Threatened Species (IUCN 2017)

Uses: Used as medicine to treat peptic ulcer.

Specimenexamined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1489]

MORUS L. in Sp. Pl. 2: 986. 1753.

Morus indica L. in Sp. Pl. 986. 1753. *Morus longistylus* Diels in Notes Roy. Bot. Gard. Edinburgh 5(25): 293. 1912. *Morus australis* Poirat in Lam. in Ency. 4: 380. 1796; Ohashi in Hara in Fl. E. Himal. 1: 55. 1966. *Morus indica* auct. non L. in Hook. f. in Hook. f. in Fl. Brit. Ind. 5: 492. 1888; Prain in Bengal Pl. 2: 968.1903. ‘**Tutt**’

Small trees, up to 14 m. Leaves ovate, 3.5–11 × 3–7.6 cm, acuminate, base cordate, margin serrate, 3 lobed, petioles 3.3 cm, stipules 2.2 cm. Male spikes 3.3 cm, peduncles 1.3 cm, perianth segments 2.3 mm, stamens 5. Female spikes 7–11 mm, peduncles 3 mm. Fruiting spikes 2 × 1.4 cm, red.

Flowering: February – April

Fruiting: March – May

Local Distribution: Shaddy slightly moist area of the three MPCAs.

General Distribution: Throughout India, widely cultivated throughout the World.

Status: Endangered Species (IUCN 2017).

Uses: The primary medicinal use of this plant is a method of glucose levels in diabetic patients.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2019, Mallick, et al. [Field No. 1489]

STREBLUS Lour. in Fl. Cochinch. 2: 754. 1790.

Streblus asper Lour. in Fl. Cochinch. 1: 615. 1790; Hook. f. in Fl. Brit. Ind. 5: 489. 1888; Prain in Bengal Pl. 2: 969.1903; H. Ohashi in Hara in Fl. E. Himal. 1: 55. 1966; 1967; Hara et al. in Enn. Fl. Pl. Nep. 3: 212. 1982; Grierson et Long in Fl. Bhutan 1(1): 102. 1983. '*Seora*'

Small tree, up to 17.2 m, shoots pubescent, sometimes spiny. Leaves obovate, 4.7 – 7.3 × 2.3 – 4.5 cm, acute, margin serrate, base cuneate, petioles 2.3 mm. Male clusters 5 mm, tepal ovate, 3.4 mm. Female flowers ovoid, 3.3 mm, style terminal, filiform. Achenes 4.4 mm.

Flowering: March – April

Fruiting: April – May.

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Orisha, Jharkhand, Bihar, Sikkim, Assam and West Bengal) ; Bhutan, Bangladesh, Cambodia, Indonesia, Sri Lanka, Thailand and Vietnam.

Status: Near Threatened Species (IUCN-2021).

Uses: Treatment of different diseases such as toothache, filariasis, diarrhea, leprosy, dysentery and cancer.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2019, Mallick, et al. [Field No. 4879]

RHAMNACEAE Juss. in Gen. Pl. 376. 1789 ('Rhamni'); *nom. cons.*

ZIZIPHUS Mill. in Gard. Dict. Abr., ed. 4. 1754.

Ziziphus rugosa Lam. in Encycl. 3: 319. 1789; Grierson et Long in Fl. Bhutan 2 (1): 140. 1991; Prain in Bengal Pl. 1: 334.1903. '*Bonkul*'

Trees 8 – 11 m, spinose, evergreen. Stipular spines 1–3, recurved; petiole short; lamina broadly ovate, 8 – 10 × 4.5 – 11 cm, base subcordate, serrulate, rounded. Inflorescences 15 – 21 cm. Flowers green, pubescent; sepals acute, triangular; Disk orbicular, thick, 5 lobed; ovary globose. Fruit drupe.

Flowering: March – April

Fruiting: April – June.

Local Distribution: Road and river side of the forests.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Laos, Myanmar, Sri Lanka, Thailand and Vietnam.

Status: Least Concern (IUCN)

Uses: It is used as Cough, Ulcer, Diarrhoea, Menorrhagia and Skin disease.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2019, Mallick, et al. [Field No. 4456]

Zizyphus mauritiana Lam. in Encycl. 3: 319. 1789; Grierson et Long in Fl. Bhutan 2 (1): 138. 1991. *Zizyphus jujuba* (L.) Gaertner in Fruct. 1: 203. 1788; Hook. f. in Fl. Brit. Ind. 1: 632. 1875. *Rhamnus jujuba* L. in Sp. Pl. 194. 1753. '**Kul**'

Evergreen trees, 14 – 16 m. Stipular spinous; lamina ovate to oblong, 3–6 × 1.5–6 cm, thickly papery, 3-veined from base, acute, serrulate, slightly oblique, base subrounded. Flowers greenish gray-yellow, dichotomous cymes; sepals ovate; petals oblong-spatulate. Disk thick, fleshy, 12-lobed; ovary glabrous, globose. Fruit black at maturity; mesocarp hardy.

Flowering: August – September

Fruiting: November – March

Local Distribution: Throughout the Forests.

General Distribution: India (Assam, West Bengal, Tripura); Bhutan, Nepal, Sri Lanka, Afghanistan, Thailand, Vietnam; Africa and Australia.

Status: Least Concern (IUCN)

Uses: It is used as cough, ulcer, diarrhoea, menorrhagia and skin disease.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2019, Mallick, et al. [Field No. 4046]

Zizyphus oenopolia (L.) Miller in Gard. Dict. (ed. 8) no. 3. 1768. *Rhamnus oenopolia* L. in Sp. Pl. 1: 194. 1753. '**Janglikul**'

Erect shrubs, spinose. Lamina ovate-oblong 3–11 × 2–6 cm, papery, 3 veined acute to acuminate, inconspicuously crenate, subrounded, asymmetric. Flowers greenish yellow, few to 12 in axillary cymes. Sepals acute, ovate. Petals and stamens spatulate, enfolding, clawed. Stamens short; ovary globose, style 2 – 5 branched. Fruit drupe globose, black.

Flowering: June – August

Fruiting: August – February.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, West Bengal, Tripura); Bhutan, Nepal, Sri Lanka, Afghanistan, Thailand, Vietnam; Africa and Australia.

Status: Least Concern (IUCN).

Uses: It is used as cough, ulcer, menorrhagia and skin disease.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2019, Mallick, et al. [Field No. 4587]

BERCHEMIA Necker ex DC. in 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. in Harbin 5: 19. 1979. *Berchemia laxa* Wall. in Numer. List 4257. 1831.

Scandent Stipulous shrubs; lamina abaxially dark blue, adaxially green, ovate, elliptic, 4.3 – 11 × 2.5 – 6.3 cm, papery, tip acute, entire, base cordate. Inflorescences cymose. Flowers numerous, fascicles, glabrous; calyx tube patelliform; lobes triangular; petals spatulate; ovary completely immersed; style cylindrical; stigma 2 – 3 lobed. Fruit drupe red, elliptic, ovoid.

Flowering: March – May

Fruiting: May – October.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Tripura, Nagaland); Bhutan, Japan, Nepal, Thailand and Vietnam.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA).04.08.2018, Mallick, et al. [Field No. 4587]

GOUANIA Jacq. in Select. Stirp. Amer. Hist. 263. 1763.

Gouania tiliifolia Lam. in Encycl. 3: 4. 1789. *Gouania scandens* (Gaert.) Drum in in Fl. Zambes. 2: 435. 1966. *Gouania sieberiana* Schldle ex Presl in Abh. Konigl. Bohm. Ges. Wiss. V, 3: 469. 1845. *Gouania leptostachya* Candolle in Prodr. 2: 40. 1825; Grierson et Long in Fl. Bhutan 2 (1): 146. 1991.

Climbing shrubs. Leaves alternate; stipules lanceolate; lamina abaxially pale yellow, adaxially dark blue, ovate to obovate, 5 – 11 × 2.5 – 6 cm, acuminate, papery, crenate-serrate, cordate base. polygamous flowers, solitary, fascicles, penta merous, axillary cymose racemes 26 – 32 cm; sepals triangular; obovate, petals white; ovary immersed; styles short; capsule 3 winged.

Flowering : June – August

Fruiting: August – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Orisha, Sikkim, Jharkhand, Assam, Tripura, Nagaland); Bhutan, Nepal, Malaysia, Philippines, Singapore, Thailand.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA).04.05.2018, Mallick, et al. [Field No. 4587]

ROSACEAE Juss. in Gen. Pl. 334. 1789; *nom. cons.*

DUCHESNEA Sm. in Trans. Linn. Soc. London 10: 372. 1811.

Duchesnea indica (Jackson) Focke in Nat. Pflanzenfam. 24: 33. 1888; Grierson et Long in Fl. Bhutan 1 (3): 579. 1987. *Fragaria indica* Jackson in The botanist's repository; 479. 1807; Sensu Hook. f. in Fl. Brit. Ind. 2: 343. 1878. '**Tara Ful**'

Herbs perennial. Stipules ovate; leaflets petiolulate, obovate, margin obtusely serrate, apex rounded. Flowers 2.5 – 2.7 cm; carpels numerous; aggregate fruit, red. Achenes fresh, ovoid.

Flowering : June – September

Fruiting: August – October

Local Distribution: Throughout forest MPCAs of North Bengal

General Distribution: India (West Bengal, Sikkim, Jharkhand, Assam, Tripura, Nagaland); Bhutan, Nepal, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.

Status: Vulnerable Species (IUCN 2021).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 04.05.2018, Mallick, et al. [Field No. 5698]

RUBUS L. in Sp. Pl. 1: 492. 1753.

Rubus treutleri J. D. Hooker in Fl. Brit. Ind. 2: 331. 1878.

Large shrubs 0.5 – 3.2 m tall. Branches grayish green. Leaves simple; petiole 4.5 – 7.2 cm, with dense purplish glands, long hairs, and sparse, needle-like prickles; stipules free, 1 – 1.7 cm, palmatipartite nearly to base; blade suborbicular, 6 – 12 cm in diameter, stipitate glands along veins, base deeply cordate, margin 3 – 7-lobed, terminal lobe slightly larger than lateral lobes. Inflorescences terminal, subracemes, 3 – 4 cm or slightly longer, than 10-flowered, or flowers few in clusters 7 – 11 mm. Flowers 1.5 – 2.3 cm in diam. Calyx tube copular 5.1 mm; sepals narrowly ovate or narrowly ovate-lanceolate, apex acuminate, petals pink, suborbicular, 8 – 11 mm in diam., barely clawed. Stamens many, shorter than petals. Pistils long as stamens; ovary and style glabrous. Fruit red, globose, enclosed in calyx; pyrenes densely rugulose.

Flowering: June – July

Fruiting: August – September.

Local Distribution: Throughout forest area of three MPCAs of North Bengal

General Distribution: India (West Bengal, Sikkim, Orissa, Jharkhand, Assam, Nagaland); Bhutan, Nepal, Malaysia, Singapore, Thailand, Vietnam.

Status: Least Concern (IUCN 2019).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA).04.05.2018, Mallick, et al. [Field No. 5698]

ULMACEAE Mirb. in Elem. Physiol. Veg. Bot. 2: 905. 1815; *nom. cons.*

TREMA Lour. in Fl. Cochinch. 2: 539, 562. 1790.

Trema orientalis (L.) Bl. in Mus. Bot. Lugd. Bot. 2: 62. 1856; Hook. f. in Fl. Brit. Ind. 5: 484. 1888; Hara in Fl. E. Himal. 1: 52. 1966; Hara et al. Enn. Fl. Pl. Nep. 3: 207. 1982; Grierson et Long in Fl. Bhutan 1(1): 86. 1983; Prain in Bengal Pl. 2: 960.1903.

Trema africana Bl. in Mus. Bot. 58. 1856. '**Khorigachh**'

Dioecious trees 14 – 17 m high, bark 0.7 cm, thin, greyish to bluish–green, rough, lenticellate; blaze creamy–yellow and streaked; branchlets are scabrous to adpressed pubescent. Leaves are simple, alternate; stipules lateral, cauducous; petiole 4–10 mm, slender, tomentose, grooved above; lamina 6.5 – 15 × 2.5 – 6 cm, ovate to lanceolate, ovate or oblong–lanceolate, base is obliquely cordate, apex acuminate, margin is serrulate, scabrid above, tomentose beneath, Flowers are unisexual 3 – 5 mm across, greenish, in axillary fascicles to cymes. Fruit is a drupe 4 × 3.2 mm, globose and black; stylar tip persistent; seeds are globose.

Flowering: Msrch – May

Fruiting: June – November.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Andaman and Nicobar Island, Assam, Bihar, Kerala, Maharastra, Madhya Pradesh, Orissa, Tamil Nadu); Nepal, Bhutan, Bangladesh.

Status: Common

Uses: The leaves and the barks are used for the treatment of coughs, sore throats, asthma and bronchitis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 4161]

URTICACEAE Juss. in Gen. Pl. 400. 1789 ; *nom. cons*

BOEHMERIA Jacq. in Enum. Syst. Pl. 9: 31. 1760.

Boehmeria glomerulifera Miq. in Zollinger, Syst. Verz. 2: 101, 104. 1854; Grierson et Long in Fl. Bhutan 1(1): 124. 1983. *Boehmeria depauperata* Weddell in Ann. Sci. Nat., Bot. IV, 1: 202. 1854. *Boehmeria travancarica* Bedd. in Fl. Sylv. S. India 225. 1872.

Shrubs of 70 cm height. Stipules lanceolate. Petiole long, pubescent to glabrous. Leaves alternate, ovate to elliptic, 8 – 22 × 4 – 5 cm, papery, cuneate, acuminate to caudate-acuminate, denticulate. Glomerules unisexual; males placed proximally; females distally. Male flowers tetra-merous, pedicellate, pubescent. Female flowers obovoid, pubescent, contain short neck. Fruit brown, obovoid.

Flowering: March – June **Fruiting:** May – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Jharkhand, Orissa, Assam, Sikkim); Bhutan, Indonesia, Myanmar, Sri Lanka, Thailand.

Status: Common

Uses: The leaves and the bark are used for the treatment of coughs, sore throats, asthma and bronchitis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8976]

Boehmeria hamiltoniana Wedd. in Ann. Sci. nat. ser. 4, 1: 199. 1854; Hook. f. in Fl. Brit. Ind. 5: 579.1885; Tuyama in Hara in Fl. East. Himal. 1: 56. 1966; Grierson et Long in Fl. Bhutan 1(1): 127. 1983. *Boehmeria platyphylla* var. *hamiltoniana* (Wedd.) Wedd. in Prodr. 16(1): 213. 1869.

Shrubs, up to 1 – 2 m; branches glabrous. Leaves opposite; subulate stipules; leaf obliquely ovate, 5 – 17 × 3 – 9 cm, base broadly cuneate, herbaceous, apex acuminate. inflorescences unisexual, usually long basal branches, separated; female spikes much slender. Perianth lobes connate at base, elliptic; ovule rudimentary, ellipsoid. Fruiting ellipsoid.

Flowering: June – September **Fruiting:** June – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Jharkhand, West Bengal, Sikkim, Assam, Orissa, Nagaland, Uttarpradesh), Nepal, Bhutan, Malaysia Bangladesh, China.

Status: Least Concern (IUCN)

Uses: The leaves, root and the bark are used for the treatment of cut deases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8974]

DENDROCNIDE Miq. in Pl. Jungh. 1: 29. 1851.

Dendrocnide sinuata (Bl.) Chew in Gard. Bull. Sing. 121; 206. 1965; Hara in Fl. East. Himal. 3: 19. 1975. *Urtica sinuata* Bl. in Bijdr. Fl. Ned. Ind. 505. 1825. *Laportea sinuata* (Bl.) Miq. in Ann. Mus. Bot. Lugduno-Batavum 4: 301. 1869. *Laportea crenulata* Gaudich. in Voy. Bonite, Bot. 498. 1826. '**Daman**'

Large shrubs, up to 5 m; branchlets bark yellow-green. Stipules brownish, ovate-lanceolate, puberulent abaxially; petiole sparsely pubescent; lamina lanceolate, oblong to obovate, 11– 39 × 6 – 17 cm, leathery, sparsely armed, rounded to deeply cordate, base cuneate, margin entire, apex acuminate. Inflorescences axils, long paniculate. Male flowers subsessile, stamens 4. Female flowers short, fleshy; lobes 4.

Flowering: September – December **Fruiting:** October – February

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Orissa, Jharkhand, Assam and Bihar); Nepal, Bhutan, Myanmar, Sri Lanka, Thailand and Malaysia.

Status: Least Concern (IUCN)

Uses: The leaves, root and the bark are used for the treatment of cut deases.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8698]

ELATOSTEMA Forst. et Forst. in Char. Gen. Pl. 53. 1775; *nom. cons.*

Elatostema monandrum (Buch.-Ham. ex Don) Hara in Fl. East. Himal. 3: 21. 1975; Hara et al. in Enn. Fl. Pl. Nep. 3: 203. 1982; Grierson et Long in Fl. Bhutan 1(1): 122. 1983. *Procris monandra* Buch.-Ham. ex Don in Prodr. Fl. Nepal. 61. 1825; Hook. f. in Fl. Brit. Ind. 5: 572. 1888. *Elatostema diversifolium* Wedd. in Prodr. 16(2): 189. 1868.

Herbs small, erect 7 – 14.7 cm. Stems either glabrous. Leaves alternate, sessile; lamina lanceolate, 2 – 5 × 0.3 – 2.3 cm, lower leaves small, rudimentary leaves to 0.6 cm long, entire, oblong. Flowers sessile, rarely pedunculate.

Flowering: September – December **Fruiting:** October – January

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Orissa, Assam, Jharkhand, Bihar); Nepal, Bhutan, Sri Lanka,

Thailand, Malaysia.

Status: Least Concern (IUCN)

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8606]

GONOSTEGIA Turcz. in Bull. Soc. Imp. Naturalistes Moscou 19(2): 509. 1846.

Gonostegia hirta (Blume ex Hassk.) Miq. in Ann. Mus. Bot. Lugduno Batavi 4: 303. 1869. *Pouzolzia hirta* Blume ex Hasskal in Cat. Hort. Borger. 80. 1844; Hook. f. in Fl. Brit. Ind. 5: 586.1888; Prain in Bengal Pl. 2: 965.1903; Grierson et Long in Fl. Bhutan 1(1): 129. 1983. *Urtica hirta* Blume in Brijdr. 495. 1825.

Herbs, prostrate, 78 – 84 cm, dioecious. Stems 4 – 6 angled, pubescent. Leaves opposite, stipules ovate; leaf narrowly lanceolate to ovate, 3 – 7 × 1.5 – 4.3 cm, herbaceous, 3 veined, subglabrous, base subcordate, apex acute. Glomerules bisexual. Male flowers lobes 5, tip acute. Female flowers sub-sessile; perianth ovoid, tip toothed. Achene white.

Flowering: February – April **Fruiting:** March – August

Local Distribution: India (West Bengal, Assam, Meghalaya), Asia.

General Distribution: India (West Bengal, Orissa, Meghalaya and Assam); Nepal, Bhutan, Myanmar, Sri Lanka.

Status: Least Concern

Uses: This plant used to treat abdominal cramps and leucorrhoea.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8607]

LAPORTEA Gaudich.-Beaupre in Voy. Uranie, Bot. 498. 1830; *nom. cons.*

Laportea interrupta (L.) Chew in Gard. Bull. Singapore 21(2): 200 – 201. 1965; Tuyama in Hara in Fl. E. Himal. 1: 60. 1966. *Urtica interrupta* L. in Sp. Pl. 2: 985. 1753; Prain in Bengal Pl. 2: 961.1903.

Annual, monoecious, green, herbs. Stems erect, branched, up to 80 cm tall; short stinging and pubescent hairs present on upper stems and petioles. Petiole 4 – 9 cm; leaves, herbaceous, 3-veined ovate-cordate, 6 – 9 × 6 – 7 cm, margin serrate, apex acuminate. Inflorescences axillary, armed with stinging hairs. Male flowers pedicellate; lobes obovate, 3 – 4; stamens 3 – 4. Female flowers unwinged pediceled; perianth lobes

free, unequal, 4, broadly ovate. Ovary triangular, asymmetric; stigma reflexed. Achene compressed, obliquely triangular.

Flowering: September – December **Fruiting:** October – January

Local Distribution: Throughout the forest area of three MPCAs

General Distribution: India (Assam, Sikkim, West Bengal); Bhutan, Malaysia, Myanmar, Nepal, and Sri Lanka.

Status: Least Concern (IUCN)

Uses: This plant used to treat as herbal medicines to aid in pregnancy.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 25.04.2017, Mallick. et al. [Field No. 8601]

PILEA Lindl. in Collect. Bot. t. 4. 1821, nom. cons.

Pilea microphylla (L.) Liebmann in Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 5, 5(2): 302. 1851. *Parietaria microphylla* L. in Syst. Nat., ed. 10, 2: 1308. 1759.

Annual herbs. Stems succulent, ascending. Stipules triangular, persistent. Leaves 2 – 5 × 1 – 4 mm, entire, obtuse, recurved, cuneate to attenuate. Inflorescences glomerules. Male flowers pedicellate; ovary rudimentary, minute. Perianth lobes in female flowers subequal, oblong. Achene ovoid.

Flowering: January – April

Fruiting: May – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal); S.E. Asia, tropical South America.

Status: Common

Uses: It is used for folk medicine to treat allergies and wounds.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8636]

Pilea cordifolia Hook. f. in Fl. Brit. Ind. 5: 558. 1888; Tuyama in Hara in Fl. E. Himal. 1: 61. 1966; Grierson et Long in Fl. Bhutan 1(1): 114. 1983.

Stoloniferous, perennial, monoecious, herbs. Stems branched or unbranched, succulent, glabrous; persistent stipules ovate-oblong; petioles puberulent; lamina obliquely ovate-elliptic, unequal, 7 – 13 × 5 – 6 cm, base cordate to rounded; serrations coarsely crenate-serrate, acuminate. Inflorescences solitary, paniculate cyme. Male flowers

pedicellate, reddish; stamens 4. Female flowers subsessile, staminodes 3, scale-like. Achene redish or brownish, compressed, obliquely ovoid, smooth.

Flowering: June – August **Fruiting:** July – September.

Local Distribution: Forest area of MPCAs.

General Distribution: India (Assam, Bihar, Sikkim, West Bengal); Nepal, Bangladesh, China.

Status: Common

Uses: It is used for folk medicine to treat allergies and wounds.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.04.2017, Mallick, et al. [Field No. 8639]

POUZOLZIA Gaudichaud-Beaupré in Voy. Uranie, Bot. 503. 1830.

Pouzolzia hirta Blume ex Hasskal in Cat. Hort. Borger. 80. 1844; Hook. f. in Fl. Brit. Ind. 5: 586.1888; Prain in Bengal Pl. 2: 965.1903; Grierson et Long in Fl. Bhutan 1(1): 129. 1983. *Memoria lishirta* (Blume ex Hassk.) Wedd. in Prodr. 16(2): 2356. 1869.

Prostrate, monoecious or dioecious, herbs, up to 90 cm tall. Stems 4-angled, pubescent. Leaves opposite, stipules ovate; lamina lanceolate to ovate-elliptic, 4 – 8 × 1 – 4 cm, thinly papery, subglabrous, subcordate to rounded, acuminate to acute; veins 3. Inflorescence glomerules, unisexual or bisexual. Male flowers 5-lobed; lobes oblanceolate, acute. Female flowers sessile; perianth tubular, apex 2-toothed. Achene whitish to black, ovoid.

Flowering: May – June **Fruiting:** July – September

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, Bihar, Sikkim, West Bengal); Bhutan, Myanmar, Sri Lanka.

Status: Threatened Plants (IUCN 2017)

Uses: In Traditional Medicine this plant is called Nuo Mi Tuan, and is described as cooling, depurative, diuretic, febrifuge, invigorating spleen.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, Dasgupta, Mondal, Paul and Chowdhury [Field No. 1267]

Pouzolzia zeylanica (L.) Benn. in Pl. Jav. Rar. 67. 1838. *Pouzolzia zeylanica* Kuntze in Revis. Gen. Pl. 2: 631.1891. *Pouzolzia zeylanica* var. *alienata* (Wedd.) Sasaki in List

Pl. Formosa (Sasaki) 163. 1928. *Pouzolzia zeylanica* var. *angustifolia* (Wight) Chen in Fl. China 5: 178. 2003.

Erect, perennial, hairy, herbs, rarely prostrate, simple or branched, 12 – 42 cm tall; root tuberous; branches short, strigillose. Leaves opposite, sometimes alternate; stipules triangular, ciliate, 2 – 5 mm; petiole 2 – 4 mm long; stipule 2 – 4 mm long, lamina lanceolate to ovate; lanceolate, 1.2 – 9 × 0.8 – 3 cm, base rounded, margin entire, apex subobtusate. Flower axillary, often bisexual, female flower in distal axils, sessile; bracts triangular, ciliate. Male flowers: perianth lobes 4, apex acute or cuspidate. Achenes shining black to light brown.

Flowering: July – October **Fruiting:** August – December

Local Distribution: Throughout the forests area of Terai and Duars.

General distribution: India (Assam, Sikkim, West Bengal), Bhutan, Nepal, Bangladesh Myanmar.

Status: Common

Uses: It is used to treat cough, pulmonary tuberculosis, sore throat, enteritis, dysentery.

Specimen Examined: West Bengal, Jalpaiguri, sevoke, 12.05.1019, Mallick, et al. [Field No. 8945]

FAGACEAE Dumort. in Anal. Fam. Pl.: 11. 1829.

CASTANOPSIS (Don) Spach in Hist. Nat. Veg. 11: 142. 1841.

Castanopsis tribuloides (Smith) A. de Candolle in Hance in J. Bot. 1: 182. 1863.

Quercus tribuloides Smith in Rees in Cycl. 29: Quercus no. 13. 1814. [Photo Plate –II]

Trees 5 – 10 m tall; young branchlets and young leaf blades abaxially pubescent, glabrescent, waxy scalelike trichomes. Petiole 1 – 1.5 cm; leaf blade elliptic to ovate, abaxially reddish brown, base acute to rounded, margin entire, apex acute; midvein adaxially, secondary veins 11 – 14. Infructescence 25cm; rachis slender. Cupules globose to ellipsoid, small, lamellate, waxy scalelike trichomes, pubescent; bracts spinelike, slender, free. Nut 1 per cupule, conical, glabrous; scar basal.

Flowering: April – July **Fruiting:** June – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, China, Malaysia, Myanmar, Nepal, Thailand and Vietnam.

Status: Common

Uses: Leaves used as fodder. Wood used as firewood. Fruits are edible.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2019, Mallick, et al. [Field No. 4141]

CORE-EUDICOTS: ROSIDS: EUROSIDS (I) (fr.: Fabidees ou Eurosides I)

ORDER: CELASTRALES Link. 1829

CELASTRACEAE R. Br. in Flinders in Voy. Terra Austr. 2: 554. 1814; *nom. cons.*

CELASTRUS L. in Sp. Pl. 1: 196. 1753, *nom. cons.*

Celastrus paniculatus Willd. in Sp. Pl. 1: 1125. 1797. *Celastrus paniculatus* ssp. *aggregatus* Mathew ex Matthew in Kew Bull. 467(3): 540. 1991. *Celastrus paniculatus* var. *balansae* Loes. in Bot. Jahrb. Syst. 39: 160. 1906. *Celastrus paniculatus* ssp. *multiflorus* Ding Hou Ann. in Missouri Bot. Gard. 42(3): 231 – 234. 1955.

Climbing shrubs; stem thin rounded. Leaves 7.2 – 12.2 × 4.2 – 7.1 cm, alternate, apex acuminate, ovate, tip acute, crenulate; petiole 6 – 9 mm long. Panicle to 17.1 × 8.3 cm, terminal, axillary; pedicel 9.4 mm long. Flowers many, long; sepals 5, imbricate; petals ovate, white; stamens 5, erect; stigma 3. Fruit capsule 1.2 – 2 cm across, loculicidal.

Flowering: December – February

Fruiting: March – May

Local Distribution: MPCAs forests area of Terai and Duars.

General Distribution: India (Himachal Pradesh, Punjab, West Bengal, Sikkim, West Bengal, Sikkim, Assam); Bangladesh, Cambodia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam.

Status: Common

Uses: The root is used as an antimalarial and antipyretic.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, Dasgupta, Mondal, Paul and Chowdhury [Field No. 3525]

MALPIGHIALES Juss. ex Bercht. in et Presl 1820

ACHARIAEAE Harms, Nat. Pflanzenfam. Nachtr. 1: 256. 1897; *nom. cons.*

GYNOCARDIA Roxb. in Pl. Coromandel 3(4): 95. 1820.

Gynocardia odorata Roxb. in Pl. Coromandel 3(4): 95. 299. 1820. [Photo Plate –VIII]

Trees, evergreen, upto 30 m tall. Leaves alternate, oblong- elliptic, rarely ovate, Petiole 1 – 3 cm, leaves 12 – 20cm long, 5 – 10cm breath, leathery vein reticulate margin entire. flowers yellow, sweet scented; calyx 7 mm, obtuse to rounded; petal 5, 1.5 – 2 cm, glabrous, epipetalous, ciliate, apex obtuse; stamen 1 cm long, staminate flower smaller than pistillate flowers, style short. Fruit round, numerous, woody, glabrous.

Flowering: January – February

Fruiting: June – August.

Local Distribution: MPCAs area of North Bengal

General distribution: India (Assam, Sikkim, West Bengal); Bhutan, Nepal, Bangladesh.

Status: Common

Uses: It is used in antipyretic agent, seed extract used as lotion in leprosy skin diseases.

Specimen Examined: West Bengal, Jalpaiguri, NRVK (MPCA) 22.12.1019, Mallick et al. [Field No. 4696]

CLUSIACEAE Lindl. in Nat. Syst. ed. 2. 74. 1836; *nom. cons.*

MESUA L. in Sp. Pl. 1: 515. 1753.

Mesua ferrea L. in Sp. Pl. (ed. 2) 1: 734. 1762; Grierson et Long, Fl. Bhutan 1(2): 371. 1984. *Mesua nagassarium* (Burm. f.) Kosterman in Ceylon J. Sci., Biol. Sci. 12: 71. 1976. *Calophyllum nagassarium* Burm. f. in Fl. Ind. 121. 1768. '*Nageswar*'.

Tree, 18.5 – 20.2 m. Leaves elliptic, 8 – 11 × 3 – 5 cm, acuminate, glossy above, whitish waxy beneath, leaves pinkish. Flowers terminal/axial, large, fragrant. Pedicels 7.3 mm; sepals thickened; petals obovate; anthers large, inconspicuous; style curve. Fruits ovoid, dehiscent, tip apex, 1 – 7 seeded.

Flowering: February – March

Fruiting: February – April .

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Karnataka, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh and West Bengal); Bhutan, China, Myanmar.

Status: Not evaluated (IUCN)

Uses: It is antiseptic, blood purifier, anti-inflammatory, anthelmintic, antipyretic, cardiogenic, diuretic, expectorant, purgative, antiasthmatic and antiallergic

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 8798]

EUPHORBIACEAE Juss. in Gen. Pl. 384. 1789; *nom. cons.*

ACALYPHA L. in Sp. Pl. 2: 1003. 1753.

Acalypha hispida Burm. f. in Fl. Ind.: 303, t. 61, fig. 1. 1768; Hook. f. in Fl. Brit. Ind. 5: 417. 1887; Grierson et Long in Fl. Bhutan 1(3): 797. 1987. *Ricinocarpus hispidus* (Burm. f.) Kuntze in Revis. Gen. Pl. 2: 618. 1891. '*Morog Jhunti*'

Shrubs, 2 – 4 m. Leaves petioles 2 – 15 cm, grooved above; lamina ovate, 7 – 11 × 1 – 6 cm, coriaceous, acuminate, crenulate, base obtuse. Inflorescences solitary, unisexual, pistillate flowers, pendulous, axillary. Pistillate flowers 3 – 9 per node; bracts ovate, minute, sepals 3, ovate; ovary tomentose, subglobular.

Flowering: April – September **Fruiting:** June – November

Local Distribution: Throughout the forest area.

General Distribution: India (Assam, Sikkim, West Bengal), Bhutan, China, Bangladesh, Malay Peninsula, New guinea.

Status: Threatened (IUCN, 2017).

Uses: Its leaves are laxative, diuretic, used in the treatment of gonorrhoea and leprosy

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3598]

Acalypha indica L. in Sp. Pl.: 1003. 1753; Drury, Useful Pl. Ind.: 10. 1873; Hook. f. in Fl. Brit. Ind. 5: 416. 1887; Prain in Bengal Pl. 2: 948. 1903. *Ricinocarpus indicus* (L.) Kuntze in Revis. Gen. Pl. 2: 618. 1891. *Acalypha chinensis* Benth. in Fl. Hongk.: 303. 1861. '*Mukta jhuri*'.

annual erect herbs, 85 – 90 cm; stem grooved. Stipules triangular. Petioles longitudinally grooved, pubescent. Inflorescences 2 to 5 together, axillary, bisexual. Staminate flowers 6 – 11 per node; bracts oblong to lanceolate. Pistillate flowers 1 – 7 per node; bracts campulate shape; ovary subglobular. Fruits 5-lobed.

Flowering: April – July **Fruiting:** June – September.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (throughout); Bhutan, China, Sri Lanka, Japan, Taiwan, Malaysia.

Status: Threatened (IUCN, 2019).

Uses: It serve as anti-inflammation, anthelmintic, anti-cancer, anti-bacterial, anti-diabetes, anti-venom and anti-obesity.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 14.03.2019, Mallick, et al. [Field No. 3651]

ANTIDESMA Burm. ex L. in Sp. Pl. 2: 1027. 1753.

Antidesma acidum Retz. in Observ. Bot. 5: 30. 1789. Grierson et Long in Fl. Bhu. 1(3): 778. 1987. Prain in Bengal Pl. 2: 939. 1903.

Shrubs, up to 10 m. leaf margin elliptic-oblong, 5–19 × 2.5–8 cm, base acute, entire, rounded to acute, mucronate. Inflorescences axillary. Male flowers: pedicels 1 – 2.2 mm; cupular 5 lobed; dis; stamens 2; ovary rudimentary, terete. Female flowers: pedicels 2.7 mm; 4 – 7 lobed; ovary glabrous; stigmas 3 or 5. Fruit drupes,

Flowering: May – July **Fruiting:** June – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal); Bangladesh, Bhutan, Cambodia, Indonesia, Laos, Myanmar, Nepal, Thailand and Vietnam.

Status: Threatened (IUCN, 2017).

Uses: Leaves are laxative, diuretic, used in the treatment of gonorrhoea and leprosy.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3598]

BALAKATA Esser in *Blumea* 44: 154. 1999.

Balakata baccata (Roxb.) Esser in *Blu.* 44: 155, map 1. 1998. *Sapium baccatum* Roxb. in *Fl. Ind.* ed. 2, 3: 694. 1832; Hook. *f.* in *Fl. Br. Ind.* 5: 470. 1888; Grierson et Long in *Fl. Bhutan* 1(3): 812. 1987; Prain in *Bengal Pl.* 2: 954. 1903. *Excoecaria affinis* Griff. in *Not. Pl. As.* 4: 486. 1854. *Excoecaria baccata* (Roxb.) Müll.-Arg. in *DC. in Prodr.* 15, 2: 1211. 1866. *Carumbium baccatum* (Roxb.) Kurz in *Fl. Burm.* 2: 412. 1877.

Trees, up to 28 m. Leaves elliptic, 8 – 22 × 4 – 15 cm, acuminate, leathery, margin flat, base obtuse. Staminate flowers 0.5 – 2.3 mm long; calyx 0.5 – 2.2 mm; filaments 0.4 – 0.8 mm. Pistillate flowers white, pedicel 0.6 – 2.2 mm long; calyx 1.8 mm; style 0.2 – 0.9 mm; stigmata 0.9 – 3.2 mm.

Flowering: March – June **Fruiting:** July – October.

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (West Bengal, Bihar, Jharkhand, Orissa, Maharashtra); Bangladesh, Thailand.

Status: Least Concern (IUCN).

Uses: Its leaves are used to treat like laxative, diuretic, used in the treatment of gonorrhoea and leprosy

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 2579]

BALIOSPERMUM Bl. in *Bijdr.* 603. 1826.

Baliospermum solanifolium (Burm.) Suresh in Regnum Veg. 119: 106. 1988. *Croton solanifolius* Burm. in Fl. Malab. 6. 1769. *Jatropha montana* Willd. in Sp. Pl. 4: 563. 1805; Grierson et Long in Fl. Bhutan 1(3): 811. 1987. *Croton solanifolius* (Burm.) Geiseler in Croton Monogr.: 74. 1807. *Baliospermum axillare* Bl. in Bijdr.: 604. 1826; Prain in Bengal Pl. 2: 946. 1903. *Croton polyandrus* Roxb. in Fl. Ind. ed. 2. 3: 682. 1832.

monoecious shrubs, 2 – 5 m.; branches greenish brown; lamina elliptic, oblong ovate, 5 – 15 × 1 – 5 cm, acute, papery, acuminate, broadly cuneate. Inflorescence axillary, male flower pubescent; sepals 5, ovate. Female flowers 1 – 5, axillary; sepals 7, ovate; ovary pubescent; style apex bifid.

Flowering: March – June

Fruiting: March – August

Local Distribution: Rarely found in the forests margins.

General Distribution: India (tropical forest), Bangladesh, Bhutan, Nepal, Sri Lanka, Myanmar

Status: Least Concern (IUCN 2019).

Uses: Leaves and seed are used to treat constipation, anemia, jaundice, piles.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 9870]

CROTON L. in Sp. Pl. 2: 1004. 1753.

Croton bonplandianus Baill. in Adansonia 4: 339. 1864; Guha Bakshi in Fl. Mur. Dist. 283. 1984; Panda and Das in Fl. Sambalp. 328. 2004. *Croton sparsiflorus* Morung in Ann. New York Acad. Sci. 7:221.1893; *Oxydectes bonplandiana* (Baill.) Kuntze in Revis. Gen. Pl. 2: 610. 1891. '**Bontulsi**'

Annual herbs with moist latex. Leaves simple, alternate; lamina lanceolate. Inflorescence terminal raceme; male flower 7 sepals, 6-petals. Female flower with 7 sepals, carpel-3

Flowering: January – March

Fruiting: March – May

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh, West Bengal); Bangladesh, Bhutan, Nepal, Sri Lanka, Myanmar.

Status: Least Concern (IUCN 2019),

Uses: Leaves and seed are used to treat constipation, anemia, jaundice, piles.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 1598]

EUPHORBIA L. in Sp. Pl. 1: 450. 1753.

Euphorbia heyneana Spreng. in Syst. Veg (ed. 16) 3: 791. 1826; Panda et Das in Fl. Sambalp. in 330.2004. *Euphorbia microphylla* Heyne ex Roth in Nov. Pl. Sp. 229. 1821, non Lam. in 1788 (*nom. Illeg.*); Hook. f. in Fl. Brit. Ind. 5: 252. 1887; Haines in Bot. Bihar and Orissa pt. II: 148. 1921; Prain in Bengal Pl. 2: 925. 1903. *Chamaesyce heyneana* (Spreng.) Sojak in Cas. Nar. Mus. in Odd. Prir. 140: 169. 1972.

Annual herbs with stem glabrous, grooved internodes. Leaves opposite, margin ovate to oblanceolate, base rounded, serrulate. Cyathia reddish blue, axillary, glands 6. male flowers in 6, staked. Female flower pendulous, ovary glabrous. Fruit capsules, glabrous.

Flowering: January – March **Fruiting:** May – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland Orissa, Punjab, Rajasthan and West Bengal); Bhutan, China, Bangladesh, Myanmar.

Status: Common

Uses: It is used to treat of migraine, skin diseases and intestinal parasites.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 27.6.2019 Mallick, et al. [Field No. 7060]

Euphorbia hirta L. in Sp. Pl. 454. 1753; Haines in Bot. Bihar and Orissa pt. II: 147. 1921; Guha Bakshi in Fl. Mur. Dist. 286. 1984; Grierson et Long in Fl. Bhu. 1(3): 766. 1987. *Euphorbia pilulifera* auct. non L. 1753; Hook. f. in Fl. Brit. Ind. 5: 250. 1887. *Euphorbia capitata* Lam. in Encycl. 2: 422. 1788. *Euphorbia nodiflora* Steud. in Nomencl. Bot. ed. 2, 1: 613. 1840. Prain in Bengal Pl. 2: 925. 1903. '**Dudhali**'.

Erect herbs. Stem purplish, jointed, hairy. Leaves simple, opposite, serrulate, lanceolate, pubescent, acute. Flowers in terminal; perianth green; stamens 1 – 2. Fruits globose.

Flowering: January – July **Fruiting:** March – September

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Tripura, Uttar Pradesh and West Bengal); Bhutan, China, Bangladesh and Myanmar.

Status: Common.

Uses: It is used in bronchitis, gonorrhoea, cough, asthma, pimples, jaundice, and tumors.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 27.6.2019 Mallick, et al. [Field No. 5789]

Euphorbia hypericifolia L. in Sp. Pl. 454. 1753; Hook. f. in Fl. Brit. Ind. 5: 249. 1887; Prain in Bengal Pl., 2: 924. 1903; Guha Bakshi in Fl. Mur. Dist. 286. 1984. *Euphorbia parviflora* L. in Syst. ed. 10, 2: 1047. 1759. *Chamaesyce hypericifolia* (L.) Millsp. in Publ. Field Columb. Mus. in Bot. Ser. 2: 302. 1909.

Annual herbs, 42 – 52 cm. Root underground descending, fibrous. Stems erect, often purplish tinged. Leaves opposite with triangular stipules; margin ovate, 3 – 7 × 1.5 – 3.4 cm, rounded, obscurely toothed. Cyathia terminal cymes; involucre cuplike. Male flowers slightly inserted. ovary pubescent; stigma deeply 2 – 4 lobed. Fruit capsule 3 angular.

Flowering: January – March

Fruiting: March – May.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujarat); Bhutan, China, Bangladesh, Myanmar.

Status: Common.

Uses: It is used to treatment of gonorrhoea, menorrhagia, leucorrhoea, pneumonia and bronchitis

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 12. 6.2019 Mallick, et al. [Field No. 5190]

GLOCHIDION Forster et Forster in Char. Gen. Pl. 57. 1775; *nom. cons.*

Glochidion acuminatum Muell. Argov. in Linnaea 32: 68. 1863; Hook. f. in Fl. Brit. Ind. 5: 323. 1887; Kitamura in Hara in Enum. Fl. Pl. Nepal 3: 196. 1982; Grierson et Long in Fl. Bhutan 1(3): 779. 1987. '*Lalikaath*'

Tree evergreen medium plant 6 – 12 m, pubescent, branchlets. Leaves alternate; lamina 4 – 15 × 2 – 6 cm, entire, lanceolate, acuminate, greenish above, pinnately veined. Flowers axillary fascicles. Sepals 5; unequal; male flowers 3 anthers; styles connate, column 4 – 7 lobed. Fruits subglobose.

Flowering: April – June

Fruiting: May – October

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Nepal, Bhutan and China.

Status: Threatened (IUCN 2017).

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 7536]

JATROPHA L. in Sp. Pl. 2: 1006. 1753; *nom. cons.*

Jatropha curcas L. in Sp. Pl. ed. 1: 1006.1753; Hook. f. in Fl. Brit. Ind. 5: 383.1887; Grierson et Long in Fl. Bhutan 1(3): 790. 1987. *Curcas indica* Rich. in Hist. Fis. Cuba, Bot. 11: 208. 1850. *Jatropha acerifolia* Salisb. in Prodr. Stirp. Chap. Allerton 389. 1796. '*Sada Varenda*'.

Bushy, Erect, undershrubs, raddish. Leaves alternate, lobed, base cordate; stipules hairy. Flower in cyme; bracts lanceolate. Sepals persistent, contain glandular hairs; corolla purplish yellowish red; stamens connate at base. Fruit capsules 3 – lobed.

Flowering: June – July

Fruiting: June – September

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Jharkhand, Sikkim, Assam, Tripura and West Bengal) Nepal, Malaysia, Bangladesh, Bhutan.

Status: Least Concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 3698]

MACARANGA Thouars in Gen. Nov. Madagasc. 26. 1806.

Macaranga denticulata Mull. Arg. in Prodr. [A.P. de Candolle] 15(2.2): 1000. 1866.

Small trees, 3 – 15 m tall. Branchlets yellowish brown, tomentose. Stipules lanceolate, 5 – 8 mm; lamina broadly ovate, 12 – 32 × 11 – 26 cm, thinly leathery or thickly papery, abaxially pubescent, densely glandular scaly, adaxially glabrescent, base obtuse or subtruncate, margin repand or subentire, apex cuspidate–acuminate, palmately 7 – 9–veined. Male inflorescences 6 – 11 cm, tomentose. Male flowers 3 – 7 per bract; pedicel 0.5 mm; calyx 2 lobed; stamens 9 – 16. Female inflorescence branched, tomentose; bracts oblong or ovate. Female flower solitary; calyx cup-shaped, 2-lobed; ovary 3-locular, puberulent, styles 3; capsule 2-lobed, densely glandular–scaly; persistent calyx 3 or 4-lobed.

Flowering: April– June

Fruiting: May– October.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Bhutan, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand and Vietnam.

Status: Not Evaluated (IUCN)

Uses: Leaves used for flavoring.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2019, Mallick, et al. [Field No. 2473]

Macaranga peltata (Roxb.) Mull. Arg. in Prodr. 15(2): 1010. 1866. *Macaranga peltata* Boivin ex Baill in Etud. Gen. Euphorb. 1858. [Photo plate -VII]

Dioecious trees, upto 15 m high; bark surface pale to greyish–brown mottled with white. Leaves are simple, alternate, stipulate; stipules are large, lateral, ovate–acuminate, reflexed, cauducous; lamina ovate–orbicular. Flowers unisexual, greenish–yellow; male flowers: in axillary, dense, tomentose, much branched, panicles, concealed in large bracts; stamens 2 – 8, free, female flowers: in panicles simpler than in males, branches racemes with larger bracts; tepals 4, basally connate at the base. Fruit capsule, hairy, glandular, globose.

Flowering: January–February

Fruiting: March – April

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Telangana, Tripura, Uttar Pradesh, West Bengal); Sri Lanka, Sikkim to W. Indo-China.

Status: Least Concern (IUCN).

Uses: It is used to treat stomach–ache, cough and fever, and externally to treat wounds and the ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2019, Mallick et al. [Field No. 427]

MALLOTUS Lour. in Fl. Cochinch. 2: 635. 1790.

Mallotus philippensis (Lam.) Müll.-Arg. in Linnaea 34: 196. 1865; Hook. f. in Fl. Brit. Ind. 5: 442.1887. *Rottlera tinctoria* Roxb. in Pl. Corom. 2: 36, t. 168. 1802. *Croton montanum* Willd. in Sp. Pl. 4: 547. 1805. *Rottlera aurantiaca* Hook. et Arn. in Bot. Beech. Voy. 270. 1841.[Photo Plate –VII] ‘*Sindure*’

Small trees, 14 – 15 m. Leaves alternate; lamina elliptic, 4 – 22 × 2 – 11 cm, acuminate, rounded, entire. Inflorescences terminal, axillary. Staminate inflorescences 12 – 18 cm long; flowers 3 to 6; bracts triangular, green; sepals 2 – 6, elliptic; stamens 17 – 25, light green, anthers yellow. Pistillate inflorescences 17 – 21 cm long; *Pistillate flowers*, brown to red; sepals 3 – 7, ovate, green; ovary 2 – 3 locular. Fruits capsules.

Flowering: March – July

Fruiting: June – September

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (throughout); Bhutan, Nepal, Bangladesh, China and Sri Lanka.

Status: Rare Occurrence (IUCN 2017)

Uses: It is used to kill intestinal worms.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 33250]

RICINUS L. in Sp. Pl. 2: 1007. 1753.

Ricinus communis L. in Sp. Pl. 2: 1007. 1753; Hook. f. in Fl. Brit. Ind. 5: 457. 1887; Prain in Bengal Pl. 2: 946. 1903. *Cataputia minor* Ludwig. in Def. Gen. Pl. ed. 3: 81. 1760. *Croton spinosus* L. in Sp. Pl. 2: 1005. 1753. *Ricinus communis* L. in Sp. Pl. 2: 1007. 1753. '**Reri**'

Large perennial, glabrous, fleshy, erect, herbs. Leaf margin simple 9 – 11 lobed. Inflorescence raceme. Male flower with midium bract, ctinomorphic 5; stamens-7; female flower 5-perianth, carpel-4. Fruits schizocarpic.

Flowering: May – July

Fruiting: June – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Tropical India and Africa.

Status: Least Concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 7893]

TREWIA L., Sp. Pl. 2: 1193. 1753.

Trewia nudiflora L. in Sp. Pl. 1193. 1753; *Trewia nudiflora* var. *dentata* Susila and N.P. Balakr. in J. Econ. Taxon. Bot. 22: 352. 1998. *Trewia nudiflora* var. *polycarpa* (Benth. and Hook. f.) Susila and Balakr. in J. Econ. Taxon. Bot. 22: 351. 1998. *Trewia*

nudiflora var. *tomentosa* Susila and Balakr. in J. Econ. Taxon. Bot. 22: 351. 1998.

'Pithali'

Deciduous tree, branchless wood and leaves 11 – 20 cm by 7 – 12 cm, ovate, opposite, long pointed, at youth hairy beneath, later glabrous, stalks 2 – 7.5 cm long. On separate trees female and male flowers, males with lax drooping inflorescences, yellow, females 2 – 3 together 2 – 3 in the leaf Axis or solitary, green. Fruits 3.5 cm by 3 cm, fleshy, grayish green, depressed globose.

Flowering: December – March

Fruiting: April – May

Local distribution: Throughout the forests area of terai and duars.

General Distribution: India (throughout); China and Malaysia.

Status: Common

Uses: It is used to treat flatulence, gout and rheumatism.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 27.09.2019, Mallick, et al. [Field No. 4214]

HYPERICACEAE

HYPERICUM L. in 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 in Dagb. OstInd. Resa 244. 1757. *Brathys orysetum* Bl. in Mus. Bot. 2: 20. 1856; Dyer in Hook.f. in Fl. Brit. Ind. 1: 256. 1874; Hara et al. in Enn. Fl. Pl. Nep. 2: 62. 1979.

Annular herbs, 9 – 29 cm. Stem erect, prostrate, stems quadrangular, branches dichotomous, rooting struts from basal nodes. Leaves sessile, 3 – 9 × 1 – 7 mm, lamina oblanceolate, obtuse, cordate. Flowers terminal, dichotomous, cymes; bracts linear, sepals elliptic, acute, obtuse; petals yellowish brown. Fruit capsules.

Flowering and Fruiting: Throughout the year.

Local Distribution: MPCAs forests area of terai and duars.

General Distribution: India (tropical states); Nepal, Bangladesh, Sri Lanka, Myanmar.

Status: Common

Uses: It is used against bacterial diseases, infectious hepatitis, internal hemorrhages and tumors.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 5406]

PASSIFLORACEAE Juss. in Ann. Mus. Hist. Nat. Paris 6: 102. t. 37-41. 1805; *nom. cons.*

PASSIFLORA L. in Sp. Pl. 2: 955. 1753; *nom. cons.*

Passiflora foetida L. in Sp. Pl. 959. 1753; Prain in Bengal Pl. in 1: 512. 1903. *Dysosmia hircina* Sweet ex Roem. in Fam. Nat. Syn. Monogr. 2: 150. 1846. *Passiflora balansae* Chodat in Bull. Herb. Boissier 2: 744. 1902. *Passiflora variegata* Mill. in Gard. Dict. 8. 1768.

Herbaceous smelling vines. Stem slender, pubescent. Stipules clasping, slightly parted. Leaves opposite, simple; margin broadly ovate, 5 – 17 × 3 – 9 cm, base cordate, acute. Inflorescence with single flower, opposite tendril. Flowers white. Petals 1.1– 1.9 cm., corona 4 – 7 seriate. Stamens flat; anthers oblong. Ovary ellipsoid, short. Fruit berry orange-red.

Flowering: August – October **Fruiting:** September – January

Local Distribution: MPCAs forests area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, West Bengal, Orissa, Tripura, Meghalaya) West Indies and N South America

Status:Least Common (IUCN)

Uses: Roots are used as bacterial diseases, infectious hepatitis, internal hemorrhages and tumors

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 25.6.2019 Mallick, et al. [Field No. 5406]

PHYLLANTHACEAE Agardh in Theoria Syst. Pl. Fam. Phan. 249. 1858.

ANTIDESMA Burm. ex L. in Sp. Pl. 2: 1027. 1753.

Antidesma acidum Retz. in Observ. Bot. 5: 30. 1789.

Shrubs, leaves 3.1 – 9.3 × 2.2 – 4.4 cm, obovate, base attenuate, apex shortly acuminate; petiole 3.1 mm long. Spikes terminal, single or 2 branched 2.4 – 3.3 cm long. Perianth greenish yellow, lobes 4, 1.6 mm long, brown hairy within. Male flowers stamens 2, attached on the disc. Female flowers ovary obovoid, 1-loculed; ovules 2. Fruit drupe, globose.

Flowering: March – April **Fruiting:** June – January

Local Distribution: Three MPCAs forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu Telangana, Uttar Pradesh, West Bengal); Bangladesh, Bhutan, Nepal, Thailand, Vietnam.

Status: Common

Uses: In the Cooch Behar district of West Bengal, the ripe fruits are eaten by children

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 26.09.2019, Mallick, et al.[Field No. 2647]

Antidesma montanum Blume in Bijdr. Fl. Ned. Ind. 1124. 1827. *Antidesma montanum* Thwaites in Enum. Pl. Zeyl. 289. 1861. *Antidesma montanum* var. *microcarpum* in Airy Shaw Kew Bull. 36: 363. 1981. *Antidesma montanum* var. *microphyllum* (Hemsl.) Petra Hoffm. in Kew Bull. 54: 357. 1999.

Tree about 10.2 m tall, with thin flaky bark. Leaves 8.2 – 22 × 2.5 – 7.7 cm oblong to elliptic or oblanceolate, tip pointed with a sharp point. Base acute to rounded simple; stipules occur in pairs, linear-lance-shaped, pointed 1.2 cm long, Leaf stalk 0.26 – 1.4 cm long. Flowers borne in racemes in leaf axils. Flowers unisexual, clusters. Fruit drupe, elliptic, somewhat oblique, turning red seed 1.1m.

Flowering: June – August

Fruiting: July – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Assam, Uttar Pradesh, Bihar); Sri Lanka, Bhutan, Bangladesh, Borneo, Thailand.

Status: Common

Uses: Roots are used internally to treat measles, chickenpox and malaria.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 26.10.2019, Mallick, et al. [Field No. 8909]

Antidesma bunius (L.) Spreng. in Syst.Veg. Sprengel 1: 826. 1824. *Antidesma bunius* var. *cordifolium* (Presl) Müll. Arg. in Prodr. 15(2): 262. 1866. *Antidesma bunius* var. *genuinum* Mull. Arg. in Prodr. 15(2): 262. 1866.

Tree, densely branched, dioecious; stem pale brown; stipule 0.7 cm long, pubescent; leaves obovate, dark green, alternate, base acute, apex acute, lateral veins 5 – 9 pairs, petiole 0.9 cm long, margin 10.7 – 14.8 × 4.3 – 7.9 cm. Inflorescence racemes, terminal; male inflorescence 14.3 cm long, peduncle 0.6 cm diameter; bracts brown green; male flowers sessile 0.8 cm long; calyx reduced 5 lobed, pubescent, green, sparsely; stamens 3 – 5, anther 2 lobed, greenish yellow, filament 1.5 cm long; female inflorescence 4.7cm long; bracts 0.7 cm, female flower 0.5 cm long, pedicel short,

upto 0.4 cm; calyx 0.07 cm. long, reduced 4 lobed; style 3 – 4, dominantly 3, very short, brown; ovary 0.4 cm smooth.

Flowering: February – April

Fruiting: March – June

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Bangladesh, Bhutan, Borneo and China.

Status: Not evaluated (IUCN)

Uses: Fruits juice is used to treat high blood pressure and heart diseases. The leaves are used to treat coughs and indigestion.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 3069]

BACCAUREA Lour. in Fl. Cochinch. 2: 651. 1790.

Baccaurea ramiflora Lour. in Fl. Cochinch. 2: 661. 1790.

Middle sized tree 36 – 50 ft, hairy. Bark darkish grey. Leaves 4 – 9 × 1.2 – 3.4 in., elliptic to oblong, obovate, lanceolate, acuminate, membranous, glabrous; lateral nerves 5 – 10 on either half; petiole 0.4 – 1.75 inch, thick. Flowers dioecious, shortly pedicellate, densely fascicled racemes from old wood or below the leaves. Male bracts longer than the clusters. Female bracts very small. Calyx segments 4 – 5, unequal. Stamens 4 – 10; filaments short, anthers small; pistillode pubescent; ovary tomentose, stigma small, ovules 2 in each cell. Fruit globose, capsular, yellowish brown.

Flowering: December – May

Fruiting: June – August

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Bhutan, Bangladesh, Cambodia, Malaya, Myanmar, Thailand and Vietnam.

Status: Common

Uses: Pulp edible and delicious. Bark is used to treat constipation.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No.1109]

BISCHOFIA Blume in Bijdr. Fl. Ned. Ind. 17: 1168.

Bischofia javanica Blume in Bijdr. 1168. 1827; Ben. Pl. 2: 926. 1903. *Andrachne trifoliata* Roxb. in Fl. Ind. 3: 728. 1832. '*Kainjal*'

Trees evergreen 40.3 m tall, to 2.2 m broad at middle. Stembranching lower, straight; bark brown to gray–brown, with red latex 1.1 cm thick; Leaves 3–foliolate palmately; stipules lanceolate, caduceous 8.3 mm; petiole 8.2 – 20.3 cm long; lamina elliptic, ovate, papery, 7.2 – 15.3 × 4.1 – 8.3 cm, glabrescent, margins with 2 or 3 teeth per cm. Inflorescence paniculate, axillary; male peduncle 8.2 – 13.4 cm, glabrous to puberulent, female peduncle pendent 15.3 – 27.5 cm. Male flowers 2.4 mm in diam; sepals abaxially puberulent outside, adaxially concave; filaments short; pistillode pubescent, peltate, small. Female flowers: sepals like male flowers but oblong–ovate, margins membranous; ovary glabrous, styles entire, linear 4 or 3. Fruits subglobose or globose, brownish.

Flowering: April – May

Fruiting: August – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Andaman and Nicobar Island, Assam, Tamil Nadu); Indonesia, Japan, Thailand, Vietnam, Australia and Pacific Islands.

Status: Least Concerned (IUCN)

Uses: Used as a medicine against rheumatic pain and malaria, tuberculosis, stomach ulcers, mouth ulcers and inflammatory conditions.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 09.07.2019, Mallick, et al. [Field No. 4408]

BRIDELIA Willd. in Sp. Pl. 4: 978. 1806.

Bridelia retusa (L.) Spreng. in Syst. Veg. 3: 48. 1826. *Bridelia retusa* (L.) Juss. in Euphorb. Gen. 22. 1824. *Bridelia retusa* var. *genuine* Mull. Arg. ex DC. in Prodr. 15(2): 493. 1866. *Bridelia retusa* var. *glabra* Gehrm. in Bot. Jahrb. Syst. 41(95): 30. 1908. *Bridelia retusa* var. *glauca* Hook. f. in Fl. Brit. Ind. 5(14): 268. 1887.

Plant deciduous trees, to 20 m high, bark greyish brown. Leaves simple, alternate; stipules 7.5 mm long, lateral, lanceolate, deciduous; petiole 9.1 – 15.3 mm long, Flowers unisexual; greenishyellow, shortly pedicellate; male flowers 7.1 mm, tepals 10, biseriate, valvate; outer tepals 3.1 mm long, ovatelanceolate; stamens 5, monadelphous; filaments 0.8 mm, anthers oblong; pistillode bifurcate; female flowers 6.3 mm, tepals 10, biseriate, lanceolate, valvate, outer and inner 2.4 and 1.2 mm long; ovary half inferior, globose, 2 locular, ovules 2 in each cell, styles 2; Fruit a drupe 7.1 – 8.2 mm, purplish black.

Flowering: August – September

Fruiting: November – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal); Bangladesh, Nepal, Sri Lanka, Indochina and Thailand.

Status: Common

Uses: The plant is pungent, bitter, heating, useful in lumbago; bark is good for the removal of urinary concretions.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 27.06.2019, Mallick, et al. [Field No.1030]

Bridelia sikkimensis Gehrm. in Bot. Jahrb. Syst. 41(95): 34.1908. *Bridelia sikkimensis* var. *macrophylla* Gehrm. in Bot. Jahrb. Syst. 41(95): 34. 1908. *Bridelia sikkimensis* var. *minuta* Gehrm. in Bot. Jahrb. Syst. 41(95): 34. 1908.

Trees or shrubs, sometimes climbing. Leaves alternat, entire, stipulate. Monoecious or dioecious, flowers surrounded by scarious bracts in axillary clusters, these sometimes forming spikes leafless or bearing smaller leaves. male flowers, calyx deeply 5lobed, petals 5, minute, obovate disc broad, cuplike, stamens 5, filaments united below into a column, pistillodepresent. Female flowers, similar to males to but disc enclosing ovary, ovary 2celled each with 2 ovules, styles 2, free. stigmas deeply bifid. Fruit drupe, 1 – 2 seeded.

Flowering: January – June

Fruiting: May – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Meghalaya, Arunachal Pradesh); Bhutan and Bangladesh.

Status: Common

Uses: Plants parts are used as food plants by the larvae of some Lepidoptera species.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick et al. [Field No. 2019]

FLUEGGEA Willd. in Sp. Pl. 4: 637, 757. 1805.

Flueggea virosa (Roxb. ex Willd.) Voigt in Hort. Suburb. Calc.: 152. 1845. Grierson and Long in Fl. Bhutan 1(3): 775. 1987. *Xylophylla obovata* Willd. in Enum. Hort. Berol.: 329. 1809. *Flueggea microcarpa* Blume in Bijdr.: 580. 1825; Prain in Bengal Pl. 2: 931. 1903. *Securinega microcarpa* (Bl.) Müll.-Arg. in DC. in Prod. 15, 2: 434. 1866.

Securinega obovata (Willd.) Müll.-Arg. in DC. in Prod. 15, 2: 449. 1866. *Flueggea obovata* (Willd.) Wall. ex Vill. in Novis. App.189. 1880.

Tall shrubs, 2 – 4 m, dioecious. Leaves distichous; margin obovate, papery, 1 – 9 × 0.6 – 7 cm; slightly acuminate, flat. Inflorescences fascicles. Flowers greenish white; sepals outer two small. Staminate yellowish blue, pendulous; filaments white short; disc glands fleshy; pistillode divided 3 branches. Pistillate flowers greenish white; sepals 0.7 – 1 mm diameter, disc annular; ovary 1 × 0.7 mm wide. Fruits globular.

Flowering: April – June

Fruiting: May – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal); Egypt, the Arabian Peninsula, Australia and Polynesia.

Status: Common

Uses: Roots and fruits are used as snakebite remedy.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 2021]

PHYLLANTHUS L. in Sp. Pl. 2: 981. 1753.

Phyllanthus amarus Schum. et Thonn. in Kongl. Danske Vidensk. Selsk. Skr. in Naturvidensk. Math. Afd. 4: 195. 1829. *Phyllanthus niruri* auct. non L. in Hook. f. in Fl. Brit. Ind. 5: 298. 1887; Hara in Fl. East. Himal. 181. 1966. *Phyllanthus nanus* Hook. f. in Fl. Brit. Ind. 5: 298. 1887. *Diasperus nanus* (Hook.f.) Kuntze in Revis. Gen. Pl. 2: 601. 1891.

Annual erect/prostrate, herbs, 105 – 138 cm. Leaves distichous, simple; stipules linear-lanceolate, greenish blue; margin oblong to elliptic, 3.4 – 9.7 × 2.2 – 5.7 mm, thinly obtuse, papery, base rounded. Flower fascicles, middle flower usually bisexual with 1 female and 1 male flower. Fruit capsules, globose, smooth.

Flowering and Fruiting: Throughout the year.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal); Pantropical weed possibly originating in the America.

Status: Common

Uses: It is bitter, astringent, diuretic, stomachic, antiseptic and febrifuge

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 1530]

Phyllanthus emblica L. in Sp. Pl. 2: 982. 1753; Hook. f. in Fl. Brit. Ind. 5: 289. 1887; Grierson et Long in Fl. Bhutan 1(3): 772. 1987. Prain in Bengal Pl. 2: 933. 1903. *Emblica officinalis* Gaertn. in Fruct. 122-123, Pl. 108, f. 2. 1790. *Emblica officinalis* Gaertn. in Fruct. Sem. Pl. 2: 122. 1790. *Emblica arborea* Raf.-Schmaltz in Sylva Tellur. 91. 1838. '*Amlaki*'

Small monoecious trees, 11 – 12.2 m. Leaves distichous; stipules ciliate, ovate; Margin oblong to linear, 8.7 – 18.2 × 1.3 – 8.7 mm, truncate, papery to leathery, narrowly revolute, base shallowly cordate,. Male flowers: sepals 7, yellow; stamens 5; anthers erect. Female flowers: sepals 7, oblong; ovary ovoid; styles connate at base, deeply bifid. Fruit drupe, exocarp fleshy.

Flowering: May – July

Fruiting: June – October

Local Distribution: Grass and marshy MPCAs of the forest area.

General Distribution: India (Kerala, Orissa, Jharkhand, West Bengal); Bhutan, Nepal, Sri Lanka, Philippines, Myanmar, Thailand.

Status: Threatened (IUCN 2019).

Uses: It is used for traditional medicine for the treatment of jaundice, diarrhea, and inflammation.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No. 15356]

Phyllanthus fraternus Webster in Contr. in Gray. Herb. 176: 53. 1955; and in J. Arnold Arbor. 38: 308. 1957. *Phyllanthus niruri* auct non L. in Sp. Pl. 2: 982. 1753, Hook. f. in Fl. Brit. Ind. 5: 298 1887; Prain in Bengal Pl. 2: 936. 1903. 1887. *Phyllanthus fraternus* subsp. *togoensis* Brunel et Roux in Bull. Soc. Bot. France 122: 161. 1975.

Annual, erect herbs with alternate elliptic to oblong, compound, subsessile, leaves. Male flowers green in colour, solitary, axillary, filament united. Female flowers white yellow, solitary, style 3. Fruit capsules globose.

Flowering: June – October

Fruiting: June – February.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Telangana, Tripura, Uttar Pradesh, West Bengal); Nepal, Bhutan, Bangladesh and South America.

Status: Common

Uses: It is used for strongly diuretic and taken to allay spasms.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 21.11.2019, Mallick, et al. [Field No. 1730]

Phyllanthus reticulatus Poir. in Encyclop. thodique, Botanique 5. 1804. *Phyllanthus reticulatus* Lodd. in Bot. Cab. 2(2): 116. 1818. *Phyllanthus reticulatus* var. *orae-solis* Radcl.-Sm. in Kew Bull. 51(2): 319. 1996 '**Panjuli**'

Shrubs to 4.7 m tall, monoecious; branches brownish; leaves, and pedicels yellowish pubescent or glabrous. Stipules subulate-lanceolate, brown 1.3 –3.5 mm, hard and spiny when dry; petiole 2 – 5.1 mm; Inflorescence an axillary rarely a cyme, with 4 – 10 male and 1 or 3 female flowers. Male flowers: pedicels delicate 6.2 –1.3 mm; sepals 4 or 5, in 2 series, ovate or obovate, entire; disk glands 5, scalelike, 0.7 mm wide; stamens 5, erect 3 with longer filaments coherent in a central column 2 with shorter filaments, anthers triangular, longitudinally dehiscent. Female flowers: pedicels 3.2 –7.3 mm, delicate; sepals 4 or 6, in 2 series, broadly ovate, puberulent inside at base; disk glands 4 or 6, oblong, ovary 5 – 12-celled, smooth; styles free, Seeds trigonous, brown.

Flowering: March – June

Fruiting: June – July

Local distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, assam, Nagaland, Tripura, West Bengal, Bihar); Nepal, Bhutan and Bangladesh.

Status: Common

Uses: The twigs are used as chew–sticks. A soup made of the leaves, boiled with palm fruits, is given to woman after child–birth.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4016]

Phyllanthus urinaria L. in Sp. Pl. 2: 982. 1753; Hook. f. in Fl. Brit. Ind. 5: 293. 1887; Grierson et Long in Fl. Bhutan 1(3): 772. 1987; Prain in Bengal Pl. 2: 935. 1903. *Diasperus urinaria* (L.) Kuntze in Revis. Gen. Pl. 2: 601. 1891. *Phyllanthus cantoniensis* Horn. in Enum. Pl. Hort. Hafn. 29. 1807.

Erect, branched, annual herbs; stem terete, smooth. Leaves compound, alternate, leaflets oblong. Flowers unisexual, in axillary; all male flower succeeding axils with bisexual cymules, calyx 5 lobes, sub equal, acute; stamen-3; Female flowers: sepal 5, sub equal; style 3, free. Capsules obovate.

Flowering: April – July

Fruiting: May – January

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (tropical part); Bhutan, Nepal, Sri Lanka, China, Japan, Malaysia, Thailand, Vietnam.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 401]

Phyllanthus virgatus Froster *f.* in Fl. Ins. Austrl. Prodr. 65. 1786. Airy Shaw in Kew. Bull. 26: 325. 1972; Guha Bakshi in fl. Mus. Dist. 294.1984. *Phyllanthus simplex* Retz. in Obs. Bot. 5: 29.1789; Hook. *f.* in Fl. Brit. Ind. 5: 295. 1887; Prain in Bengal Pl. 2: 936. 1903.

Annual herbs, up to 80 cm long, monoecious. Stipules membranous; lamina thin, leathery, linear-lanceolate to elliptic, 5 – 25.6 × 2 – 6.3 mm, obtuse to acute, base obliquely rounded. Flowers in axillary fascicles, bisexual. Male flowers: sepals ovate to rotund, 6; disk glands 6, oblong; stamens 3. Female flowers: sepals ovate-oblong, 6, reflexed, persistent in fruit; ovary globose; styles 3. Capsules oblate.

Flowering: June – April

Fruiting: May – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal); Bhutan, Nepal, Sri Lanka, Indonesia, Malaysia, Cambodia, Thailand, Pacific islands.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No.5369]

SAUROPUS Bl. in Bijdr. Fl. Ned. Ind. 12: 595. 1826.

Sauropus androgynus Merr. in Bull. Bur. Forest. Philipp. Islan. 1: 30. 1903. *Clutia androgyna* L. in Mant. Pl. 1: 128. 1767.

Shrubs 1–3 m tall, erect, monoecious, glabrous; branchlets angular at young, terete with age, slender, green. Stipules lanceolate or linear–lanceolate, 1.5 – 3 mm; lamina ovate–lanceolate or lanceolate, 3 – 10 × 1.5 – 3.5 cm, thinly papery, base cuneate, rounded, apex acuminate; venation pinnate. Inflorescence axillary, 1–2 flowered, or several male and female per cluster. Male flowers: pedicels slender; calyx disk shaped, shallowly 6–fid; sepals obovate; disk segments 6, opposite to sepals, incurved distally, covering anthers, stamens 3, filaments connate. Female flowers usually solitary, axillary; calyx red, 6–lobed; sepals obovate or obovate–triangular; disk absent; ovary depressed

Viola tricolor L. in Sp. Pl. 935. 1753. *Viola tricolor* var. *hortensis* Candolle in Prodr. 1: 303. 1824. '**Pansy**'

Annual herbs. Stems angled, erect, branched. Basal margin stipules large, ovate to lanceolate, long petiolate. Flowers solitary, usually purple, axils, with 3 – 11 flowers per stem. Sepals green, oblong-lanceolate, tip acute; corolla flat, petals deep purple-violet, lateral petals and anterior one 3 colored; ovary glabrous, stigmas enlarged, globose. Capsule ellipsoid.

Flowering: April – June **Fruiting:** July – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Jharkhand, Tripura, Assam, Nagaland); Indonesia, Malaysia, Myanmar and Philippines.

Status: Less common.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 8045]

PANDANALES Brown ex Berchtold and J. Presl, 1820.

PANDANACEAE R. Brown in Prodr. 340. 1810; *nom. cons.*

PANDANUS Parkinsonb in J. Voy. South Seas 46. 1773.

Pandanus unguifer Hooker f. in Bot. Mag. 104: t. 6. 347. 1878; St. John. in Bot. Mag. Tokyo 85: 241 – 262. 1972; Karthikyan et al. in Fl. Ind. Enum. 177. 1989. *Pandanus minor* Buch-Ham. ex Solms in Linnaea 42: 18. 1878; Beccari and Hooker. f. in Fl. Brit. Ind. 6: 485. 1894; Prain in Bengal Pl. 2:1101. 1903.

Shrubs evergreen, dioecious. Stems simple or branched, prostrate, often with stiltlike, verrucose prop roots, sometimes virtually absent. Leaves simple, terminal. Male inflorescence paniculate with spiciform branches, usually colored, branches covered with numerous stamens; flowers not individually distinguishable. Female inflorescence globose to cylindrical; flowers not individually distinguishable; carpels 2-ovuled; staminodes absent in female flower. Fruit a hard drupe, syncarpous, comprising, angled, fibrous phalanges; mesocarp sometimes hollow; exocarp fleshy; endocarp woody; locules 2 or more; phalanges separating at maturity; stigma persistent. Seed solitary.

Flowering: June – July **Fruiting:** August – September

Local Distribution: Found area in Sursuti MPCA.

General Distribution: Throughout India, Maynmer.

Status: Least concern (IUCN 2020).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3029]

OXALIDALES Bercht. et Presl. 1820.

ELAEOCARPACEAE Juss. ex DC. in Prodr. 1: 519. 1824; *nom. cons.*

ELAEOCARPUS L. in Sp. Pl. 1: 515. 1753.

Elaeocarpus floribundus Bl. in Bijdr. 120. 1825; Dyer in Hook.f. in Fl. Brit. Ind. 1: 401. 1874; Grierson et Long in Fl. Bhutan 2(1): 170. 1991. *Elaeocarpus rigidus* Ridl. in J. Straits Branch Roy. Eudi. 171 Asiatic Soc. 54: 28 1910. '**Jalpaai**'

Trees 15 – 22 m high. Margin acute to acuminate, ovate to elliptic-ovate, base cuneate glabrous. Inflorescence racemes 22 – 27-flowered. Sepals glabrescent, lanceolate, hairy; petals white, margin hairy, obtriangular; ovaries 3separate celled. Fruits ellipsoid-obovoid.

Flowering: January – July **Fruiting:** May – September

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Throughout India; Bangladesh, Bhutan, Myanmar, Malaysia and Indonesia.

Status: Vulnerable Species (IUCN 2020)

Uses:The bark and leaves are used to treat ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1100]

OXALIDACEAE Br. in Tuckey in Narr. Exped. Congo 433. 1818; *nom. cons*

BIOPHYTUM DC. in Prodr. 1: 689. 1824.

Biophytum reinwardtii (Zuccarini) Klotzsch), W.C.H. Peters in Naturw. Reise Mossambique 6(1): 85. 1861. *Biophytum reinwardtii* var. *gracilentata* Edgew. and Hook.f. in Fl. Brit. Ind. 1: 438. 1874. *Oxalis gracilentata* Kurz in J. Asiatic Soc. Bengal Pt. 2, Nat. Hist. 39: 68. 1870.

Annual herb; stem slender, simple, straight, 5.3 – 28.2 cm. high and 1.8 – 1.9 mm. in diameter. Leaves 5 to many in a simple rosette at the top of the stem, up to 10 cm. long and 10 – 16 mm; leaflets sessile or with a short petiole 0.6 mm. Long. Flowers in peduncled 1 – 5 flowered pseud umbels; peduncles slender, as long as or longer than the leaves, glabrous; bracts very small, linear 1.3 – 1.5 mm. long, acute, 1–nerved. Sepals

lanceolate, acutely acuminate 2.3 – 2.7 mm long, 3–nerved; petals free, later adherent for one–thirds of their length above the free bases, spatulate 1.5 – 2.7 times as long as the sepals. Capsule subglobose to obovoid.

Flowering: March – June

Fruiting: May – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India(Jharkhand, Orissa, Tripura, West Bengal), Bhutan, China, Nepal, Sri Lanka, Malaysia, Thailand Vietnam.

Status: Common

Uses: It is taken for cough. Crushed leaves used for cuts and wounds to stop bleeding.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 351]

Biophytum sensitivum DC. Prodr. In 1: 690. 1824. *Biophytum candolleianum* Wight in Ill. Ind. Bot. 1: 161. 1840. *Biophytum sensitivum* var. *assamica* Edgew. and Hook. f. in Fl. Brit. Ind. 1(2): 437. 1874.

Annual herbs, 19 – 24 cm in height. Leaves 10 – 12, rachis slender, covered by dense thick hair, leaflets blades obovate–oblong, 3 – 12 × 2 – 6 mm, base symmetric, usually smooth. Flowers on umbels, peduncle subequal to the length of the leaf; bracts several, lanceolate; Sepals glandular; petals long, yellow. Fruit capsule ellipsoid.

Flowering: June – August

Fruiting: September – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (tropical parts); Bhutan, China, Nepal, Sri Lanka, Malaysia, Philippines, Thailand and Vietnam.

Status: Not Evaluated (IUCN)

Uses: It is taken for cough. Crushed leaves used for cuts and wounds to stop bleeding.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 16.09.2019, Mallick, et al. [Field No. 151]

OXALIS L. in Sp. Pl. 1: 433. 1753.

Oxalis corniculata L. in Sp. Pl. 435. 1753; Hook. f. in Fl. Brit. Ind. 1: 436. 1874; Hara, Fl. East. Himal.1:168. 1966; Hara et al. in Enn. Fl. Pl. Nep. 2: 77. 1979; Fl. West Bengal in 1:373. 1997; Grierson et Long in Fl. Bhutan 1(3): 742.1987.

Annuals herbs, 40 – 50 cm, semierect, creeping. Roots slender; stolons absent. Stipules very small. Leaves petiolate 4 – 7 cm; margin obcordate, 0.7 – 2 × 0.4 – 5 cm, greenish

yellow, pubescent, deeply emarginate. Inflorescences umbellate, 1 – 4 flowered; peduncle long than petioles; bracts linear–lanceolate straw in colour. Sepal oblong lanceolate, margin ciliate; petals green yellow, oblong. Fruit capsule with long cylindrical, 5 angled. Seeds ovoid-oblong.

Flowering: March – May

Fruiting: June – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Throughout India; Bhutan, China, Nepal, Japan, Korea, Malaysia and Thailand.

Status: Common

Uses: It is used as an anti-inflammatory medicine.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 6689]

Oxalis latifolia H B K. in Nov. Gen. Sp. 5:184, t. 467. 1821; Hara in Fl. East Himal. 1: 168. 1966; Hara et al. in Enn. Fl. Pl. Nep. 2:77. 1979; Grierson et Long in Fl. Bhutan 1(3): 743. 1987.

Perennials herbs, 20 – 25 cm, stem pubescent. Subterranean 1 – 4 cm; papery, 3-veined. Leaves basal; petiole 7 – 18 cm, with white trichomes; argin triangular, 2 – 5 × 1 – 4 cm. Inflorescences cymes, corymbose, branched; bract gray white, lanceolate, membranous. Sepals lanceolate, tip with 3 reddish; petals purplish black with veins.

Flowering: June – August

Fruiting: July – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Throughout), Nepal and Bhutan.

Status: Common

Uses: This herb is anthelmintic, anti-inflammatory, diuretic, relaxant, febrifuge and stomachic.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 4870]

Oxalis corymbosa DC. in Prodr. 1:696. 1824; Hara in Fl. East. Himal. 1: 168. 1966; Hara et al. Enn. in Fl. Pl. Nep. 2:77. 1979; Grierson et Long in Fl. Bhutan 1(3): 743.1987.

Perennials herbs, 18 – 24 cm pubescent, stemless. Subterranean bulb 1.9 – 4.7 cm; scales papery, loose, 3-veined. Leaves basal; petiole 6.4 – 14.4 cm, moderately dense

spreading, white trichomes; leaflet obcordate, $3.3 - 4.3 \times 1.5 - 4.5$ cm, both surfaces covered with small hairs, tip deeply emarginate. Inflorescences corymbose cymes, branched; peduncle 11 – 16 cm or longer; bracts lanceolate. Pedicels, bracts, sepals pubescent. Sepals ovate to lanceolate, apex with 2 reddish brown. Petals purple pink. Ovary pubescent.

Flowering: March – August

Fruiting: June – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Sikkim, West Bengal, Tripura, Kerala, Nagaland) Nepal, Bhutan, Myanmar, Thailand and Japan.

Status: Common

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 5039]

MALVIDS

BRASSICALES Bromhead. in 1838.

BRASSICACEAE Lindl. in Nat. Syst. ed. 2. 58. 1836; *nom. cons.*

CARDAMINE L., Sp. Pl. 2: 654. 1753.

Cardamine hirsuta L. in Sp. Pl. 655. 1753; Grierson et Long in Fl. Bhutan 1(2): 431. 1984. *Cardamine multicaulis* Hoppe ex Schur in Enum. Pl. Transsilv. 47. 1866. *Cardamine tenella* Clarke in Trav. Var. Eur. 2: 117. 1812.

Annual small stems erect herbs. Lower leaves rosulate; petiole ciliate; margin 2.7 – 8.5 cm; terminal lobe entire, orbicular, reniform or repand or 3 – 7 lobed. Fruiting pedicels erect, slender; sepal oblong; petals greenish white, spatulate; stamens 5; ovule 15– 39 every ovary. Fruit linear to lanceolate.

Flowering: March – August

Fruiting: November – January

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Orissa, Tripura, Nagaland, Kerala, West Bengal, Assam, Sikkim), Bhutan, Sri Lanka, Pakistan, Malaysia, Japan, Laos, New Guinea, Philippines.

Uses: Cure dysentery

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6891]

RORIPPA Scopoli in Fl. Carniol. 520. 1760.

Rorippa benghalensis (DC.) Hara in Jour. Jap. Bot. 49: 132. 1974. *Nasturtium benghalense* DC. in Syst. Nat. 2: 198. 1821. *Sinapis benghalensis* Roxb. ex DC. in Syst. Nat. 2: 198. 1821. *Nasturtium indicum* var. *benghalensis* (DC.) Hook.f. in et Anderson in Hook. f. in Fl. Brit. Ind. 1: 134.1872.

Annual small herbs. Stems simple, few branched above. Leaves cauline, auriculate; lamina oblong to obovate; terminal lobe ovate or oblong; lateral lobes 1 – 5, ovate, margin serrate/dentate. Inflorescence raceme, bracteate; bracts lanceolate, subentire or denticulate. Sepals elliptic; petals pale yellow, oblanceolate; ovules 95 – 165 per ovary. Fruit linear, straight.

Flowering: March – May

Fruiting: June – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (tropical parts); Nepal, Bhutan, Bangladesh, Thailand and Vietnam.

Uses: Root and leaves have antibacterial properties.

Status: Common

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7878]

BIXACEAE Kunth in Diss. Malv. etc. 17. 1822 ('Bixineae').

BIXAL. in Sp. Pl. 1: 512. 1753.

Bixa orellana L. in Sp. Pl. 512. 1753; Prain in Bengal Pl. 1: 230. 1903. *Bixa purpurea* Sweet in Hort. Brit. 33. 1826. *Orellana americana* (Poir.) Kuntze in Revis. Gen. Pl. 1: 44. 1891. *Orellana orellana* (L.) Kuntze in Revis. Gen. Pl. 3(2): 9. 1898. '*Sindure*'

Evergreen shrubs or small trees. Leaves alternate, simple; margin abaxially pale green, adaxially deep blue green, cordate ovate, 10 – 22 × 4 – 14 cm, palmately 6 veined, glabrous, acuminate, entire, subtruncate, sometimes slightly cordate. Sepals obovate. Petals obovate. Stamens few; anthers yellowish green, apically dehiscent. Fruit capsule subglobose, slightly compressed.

Flowering: March – July

Fruiting: June – October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (throughout); native to tropical America.

Uses: It is used in antidiabetic and as insect repellent.

Status: Common

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick,

CAPPARACEAE Juss., Gen. Pl. 242. 1789; *nom. cons.*

Capparis multiflora Hook. f. in et Thom. in Hook. f. in Fl. Brit. Ind. 1: 178. 1872; Grierson et Long in Fl. Bhutan 1(2): 414. 1984.

Small trees or shrubs 5 – 7 m. terete slender branches, spineless or sometimes small stipular spines. Margin lanceolate to oblong, 5 – 11 × 2.5 – 5.3 cm, base entire, cuneate to contracted. Inflorescences superaxillary 7 – 11 flowers. Sepals unequal, outer whorl round, larger; petals ovate to oblong, white; stamens 11 – 14; gynophore 6 – 12.7 mm. Fruit globose.

Flowering: January – December

Fruiting: December – February

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India; Bhutan, Myanmar, Nepal and Vietnam.

Uses: It is used to treat liver and kidney diseases.

Status: Common

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3701]

Capparis zeylanica L. in Sp. Pl. ed. 2: 720. 1762. *Capparis acuminata* Roxb. in Fl. Ind. 2: 566. 1824. *Capparis aeylanica* Roxb. in Fl. Ind. 2: 567. 1824. *Capparis polymorpha* Kurz in J. Asiat. Soc. Bengal in Pt. 2, Nat. Hist. 42(2): 227. 1873.

Scandent trailing shrubs. Strong stipular spines, recurved, sharp. Leaves simple; margin obovate-lanceolate to elliptic lanceolate 3 – 7 × 2 – 5.3 cm, tip acute, base cuneate to rounded. Inflorescences racemes, axillary 2 or 5 flowered. Sepal unequal, nearly orbicular acute to obtuse; petals yellowish red; stamens 29 – 41; gynocium base tomentose. Fruit ellipsoid.

Flowering: February – August

Fruiting: July – December.

Local Distribution: MPCAs forests area of terai and duars of West Bengal

General Distribution: Tropical India (Manipur, Mizoram, Nagaland, Orissa, Punjab, , Tripura, Uttar Pradesh, West Bengal); Bhutan, Nepal, Indonesia, Myanmar, Philippines, SriLanka, Thailand, Vietnam.

Uses: It is used to Treating Boils and Piles.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 8789]

CRATEVA L. in Sp. Pl. 1: 444. 1753.

Crateva religiosa Forster in Diss. Pl. Esc. 45. 1786; Grierson et Long in Fl. Bhutan 1(2): 412. 1984.

Large trees; 18 – 25m. Petiole triangular; lamina 5 – 11 × 3 – 5.3 cm, leathery, abaxially gray white, acuminate. 11 – 27 flower in corymbs; bracts caducous leaflike. Flowers open, simple. Sepals acuminate to ovate. Petal yellowish green. Stamens 15 – 23. Fruit ovoid. Seeds dark blue 18 – 33 per fruit.

Flowering: April – August **Fruiting:** October – December

Local Distribution: MPCAs forests area of terai and duars.

General Distribution: India (Assam, Orissa, Jharkhand, West Bengal), Bhutan, Nepal, Sri Lanka, Indonesia, Myanmar, Thailand.

Uses: Immunity booster and weight loss.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3976]

DIPTEROCARPACEAE Bl. in Bijdr. 1: 222. 1825.

SHOREA Roxb. ex Gaertn. in Suppl. Carp. 47. 1805.

Shorea robusta Roxb. ex Gaertn. f. in Suppl. Carp. 3: 48.t. 186. 1805; Clarke in Hook. f. in Fl. Brit. Ind.1: 306. 1874; Grierson et Long in Fl. Bhutan 1(2): 361. 1984. '*Saal*'.

Trees 38 – 39 m, deciduous, crown spreading. Leaves alternate, simple; margin 7.4 – 19.4 × 4.2 – 17.2 cm, ovate, acuminate, entire, base cordate, obtuse, leathery. Flowers subsessile; branches racemose; bracts minute, caducous. Petals toughly contorted, linear. Sepals subequal, ovate. Ovary ovoid. Fruit sepal spatulate, unequal, lightly pubescent; fruit ovoid.

Flowering: February – September **Fruiting:** July – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Tropical and sub-tropical.

Uses: Used in constructing boats and ships.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 9689]

MALVACEAE Juss. in Gen. Pl. 271. 1789.

ABELMOSCHUS Medikus in Malvenfam. 45. 1787

Abelmoschus moschatus Medik. in Malv. 1: 46. 1787; Hara et Ohashi in Enn. Fl. Pl. Nep. 2: 66. 1979; Paul in Sharma et Sanjappa in Fl. Ind. 3: 308. 1993. *Hibiscus abelmoschus* L. in Sp. Pl. 696. 1753; Roxb. in Fl. Ind. ed. 2, 3: 202. 1832; Dyer in Fl. Brit. Ind. 1: 347. 1874. '*Muskdanaa*'.

Perennial annual shrub. Stems hairy. Margin ovate or orbicular, 5.3 – 19.2 × 3 – 19.5 cm; 3 – 9 lobed, higher leaves narrower, lanceolate, lobes linear, ovate to oblong, dentate, acute, acuminate, base cordate. Flowers axillary, solitary. Calyx tomentose, stellate, outside. Corolla yellow, petals rounded at tip, obovate. Fruit capsules ovoid, acuminate.

Flowering: October – November

Fruiting: December – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Tripura, Orissa, Panjab, West Bengal); Bangladesh, Thailand and Malaysia.

Uses: Treating snake bites, abdominal and intestinal problems.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3459]

ABROMA L. f. in Suppl. Pl. 54. 1782.

Abroma augusta L. f. in Suppl. Pl. 341. 1782; Grierson and Long in Fl. Bhutan 2(1): 206. 1991; Prain in Bengal Pl. 1: 278. 1903. [Photo Plate -VII] '*Ulat Khambal*'.

Shrubs, 3 – 7 m. Branchlets compactly velutinous. Stipules caducous linear; Leaves simple; lamina cordate, 3 – 7 lobed, 9– 19 × 8 – 20 cm, basal veins 3 – 9, acute, base cordate. Inflorescence cymose, 1 – 7 pendulous flowered. Sepals both surfaces lanceolate, puberulent; petals dark brown, basal part long and hairy, upper part spatulate, elliptic, tip acute or obtuse. ovary slightly hairy, oblong; style triangular. Fruit capsule erect, 5 winged.

Flowering: June – February

Fruiting: January – August

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Sikkim, Assam, West Bengal, Nagaland, Orissa, Tripura), Nepal, Bhutan, China, Malaysia.

Uses: It is used to treat rheumatism, sleeping disorders, abnormal vaginal discharge and fever.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6561]

BOMBAX L. in Sp. Pl. 1: 511. 1753; *nom. cons.*

Bombax ceiba L. in Sp. Pl. 1: 511. 1753; Nayar in Sharma et Sanjappa in Fl. Ind. 3: 398. 1993; Grierson et Long in Fl. Bhutan 2(1): 195. 1991. *Bombax ceiba* Burm. f. in Fl. Ind. 145. 1768. *Bombax malabaricum* DC. in Prodr. 1: 479. 1824. *Gossampinus rubra* Buch.-Ham. in Trans. Linn. Soc. London 15: 128. 1826. *Melaleuca grandiflora* Blanco in Fl. Filip. 615. 1837. '*Simul*'

Large tree, 19 – 25 m; trunk buttressed at base. Leaves clustered with 6 – 9 leaflets; leaflets elliptic, 11 – 19 × 4 – 7 cm, caudate, entire. Flowers axillary, solitary, borne towards branch tops. Calyx greenish yellow. Petal thick, crimson, narrowly oblong – obovate. Stamens shortly united. Style 5.3 – 7.5 mm. Fruit ellipsoid, capsule.

Flowering: March – May

Fruiting: April – July

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Tropical and sub-tropical.

Uses: Decoction of the bark is given to reduce stomachache.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 9782]

CEIBA Miller in Gard. Dict. Abr. in ed. 4, [287]. 1754.

Ceiba pentandra (L.) Gaertner in Fruct. Sem. Pl. 2: 244. 1791; Nayar et Biswas in Sharma et Sanjappa in Fl. Ind. 3: 400. 1993. *Bombax pentandrum* L. in Sp. Pl. 1: 511. 1753; Mast. in Hook. f. in Fl. Brit. Ind. 1: 350. 1874. *Ceiba pentandra* (L.) Gaertn. var. *indica* (DC.) Bakh. f. in Bull. Jard. Bot. Buite. ser.3, 6: 195. 1924.

Trees, 19 – 30 m; main branches dispersion horizontally; branches spiny. Petiole 9 – 19 cm, long; leaflets 5–11, oblong to lanceolate, 5.9 – 21 × 2 – 7.3 cm, glabrous, base acuminate. Flowers solitary subterminal, 17 flowered. Calyx glabrous; petals pink to

deep red; filaments long, ovary glabrous. Fruit capsule oblong, leathery endocarp.

Flowering: March – May

Fruiting: June– August

Local Distribution: Throughout the MPCAs forest area of terai and duars.

General Distribution: India (Assam, Sikkim Orissa, Kerala, West Bengal), Nepal, Bangladesh, Mayanmer, Srilanka

Uses: It is theSource of fiber and timber.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3989]

CORCHORUS L. in Sp. Pl. 1: 529. 1753.

Corchorus aestuens L. in syst. Nat. ed. 10. 2: 1079. 1759; Sharma et al. in Fl. Ind. 3: 485. 1993. *Corchorus acutangularis* Lam. in encycl. 2: 104. 1786. Mast. in Hook. f. in Fl. Brit. Ind. 1: 398. 1874.; Prain in Bengal Pl. 1: 259.1903. *Corchorus acutangulus* Lam. in Encycl. 2: 104. 1786. *Corchorus oppositiflorus* Hassk. in Tijdschr. Natuurl. Gesch. Physiol. 12: 126. 1845. *Corchorus fuscus* Roxb. in Fl. Ind. 2: 582. 1824.

‘Jungli paat’

Annual herbs, 1 – 1.3 m tall. Leaves alternate to simple. Margin ovate, 4 – 7 × 3 – 5.2 cm, shortly acuminate or acute, serrate. Flowers cymes, axillary. Sepals 5, oblong. Petals 5, yellowish brown, sepals, long, obovate. Stamens few, yellowish green. Ovary 3 – 7 loculed. Fruit capsule, angled, 2 – 6 valved. Seeds with septum.

Flowering August – December

Fruiting: January – April.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim Orissa, Kerala, West Bengal); Bangladesh, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Bhutan, Sri Lanka, Thailand, Vietnam.

Uses: Used for the treatment of stomachache and pneumonia.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7451]

FIRMIANA Marsili in Saggi Sci. Lett. Accad. Padova 1: 114, 116. 1786.

Firmiana colorata (Roxb.) R. Br. in Bennett et Brown in Pl. Jav. Rar. 235. 1844; Malick in Sharma et Sanjappa in Fl. Ind. 3: 420. 1993. *Sterculia colorata* Roxb. in Pl.

Corom. t. 25. 1795; Mast. in Hook. *f.* in Fl. Brit. Ind. 1: 359. 1874. *Sterculia rubicunda* Wall. ex Mast. in Hook. *f.* in Fl. Brit. Ind. 1: 360. 1874.

Medium trees. Leaves 17 – 22 × 24 – 27.2 cm, base cordate, acuminate lobes; petiole 17 to 21.3 cm. Flowers terminal paniced racemes with unisexual flower; calyx tubular, tomentose outside, reddish brown; gynophore 1.9 – 3.2 cm; stamens 14, filaments cup shaped, pistillode; carpels 5, flattened; style very short. Follicle 4.3 – 7.1 cm long.

Flowering: January – August **Fruiting:** June– December.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, Sikkim Orissa, Kerala, West Bengal); Bhutan, Nepal, Sri Lanka, Cambodia, Myanmar, Thailand, Vietnam.

Uses: It is used to treat swelling and sores.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1889]

GREWIA L., Sp. Pl. 2: 964. 1753.

Grewia serrulata DC. in Prodr. 1: 510. 1824; Sharma et Sanjappa in Fl. Ind. 3: 509. 1993. *Grewia glabra* Bl. in Bijdr. 115. 1825. *Grewia laevigata* sensu Mast. in Hook. *f.* in Fl. Brit. Ind. 1: 389. 1874, non Vahl 1790.

small tree or erect shrubs, branchlets glabrous slender. Leaves 13.8 – 15.4 × 3.4 – 7.7 cm, serrate, elliptic, sharply acuminate. Peduncle 3.4 – 5.3 cm, glabrous, slender; sepal tomentose, oblong; petals white yellow, ovate; gynandrophore compactly hairy; stigma shortly fimbriate. Fruit drup, glabrous.

Flowering: August – February

Fruiting: November– March

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: Indo-Malesia and Tropical Africa.

Uses: Heart Blood and liver disorders.

Status: Not Evaluated (IUCN)

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5889]

HELICTERES L. in Sp. Pl. 2: 963. 1753.

Helicteres isora L. in Sp. Pl. 2: 963. 1753; Mast. in Hook. *f.* in Fl. Brit. Ind. 1: 365. 1874; Malick in Sharma et Sanjappa in Fl. Ind. 3: 426. 1993.

Small trees, shrubs 6 – 8 m. Branchlets puberulent. Stipules caduceous, linear; petiole puberulent; lamina broadly oblong, circular, 10–17× 7–19 cm, leathery, base rounded, cordate, truncate, serrate, shortly acuminate tip. Inflorescences densely clustered, axillary. Flowers 3–7 cm in diam. Sepals 4–7 lobed, lobes triangular, 3 lipped; petals red or purple blue; stamens 12, ovary twisted after pollination. Fruit capsule cylindrical. Seeds wrinkled, many.

Flowering: April – October **Fruiting:** August – February

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim Orissa, Kerala, Jharkhand, West Bengal), Bhutan, Sri Lanka, Indonesia, Thailand, Nepal, Vietnam, Cambodia and Australia.

Uses: It is used to treating urine problem.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. [6889]

MALVA L. in Sp. Pl. 2: 687. 1753.

Malva verticillata L. in Sp. Pl. 689. 1753; Masters, Fl. Brit. Ind. 1: 320. 1874; Prain in Bengal Pl. 1:256. 1903. *Malva neilgherrensis* Wight in Icon. Ind. Orient., t. 950. 1845. Sharma et al. in Fl. Ind. 3: 363.1993. '*Laffaa saak*'

Biennial medium herbs; stem stellate sparsely velutinous. Stipules ovate to lanceolate. Leaves simple; lamina kidney shaped to round, 5 – 13 × 5 – 13 cm, 5 – 9 lobed, lobes rounded acute, margin serrated. Flowers close cluster, axillary. Calyx campanulate; corolla whitish to greenish, slightly long; filament 3 – 5.4 mm, glabrous; style branches. Fruit schizocarp.

Flowering: December – March **Fruiting:** April – June

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Tripura, Orissa, Kerala, Jharkhand, West Bengal); Bhutan, Nepal, Bangladesh, Korea, Myanmar and Mongolia.

Uses: Used as Chinese mallow as a laxative to relieve constipation and as a diuretic to relieve water retention by increasing urine production.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5661]

MELOCHIA L. in Sp. Pl. 2: 674 [“774”]. 1753; *nom. cons.*

Melochia corchorifolia L. in Sp. Pl. 675. 1753; Mast. in Hook. *f.* in Fl. Brit. Ind. 1: 374. 1874; Sharma et al. in Fl. Ind. 3: 441. 1993; Grierson et Long in Fl. Bhutan 2(1): 206. 1991; Prain in Bengal Pl. 1: 277.1903. *Geruma subtriloba* Blanco in Fl. Filip. 182. 1837. *Melochia supina* L. in Sp. Pl. 675. 1753. *Melochia erecta* Burm. *f.* in Fl. Ind. 143. 1768. *Riedleia corchorifolia* (L.) DC. in Prodr. 1: 491. 1824.

Shrubs, less than 1 – 1.5 m, erect. Branches sparsely stellate puberulent. Stipules linear to lanceolate. Leaves simple; margin ovate to lanceolate, 2 – 7 × 1 – 3.3 cm, dentate, tip acute, base cordate, papery. Inflorescence axillary cyme or dense terminal. Calyx lobes hairy, linear, campanulate; sepals 5, triangular; petals 5, oblong, drying reddish; stamens 5; ovary sessile, styles filiform. Fruit capsule globose, five angular. Seeds ovoid, triangular.

Flowering: June – December

Fruiting: February – April

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Tripura, Orissa, Panjab, Uttarpradesh, Kerala, Jharkhand, West Bengal); Nepal, Srilanks Bangladesh, Bhutan and Thailand.

Uses: Used as fodder for cattle.

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6561]

PTERYGOTA Schott et Endlicher in Melet. Bot. 32. 1832.

Pterygota alata (Roxb.) Br. in Bennett et Brown in Pterocymbium Jav. Rar. in 234. Jun 1844; Malick in Sharma et Sanjappa in Fl. Ind.: 455. 1993. *Sterculia alata* Roxb. in Pl. Coromandel 3: 84. 1811; Mast in Hook. *f.* in Fl. Brit. Ind.1: 360. 1874. *Sterculia heynei* Bedd. in Fl. Sylv. t. 230.1874. [Photo Plate VIII]

Trees, 18 – 31 m. Stipules caducous; lamina cordate, ovate, 13 – 29 × 10 – 21 cm, both surfaces glabrous, base entire, cordate, acute. Inflorescence paniculate, axillary, shorter than petiole. Flowers reddish yellow; pedicels absent. Calyx campanulate. Male flowers: androgynophore cylindric, puberulent; anthers 3 – 7. Female flowers: androgynophore; ovary sub-globose, ovules 34– 47 in each carpel, styles 5.

Flowering: November – January

Fruiting: March – June

Local Distribution: Throughout the MPCAs forests area of terai and duars.

General Distribution: India (Sikkim, West Bengal, Jharkhand, Bihar), Bangladesh, Bhutan, Malaysia, Myanmar, Philippines, Thailand.

Uses: Bark is used as leprosy, swelling and pain.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. [6458]

PTEROSPERMUM Schreber in Gen. Pl. 2: 461. 1791; *nom. cons.*

Pterospermum acerifolium Willd. in Sp. Pl. 3: 729. 1800; Grierson et Long in Fl. Bhutan 2(1): 206. 1991; Prain in Bengal Pl. 1: 278. 1903. *Pentapetes acerifolia* L. in Sp. Pl. 698. 1753. *Pterospermadendron acerifolium* (L.) Kuntze in Revis. Gen. Pl. 1: 80. 1891. *Dombeya acerifolia* (L.) Gaertn. in Fruct. Sem.Pl. 2: 260. 1791.

Large trees. Branchlets thickly velutinous. Petiole striate, robust; lamina nearly oblong, 21 – 37 × 12 – 29 cm, truncate, entire or crenate, base cordate, nearly pointed, leathery; young leaves, peltate. Flowers solitary, epicalyx divided palmately. Sepal linear; petals linear oblong, faintly cuneate, glabrous; ovary oblong, ovules many in each locule. Fruit capsule hardy, cylindrical.

Flowering: August – December

Fruiting: January – July

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim Orissa, Kerala, Jharkhand, West Bengal); Bhutan, Bangladesh, Nepal, Myanmar, Malaysia and Thailand.

Uses: Used in inflammation, abdominal pain, ascites, cures ulcers, leprosy, constipation, urinary discharges and tumours.

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4501]

SIDA L. in Sp. Pl. 2: 683. 1753.

Sida acuta Burm. f. in Fl. Ind. 147. 1768; Hara in Fl. East Himal. 1: 205. 1966; Hara et Ohashi in Enn. Fl. Pl. Nep. 2: 68. 1979; Dyer in Hook. f. in Fl. Brit. Ind. 1: 323. 1874. *Malvinda carpinifolia* (L. f.) Medik. in Malvenfam. 24. 1787. *Sida carpinifolia* L. f. in Suppl. Pl. 307. 1782. [White Berela' [Photo Plate -2]

Erect branched shrubs, shoots pubescent, glabrous. Lamina serrate, scarcely lanceolate to lanceolate, acute, base cuneate, infrequently rounded, stipules of each pair unequal,

glabrescent, filiform lanceolate. Flowers solitary some times axillary, 2 – 7 flowered. Petals yellowish brown, obovate.

Flowering: September – May

Fruiting: August – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Orissa, Kerala, Jharkhand, West Bengal), Nepal, Bhutan, Bangladesh, Thailand, Myanmar and Indonesia

Uses: It is used to treating fracture wounds and snake bites.

Status: Not evaluated

Specimen West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 8051]

Sida cordifolia L. in Sp. Pl. 684. 1753; Dyer in Hook. f. in Fl. Brit. Ind. 1: 324. 1874; Hara, Fl. East Himal. 1: 205. 1966; Hara et Ohashi in Enn. Fl. Pl. Nep. 2: 68. 1979; Paul in Sharma et Sanjappa in Fl. Ind. 3: 285. 1993; Grierson et Long in Fl. Bhutan 2 (1): 192. 1991; Prain in Bengal Pl. 1: 256.1903 '*White Berala*'.

Erect shrubs. Lamina oblong or orbicular, serrate, obtuse, acute; foolishly cordate at base. Flowers solitary, axillary 2 – 7 in clusters. Corolla cream yellow, petals obovate, truncate at apex. Staminal column hairy.

Flowering: January – March

Fruiting: June – August.

Local Distribution: Throughout the MPCAs forests area of terai and duars.

General Distribution: India (Sikkim, Orissa, Kerala, Jharkhand, West Bengal), Nepal, Bhutan and Bangladesh.

Uses: Treating fracture wounds and snake bites

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5851]

Sida rhomboidea Roxb. ex Fleming in Asiat. Res. 11. 178. 1810; Grierson et Long in Fl. Bhutan 2 (1): 192. 1991; Prain in Bengal Pl. 1: 256.1903. *Sida rhombifolia* var. *rhomboidea* (Roxb. ex Flem.) Mast. in Hook. f. in Fl. Brit. Ind. 1: 324. 1874.

Erect branched prostrate under-shrubs. Stipules simple, linear, lamina rhombic to oblong, obovate, 1–7 × 1 – 3.3 cm, obtuse to acute, dentate, base cuneate. Flowers axillary, solitary. Pedicel 1 – 3.3 cm. Calyx campanulate, apices acute, lobes triangular,. Petals yellowish brown, obovate, apex rounded, base attenuate. Filament 4 – 6.3 mm,

glabrous. Style branches 8 – 11.3. Fruit broadly turbinate, semiglobose, shallowly grooved. Seeds kidney shaped, blackish.

Flowers: September – March

Fruiting: June – August.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Orissa, Kerala, Jharkhand, West Bengal; throughout); Bhutan, Cambodia, Laos, Nepal, Thailand and Vietnam

Uses: Treating facture wounds and snake bites

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6781]

Sida cordata (Burm. f.) Borss. Waalk. in Blumea 14: 182. 1966; Grierson et Long in Fl. Bhutan 2 (1): 192. 1991; Prain in Bengal Pl. 1: 256.1903. *Melochia cordata* Burm. f. in Fl. Indica 143.1768. *Sida multicaulis* Cavan. in Diss. 1: 10, pl. 1, f. 6: 10. 1785. *Sida humilis* Cav. var. *veronicaefolia* (Lamk.) Mast. in Hook. f. in Fl. Brit. Ind. 1: 322. 1874. **‘Sweet Berela’**

Procumbent slender shrubs. Stipule filiform; leaf alternate, simple, lamina ovate, 3 – 6 × 2.2 – 6.3 cm, dentate, acuminate, base cordate. Flowers solitary, axillary. Pedicel short slender. Calyx campanulate, lobes acute; corolla reddish brown; filament short, tube glabrous.

Flowers: July – February

Fruiting: April – June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Orissa, Kerala, Jharkhand, West Bengal; throughout) Philippines, Sri Lanka and Thailand.

Uses: Treating facture wounds and snake bites

Status: Not Evalauted (IUCN).

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3451]

STERCULIA L. in Sp. Pl. 2: 1007. 1753.

Sterculia villosa Roxb. in Fl. Ind., ed. 1832, 3: 153. 1832; Dyer in Hook. f. in Fl. Brit. Ind. 1: 355. 1874; Grierson et Long in Fl. Bhutan 2(1): 199. 1991; Prain in Bengal Pl. 1: 274.1903. *Sterculia armata* Mast. In Hook. f. in Fl. Brit. Ind. 1: 357. 357. *Sterculia lantsangensis* Hu, Bull. Fan Mem. Inst. Biol. in Bot. 8(1): 42. 1937. **‘Odal’**.

Tree branchlets leaf scars robust. branch stellate pubescent at juvenile stage. Leaves simple; stipules ovate to lanceolate; lamina palmately lobed, 3 – 9 number, 21 – 23 cm, caudate, base cordate, central lobe ovate. Inflorescence subterminal, paniculate. Calyx campanulate, apex acute to acuminate. Male flowers: androgynophore, glabrous; stamens 11. Female flowers; ovary globose; style short, hairy curved,. Follicles scarcely ellipsoid, tip shortly beaked.

Flowering: February – December

Fruiting: October – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Kerala, West Bengal, Nagaland); Bhutan, Cambodia, Myanmar, Nepal, Thailand.

Uses: Used by Indians as a traditional remedy for inflammation

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5701]

TRIUMFETTA L. in Sp. Pl. 1: 444. 1753.

Triumfetta rhomboidea Jacq. in Enum. Syst. Pl. 22. 1760; Mast. in Hook. f. in Fl. Brit. Ind. 1: 395. 1874; Grierson et Long in Fl. Bhutan 2 (1): 196. 1991; Prain in Bengal Pl. 1: 258.1903. *Bartramia indica* L. in Sp. Pl. 389. 1753. *Triumfetta angulata* Lam. in Encycl. 3(2): 421. 1791. *Triumfetta bartramii* L. in Syst. Nat. (ed. 10) 2: 1044. 1759. *Triumfetta indica* Lam. in Encycl. 3: 420. 1791. *Bartramia rhombifolia* Stokes in Bot. Mat. Med. 3: 15. 1812.

Shrubby branchlets gray-white tomentose plant. Leaves alternate, simple; lamina broadly ovate, rhomboid, 5 lobed, 3 – 9 × 2 – 9.3 cm, acute, base cuneate or rounded; upper leaf oblong-lanceolate. Inflorescence cymes, 3 – 7 each axil. Sepals villous, closely oblong; petals yellowish brown, short with hairy margins; stamens 12; ovary small, spiny. Fruit capsule spiny, globose, tip hooked, indehiscent,.

Flowering: August – July

Fruiting: May – December.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Assam, Kerala, West Bengal and Nagaland); West Indies.

Uses: Used in urinary trouble and dysentery, bark and leaves are used in Jaundice-Hepatitis, diarrhoea, asthma and inflammation

Status: Not evaluated

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1673]

URENA L. in Sp. Pl. 2: 692. 1753.

Urena lobata L. in Sp. Pl. 692. 1753, s.l.; Masters in Hook. *f.* in Fl. Brit. Ind. 1: 329. 1872; Roxb. in Fl. Ind. ed. 2, 3: 182. 1832; Hara in Fl. East Himal. 1: 206. 1966; Hara et Ohashi in Enn. Fl. Pl. Nep. 2: 69. 1979; Paul in Sharma et Sanjappa in Fl. Ind. 3: 380. 1993; Grierson et Long in Fl. Bhutan 2(1): 194. 1991. *Urena trilobata* Velloso in Fl. Flumin. 7: t. 44t. 44. 1825. *Urena grandiflora* Candolle in Prodr. 1: 442. 1824.

Perennial pubescent shrubs. Leaves different size and shape, lamina 2 – 11 × 1 – 9.3 cm, ovate to orbicular, pettily lobed, lobes 2 – 4, serrate, acute, base cordate to rounded, hairy; stipules lanceolate, acute. Flowers solitary 3 – 7 in clusters. Calyx campanulate, sepals ovate to deltoid, acuminate, hairry; corolla pink to purple, obovate, rounded at tip. Fruit schizocarps globose. Seeds kidney shaped.

Flowering: August to December

Fruiting: January – June

Local Distribution: MPCAs forests area of terai and duars.

General Distribution: Throughout in India; Bangladesh and Mayanmar.

Uses: Treating facture wounds and snake bites.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5487]

SAPINDALES Juss. ex Bercht. in et Presl. 1820

ANACARDIACEAE R.Br. in Tuckey in Narr. Exped. Congo 431. 1818; *nom. cons.*

LANNEA A. Rich. in Guillemain et al. in Fl. Seneg. Tent. 153. 1831; *nom. cons.*

Lannea coromandelica (Houtt.) Merr. in Jour. Arnold Arb. 19: 353. 1939; Grierson et Long in Fl. Bhutan 2(1): 61. 1991. *Dialium coromandelicum* Houtt. in Nat. Hist. Ser. 2(2): 39. t.5. f.2. 1774. *Odina wodier* Roxb., Fl. Ind. 2: 293. 1832; Hook. *f.* in Fl. Brit. Ind. 2: 29. 1876.

Deciduous trees, 8 – 11 m. Leaves compound; lamilets 9 pairs, ovate to oblong, 5 – 11 × 2.5 – 5.5 cm, acuminate, entire, base cuneate, papery. Inflorescences paniculate some times racemose. Flowers tetramerous, unisexual. Calyx ovate to broadly ovate. Petals reddish brown, ovate-oblong. Ovary small, glabrous, 4- locular; ovule fertile. Fruit obovoid, drupes.

Flowering: January – May

Fruiting: July – December

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (throughout); Bhutan, India, Myanmar, Nepal, Sri Lanka; Malaysia, Thailand and Vietnam.

Uses: It is used as folk medicine to treat fever, dyspepsia, general debility, gout, dysentery, sore eyes, wounds and much more disorders.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 3257]

MANGIFERA L. in Sp. Pl. 1: 200. 1753.

Mangifera indica L. in Sp. Pl. 1: 200. 1753; Hook. *f.* in Fl. Brit. Ind. 2: 13. 1876; Grierson et Long in Fl. Bhutan 2(1): 59. 1991; Chandra et Mukh. in Singh et al. in Fl. Ind. 5: 466. 2000; Prain in Bengal Pl. 1: 352.1903. ‘*Aaam*’

Trees, 10 – 22 m. Leaves simple; petiole grooved, inflated; lamina oblong, lanceolate, 11 – 22 × 3 – 5.5 cm, leathery, acute, acuminate, undulate, entire. Inflorescence terminal, paniculate, tomentose; bracts pubescent, lanceolate. Sepals glabrous, sented ovate-lanceolate, acuminate. Petals light greenish yellow, oblong lanceolate. Stamen 1, fertile, anther ovate; staminodes 3 – 7. Ovary ovate. Fruit drupe, greenish yellow.

Flowering: March – July

Fruiting: June – June

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (throughout) Nepal, Bangladesh, Myanmar and Malaysia.

Uses: Plant parts are used as a dentrifice, antiseptic, astringent and diaphoretic

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3691]

MELIACEAE Juss. in Gen. Pl. 263. 1789 (‘Meliae’); *nom. cons.*

MELIA L. in Sp. Pl. 1: 384. 1753.

Melia azadirachta L. in Sp. Pl. 385. 1753; Hook. *f.* in Fl. Brit. Ind. 1: 544. 1875; Prain in Bengal Pl. 1: 314.1903. “*Nim*”

Trees, 8 – 10 m, deciduous. Leaves pinnate; leaflets opposite; lamilets ovate, elliptic to lanceolate, 3 – 9 × 2 – 5 cm, acuminate, crenate to entire, base cuneate to broadly cuneate. Flowers fragrant. Calyx 5; sepals ovate to oblonge, acute. Petals obovate

spatulate. Staminal tube purple green; anthers 10. Ovary glabrous, 6 – 11 locular; style short, acerose. Fruit drupe globose. Seed ellipsoid.

Flowering: March – December

Fruiting: February – June

Local Distribution Throughout the forest area of terai and duars.

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

Status: Common

Uses: Used as an ayurvedic medicine like anti-Inflammatory, insecticidal and rodenticidal.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7691]

CHUKRASIA Juss. in Bull. Sci. Nat. Geol. 23: 239. 1830.

Chukrasia tabularis Jussieu in Mem. Mus. Hist. Nat. 19: 251. t. 22. 1830; Hook. f. in Hook. f. in Fl. Brit. Ind. 1: 568. 1875; Jain et Benn. in Hajra et al. in Fl. Ind. 4: 481. 1997; Grierson et Long in Fl. Bhutan 2 (1): 39. 1991. '*Chikrasi*'

Trees, 20 – 25 m. Leaves usually 32 – 57 cm; lamina 11 – 19, ovate lanceolate, 6 – 15 × 3 – 7 cm, acute to acuminate, papery, entire, base oblique; bracts linear. Flowers fragrant. Calyx hairy; petals cream yellow colored, linear to oblong, spatulate; staminal tube cylindrical with gellatinous substance, anthers 10, oblong; ovary short disk, elongate. Capsule yellowish green, subglobose, usually 3valved. Seeds flat, oblong.

Flowering: April – June

Fruiting: March – September .

Local Distribution: Forests area of terai and duars.

General Distribution: India (Bihar, West Bengal, Tripura, Sikkim, Nagaland, Delhi); Bhutan, Nepal, Sri Lanka, Indonesia, Laos, Malaysia, Thailand, Vietnam.

Status: Common

Uses: Used as a febrifuge and to treat diarrhoea.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6476]

DYSOXYLUM Blume in Bijdr. Fl. Ned. Ind. 172. 1825.

Dysoxylum excelsum Blume in Bijdr. Fl. Ned. Ind. 176. 1825. *Dysoxylum excelsum* var. *hasseltii* Miq. in Ann. Mus. Bot. Lugduno-Batavi 4: 19. 1868. *Dysoxylum excelsum* var. *parvifolium* Koord. and Valetton in Bijdr. Booms. Java 3: 57. 1896.

Trees 13 m tall. Branchlets brown, glabrous; apical bud leaves like. Leaves 40 - 50 cm, pinnate; leaflets alternate; petiole 1 cm; leaflet blades elliptic to oblong, thickly papery, surfaces glabrous, secondary veins 11 – 16, base oblique, cuneate, apex acute. Leaves, glabrous pubescent; branches spreading. Flowers 7 – 9 mm. Calyx 4-lobed, puberulent. Petals 4, white, linear, elliptic. Staminal tube glabrous, apical margin entire; anthers 8, oblong. Disk cylindrical, ciliate, apex 8-lobed. Ovary conic, 4-locular; style longer than ovary. Capsule globose, glabrous, apex concave. Seeds bright red.

Flowering: September – November **Fruiting:** April – June

Local Distribution: Throughout the forests area.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands.

Status: Common

Uses: The bark shows insecticidal properties.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2019, Mallick, et al. [Field No. 4101]

Dysoxylum gotadhora (Buch.-Ham.) Mabb. in Fl. China 11: 127. 2008.

Trees 8 – 20 m tall, branches pubescent or glabrescent. Leaves even-pinnate; petiolules 3 - 6 mm; leaflet blades oblong, oblong to elliptic, papery, surfaces glabrous, secondary veins 9 – 14, base oblique, apex acuminate. Thyrses axillary shorter; short branches pulverulent pubescent. Pedicel pubescent. Calyx cup-shaped, leathery, pubescent, 4-lobed. Petals 4, yellow, oblong, pubescent. Staminal tube cylindrical, pubescent; anthers 8, alternate, oblong. Disk cylindrical, apex 8 – 10 crenate. Ovary pubescent; style cylindrical, glabrous; stigma globose to oblate. Capsule obovoid, pyriform, glabrous. Seeds 4.

Flowering: March – July **Fruiting:** May – November

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Sri Lanka, Nepal, Myanmar, Thailand, Laos, Vietnam.

Status: Common

Uses: Leaf and bark used to cure of inflammation, cardio-disorder, CNS disorder and tumor.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2019, Mallick, et al. [Field No. 4143]

SWIETENIA Jacq. in Enum. Syst. Pl. 4. 1760.

Swietenia mahagoni (L.) Jacq. in Enum. Syst. Pl. 20. 1760; Jain et Bennett in Hajra et al., 4: 525. 1997. *Cedrela mahagoni* L. in Syst. Nat., ed. 10, 2: 940. 1759. '*Mehagonii*' Large trees, 15 – 27 m. Leaves alternate, base swelling; leaflets 8 – 14; leaflet ovate to lanceolate, 12 – 19 × 4 – 7 cm, long acuminate, leathery, entire, 1 to 2 serrations. Flowers very small. Calyx cup-like, 5 lobed; lobes truncate, tip rounded; petals greenish yellow, obovate; staminal tube glabrous, cylindrical; anthers 10. Disk annular; ovary conic to ovoid. Capsule ovoid. Seeds apically winged.

Flowering: May – October

Fruiting: December – April.

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India, tropical Asia. Native to tropical America.

Status: Common

Uses: Used as for malaria, hypertension, diabetes and diarrhea, as antipyretic and bitter tonic

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick et al. [Field No. 5851]

TOONA (Endl.) Roem. in Fam. Nat. Syn. Monogr. 1: 131. 1846.

Toona ciliata Roemer in Fam. Nat. Syn. Monogr. 1: 139. 1846; Grierson et Long in Fl. Bhutan 2 (1): 38. 1991. *Cedrela toona* Roxb. ex Rottler in Ges. Natur f. Freunde Berlin Neue Schriften 4: 198.1803; Hook. f. in Fl. Brit. Ind. 1: 568. 1875; Prain in Bengal Pl. 1: 320.1903. [Photo Plate –V] '*Tun*'

Trees, 18 – 25 m. Leaves pilose; leaflets usually 7 – 17 pairs, glabrescent; leaflet lanceolate, ovate, lanceolate, 9 – 13 × 3 – 7 cm, acute, entire, acuminate, base asymmetric. Inflorescences pendent. Flowers scented sweetly; sepals spatulate, margins ciliate; petals white to creamy yellow. Disk reddish brown. Seeds winged, unequal, tip narrowly obtuse.

Flowering: January – March

Fruiting: February – June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical parts of the world. India, Bangladesh, Bhutan, Nepal.

Status: Common

Uses: Used to treat chronic dysentery, leprosy, headache, blood complaints and cardiotoxic,

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4981]

APHANAMIXIS Bl. in Bijdr. 165. 1825.

Aphanamixis polystachya (Wall.) Parker, Indian Forester 57: 486. 1931; Grierson et Long in Fl. Bhutan 2 (1): 35. 1991. *Amoora rohituka* (Roxb.) Wight in Cat. Ind. Pl. 24. 1833; Hook. f. in Fl. Brit. Ind. 1: 559. 1875. *Andersonia rohituka* Roxb. in Fl. Ind. 2: 213. 1832. *Aglaia polystachya* Wall. in Roxburgh in Fl. Ind. 2: 429. 1824. '**Lahsune**'. Medium trees, 25 – 33 m. Leaves evenpinnate, 32 – 63 cm; leaflets 7 – 23, opposite; leaflet oblong, ovate, elliptic, 12 – 25 × 4 – 14 cm with basal pair smallest, leathery, acuminate to obtuse, caudate, entire, base cuneate to broadly cuneate. Inflorescence axillary. Sepals 5; petals concave green in colour; staminal tube glabrous, subglobose; ovary 3 locular. Fruit capsule, ovoid.

Flowering: May – June

Fruiting: April – October

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (Sikkim, Assam, Bihar, Uttarpradesh, Jharkhand, West Bengal), Bhutan, Indonesia, Sri Lanka, Malaysia, Philippines, Thailand and Vietnam.

Status: Common

Uses: Used to treat tumors, ulcer, dyspepsia, skin diseases, leprosy, diabetes and eye diseases.

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5881]

RUTACEAE Juss. in Gen. Pl. 296. 1789; *nom. cons.*

AEGLE Correa Trans. in Linn. Soc. London 5: 222. 1800; *nom. cons.*

Aegle marmelos (L.) Correa in Trans. Linn. Soc. London 5:223.1800; Hook. f. in Fl. Brit. Ind. 1:516.1875; Grierson et Long in Fl. Bhutan 2 (1): 10. 1991. *Crateva marmelos* L. in Sp. Pl. 444.1753. Fl. Ind. 4: 264. 1997. '**Beel**'

Trees straight spines. Lamina crenate, ovate, bluntly acuminate, base cuneate, glabrous; petioles unwinged. Calyx cup-like; petals oblong, elliptic, creamy white. Fruits ellipsoid, ovoid.

Flowering: March – May

Fruiting: April – July

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India, Myanmar and Sri Lanka.

Status: Common

Uses: Used to treat antidiarrhoeal, antimicrobial, antiviral, radioprotective, anticancer, chemopreventive, antipyretic

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6781]

CITRUS L. in Sp. Pl. 2: 782. 1753.

Citrus limon (L.) Osbeck in Reis Ostindien China, 250. 1765; Grierson et Long in Fl. Bhutan 2 (1): 22. 1991. *Citrus medica* var. *limon* L. in Sp. Pl. 2: 782. 1753. '**Lebu**'

Shrubs. Branches small and medium spiny. Leaf ovate, elliptic, margin crenulate, tip usually mucronate. Flowers solitary. Calyx cuplike; petals purplish brown, inside creamy white; ovary cylindrical or barrel. Fruit yellowish green, ellipsoid.

Flowering: April – June

Fruiting: May – August.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, West Bengal, Tripura), Tropical parts of the world.

Status: Common

Uses: Used to treat scurvy, sore throats, fevers, rheumatism, high blood pressure.

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5481]

Citrus maxima (Burm.) Merrill in Interpr. Herb. Amboin. 296.1917; Grierson et Long in Fl. Bhutan 2 (1): 21. 1991. *Aurantium maximum* Burm. et Burm. in Herb. Amboin. Auctuar. 7: Index [16]. 1755. '**Jambura**', '**Batabi Lebu**'

Trees; twigs spiny. Leaves ovate to obtuse, base rounded, margin crenate, pubescent; petiole winged broadly. Flowers clusters, solitary, axillary. Petals oblong, white. Ovary globose, sharply delimited. Fruit globose.

Flowering: April – June

Fruiting: May – August

Local Distribution: Throughout the forests area of terai and duars.

General Distribution: India (West Bengal, Assam, Nagaland), Pantropical.

Status: Common

Uses: Used to treat scurvy, sore throats, fevers, rheumatism, high blood pressure.

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1691]

CLAUSENA Burm. in Fl. Indica, 87, 243. 1768.

Clausena excavate Burm. f. in Fl. Ind. 87, t. 29, 2. 1768; Hook. f. in Fl. Brit. Ind. 1: 504. 1875; Grierson et Long in Fl. Bhutan 2 (1): 16. 1991; Hajra et al. in Fl. Ind. 4: 325. 1997; Prain in Bengal Pl. 1: 301.1903. '**Bonkari**'

Shrubs, 1.5 – 2 m. Leaves 23 – 29 foliolate 43 foliolate; lamina ovate, rhomboid, asymmetric, 2 – 11 × 1 – 5.3 cm, surface pubescent, shortly acuminate, base oblique, repand. Inflorescence terminal; bracts opposite. Flowers globose. Petals pale green white, obovate. Stamens 8; filaments dilated, geniculate, apically linear, middle. Style short. Fruit ellipsoid; 1 to 3 seeded.

Flowering: April – December

Fruiting: October – June

Local Distribution: Throughout the forests area of Terai and Duars.

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, West Bengal, Tripura); Bhutan, Bangladesh, Nepal, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

Uses: Used to treat tumors, ulcer, dyspepsia, intestinal worms, skin diseases and leprosy.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1893]

GLYCOSMIS Correa, Ann. Mus. Natl. Hist. Nat. 6: 384. 1805; *nom. cons.*

Glycosmis pentaphylla (Retz.) Candolle in Prodr. 1: 538. 1924; Grierson et Long in Fl. Bhutan 2 (1) :15. 1991. *Limonia pentaphylla* Retz. in Observ. Bot. 5: 24. 1789.

Trees, up to 7 m. Leaves 3 to 5 foliolate; leaflet oblong, 11– 25 × 3 – 9 cm, papery, mucronate, base cuneate, serrate. Inflorescence terminal paniculate, axillary. Flowers globose. Sepals roughly ovate. Petals pale yellow to greenish yellow. Stamens 10. Ovary globose, ovoid; style short. Fruit subglobose.

Flowering: July – March

Fruiting: June – Decembe

Local Distribution: Forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Nagaland, Kerala, Orissa), Bhutan, Sri Lanka, Indonesia, Malaysia, Myanmar, Nepal, Philippines and Thailand.

Uses: Used to treat tumors, ulcer, dyspepsia, intestinal worms and skin diseases.

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7889]

MURRAYA Koenig ex L. in Mant. Pl. 2: 554, 563. 1771; *nom. cons.*

Murraya koenigii (L.) Spreng. in Syst. Veg. 2: 315. 1817; Hook. f. in Fl. Brit. Ind. 1: 503. 1875; Ohashi in Hara in Fl. E. Himal. 3: 75. 1975; Hara et al. in Enn. Fl. Pl. Nep. 2: 82. 1979; Grierson et Long in Fl. Bhutan 2 (1): 17. 1991; Prain in Bengal Pl. 1: 302.1903. *Bergera koenigii* L. in Mant. Pl. 2: 555, 563. 1771. '**Kaaripata**'

Shrubs, 3 – 5 m. Leaves 19 – 35-foliolate; margin ovate, 2 – 7 × 0.5 – 3.3 cm, entire, base obtuse. Inflorescences terminal with few flowered. Flowers 5-merous, bud ellipsoid. Sepals ovate. Petals oblanceolate, oblong white. Stamens 11. Stigma capitate. Fruits ovoid to oblong, bluish black.

Flowering: March – August

Fruiting: October – February

Local Distribution: Forest area of MPCAs in North Bengal

General Distribution: India (West Bengal, Assam, Uttarpradesh, Nagaland, Kerala, Orissa), Bhutan, Nepal, Sri Lanka, Thailand, Bangladesh, Vietnam.

Uses: Used in many cultures for the treatment of cough, stomach ulcers, diabetes, obesity.

Status: Not evaluated.

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 9891]

Murraya paniculata (L.) Jack in Malayan Misc. 1: 31. 1820; Grierson et Long in Fl. Bhutan 2 (1): 17. 1991. *Chalcas paniculata* L. in Mant. Pl. 1: 68. 1767. '**Kamini**'

Shrubs, 4 – 6 m. Leaves 2 – 5 foliolate; petiolule less than 1.5 cm; lamina orbicular, ovate, elliptic, 2 – 7 × 1.5 – 5 cm, rounded, acuminate, entire, crenulate. Inflorescence terminal, axillary. Flowers 5 merous, fragrant. Sepals lanceolate, ovate, persistent. Petals white, narrowly oblanceolate to elliptic. Stamens 10. Fruit orange yellow, ellipsoid. Seeds villous.

Flowering: May – February

Fruiting: April to June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Nagaland, Kerala, Orissa), Bhutan, Nepal, Sri Lanka, Cambodia, Indonesia, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Australia,

Uses: Used in many cultures for the treatment of cough, flatulence.

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5901]

TODDALIA Juss., Gen. Pl. 371. 1789; *nom. cons.*

Toddalia asiatica (L.) Lam. in Tabl. Encycl. 2: 116. 1797; Grierson et Long in Fl. Bhutan 2(1): 9. 1991. *Paullinia asiatica* L. in Sp. Pl. 1: 365. 1753, typ. cons. 'Belkanta'.

Woody armed climbers, Petiole 1 – 6.3 cm; leaflet compound, usually sessile to subsessile, elliptic, obovate to lanceolate, 3 – 15 × 1 – 5 cm, acuminate, acute, obtuse, base narrowly cuneate. Inflorescences 15 – 17 cm. Sepals 0.3 – 0.7 mm. Petal cream-white, elliptic, ovate. Male flowers 3 – 5.6 mm, in female flowers ligulate; gynoecium ovoid to ellipsoid. Fruit 7 – 17 mm.

Flowering: August – January

Fruiting: April – July

Local Distribution: Forest area of terai and duars.

General Distribution: India (Assam, Bihar, West Bengal, Tripura), Bhutan, Nepal, Bangladesh, Japan, Malaysia, Thailand and Vietnam.

Uses: Used in many cultures for the treatment of stomach ulcers, diabetes and obesity.

Status: Common

Specimen Examined West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 5489]

SUPERASTERIDS

CARYOPHYLLALES Perleb., 1826.

AMARANTHACEAE Juss. in Gen. Pl. 87. 1789; *nom. cons.*

ACHYRANTHES L. in Sp. Pl. 1: 204. 1753.

Achyranthus aspera L. in Sp. Plant. 204. 1753; Hara in Fl. E. Himal. 1:76. 1996; Hook. f. in Fl. Brit. Ind. 4: 4. 1885; Grierson et Long in Fl. Bhutan 1(2): 227. 1984; Prain in Bengal Pl. 2: 875. 1903. *Achyranthes australis* R.Br. in Prodr. Fl. Nov. Holl. 417. 1810. *Achyranthes canescens* R. Br. in Prodr. Fl. Nov. Holl. 417. 1810. 'Apang'

Perennial erect herbs, 55 – 85 cm. Leaves opposite, lamina elliptic, ovate, 3 – 15 × 2 – 9 cm, base cuneate, acute, pubescent. Flowers long, slender spike, 24 – 29 cm; bracts

occasionally spinous, subulate, concave. Perianth rigid, lanceolate, stamens 5, anthers 2 celled; ovary oblong to ovate, style filiform.

Flowering: March – June

Fruiting: May – August

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Assam, Bihar, West Bengal, Jharkhand, Orissa, Tripura), Bhutan, Nepal, Bangladesh, Myanmar, China.

Status: Less common

Uses: This plant is used in asthma, in facilitating delivery, bronchitis, debility, dropsy, cold, colic, dog bite, snake bite, scorpion bite, earache, headache and leukoderma.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No.102]

Achyranthus bidentata Blume in Bijdr. 545. 1826. 68. 1982; Grierson et Long in Fl. Bhutan 1(2): 227.1984; Prain in Bengal Pl. 2: 875.1903. *Achyranthes chinensis* Osbeck in Dagb. Ost. Ind. Resa 205. 1757. *Achyranthes fruticosa* Lam. in Encycl. 1: 545. 1785. Stem glabrous. Leaves 11 – 19 × 2 – 3.6 cm, lanceolate, linear, tip acuminate, thinly pubescent, nerves 7 – 11 pairs; petiole 6.3 mm long. Spike terminal, 12–33 cm long, narrow; bracts 4 × 2.9 mm, lanceolate; bracteoles 3.5 mm entire, long, aristate. Flowers distant; tepals different, 7 × 1.8 mm, acuminate, lanceolate. Fruit achenes 3 × 2.3 mm, longitudinally striate, cylindrical, reddish blue.

Flowering: March – June

Fruiting: May – August

Local Distribution: MPCAs area of terai and duars.

General Distribution: India (Assam, Bihar, West Bengal, Tripura), Bhutan, Nepal, Bangladesh, Myanmar, China.

Status: Common

Uses: This plant is taken internally to treat back pains, hypertension, urine in the blood, menstrual pain.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 28]

AERVA Forssk., Fl. Aegypt.-Arab. 170. 1775; *nom. cons.*

Aerva sanguinolenta (L.) Bl. in Bijdr. 547.1826; H. Hara in Fl. East. Himal. 1:77. 1966. *Achyranthes sanguinolenta* L. in Sp. Pl. ed. 2: 294. 1762. *Achyranthes scandens* Roxb. in Fl. Ind. 1: 676. 1820. *Aerva sanguinea* Miq. in DC. in Prodr. 13(2): 3. 1849.

Aerva scandens (Roxb.) Wall. in Icon. Pl. Orient. 2: t. 724. 1840; Prain in Bengal Pl. 2: 874.1903. '**Lopang**'

Perennial erect herbs. Stem slightly stoloniferous, branched. Leaves ovate to elliptic, lanceolate, 2 – 8 × 1 – 6.3 cm. Inflorescences purple. Bracts, bracteoles, tepals pink yellow; staminodes triangular. Fruit ovate, glabrous. Seeds kidney shaped.

Flowering: January – June. **Fruiting:** March – August

Local Distribution: Throughout the MPCAs area of terai and duars.

General Distribution: India (Assam, Bihar, West Bengal, Tripura), Nepal, Bangladesh, Cambodia, Malaysia, Thailand, Vietnam.

Status: Common

Uses: It has significant therapeutic effects, hepatoprotective, including antihyperglycaemic, antioxidant, anti inflammatory, antimicrobial.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 305]

ALTERNANTHERA Forssk. in Fl. Aegypt.-Arab. 28. 1775.

Alternanthera paronychioides St. Hill in Voy. Bres. 2 (2): 39. 1833; Panda et Das in Fl. Sambalp. 308. 2004. *Achyranthes chacoensis* (Mor.) Standley in Jour. Wash. Acad. Sci. 5: 74. 1915. *Alternanthera ficoidea* (L.) R.Br. in Prodr. Fl. Nov. Holl. 417. 1810.

Perennial hairy herb. Lamina oblanceolate to spatulate, hairy, tip obtuse, rounded. Heads ovoid to globose, sessile. Tepals ovate - oblong, white, scarious. Stamens 5; anthers yellowish green, ellipsoid; staminodes 3/ 5-toothed; stigma capitate.

Flowering: January – March **Fruiting:** April – June

Local Distribution: Throughout the MPCAs area of terai and duars.

General Distribution: India (Assam, Bihar, West Bengal, Jharkhand, Tripura), Nepal, Bangladesh, Myanmar, Indonesia and Thailand.

Status: Common

Uses: It has significant therapeutic effects, hepatoprotective, including antihyperglycaemic, antioxidant, anti inflammatory, antimicrobial.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 305]

Alternanthera philoxeroides (Mart.) Griseb., Abh. Koen. Ges. Wiss. Goett. Phys. Cl. 24: 36.1983; Bora et al. in Flor. Div. Ass., 275. 2004. *Bucholzia philoxeroides* Mart. in

Beitr. Amarantac. 107. 1825; Nova Acta Leop. 13: 315.1826. *Achyranthes paludosa*
Bunbury in Proc. Linn. Soc. London 1: 109. 1841. '**Jol Chhenchi**'

Perennial ascending creeping base herb. Stem and leaf axil, glabrous. Petiole glabrous. Margin oblong, lanceolate, ovate, acute, entire, base attenuate, glabrous. Heads solitary, globose. Bracts and bracteoles greenish white, acuminate; bracts ovate, lanceolate; tepals white, oblong, 7 mm, glabrous, acute; filaments connate; ovary obovoid, short stalk.

Flowering: January – March

Fruiting: April – June.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Tripura, Jharkhand, Orissa), Bangladesh, Nepal, Bhutan and Mayanmer.

a native of tropical America; naturalized in tropics.

Status: Less common

Uses: It is used to treat tight chest, hepatitis, asthma, bronchitis and other lung troubles.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 149]

Alternanthera pungens HBK in Nov. Gen. Sp. 2: 206. 1818; Grierson et Long in Fl. Bhutan1(2): 228. 1984 ; Datta et Majumdar in Bull. Bot. Soc. Bengal 20 (2): 50. 1966.

Telanthera pungens (HBK) Moq. in Prodr. 13(2): 371. 1849.

Annual diffuse herbs. creeping, branched, 21 – 30 cm, densely hairy. Leaf ovate to elliptic, 2 – 7 × 0.5 – 2.3 cm, unequal, glabrous, slightly pilose, base acuminate, tip obtuse. Heads axillary, sessile, globose to oblong. Bracts lanceolate, spiny at tip; bracteoles acuminate, lanceolate. Stamens 5. Style short.

Flowering: May – July

Fruiting: June – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Nagaland, Sikkim, Tripura, Jharkhand), Bhutan, Myanmar, Thailand, China and Australia.

Status: Less common

Uses: It has used to treat stomachache, swelling and nasopharyngeal infections

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 149]

Alternanthera sessilis (L.) R.Br. ex DC. in Cat. Pl. Hort. Mon sp. 4: 77. 1813; Hook. f. in Fl. Brit. Ind. 4:731. 1885. *Achyranthes sessilis* (L.) Besser in Cat. Jard. Bot. Krzemieniec 12. 1810. *Alternanthera nodiflora* R. Br. in Prodr. Fl. Nov. Holl. 417. 1810. *Alternantheratriandra* Lam. in Encycl. 1: 95. 1785. *Achyranthes triandra* Roxb. in Fl. Ind. 1: 678. 1820. '*Chhenchi sag*'.

Prostrate herb, stems with 3 lines of hairs. Margin elliptic, 2.4 – 4.3 × 0.5 – 2.2 cm, acute, sessile, glabrous. Flower sessile, clusters, globose. Perianth similar, 2 – 5 mm, unarmed. Stamens 5, 3 bearing anthers, pseudostaminodes minute. Fruit capsule rounded, 2.3 mm compressed, diameter; seed 1.3 mm, thick wing.

Flowering: August – November

Fruiting: August – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Arunachal Pradesh, Tripura, West Bengal), Myanmar, China, Pantropical.

Status: Least Concern (IUCN 2021)

Uses: This is used to treat hepatitis, bronchitis, asthma, tight chest and other lung troubles.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 485]

AMARANTHUS L. in Sp. Pl. 2: 989. 1753.

Amaranthus blitum ssp. *oleraceus* (L.) Costea in *Sida* 19: 984 2001. *Amaranthus blitum* L. in Sp. Pl.1: 990. 1753; Hook. f. in Fl. Brit. Ind. 4: 721. 1885; Prain in Bengal Pl. 2: 871.1903. *Amaranthus lividus* L. in Sp. Pl. 1: 990. 1753; *Amaranthus circinnatus* Poirat in Encycl. Suppl. 1: 311. 1810. *Blitum lividum* (L.) Moench in *Methodus* 359. 1794.

Annual prostrate herbs. Leaves ovate, 3 – 9 × 2 – 6 cm, obtuse. Flowers clusters densely aggregated spikes, up to 6.8 cm. Flowers unisexual, perianth segments 3; stamens 3; tepal 3; stigma 3; Fruit capsules, seeds strongly glossy

Flowering: April – June

Fruiting: May – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Bhutan, Bangladesh, Myanmar, China

Uses: This plant is used as vegetable and medicinal purposes.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 1510]

Amaranthus spinosus L. in Sp. Pl. 2: 991. 1753; Hook. f. in Fl. Brit. Ind. 4: 718.1885; Hara, Fl. East. Himal. 1:77. 1966; Grierson et Long in Fl. Bhutan 1(2): 225. 1984; Prain in Bengal Pl. 2: 879.1903. *Galliardia spitosa* (L.) Nieuwl. in Amer. Midl. Naturalist 3(9): 278. 1914. *Amaranthus spinosus* var. *viridicaulis* Hassk. in Flora 25: litt. 20 litt. 20. 1842. '**Kata notey**'

Perennial stem erect herb; branched, green, glabrous terete; petiole 2.3 cm, glabrous; leaf blade ovate-lanceolate, pubescent, base cuneate, apex obtuse margin entire. Bracts spiny. Tepals green margin transparent, apex acute; male flowers oblong; female flowers spatulate; filaments short; stigmas 3. Seeds brownish green.

Flowering: August – November

Fruiting: August – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Bihar, Uttar Pradesh), native range is Mexico to Tropical America.

Status: Threatened (IUCN 2021).

Uses: It is used treat breathing and bronchitis problem.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 151]

Amaranthus viridis L. in Sp. Pl. ed. 2: 1405. 1753; Hook. f. in Fl. Brit. Ind. 4: 720. 1885; Prain in Bengal Pl.2: 651. 1903; Grierson et Long, Fl. Bhutan 1(2): 224. 1984; Bora et al. Flor. Div. Ass. in 277.2003. *Galliardia adscendens* Bubani in Fl. Pyren. 1: 186. 1897. *Amaranthus fasciatus* Roxb. in Fl. Ind. ed. 1832 3: 609. 1832. [Photo Plate - V] '**Nootey**'

Erect annual herbs, 45 – 52 cm high. Margin broadly ovate, 3 – 7 × 2 – 5.3 cm, obtuse. Flowers densely aggregated, in clusters 6.3 – 7.3 cm. Flowers unisexual, perianth segments 3, 1.4 mm long; stamens 3; stigma 3, minute; fruit capsules with 1-seeded, seeds glossy, minutely reticulate with scurfy warts.

Flowering: April – August

Fruiting: August – November

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Bihar, West Bengal, Sikkim, Orisa, Assam, Uttar Pradesh), Bhutan, Bangladesh, Thailand, Malaysia and Myanmar.

Status: Abundant.

Uses: Traditionally root and bark and leaves are used to treat for fever, asthma, diabetes, dysentery, liver disorders, urinary disorders and venereal diseases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 121]

CELOSIA L. in Sp. Pl. 1: 205. 1753.

Celosia argentea L. in Sp. Pl. 1: 205. 1753; Hook. *f.* in Fl. Brit. Ind. 4: 714. 1885; Hara, Fl. East. Himal. 1:77. 1966; Prain in Bengal Pl. 2: 867. 1903; Grierson et Long in Fl. Bhutan 1(2): 221. 1984. *Amaranthus purpureus* Nieuwl. in Amer. Midl. Nat. 3: 279. 1914. *Celosia pallida* Salisb. in Prodr. Stirp. Chap. Allerton 145. 1796. '**Morog Jota**'

Erect branches annual herbs. Leaves alternate, shortly petiolate, variable, lanceolate, acute, base tapering, glabrous. Flowers bisexual, white terminal, lanceolate spikes. Fruit capsules; seeds 4 – 8.3, kidney shaped, black, shining.

Flowering: March – June

Fruiting: July – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical regions of Asia, Africa and America.

Status: Rare occurrence.

Uses: Young plants edible as vegetable.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 258]

CHENOPODIUM L. in Sp. Pl. 1: 218. 1753.

Chenopodium album L. in Sp. Pl. 1: 219. 1753; Hook. *f.* in Fl. Brit. Ind. 5: 3. 1886; Hara, Fl. E. Himal. 1: 76. 1966; Prain in Bengal Pl. 2: 657. 1903; Grierson et Long in Fl. Bhutan 1(2): 217. 1984. *Chenopodium candicans* Lam. in Fl. Franç. 3: 248. 1779. *Chenopodium browneanum* Schult. in Syst. Veg. 6: 275. 1820. '**Bethua**'

Small herb, 63 – 82 cm. Leaves ovate – deltoid, 3.2 – 7.9 × 1.5 – 4.3 cm, base cuneate, acute, margin entire, petioles 1.8 – 4.2 cm. Flower clusters, sessile, slender. Flower bisexual, 0.9 mm diameter; perianth segments 5. Seeds black.

Flowering: November – March

Fruiting: February –

August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical regions of Asia, Africa and America.

Status: Rare occurrence

Uses: Several parts of this plant used for anthelmintic, antiphlogistic, antirheumatic, contraceptive, laxative and odontalgic diseases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 258]

Chenopodium giganteum Don in Prodr. Fl. Nepal. 75 1825; Hara in Fl. E. Himal. 2: 24.1971. *Chenopodium album* L. in Sp. Pl. 1: 219.1753; Grierson et Long in Fl. Bhutan 1(2): 218. 1984. *Chenopodium punctulatum* Scop. in Delic. Fl. Faun. Insubr. 1: 26. 1786. '**Boro Bethua**'

Herbaceous, reddish 3.3 m. Leaves ovate, 5.5– 21 × 4 – 7.5 cm, base cuneate, acute, margin dentate, 3 – lobed, petioles 5.3 – 9.3 cm. Flower sessile, clusters dense, panicles. Flower bisexual, 0.6 mm diameter. Stamens 5.

Flowering: September – November

Fruiting: November – February.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Jharkhand, Tripura, West Bengal), Bhutan, Myanmar, Bangladesh, Thailand, Nepal and Malaysia,

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019, Mallick, et al. [Field No. 613]

DEERINGIA R.Br. in Prodr. Fl. Nov. Holl. 413. 1810.

Deeringia amaranthoides Merr. in Interpr. Herb. Amboin. 211. 1917. *Deeringia amaranthoides* (Lam.) Merr. in An Interpretation of Rumphius's Herb. Ambo. 1917. '**Gul Mohini**'

Shrubs climbing. Stem 3 – 7 m tall. Petiole 2 – 5.7 cm, glabrous; leaf ovate, at first sparsely villous, obtuse, rounded, glabrescent, tip acuminate, acute, unequal. Inflorescence terminal racemes; rachis pubescent. Bracts 1.5 mm; bracteoles ovate, 1.5 mm. Pedicel 2 – 4.3 mm. Flowers spreading; tepals light yellow, green; stigmas 3, terete, reflexed. Fruit berry red.

Flowering: October – December

Fruiting: January – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal Assam, Sikkim, Nagaland), Nepal Bhutan, Bangladesh.

Status: Threatened (IUCN 2021).

Uses: Tender leaves are eaten for head pain.

Specimenexamined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 712]

DYSPHANIA R.Br. in Prodr. Fl. Nov. Holl. 411. 1810.

Dysphania ambrosioides (L.) Mosy. et Clemants in Ukrayins'k. Bot. Zhurn. 59: 382. 2002. *Chenopodium ambrosioides* L. in Sp. Pl. 219. 1753; Hook. f. in Fl. Brit. Ind. 5: 4. 1886, Hara in Fl. E. Himal. 76. 1966; Grierson et Long in Fl. Bhutan 1(2): 218. 1984; Prain in Bengal Pl. 2: 657. 1903; Hara et al. in Enn. Fl. Pl. Nep. 3: 170. 1982. *Chenopodium suffruticosum* Willd. in Enum. Pl. Hort. Berol.: 290. 1809.

Aromatic herb, 78 – 100 cm. Leaves lanceolate, 3 – 7.5 × 1 – 2.3 cm, base attenuate, acuminate, serrate, dentate, beneath; petiole 0.8– 1.3 cm. Flower clusters, elongate. Flowers bisexual. Seeds smooth.

Flowering: May – July **Fruiting:** April – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Tripura, Nagaland, Jharkhand); native to Tropical America.

Status: Least Concern (IUCN).

Uses: This herb is used for folk medicine, poultices, and infusions for inflammatory problems and lung infections.

Specimenexamined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 712]

PUPALIA Juss. in Ann. Mus. Natl. Hist. Nat. 2: 132. 1803.

Pupalia lappacea (L.) A. Juss. in Ann. Mus. Hist. Nat. Paris 2:132.1803; Hook. f. in Fl. Brit. Ind. 4:724. 1885; Grierson et Long in Fl. Bhutan 1(2): 207. 1984 ; Prain in Bengal Pl. 2: 872.1903. *Achyranthes lappacea* L. in Sp. Pl. 204.1753. *Pupalia atropurpurea* (Lam.) Moq. in DC. in Prodr. 13(2): 331.1849.

Annual perennial ascending quadrangular herb. Lamina ovate, entire, hombic-oblong, obtuse, base rounded. Inlorescence racemes terminal, erect, straight, 2 or 3 unisexual, hermaphroditic flowers; rachis thickly pubescent; flower clusters, stalked. Bracts acuminate; tepals ovate, acuminate, glabrous; stamens 5, staminodes rectangular, truncate.

Flowering: June – August

Fruiting: August – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Jharkhand, Orissa, Tripura, West Bengal), Myanmar, Bhutan, Bangladesh, Nepal, China.

Status: Least Concern (IUCN).

Uses: It has been used to treat bone fractures, cough, toothache, fever and diarrhea.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 784]

CARYOPHYLLACEAE Juss. in Gen. Pl. 299. 1789; *nom. cons.*

DRYMARIA Willd. ex Schult. in Roem. et Schult. in Syst. Veg. 5: 31. 1819.

Drymaria cordata (L.) Willd. ex Roem. et Schult. in Syst. Veg. 5: 406.1819; Hook. *f.* et Thomson in Hook. *f.* in Fl. Brit. Ind. 1: 244. 1874; Grierson et Long in Fl. Bhutan 1(2): 215.1984; Prain in Bengal Pl. 1: 238.1903. *Drymaria procumbens* Rose in Contr. Natl. Herb. 1: 304. 1895. ‘*Abhijalo*’

Stems elongate. Leaves broadly ovate, Leaves ovate, 0.5 – 2.7 × 0.5 – 2.1 cm, acute or obtuse, mucronate, glabrous, base rounded, 5 veined, petiole 2 – 4.2 mm; stipules lacerate 1 – 2.3 mm filaments. Flowers broadest. Sepals green, leaflike, ovate, 3 veined, inflexed, glandular. Petals white, 2 – 7 parted. Seeds tuberculate.

Flowering: May– June

Fruiting: June – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland, Tripura, Sikkim, West Benagal), Nepal, Bhutan and Bangladesh.

Status: Endangered Species (IUCN 2020)

Uses: It is used as cold, coryza, headache, bronchitis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 357]

POLYCARPON L. in Syst. Nat., ed. 10. 2: 881. 1759.

Polycarpon prostratum (Forssk.) Asch. et Schw. in F. Ost. in Bot. Zoitschr. 39: 128. 1889. Sharma et al. in Fl. Ind. 2: 553. 1993; Grierson et Long in Fl. Bhutan 1(2): 216. 1984. Guha Bakshi in Fl. Mur. Dist. 57. 1984. *Polycarpon loeflingiae* (Wight et Arn.) Benth. et Hook. *f.* in Gen. Pl. 1: 153. 1862; Hook. *f.* et Thomson in Hook. *f.* in Fl. Brit. Ind. 1: 245. 1874; Prain in Bengal Pl. 1: 238.1903.

Plants annual base rigid, prostrate, glabrous, 10 – 24.3 cm. Lamina obovate, 5.4 – 20 × 1.5 – 5.3 mm, entire, glabrous, acute, attenuate. Inflorescence cymes, axillary, sometime 2 – 4.3 cm; bracts stipule. Pedicel short, pilose. Sepals lanceolate, apex obtuse, hooded. Petals oblong, entire; stamens 3. Fruit capsules, ovoid, short. Seeds cylindrical.

Flowering: May– June

Fruiting: June – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, West Bengal, Tripura, Assam, Nagaland), Nepal, Bhutan, China, Thailand Myanmar and Malaysia

Status: Endangered Species (IUCN 2020).

Uses: It is used as medicine like Skin disease.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 789]

STELLARIA L. in Sp. Pl. 1: 421. 1753.

Stellaria media (L.) Vill. in Hist. Pl. Dauphine 3: 615. 1789; Mizushima in Hara in Fl. East. Himal. 1:82. 1966; Grierson et Long in Fl. Bhutan 1(2): 207. 1984; Prain in Bengal Pl. 1: 237.1903. *Alsine media* L. in Sp. Pl. 272. 1753. *Stellaria apetala* Ucria ex Roem. in Pl. Linn. Op. Arch. I (1): 68.1796. *Stellaria vulgaris* Raunk. in Bot. Studier 13, 22. 1934.

Diffuse prostrate, erect herb, 11 – 44 cm. Lamina ovate, 1.7 – 2 × 1 – 1.9 cm, base cordate, acute, petioles minute, glabrous. Few flowers cymes, pedicels 1.2 – 2.3 cm. Sepals ovate, 3 – 5.3 m, deeply bifid, petals short than sepals. Stamens 4 – 7. Fruit capsule ovoid.

Flowering: March– August

Fruiting: June – November

Local Distribution: Throughout the forest area of Terai and Duars.

General Distribution: India (Jharkhand, Sikkim, Orissa, Bihar, Gujrat, arunachal Pradesh, West Bengal), Bhutan, Japan, Korea, Russia and Europe.

Status: Threatened (IUCN 2013).

Uses: It is used as medicine like Skin disease and other purposes.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 459]

Stellaria uliginosa Murray in Prodr. Strip. Gotting. 55. 1770; Hara et al. in Enn. Fl. Pl. Nep. 1:58. 1979; Grierson et Long in Fl. Bhutan 1(2): 208. 1984. *Alsine uliginosa* Britt.

Inn in Mem. Torrey Bot. Club 5(10): 150. 1894. *Stellaria dilleniana* Leers in Fl. Herborn. 107. 1775.

Diffuse, decumbent herb, stems 4–33 cm, 5 angular, pubescence, oneside, rooting at nodes. Lamina elliptic, 0.5–2.7 × 0.15 – 0.47 cm, acute, acuminate, glabrous, sessile. Flowers terminal cymes; bracts ovate, acute 1.7 mm, scarious; sepals 2.5 – 4.8 mm, glabrous; stamens 11 or sometimes 3 – 7, hypogynous.

Flowering: April – August

Fruiting: June – November

Local Distribution: MPCAs forests area of north Bengal

General Distribution: India (West Bengal and North East India), Bhutan, Nepal, Japan, Vietnam

Status: Threatened (IUCN 2017).

Uses: It has been used as to treat pulmonary diseases and itchy skin conditions.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 1078]

Stellaria wallichiana Benth. ex Haines in Bull. Misc. Inf. Kew 1920: 66.1920; Sharma et al. in Fl. Ind 2:591. 1993; Bora et al. in Flor. Div. Ass., 56. 2003. *Stellaria media* (L.) Vill. in Hist. Pl. Dauph 3: 615.1789; Hook. f. et Thomson in Hook. f. in Fl. Brit. Ind. 1: 230. 1874.

Prostrate annual herbs. Lamina entire, flat, simple. Inflorescence cymose. Flower actinomorphic; corolla pinkish blue, bisexual; sepals 5; petals 5; hypogynous stamens. Fruits capsule; embryo annular.

Flowering: January– March

Fruiting: June – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (East and North East india and West Bengal); Bhutan, Afghanistan, Japan, Russia, Europe.

Status: Threatened (IUCN 2013).

Uses: It is used as medicine like Skin disease and othe purposes.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 459]

DROSERACEAE Salisb. in Hook. in Parad. Lond. t. 95. 1808.

DROSERA L. in Sp. Pl. 1: 281. 1753.

Drosera burmanni Vahl in Symb. Bot. 3: 50. 1794; Grierson et Long in Fl. Bhutan 1(2): 379. 1984; Prain in Bengal Pl. 1: 472.1903. *Drosera dietrichiana* Rchb. f., Beitr. in Syst. Pflanzenk. 73. 1871. '*Surja Shisir*'

Small unbranched short herbs. Leaves flat rosette, subsessile, margin yellowish blue 7 – 10 × 5.9 – 8.3 mm, obtuse, obovate, prostrate, tightly covered hairs. Flowers racemes; 6.3 – 9.1 cm high; calyx glandular. Sepals 5, united, light reddish violet, oblong; petals light red, obovate; style 3.

Flowering: August – September

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Jharkhand, Bihar, Orissa, West Bengal), Bhutan, Nepal and Australia.

Status: Threatened (IUCN 2011).

Uses: Species is used in medications for asthma, cough and ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 450]

MOLLUGINACEAE Bartl. et Wendl. in Beitr. Bot. 2: 158. 1825; *nom. cons.*

GLINUS L. in Sp. Pl. 1: 463. 1753.

Glinus lotoides L. in Sp. Pl. 463. 1753; Bora et al. in Flor. Din. Ass. 169. 2003; Grierson et Long in Fl. Bhutan 1(2): 195. 1984. *Mollugo lotoides* (L.) Kuntze in Revis. Gen. Pl. 1: 264. 1891. *Molluga hirta* Thunb. in Prodr. Pl. Cap. 24. 1794; Prain in Bengal Pl. 1: 533. 1903. *Mollugo hirta* var. *lotoides* (L.) Clarke in Hook. f. in Fl. Brit. Ind. 2(6): 662. 1879.

Herbs stellate densely tomentose. Stems decumbent, 11 – 30 cm, much branched. Petiole very short; basal leaves rosette; upper leaves verticillate to opposite, obovate to oblong-spatulate, base attenuate, decurrent, margin entire, obtuse, rounded. Flowers several, subsessile; tepals elliptic to oblong; stamens free; ovary ovoid, 5 loculed. Capsule ovoid, 5 valved. Seeds numerous.

Flowering: March – May

Fruiting: May – July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Sikkim, Nagaland), Bhutan, Nepal, Bangladesh, Indonesia, Philippines and Sri Lanka.

Status: Threatened (IUCN 2020).

Uses: It is used as an anthelmintic, an antiseptic, treatment for diarrhea.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 451]

Glinus oppositifolius (L.) DC. in Bull. Herb. Boiss. 2, 1: 552. 1901; Guha Bakshi, Fl. Mur. Dist. 148. 1984. *Mollugo oppositifolia* L. in Sp. Pl. 89. 1753. *Molluga spargula* L. in Syst. ed. 10: 881. 1759; C.B. Clarke in Hook. f. in Fl. Brit. Ind. 2: 662. 1879. *Mollugo glinoides* Rich. in Tent. Fl. Abyss. 1: 48. 1847. '**Gima**'

Rosette herbs. Branches many, prostrate, radiating, 12 – 32 cm, pilose to subglabrous. Leaves many, in pseudowhorls of 5 – 10; spatulate to elliptic, 1.25 – 3 cm × 4 – 6 mm, attenuate, margin dentate, obtuse to acute. Flowers in cyme, 3 – 7. Tepals green or white, oblong, 3 veined; stamens 4 to 6; styles 3. Capsule ellipsoid.

Flowering: January – May

Fruiting: May – June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical parts of India, Bhutan, Bangladesh, Pantropical and Africa

Status: Threatened (IUCN 2020).

Uses: Stem and Leaves are used to treat joint pains, diarrhea, inflammation, intestinal parasites, furuncles, fever and skin disorders.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 455]

NYCTAGINACEAE Juss. in Gen. Pl. 90. 1789; *nom. cons.*

BOERHAVIA L. in Sp. Pl. 1: 3. 1753.

Boerhavia diffusa L. in Sp. Pl. 1: 3. 1753; Grierson et Long in Fl. Bhutan 1(2): 194. 1984; Prain in Bengal Pl. 1: 533. 1903. '**Punarnaba**'

Herb, perennial. Stems diffuse, up to 50 cm. Leaves opposite, ovate elliptic to ovate, 4–6 × 2 – 3cm, subacute, base cordate, glabrous, petiole 3 cm. Flowers in cymose, umbels, 3 – 5 flowered. Perianth campanulate, purplish to redish, fruit 3mm, obconic to obovoid, 5 or 10 ribbed, with sticky glands.

Flowering: April – May

Fruiting: May – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (throughout); Native of tropical America.

Status: Threatened (IUCN 2015).

Uses: Plants has medicinal values for several diseases like skin, tunge and hair fall.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 159]

MIRABILIS L. in Sp. Pl. 1: 177. 1753.

Mirabilis jalapa L. in Sp. Pl. 177. 1753; Hara et al. in Enn. Fl. Pl. Nep. 3: 167. 1982; Grierson et Long in Fl. Bhutan 1(2): 192. 1984; Prain in Bengal Pl. 2: 862.1903. *Nyctago jalapae* (L.) DC. in Fl. Franç. ed. 3, 3: 426. 1805. '*Sandhya malati*'

Erect Robust herb, up to 150 cm. Leave triangular opposite, ovate, 6 – 10 × 3 – 5 cm, acuminate, truncate base, petioles 2 –3cm. Flowers in terminal cymes. Involucre campanulate, 2cm. Perianth red , narrowly funnel – shaped, limb 5 lobed; stamens 5. Fruit globose, oblong, fusiform, sometimes ribbed, without sticky glands.

Flowering: April – June **Fruiting:** May – February

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Native of tropical America.

Status: Common

Uses: It is used as a purgative, diuretic, and vulnerary (wound healing) purposes.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 591]

NYCTANTHES L., Sp. Pl. 1: 6. 1753.

Nyctanthes arbor-tristis L. in Sp. Pl. 1: 6. 1753; Clarke in Hook. f. in Fl. Brit. Ind. 3: 603. 1882; Grierson et Long in Fl. Bhutan 2(2): 937. 1999; Prain in Bengal Pl. 2: 660.1903. *Nyctanthes dentata* Bl. in Mus. Bot. 1: 282 1851. *Nyctanthes tristis* Salisb. in Prodr. Stirp. Chap. Allerton 11 1796. *Scabritatriflora* L. in Mant. Pl. 1: 37 1767. '*Shefali*'

Shrubs or trees; quadrangular branches. Leaves acuminate, ovate, rounded or cuneate, coarsely serrate or entire, scabrid-hairy above. Flowers sessile, fragrant; corolla tube orange; lobes whitish. Capsule 2-lobed, elliptic or suborbicular.

Flowering: September – November **Fruiting:** November – January

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Karnataka, Bihar, West Bengal), Nepal, Bhutan Bangladesh.

Status: Common

Uses: This plant is sued as anti-helminthic, anti-pyretic besides and laxative.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 459]

PLUMBAGINACEAE Juss. in Gen. Pl. 92. 1789 ('Plumbagines'); *nom. cons.*

PLUMBAGO L. in Sp. Pl. 1: 151. 1753.

Plumbago zeylanica L. in Sp. Pl. 1: 151. 1753; Clarke in Hook. f. in 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. Bhutan 2(2): 570. 1999. *Plumbago scandens* L. in Sp. Pl. ed. 2, 215. 1762. *Findlaya alba* Bowdich, Exc. in Madeira 258. 1825. '*Sada chita*' Scrambling shrubs. Leaves acuminate, ovate, entire, base cuneate or attenuate, glabrous. Petioles winged, auriculate. Racemes many-flowered, subglandular. Corolla whitish. Capsules ellipsoid, pale yellow.

Flowering: September – November **Fruiting:** October – February .

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Pantropical.

Status: Least concern (IUCN).

Uses: This plant treatments for skin diseases, chronic rheumatoid arthritis and tumorous growths

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 459]

POLYGONACEAE Juss. in Gen. Pl. 82. 1789 ('Polygoneae'); *nom. cons.*

PERSICARIA (L.) Mill. in Gard. Dict. Abr., ed. 4. vol. 3. 1754.

Persicaria barbata (L.) Hara in Fl. E. Him. 1: 70. 1966. *Polygonum barbatum* L. in Sp. Pl. 362. 1753; Hook. f. in Fl. Brit. Ind. 5: 37. 1886; Prain in Bengal Pl. 2: 663. 1903. *Polygonum rivulare* Roxb. in Fl. Ind. 2: 290. 1824. *Polygonum kotoshoense* Ohki. in Bot. Mag. (Tokyo) 39: 362. 1925. *Persicaria omerostroma* (Ohki) Sasaki. in List Pl. Formos. 170. 1928.

Herbs stout erect. Lamina sessile, 6.6 – 15.6 × 3.7 – 3.5 cm, acuminate, lanceolate at both ends, pubescent; slender; ochrea strigose, oblique mouth, bristled, pubescent. Spike 3 – 6 cm long, shortly peduncled, in 18 – 27 cm long panicles; bracts obovate; flowers whitish to pink, 6 – 8 in each bracts, pedicelled; pedicels persistent; tepals 5, free, obtuse, glandular; stamens 8-10; styles 3-5. Nut trigonous, acute, glabrous.

Flowering: July – September

Fruiting: September – December.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Bihar, Jharkhand, Orissa, Chattisgarh, Madhya-Pradesh), Tropical part of Asia, Africa and America

Status: Least concern (IUCN).

Uses: Root and leaves used for skin diseases, chronic rheumatoid arthritis and tumorous growths.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 589]

Persicaria chinensis (L.) Gross in Engl., Bot. Jahrb. Syst. 49(2): 269. 277 and 315. 1913; Grierson et Long, Fl. Bhutan 1(1): 163. 1983. *Polygonum chinense* L. in Sp. Pl. ed. 1, 1: 363. 1753; Hook. f. in Fl. Brit. India 5: 44. 1886; *Persicaria chinensis* var. *ovalifolia* (Meisn.) Hara, Fl. E. Him. 71. 1966; 2: 22. 1971. *Polygonum chinense* var. *ovalifolia* Meisn. sensu Hook. f. in Fl. Brit. India 5: 45. 1885.

Scandent, Grabrous shrubs. Stipules obliquely truncate. Lamina ovate, oblique, abruptly acuminate, base cordate, pubescent on midrib below. Ochrea membranous, glabrous, 2–3cm long, ribbed, mouth oblique. Spike paniced; peduncles glandular hairy; bracts ovate; flowers pedicelled; tepals 4, white, oblong; stamens 8, styles 3. Nut trigonous, glabrous.

Flowering and Fruiting: Throughout the year.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India, Bhutan, Nepal, China, Japan, Malaysia.

Status: Common

Uses: It is used to relieve inflammation to kill intestinal worms.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 478]

Persicaria hydropiper (L.) Delarbre in Fl. Auvergne ed. 2: 518. 1800. *P. hydropiper* (L.) Spach in Hist. Veg. 10: 536. 1841; Grierson et Long in Fl. Bhutan 1(1): 162. 1983. *Polygonum hydropiper* L. in Sp. Pl. 1: 361. 1753; Prain, Bengal Pl. 2: 664. 1903. *Persicaria hydropiper* (L.) Opiz in Seznam 72. 1852. '**Bishjhar**'

Annual, branched herbs, 40–70 cm tall. Leaves with peppery taste; lamina lanceolate or elliptic–lanceolate, densely brown punctate, both surfaces glabrous, appressed hispidulous along midvein, apex acuminate, margin ciliate, base cuneate; ocrea

membranous, tubular, sparsely appressed hispidulous, apex truncate, shortly ciliate 1.3–1.5 cm. Inflorescence axillary or terminal, pendulous, interrupted below, spicate, usually lax, slender 3–8 cm; bracts 2.3–3.4 mm, funnel-shaped, green, margin membranous, each 3–5-flowered, sparsely shortly ciliate. Pedicels longer than bracts. Perianth 5 or 4 parted, brownish pellucid glandular punctate, white, greenish or pink above; tepals elliptic; stamens included 6, rarely 8; styles 3 or 2. Achenes black–brown, included in persistent perianth, ovoid, opaque, trigonous or biconvex.

Flowering: May – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim), Pantropica Europe and N. Africa.

Status: Least concern (IUCN).

Uses: Used to treat bleeding, skin problems, diarrhoea.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 1410]

Persicaria lapathifolia (L.) Delarbre in Fl. Auvergne ed. 2: 519. 1800. *Persicaria lapathifolia* (L.) Gray in Nat. Arr. Br. Pl. 2: 270. 1821; Grierson et Long in Fl. Bhutan 1(1): 161.1983. *Polygonum lapathifolia* L. in Sp. Pl. 360. 1753; Hook. f. in Fl. Brit. Ind. 5: 35. 1886. *Polygonum nodosum* Pers. in Syn. Pl. 1: 440. 1805. *Polygonum incarnatum* Elliott in Sketch Bot. S. Carolina 1(5): 456. 1817.

Annual branched erect herbs. Lamina lanceolate, acuminate, ciliate, acute, base cuneate; ocrea tubular, membranous, brownish, glabrous, tip truncate. Inflorescence terminal densely flowered, several spikes, panicle like; bracts funnel-shaped, margin ciliate. Perianth pink. Stamens usually 6. Styles 2. Achenes shiny, biconcave, ovoid.

Flowering: June – September

Fruiting: August –

December

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Sikkim, Chattisgarh, Bihar, Orissa, Jharkhand, Assam, West Bengal) Bhutan, Nepal, Bangladesh, Japan, Kazakhstan, Korea, Malaysia and Thailand.

Status: Least concern (IUCN).

Uses: The whole plant is antiseptic and astringent.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 591]

Persicaria orientalis (L.) Spach in Hist. Nat. Vég. 10: 537 1841. *Persicaria orientalis* (L.) Assenov in Fl. Reip. Pop. Bulgar. 3: 250. 1966; Grierson and Long in Fl. Bhutan 1(1): 161. 1983. *Polygonum orientale* L. in Sp. Pl. 1: 362. 1753. Hook. f in Fl. Brit. Ind. 5: 30. 1886; Prain in Bengal Pl. 2: 663. 1903. *Persicaria tibetica* Rendle in J. Bot. 428. 1900. *Polygonum orientale* var. *pilosum* (Roxb. ex Meisn.) Meisn. in Prodr. 14(1): 123. 1856. *Polygonum pilosum* Roxb. ex Meisn. in Fl. Ind., ed. 1820 2: 286. 1824.

Annual densely spreading erect herbs. Margin broadly ovate lanceolate, 14 – 25 × 5 – 14 cm, densely pubescent, densely ciliate, acuminate, slightly decurrent. Ocrea tubular, margin truncate, ciliate, usually with green leaflike wing. Inflorescence terminal or axillary, spikes aggregated; bracts green, broadly funnel shaped. Flowers dimorphic; perianth whitish; stamens 7-9, exserted; styles 3, connate, stigmas capitate. Achenes, black shiny.

Flowering: June – July

Fruiting: June – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (throughout); Bhutan, Bangladesh, Indonesia, Japan, Korea, Myanmar, Philippines.

Status: Least concern (IUCN).

Uses: It is used as an anthelmintic, an antiseptic, treatment for diarrhea.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 1570]

Persicaria strigosa (R.Br.) Nakai, in Rigakkwai 24: 299. 1926. *Polygonum strigosum* R.Br., Prodr. Fl. Nov. Holl. 420. 1810. *Polygonum bodinieri* Lev et Vaniot in Bull. Acad. Int. Geogr. Bot. 11: 343. 1902. Prain in Bengal Pl. 2: 888. 1963. *Truellum strigosum* (R. Br.) Sojak in Preslia 46: 149. 1974. *Tracaulon strigosum* (R. Br.) Greene in Leaflet. Bot. Observ. Crit. 1: 22. 1904.

Herbs, stems branched, decumbent, angulate, with retrorse prickles. Petiole with recurved prickles; leaf blade lanceolate or elliptic, 8 × 3 – 5 cm, acute or acuminate, retrorse prickles along midvein, ciliate; ocrea tubular, membranous, apex truncate, long ciliate. Inflorescence spicate; peduncle 2 or 3 flowered; perianth pink, 5-6 parted; tepals elliptic; styles 3 or 4, stigmas capitate. Achenes dark black.

Flowering: August – October

Fruiting: September – January

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Bangladesh, Nepal, Bhutan, Indonesia, Myanmar, New Guinea

Status: Least concern (IUCN).

Uses: This plant treatments for skin diseases, chronic rheumatoid arthritis and tumorous growths.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 4210]

POLYGONUM L. in Sp. Pl. 1: 359. 1753; *nom. cons.*

Polygonum plebeium R. Br. in Prodr. Fl. Nov. Holl. 420. 1810; Hook. *f.* in Fl. Brit. Ind. 5:27. 1886; Prain in Bengal Pl. 2: 855. 1903; Grierson et Long in Fl. Bhutan 1(1): 170. 1983; Guha Bakshi in Fl. Mur. Dist. 274. 1984. *Avicularia indica* Didrich. in Bot. Not. 1850: 187. 1850. *P. herniarioides* Spreng. in Syst. Veg. 2: 256. 1825. '**Ratoful**'

Woody herbs, with prostrate radiate branches; stems subglabrous. Lamina 0.9 – 1 × 0.4 – 0.6 cm, oblong, sessile, glabrous. Ochrea, white, ciliate. Flowers 5 – 7, sessile, axillary; tepals 5, acute, ovate, glabrous; stamens 5 – 6. Nut trigonous, acute, glabrous.

Flowering: November – April

Fruiting: July – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim, West Bengal); Asia, Africa and Australia.

Status: Rare occurrence

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 4211]

Polygonum pubescens Bl. in Bijdr. Fl. Ned. Ind. 2: 532. 1925. *Persicaria pubescens* (Bl.) Hara in Jour. Jap. Bot. 17(6): 335. 1941; Hara in Fl. East. Himal. 73: 1966. *P. burbatum* Willd. in Fl. Ind. 2: 289. 1832 non L; Grierson et Long in Fl. Bhutan 1(1): 162. 1983; Prain in Bengal Pl. 2: 664. 1903. *P. hispidum* Buch.-Ham. ex Don, Prodr. in Fl. Nepal. 71. 1825. *P. flaccidum* var. *hispidum* (Buch.-Ham. ex Don) Hook. *f.* in Fl. Brit. Ind. 5: 40. 1886.

Annual herbs. Stem hispidulous, erect. Lamina 4 – 9 × 1.25 – 5 cm ovate-lanceolate, ciliate, acute or acuminate, base cuneate. Ocrea tubular, hispid, apex truncate, ciliate.

Inflorescence terminal or axillary, pendulous, spicate, lax; funnel-shaped, margin ciliate, each 4 or 5 flowered; pedicels longer than bracts. Perianth greenish, 5 parted, densely purplish glandular punctate; tepals elliptic; stamens 8-9, included; styles 3, connate to below middle. Achenes black.

Flowering: March – June

Fruiting: June – October

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim, West Bengal), Malaya and Archipelago.

Status: Threatened (IUCN 2020).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 4780]

RUMEX L. in Sp. Pl. 1: 333. 1753.

Rumex dentatus L. in Mant. Pl. 2: 226. 1771; Hook. f. in Fl. Brit. Ind. 5: 59. 1886; Prain in Bengal Pl. 2:665. 1903. Grierson et Long in Fl. Bhutan 1(1): 174. 1983. *Rumex klotzschianus* Meisn. in Prodr. 14(1):57. 1856. *Rumex dentatus* ssp. *klotzschianus* (Meisn.) Rechard f. in Beib. Bot. Jahr. 49(2): 19.1932.

Annual erect herbs. Lower leaves: lamina oblong to elliptic, 5 – 12 × 4 – 7 cm, both surfaces glabrous, slightly undulate, obtuse or acute, truncate or subcordate; cauline leaves smaller; ocrea membranous. Inflorescence racemose. Flowers bisexual. Tepals elliptic; inner tepals enlarged in fruit; valves ovate triangular, base rounded, each margin with 3 to 5 teeth, apex acute to subacute. Achenes shiny, ovoid, sharply trigonous.

Flowering: May – August

October

Fruiting: June –

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Nagaland, Tripura, Karnataka, Haryana, Sikkim, Mizoram, West Bengal), Nepal, Bhutan, India, Kyrgyzstan, Afghanistan, Russia.

Status: Threatened (IUCN 2020).

Uses: Leaves is used for skin disease.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 4706]

Rumex maritimus L. in Sp. Pl. 335. 1753; Hook. f. fugacious, in Fl. Brit. Ind. 5: 59. 1986; Prain in Bengal Pl. 2: 665.1903. *Lapathum minus* Lam. in Fl. Franç. 3: 4. 1778. *Rumex aureus* Mill. in Gard. Dict. (ed. 8) no. 7 no.7. 1768. *Rumex fueginus* Philip in Anales Univ. Chile 91: 493-494. 1895. Grierson et Long in Fl. Bhutan 1(1): 174. 1983. Annual branched erect herbs. lamina lanceolate, oblong, glabrous smooth acute, base cuneate; cauline leaves, petiolate; ocrea membranous. Inflorescence paniculate. Flowers bisexual. tepals elliptic; inner tepals enlarged; valves triangular ovate, base truncate. Achenes yellow, ellipsoid, shiny.

Flowering: May – June

Fruiting: June – July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim, West Bengal); Bhutan, Bangladesh, Mongolia, Myanmar, Russia.

Status: Least common.

Uses: Leaves is used for skin disease and bone fracture.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.09.2019, Mallick, et al. [Field No. 4737]

PORTULACACEAE Juss. in Gen. Pl. 312. 1789; *nom. cons.*

PORTULACA L. in Sp. Pl. 1: 445. 1753.

Portulaca oleracea L. in Sp. Pl. 1: 445. 1753; Hook. f. et Thom. in Hook. f. in Fl. Brit. Ind. 1: 246. 1874; Hara in Fl. East. Himal. 1: 79. 1966; Grierson et Long in Fl. Bhutan 1(2): 196. 1984; Sharma et al. in Fl. Ind.3: 4. 1993; Prain in Bengal Pl. 1: 240. 1903. *Portulaca intermedia* Link ex Schldl. in Bot. Zeitung (Berlin)11(38): 667. 1853. *Portulaca consanguinea* Schldl. in Linnaea 24: 693. 1851. *Portulaca marginata* Kunth in Nov. Gen. Sp. 6: 72. 1823. *Portulaca latifolia* Hornem. in Hort. Bot. Hafn. 2: 491. 1815.

Annual red to purple stem herbs. Leaves subopposite, alternate; petiole short; lamina obovate, 1 – 3 × 0.7 cm, base cuneate, obtuserounded. Flowers clusters 3 to 9; sepals green, keeled, apex acute,; petals obovate, slightly yellow, tip retuse; stamens 7 – 13; anthers yellow; ovary glabrous, stigmas 4. Fruit capsule ovoid. Seeds glossy black white.

Flowering: May – June

Fruiting: July – September

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Nagaland, Tripura, Haryana, Karnataka, Mizoram, Arunachal Pradesh, Sikkim, West Bengal), tropical and temperate regions worldwide.

Status: Least Concern (IUCN).

Uses: Its use as a purgative, emollient, cardiac tonic, muscle relaxant and anti-inflammatory.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 1007]

SAXIFRAGALES Dumort. in 1829.

CRASSULACEAE DC. in Bull. Soc. Philom. no. 49: 1. 1801; *nom. cons.*

BRYOPHYLLUM Salisb. in Parad. Lond. t. 3. 1805.

Bryophyllum pinnatum (Lam.) Oken in Allg. Naturgesch. 3(3): 1966. 1841.
Bryophyllum pinnatum (Lam.) Kurz in Jour. Asiat. Soc. Bengal in Pt. 2, Nat. Hist. 40(2): 52. 1871. *Kalanchoe pinnata* (Lam.) Pers. in Syn. 446. 1805. Grierson and Long in Fl. Bhutan 1(3): 473. 1987. *Cotyledon pinnata* Lam., Dict. 2: 141. 1786. '**Pathar kuchi**'

Herbs, 130 – 140 cm, glabrous. Stems branched. Leaves pinnately composite with 3 – 5 leaflets; petiolules 3.6 cm; leaflet blades elliptic, 4 – 8 × 2 – 6.2 cm, margin crenate, tip obtuse. Inflorescences paniculate, terminal, 30 – 40 cm, many flowered. Flowers pendulous; calyx tubular; corolla whitish. Nectar scales ovate to oblong. Follicles included in corolla tube and calyx. Seeds striate.

Flowering: January – February

Fruiting: February – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Tripura, Uttar Pradesh, Bihar, Sikkim, Assam), Native of Africa and naturalized throughout the tropics.

Status: Common

Uses: Leaves are eaten for diuresis, diabetes and dissolving kidney stones.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 609]

CORE-EUDICOTS: ASTERIDS (Fr.: Asteridees)

CORNALES Link in Handbuch 2: 2. 1829.

CORNACEAE Dumort. in Anal. Fam. P1. 33. 1829.

ALANGIUM Lam. in Encycl. 1: 174. 1783; *nom. cons.*

Alangium chinense (Lour.) Harms in Ber. Deutsch. Bot. Ges. 15: 24. 1897; Clement in Grierson et Long in Fl. Bhutan 2(1): 332. 1991. *Stylidium chinense* Lour. in Fl. Cochinch. 1: 221. 1790. *Marlea begoniaefolia* Roxb. in Cor. Pl. 3: 80t. 203. 1819; Clarke in Hook. f. in Fl. Brit. Ind. 2: 743. 1879. *Stylidium chinense* Loureiro in Fl. Cochinch. 221. 1790. *Guettarda jasminiflora* Blanco in Fl. Filip. 722. 1837. [Photo Plate -2]

Small erect, trees. Leaves, ovate-suborbicular or broadly subquadrate, margin entire, acuminate, obliquely truncate or deeply cordate. Flowers white on axillary inflorescence. Fruits, purple, ovoid glabrous.

Flowering: February – April **Fruiting:** May – October.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (tropical), Bhutan, Nepal, Myanmar and Tropical Africa.

Status: Threatene (IUCN 2019).

Uses: Plants are used in the treatment of numbness, rheumatism and traumatic injuries.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 1009]

ERICALES Bercht. et. Presl., 1820.

BALSAMINACEAE DC. in Prodr. 1: 685. 1824; *nom. cons.*

IMPATIENS L. in Sp. Pl. 2: 937. 1753.

Impatiens balsamina L. in Sp. Pl. 2: 938. 1753; Grierson et Long in Fl. Bhutan 2 (1):103. 1991; Prain in Bengal Pl. 1: 296.1903. '*Dopati*'

Herbs, annual, up to 110 cm. Stem succulent. Leaves opposite, alternate; margin narrowly oblanceolate, 5 – 13 × 1.5 – 5.3 cm, lateral veins 5 – 8 pairs, acuminate, serrate, cuneate base. Inflorescences 2 to 4 flowered axillary fascicle. Flowers pinkish. Lateral sepals 2. Lower sepal navicular. Upper petal mucronulate, orbicular; lateral petals clawed, 2 lobed; basal lobes obovate, small; stamens 7, filaments linear to lanceolate; anthers ovoid, tip obtuse; ovary fusiform. Fruit capsule, fusiform.

Flowering: July – September **Fruiting:** August– October.

Local Distribution: MPCAs forest area lower hills of Darjeeling.

General Distribution: Native to SE Asia.

Status: Threatene (IUCN 2017).

Uses: Plants are used in the treatment of numbness, rheumatism and traumatic injuries.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick, et al. [Field No. 1009]

Impatiens trilobata Colebr. in Exot. Fl. 2: t. 141. 1825; Grierson et Long in Fl. Bhutan 2(1): 90. 1991. *Impatiens flavida* Hook. f. et Thom. in J. Proc. Linn. Soc., Bot. 4: 127. 1860. '*Dopati*'

Annual, stem succulent herbs, up to 110 cm. Leaves alternate, sometimes opposite; margin elliptic, oblanceolate, 3 – 11 × 1.5 – 3.6 cm, lateral veins 5 – 7 pairs, serrate, acuminate, base cuneate. Inflorescences 2 to 3 flowered; flower axillary fascicle. pink, simple or binary petalous. Lateral sepals 2. Lower sepal navicular. Upper petal mucronulate, orbicular; basal lobes obovate, small; stamens 5; filaments linear; anthers ovoid, tip obtuse; ovary fusiform; fruit capsule fusiform; seeds black, globose.

Flowering: July – September

Fruiting: August – October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Native to South East Asia.

Status: Threatene species (IUCN 2013)

Uses: Leaves and stems are usedfor treatment of poison ivy rash

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick, et al. [Field No. 1010]

BORAGINACEAE Juss. in Gen. Pl. 143. 1789. *nom. cons.*

CYNOGLOSSUM L. in Sp. Pl. 1: 134. 1753.

Cynoglossum lanceolatum Forsskal in Fl. Aegypt. – Arab. 41.1775; Clarke in Hook. f. in Fl. Brit. Ind. 4: 156.1883; Grierson et Long, Fl. Bhutan 2(2): 907.1999. *Cynoglossum micranthum* Desfontaines in Tab. Ecol. ed. 1: 220.1804; Hook. f. in Fl. Brit. Ind. 4: 156.1883. *Cynoglossum racemosum* Roxb. in Fl. Ind. 2: 6. 1824. *Cynoglossum hirsutum* Thunb. in Prodr. Pl. Cap. 34. 1794.

Perennial stems branched, erect, herbs, up to 94 cm, densely hispid; branches spreading. Stem leaves petiolate, oblong, 7 – 11 × 1 – 4.3 cm, tightly pubescent, hairs discoid base attenuate, tip acute; upper stem leaves sessile, lanceolate, smal. Inflorescences axillary. Pedicel 2.2 mm; calyx lobes ovate, pubescent, glabrous inside, slightly enlarged tip obtuse; corolla light green, campanulate; anthers ovoid. Nutlets globose, ovoid, abaxially concave.

Flowering: April – July

Fruiting: June – December

Local Distribution: Forest area of lower hills of terai and duars.

General Distribution: India (Assam, Odisha, Tamil Nadu), Bhutan, China, Indo-Malayan.

Status: Threatened (IUCN 2019).

Uses: It is used as diaphoretic, colic medicine for children and old person and diuretic expectorant

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No. 5093]

HELIOTROPIUM L. in Sp. Pl. 1: 130. 1753.

Heliotropium indicum L. in Sp. Pl. 1: 139.1753; Clarke in Hook. f. in Fl. Brit. Ind. 4:152.1883; Mill in Grierson et Long in Fl. Bhutan 2(2): 878. 1999; Bora et Kumar in Flor. Div. Ass., 222. 2003. *Tiaridium indicum* Lehm. in Pl. Asperif. Nucif. 14. 1818. *Heliotropium foetidum* Salisb. in Prodr. Stirp. Chap. Allerton 112. 1796. *Tiaridium indicum* (L.) Lehman in Pl. Asperif. Nucif. 1: 14. 1818. *Heliophytum indicum* (L.) Candolle in Prodr. 9: 556. 1845. '*Hatisura*'

Annual stems erect, much branched, stout, herbs, 43 – 50 cm. Leaves alternate, subopposite; petiole 3.4 cm; leaf blade 5 – 11 × 3 – 4.3 cm, pubescent, strigose, base truncate, petiolate, margin undulate, tip acute. Inflorescence cymes scorpioid, solitary, ebracteate. Flowers crowded, sessile; calyx strigose, lanceolate; corolla light green; lobes rotund, border crisped; anthers hardly ovate; ovary glabrous; stigma pubescent, conical. Fruit ribbed.

Flowering: April – June

Fruiting: June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Odisha, Tamil Nadu), Bhutan, Bangladesh, China, America, Tropical Africa and Malaysia.

Status: Least concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2018, Mallick, et al. [Field No.1487]

EBENACEAE Vent. in Tabl. Regne V6g. 2: 443. 1799; *nom. cons.*

DIOSPYROS L. in Sp. Pl. 2: 1057. 1753.

Diospyros malabarica (Desrouss.) Kosteletsky in Allg. Med. Pharm. Fl. 3: 1099. 1834; Grierson et Long in Fl. Bhutan 2(2): 576. 1999. *Garcinia malabarica* Desrouss. in Lam.

in Ency. 3: 701.1792. *Diospyros embryopteris* Pers. in Syn. 2: 624. 1807; Clarke in Hooker f. in Fl. Brit. Ind. 3: 556. 1882. *Diospyros glutinifera* (Roxb.) Wallich in Numer. List. 4123. B. 1831. '**Gaab**'

Trees glabrous branchlets. Leaves oblong, coriaceous, base rounded, acute-obtuse, reticulate above. Flowers fragrant, unisexual, whitish blue; inflorescence females solitary, males umbellate cymes; calyx accrescent. Fruits reddish, globose,.

Flowering: May – June

Fruiting: June– July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, assam, Tripura, Nagaland, West Bengal), Sri Lanka, Thailand.

Status: Common

Uses: It is used externally to wounds and heal sores.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No. 3605]

ICACINACEAE (Benth.) Miers in Ann. Mag. Nat. Hist. ser. 2. 9: 221. 1852; *nom. cons.*

NATSIATUM Buch.-Ham. ex Arn. in Edinburgh New Philos. in Jour. 16: 314. 1834.

Natsiatum herpeticum Buch.-Ham. ex Arnott in Edinburgh New Philos. J. 16: 314. 1834; Hook. f. in Fl. Brit. Ind. 1: 595. 1875; Ohashi in Hara in Fl. E. Himal. 1: 191. 1966; Hara et al. in . Fl. Pl. Nep. 2: 87. 1979.

Young strigose branches yellow; branches clearly lenticellate. Petiole slender; leaf blade ovate, tip acute. Flowers green. Sepals lanceolate, petals lanceolate. Fruit drupes yellow.

Flowering: June – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Orissa, Tamil Nadu), Bhutan, China, Bangladesh, Nepal, Sri Lanka, Thailand,

Status: Least concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No.1487]

LECYTHIDACEAE Poit. in Mem. Mus. Hist. Nat. Paris 13: 141. t. 2-8. 1825; *nom. cons.*

CAREYA Roxb. in Pl. Corom. 3: 13. 1811; *nom. cons.*

Careya arborea Roxb. in Pl. Corom. 3: 14, t.218. 1819; Clarke in Hook. f. in Fl. Brit. Ind. 2:511. 1879; Long et Rae in Grierson et Long in Fl. Bhutan 2(1): 290. 1991. *Barringtonia arborea* (Roxb.) in Mueller Fragm. 5: 184. 1866. *Careya orbiculata* Miers in Trans. Linn. Soc. London, Bot. 1: 98. 1875. *Cumbiaconeanae* Buch.-Ham. in Trans. Linn. Soc. London 15: 97. 1827. *Careya sphaerica* Roxb. in Fl. Ind. 2: 636. 1824. **'Kumbhi'**

Trees deciduous, to 12.2 m high, bark brownish, rough, fibrous. Leaves simple, alternate, estipulate, clustered at the tips of branchlets; petiole 10.6 mm long, slender, pubescent; lamina 15.4 – 30.1 × 5.7 – 15.1 cm, obovate, apex round or shortly acuminate. Flowers bisexual, greenishwhite, 5.3–10.2 mm; peduncle woody; bracts 3, unequal; calyx tube campanulate, glabrous, adnate to ovary and not produced beyond the ovary; lobes 4, ovate, imbricate; petals 4, ellipticoblong, revolute along margin, slightly connate at base, inserted on the top of calyx; filaments subulate, purple, exserted, inner and outer rows without anthers; ovary inferior, 4 – 5celled, ovules many; style long, filiform; stigma capitate. Fruit a berry 5.2 – 7.3 cm.

Flowering: February – April

Fruiting: May – July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Madhya Pradesh, Orissa, Tamil Nadu), Afghanistan.

Status: Common

Uses: Bark and fruit are used to treat for cough, ulcer, wound and promotes digestion

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 18.05.2018, Mallick, et al. [Field No.3201]

PRIMULACEAE Vent. in Tabl. Regne V6g. 2: 285. 1799; *nom. cons.*

ARDISIA Sw. in Prodr. Veg. Ind. Occ. 3: 48. 1788.

Ardisia solanacea Roxb. in Pl. Coromandel 1: 27. 1795; Grierson et Long in Fl. Bhutan 2(2): 514. 1999.

Shrubs, glabrous. Lamina oblanceolate to elliptic, papery, cuneate base, margin subrevolute, apex acute. Inflorescences at bases, paniculate with racemose. Flowers leathery, pinkish. Sepals ovate to reniform, ciliate. Petals free; lobes ovate, margin entire. Fruits purplish red or blackish, densely punctate.

Flowering: February – April

Fruiting: May – November

Local Distribution: Forests of MPCAs.

General Distribution: India (Assam, Madhya Pradesh, Orissa, Tamil Nadu); Nepal, Bhutan, Pakistan and Afghanistan

Status: Common

Uses: Medicinal plant used for treatment of fever, alleviating chest pains, diarrhea and liver poisoning.

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No.3201]

MAESA Forssk. in Fl. Aegypt. Arab. 66. 1775.

Maesa indica (Roxb.) Candolle, in Trans. Linn. Soc. London 17(1): 134. 1834; Grierson et Long, in Fl. Bhutan 2(2): 507. 1999. *Baeobotrys indica* Roxb. in Fl. Ind. 2: 230. 1824.

Scandent shrubs, up to 3m tall. Leaves simple, alternate; lamina ovate to oblong, 10 – 20 × 5 – 9cm, serrate-dentate, teeth not callose, acuminate or acute, obtuse or subrounded. Inflorescences axillary, racemose or paniculate; bracteoles ovate. Flowers white or light yellowish-green. Calyx lobes ovate, punctate, entire, ciliate; corolla campanulate; lobes broadly ovate; stamens inserted at middle of corolla tube, style short, stigma lobed. Fruit globose.

Flowering: April – May

Fruiting: April – July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Orissa, Tamil Nadu); Bhutan, China, Vietnam.

Status: Threatened (IUCN 2020).

Uses: Medicinal plant used for treatment of fever, alleviating chest pains, diarrhea and liver poisoning

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No.3201]

SAPOTACEAE Juss. in Gen. Pl. 151. 1789; *nom. cons.*

MANILKARA Adanson in Fam. Pl. 2: 166. 1763; *nom. cons.*

Manilkara zapota (L.) P. Royen in Blumea 7: 410. 1953. *Achras zapota* L. in Sp. Pl. ed. 2: 470. 1762. *Achras zapota* L. in Sp. Pl. App. 1190. 1753. *Pouteria mammosa* (L.) Cron. in Lloydia 9: 287. 1946. *Sapota achras* Miller in Gard. Dict. ed. 8: 1. 1768. '*Sabeda*'

Small trees or shrubs. Branchlets subglabrous. Leaves alternate; lamina obovate to obovate, 6 – 11 × 5 – 7 cm, glabrous, apex retuse, base cuneate to obtuse. Flowers axillary, fascicled. Sepals ovate triangular; corolla white or light yellow; lobes oblong; stamens 4 – 5 mm; staminodes 3 parted, lobes linear; ovary ovoid. Berry obovoid ellipsoid, 1 or 2 seeded.

Flowering: August – October

Fruiting: October – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Orissa, Tamil Nadu); Sri Lanka, Vietnam, Cambodia

Status: Threatened (IUCN 2020).

Uses: Plant used for treatment of fever, alleviating chest pains, diarrhea and liver poisoning

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No.3201]

THEACEAE Mirb. ex Ker Gawl., Bot. Reg. 2: ad t. 112. 1816; *nom. cons.*

SCHIMA Reinw. ex Blume, Cat. Gew. Buitenzorg 80. 1823.

Schima wallichii Choisy, Syst. Verz. 144.1854. *Schima wallichii* (DC.) Korth. Verh. Nat. Gesch. Ned. Bezitt., Bot. 143. 1842. *Schima wallichii* var. *khasiana* Bloemb. Reinwardtia 2: 164. 1952. **‘Chilauni’**

Trees evergreen. Branchlets with lenticels white; sericeous terminal buds. Leaves petiolate; leaf blade margin serrate or entire. Flowers axillary, bisexual, 3–5 rarely in a short raceme or solitary. Pedicel recurved and thickened apically, slender; bracteoles caducous, usually 2. Sepals basally slightly connate, persistent 5, imbricate; petals white 5; stamens numerous; dorsifixed anther; ovary placentation axile, densely tomentose, with 2 or 3 ovules per locul 5–loculed, style glabrous, stigma 5–lobed, capitate. Capsule depressed globose or globose. Seeds flat, small, reniform.

Flowering: February – April

Fruiting: May – July

Local Distribution: Throughout the forest area of Terai and Duars.

General Distribution: India, Bhutan, China, Indonesia, Japan.

Status: Least Concern (IUCN).

Uses: The bark and leaves are used as an important antiseptic for cuts and wounds

Specimen examined: West Bengal, Jalpaiguri, Lataguri (MPCA). 22.02.2018, Mallick, et al. [Field No.5123]

GENTIANALES Lindl., 1846.

APOCYNACEAE Juss. in Gen. Pl. 143. 1789; *nom. cons.*

ALSTONIA R.Br. in Mem. Wern. Nat. Hist. Soc. 1: 75. 1811; *nom. cons.*

Alstonia scholaris (L.) R. Br. in Mem. Wern. Nat. Hist. Soc. 1:76. 1811; Hook. *f.* in Fl. Brit. Ind. 3: 642. 1882; Grierson et Long in Fl. Bhutan 2(2): 672. 1999. *Echites scholaris* L. in Mant. Pl. 1:53.1767. *Pala scholaris* (L.) Roberty in Bull. Inst. Fran. Afrique Noire 15: 1426. 1953. '**Chhatim**'

Trees glabrous up to 50 m., Bark grayish; branchlets lenticellate. Leaves in whorls 3 – 10; petiole 3 – 5 cm; lamina obovate to spatulate, 8 – 28 × 3 – 11 cm, leathery, cuneate base, apex rounded. Cymes dense, pubescent; peduncle 6 – 8 cm. Pedicel usually as long as or shorter than calyx; corolla white; lobes broadly ovate overlapping to left; ovaries distinct, pubescent. Follicles linear. Seeds oblong.

Flowering: August – September

Fruiting: September – December

Local Distribution: All over the forest areas of North Bengal

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Nagaland, Tripura, Arunachal Pradesh); Bhutan, Bangladesh, Sri Lanka, Singapore.

Status: Common

Uses: It is used for tribal medicine like fever and leg pain.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4860]

CALOTROPIS R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 39. 1810.

Calotropis gigantea (L.) in Dryander in Aiton, Hortus Kew.ed. 2, 2: 78. 1811; Hook. *f.* in Fl. Brit. Ind. 4: 17. 1883; Ohashi in Hara in Fl. E. Himal. 1: 260. 1966; Grierson et Long in Fl. Bhutan 2(2): 700. 1999. *Asclepias gigantea* L. in Sp. Pl. 214. 1753. *Calotropis gigantea* (L.) R. Br. ex Schultes in Syst. Veg. 6: 91. 1820. *Periploca cochinchinensis* Lour. in Fl. Cochinch. 1: 167. 1790. '**Akanda**'

Sub-shrubs of 2 – 3 m height. Lamina obovate or oblong, 7 – 25 × 3 – 12 cm, cordate, obtuse, frequently glabrescent and glaucous green; veins 6 – 9 pairs. Cymes with fine woolly hairs, umbel-like; pedicel thick; corolla purple or lilac with pale green base. Follicles obliquely elliptic.

Flowering and Fruiting: Throughout the year.

Local Distribution: Throughout Forest floors of MPCAs.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Bhutan, Bangladesh, Nepal, Pakistan, Sri Lanka and Indonesia.

Status: Threatened (IUCN 2021).

Uses: Plant is used for digestive disorders, diarrhea and stomach ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4030]

CHONEMORPHA G. Don in Gen. Hist. 4: 76. 1837; *nom. cons.*

Chonemorpha grandiflora (Roth) M. R. and Almeida in J. Bombay Nat. Hist. Soc. 90: 427. 1993. *Echites grandiflora* Roth in Nov. Pl. Sp. 136. 1821. *C. fragrans* (Moon) Alston in Ann. Roy. Bot. Gard. 11: 203. 1929. *Echites fragrans* Moon in Cat. 20.1824. *Echites macrophylla* Roxb. in Fl. Ind. 2:13. 1832. *C. macrophylla* (Roxb.) G. Don in Gen. Syst. 4: 76. 1837; Wight, Ic.t. 432. 1841; Hook. f. in Fl. Brit. Ind. 3: 661. 1882; Gamble in Fl. Pres. Madras 818(575). 1923.

Climbers with hispid branches. Leaves 14 – 20 × 15 – 19 cm, orbicular, obtuse, cordate, tomentose; veins 9 – 11 pairs. Flowers in terminal/axillary cymes. Stamens included, 5, anthers acuminate; carpels free; style cleft below; stigma conical. Mericarps glabrous, 30 cm long. Seeds many, comose.

Flowering: May – June

Fruiting: May – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh, Andaman and Nicobar Islands); Myanmar, Sri Lanka.

Status: Threatened (IUCN 1981).

Uses: It is used to treat fever and stomach disorders.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4016]

CRYPTOLEPIS R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 69. 1810.

Cryptolepis buchananii Roem. and Schult. in Syst. Veg., ed. 15 bis 4: 409.1819. *C. buchananii* R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 69. 1809; D. Prain in Bengal Pl. 2:685.1903. *Nerium reticulata* Roxb. in Fl. Ind. 2:8.1832

Glabrous, shrub, branch terete. Leaves elliptic or ovate, Petiole 1.1 cm long; leaf blade oblong, base cuneate, apex rounded, acute. Inflorescence cymose, flower short, axillary; bract ovate, lanceolate. Pedicel 2 – 4 mm. Sepals ovate, 1 mm; corolla 10-15 mm long,

corolla lobe 6 – 7 mm long, yellow or white yellow in colour; lobes linear or lanceolate; stamens at corolla tube base, anthers hirsute. Follicles cylindrical.

Flowering: March – August

Fruiting: June – December

Local Distribution: All over the forest areas of MPCAs.

General distribution: India (West Bengal, Assam, Sikkim); Bhutan, Nepal, Bangladesh Myanmar.

Status: Least Concern (IUCN).

Uses: It is used in, blood purifier, leprosy, fever and skin diseases.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 11.02.1019, Mallick, et al. [Field No. 7612]

DREGIA Meyer in Comm. Pl. Afr. Austr. 199. 1838; *nom. cons.*

Dregea volubilis (L. f.) Benth. ex Hook. f. in Fl. Brit. India 4: 46. 1883. *Wattakaka volubilis* (L. f.) Stapf in Bot. Mag. 148: , sub pl. 8976. 1923; Grierson et Long in Fl. Bhutan 2(2): 723. 1999. *Asclepias volubilis* L. f. in Suppl. Pl. 170. 1782. *Marsdenia volubilis* (L. f.) Cooke in Fl. Bombay 2: 166. 1904. *Tylophora macrantha* Hance in J. Bot. 20(231): 79. 1882.

Lianas, up to 12 m. Lamina ovate or suborbicular, 8 – 14 × 3 – 12 cm, acute to shortly acuminate, cordate. Raceme pinkish white; sepals ovate; corolla lobes ovate; corona yellowish green; appendages white; pollinia oblong. Follicles obovoid.

Flowering: May – July

Fruiting: June – December

Local Distribution: All over the forest areas of MPCAs.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Bhutan, Bangladesh, Nepal, Sri Lanka, Thailand.

Status: Threatened (IUCN 2021).

Uses: It is used to treat rheumatic pain, fever, cold and cough.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4016]

HOLARRHENA R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 62. 1811.

Holarrhena pubescens Wall. ex G. Don in Gen. Hist. 4: 78.1837; Watson in Grierson et Long in Fl. Bhutan 2(2): 671. 1999. *Chonemorpha antidysenterica* G. Don in Gen. Hist. 4: 76. 1837. '**Kurchi**'

Trees or shrubs, up to 15 m tall. Branchlets with lenticels. Petiole 2 – 5.5 mm, grooved; leaf blade elliptic or ovate, 11 – 25 × 6 – 11.9 cm, membranous, pubescent, sometimes densely so abaxially, base rounded, obtuse or apex acute; lateral veins 11 – 15 pairs. Cymes 5 – 9 cm; peduncle 3 cm; pedicel 1 – 3 cm; sepals linear to elliptic; corolla white; anthers included, narrowly ovate, base rounded. Follicles linear.

Flowering: April – June

Fruiting: May – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Bhutan, Nepal, Bangladesh, Cambodia, Laos, Myanmar, Thailand

Status: Least Common

Uses: It is used for treating anemia, jaundice, dysentery, diarrhea, epilepsy and cholera.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1230]

HOYA R.Br., Prodr. Fl. Nov. Holland. 459. 1810

Hoya parasitica Wall. ex Wight, Contr. Bot. Ind. 37.1834. *Hoya parasitica* Wall. ex Traill, Trans. Hort. Soc. London 7: 23.1830. *Hoya parasitica* var. *citrina* (Ridl.) Rintz, Malayan Nat. J. 30(3-4): 514.1978. *Hoya parasitica* var. *hendersonii* Kiew, Sandakania 6: 66.1995.

Evergreen perennial twining or climbing. Leaves, simple entire, opposite, fleshy, sometime. Inflorescence umbel, axillary or terminal, flowers in clusters, thick, waxy, petals triangular; rachis thick; calyx small, with glands; corolla lobe 5, fleshy, valvate, often hairy; stamens short connate, pollinia 2, oblong, erect, margin; stigma head discoid or rounded. Follicle solitary.

Flowering: October – December

Fruiting: December– February

Local Distribution: All over the forest areas of North Bengal

General distribution: India (Assam, Sikkim, West Bengal), Bhutan, Nepal, Bangladesh Myanmar.

Status: Vulnerable Species (IUCN 2021).

Uses: It is used in antirheumatic and acute renal failure.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA)12.05.1019, Mallick, et al. [Field No. 7645]

ICHNOCARPUS R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 61. 1811; *nom. cons.*

Ichnocarpus frutescens (L.) Aiton in Aiton *f.* in Hort. Kew. ed. 2, 2:69.1811; Hook. *f.* in Fl. Brit. Ind. 3:669.1882; Grierson et Long in Fl. Bhutan 2(2): 686.1999. *Apocynum frutescens* L. in Sp. Pl. 213.1753. *Echites frutescens* (L.) Roxb. in Hort. Bengal 230: 20. 1814. *Gardenia volubilis* Lour. in Fl. Cochinch. 148. 1790. *Ichnocarpus frutescens* (L.) R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 62. 1809. '**Dudheli lata**'

Woody climber. Lamina elliptic to lanceolate 5.3 × 1.5 cm, acuminate, base cuneate to obtuse, coriaceous, to coriaceous, subglabrous above, sparsely pubescent on; petiole 3 – 15 mm. Flowers white. Calyx lobes obtuse, sub acute to ovate; corolla tube cylindric, lobes lanceolate. Follicles curved slender.

Flowering: April – May

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh); Bhutan, China, Bangladesh, Nepal, Sri Lanka, Myanmar and Australia.

Status: Abundant

Uses: It is used for treating anemia, diarrhea, epilepsy and cholera.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 2050]

MARSDENIA R. Br. In Prodr. 460. 1810.

Marsdenia tinctoria R. Br. in Mem. Wern. Nat. Hist. Soc. 1: 28-30. 1810; Hook. *f.* in Fl. Brit. Ind. 4: 34. 1883; Ohashi in Hara in Fl. E. Himal. 1: 262. 1966; Grierson et Long in Fl. Bhutan 2(2): 709. 1999. *Pergularia tinctoria* (R.Br.) Sprengel in Syst. Veg. 1: 844. 1824. *Asclepias tinctoria* Roxb. in Fl. Ind. ed. 2, 2: 43. 1832.

Climbing undershrub. Margin ovate to elliptic, 7.3 – 18.6 × 3.1 – 8.7 cm, tip acuminate or caudate. Flowers white, small, subsessile, cymose inflorescence; flowering axis 5.3 cm long; peduncle very short; calyx ovate, lobes and puberulent; corolla cylindrical; gynostegium 1.8 mm high. Follicles covered with hair.

Flowering: August – September

Fruiting: September –

December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Nagaland, Tripura, Arunachal Pradesh); Bhutan, Bangladesh, Nepal and Sri Lanka.

Status: Common

Uses: Traditionally leaves and roots are applied for intestinal disorders and externally to stimulate hair growth.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4890]

RAUVOLFIA L. in Sp. Pl. 1: 208. 1753.

Rauvolfia serpentina (L.) Benth. ex Kurz in For. Fl. Burma 2: 171. 1877; Hook. f. in Fl. Brit. Ind. 3: 632. 1882; Grierson et Long in Fl. Bhutan 2(2): 686. 1999. *Ophioxylon serpentinum* L. in Sp. Pl. 2: 1043. 1753.

Small shrubs, 1 – 1.5 m. Leaves 3 – 6; petiole 2 – 4.9 mm; lamina oblong to ovate 2 – 12 × 0.8 – 4.2 cm, membranous, acute, base cuneate; lateral veins 5 – 13 pairs. Peduncle 1 – 4.7 cm; corolla tube urceolate, white, lobes ovate to suborbicular; ovaries connate. Fruit drupes, connate glabrous.

Flowering: May – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Arunachal Pradesh); Bhutan, China, Bangladesh, Nepal and Sri Lanka.

Status: Common

Uses: It is used for treating anemia, diarrhea, epilepsy and cholera.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1509]

TABERNAEMONTANA L. in Sp. Pl. 1: 210. 1753.

Tabernamontana divaricata (L.) R. Br. in Roem. Schultes, Syst. Veg. 4: 427. 1819; Ohashi in Hara in Fl. E. Himal. 1: 259. 1966; Grierson et Long in Fl. Bhutan 2(2): 675. 1999. *Nerium divaricatum* L. in Sp.Pl. 209. 1753. Hook. f. in Fl. Brit. Ind. 3: 646. 1882. *Nyctanthes acuminata* Burm. f. in Fl. Ind. 5. 1768. '*Sadaful, Chaiti ful*'

Small trees or shrubs, 0.5–5.4 m tall, glabrous. Lamina elliptic, 3.3 – 17.3 × 1 – 6 cm, apex acuminate; lateral veins 5 –16 pairs. Cymes dichotomous, 1–9 – flowered. Flower buds ovoid, apex acute; calyx lobes ciliate; corolla white, obovate; stamens implanted at basal third of corolla tube. Follicles ellipsoid.

Flowering: April – June

Fruiting: May– November

Local Distribution: Throughout Forest floors of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh), Nepal, Bhutan, Myanmar, China.

Status: Common

Uses: Leaves and tender shoots are used as an anti-epileptic, anti-mania, brain tonic and anti-oxidant.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 3549]

VALLARIS Burm. f. in Fl. Ind. 51. 1768.

Vallaris solanacea (Roth) Kuntze in Revis. Gen. Pl. 2: 417. 1891; Grierson et Long in Fl. Bhutan 2(2): 678. 1999. *Peltanthera solanacea* Roth in Nov. Sp. 132. 1821.

Climbing shrubs. Bark whitish gray. Lamina elliptic to narrowly elliptic, 3 – 16 × 0.8 – 5 cm, pubescent on both surfaces, base cuneate or rounded. Flowers fragrant; sepals ovate or narrowly elliptic; corolla white or pale yellow; staminal glands yellow, globose; disc shorter than ovary, apex pilose. Follicles oblong.

Flowering: March – June

Fruiting: May – July

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Arunachal Pradesh), Bhutan, China, Bangladesh, Nepal and Sri Lanka.

Status: Abundant.

Uses: It is used for epilepsy and cholera.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 3020]

WRIGHTIA R.Br. in Mem. Wern. Nat. Hist. Soc. 1: 73. 1811.

Wrightia arborea (Dennstaedt) Mabblerl. in Taxon 26(5/6): 533.1977. Watson in Grierson et Long in Fl. Bhutan 2(2): 676.1999. *Periploca arborea* Dennstaedt in Schluessel Hort. Malab. 13, 23 and 25.1818. *Wrightia tomentosa* Roem. et Schultes in L., Syst. Veg. 4/414. 1819; Clarke in Hook. f., Fl. Brit. Ind. 3:653.1882. '**Khira**'

Trees 18 – 20 m tall. Branches gray, pubescent, lenticellate; petiole 2 – 9.3 mm; leaf elliptic, obovate, 5 – 19 × 3 – 9.3 cm, pubescent, glabrescent, tomentose; lateral veins 10 – 15 pairs. Inflorescence cymes, pubescent. Sepals ovate; corolla yellowish, subrotate; tube 4.2 – 7.5 mm, glabrous; corona scales 11, tip dentate; ovaries connate. Follicles cylindrical, connate, lenticellate. Seeds linear.

Flowering: May – July

Fruiting: June – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Himachal Pradesh, West Bengal, Sikkim, Assam, Nagaland, Tripura, Arunachal Pradesh); Bhutan, Bangladesh, Nepal and Sri Lanka.

Status: Common

Uses: It is used for the treatment of epilepsy and cholera.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 3097]

RUBIACEAE Juss. in Gen. Pl. 196. 1789; *nom. cons.*

BENKARA Adans. in Fam. Pl. 2: 85. 1763.

Benkara fasciculata (Roxb.) Ridsdale in Reinwardtia 12(4): 298. 2008.

Armed shrub, rough from small tubercles, minutely pubescent. Leaves membranous, ovate or oblong–lanceolate or lanceolate, base cuneate or rounded, petioles pubescent. Stipules much acuminate, triangular. Flowers axillary, bracteoles lanceolate, hairy and acuminate; calyx tubes villous; corolla salver shaped with tube being nearly 25 mm., hairy on inside; anthers half-exserted on the throat, not apiculate, linear; style slender, stigma exerted. Fruit pisiform, 4–seeded.

Flowering: May – June

Fruiting: July – September

Local Distribution: All over the forest areas of North Bengal

General Distribution: India, Bangladesh, Cambodia, Malayasia, Nepal, Philippines, Vietnam.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 367]

CATUNAREGAM Adanson in Fam. 2: 85. 1763.

Catunaregam spinosa (Thunb.) Tirveng. in Bull. Mus. Hist. Nat. (Paris) Ser. 3. 35: 13. 1978; Grierson et Long in Fl. Bhutan 2(2): 737. 1999. *Gardenia spinosa* Thunb. in Diss. Gard. 7: 16. t.2. f.4. 1780. *Gardenia dumetorum* Retz. in Obs. Bot. 2: 14. 1781. *Randia brandisii* Gamble in Fl. Pres. Madras 616(434). 1921; Hook. f. in Fl. Brit. Ind. 3:110.1880.

Small trees with axillary spines. Leaves opposite, short lateral branchlets, 4 – 5.6 × 1.5 – 3.2 cm, obtuse, obovate, tomentose, petiolate. Flowers solitary, terminal, pedicellate;

calyx tube 0.7 cm long, hispid, lobes obovate; corolla tube, 0.7 cm long, densely villous, broad; lobes 5, twisted, obovate, white; stamens 5, anthers sessile; ovary 2 – 7 celled; ovules many; stigma ribbed, fusiform. Fruit berry, obovoid, glabrous.

Flowering: April – July

Fruiting: June – December

Local Distribution: All over the forest area of North Bengal

General Distribution: India (Assam, Sikkim, West Bengal), Tropical Asia and Africa.

Status: Least concern (IUCN).

Uses: It is used to treat fever and stomach disorders.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 3690]

COFFEA L. in Sp. Pl. 1: 172. 1753.

Coffea bengalensis Roxb. ex Schultes in Syst. Veg. 5: 200. 1819 et. Fl. Ind. 1: 540. 1820; Clarke in Hook. f. in Fl. Brit. Ind. 3: 153. 1880; Grierson et Long in Fl. Bhutan 2(2): 803. 1999. *Coffea floreifolia* Chevalier in Rev. Bot. Appl. Agric. Trop. 18: 836. 1938. *Psilanthus bababudanii* Sivarajan, Bijuet and Mathew in Bot. Bull. Acad. Sin. 33: 212. 1992. '*Chaiti ful*'

Deciduous shrubs, 42 – 50 cm; branches spreading. Lamina elliptic 4 – 11 × 2 – 5.7 cm, acuminate, entire, base rounded, nerves hairy, 2 – 5 flowered cymes, calyx glabrous; funnellform, corolla white, outside glabrous; ovary ellipsoid. Fruit drupes ovoid black.

Flowering: February – July

Fruiting: June – November

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Orissa, Jharkhand, west Bengal), Asia, Tropical Africa.

Status: Least concern (IUCN).

Uses: Root and leaves are used in treatment AIDS / HIV in Kamuli.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.4517]

DENTELLA Forst. and G. Forst. in Char. Gen. Pl. 13. 1775.

Dentella repens (L.) Froster et Froster in Charact. Gen. Pl. 26, t. 13. 1775; Hook. f. in Fl. Brit. Ind. 3: 42. 1880; Prain in Bengal Pl. 1: 555. 1903; Springate in Mill, Wood, Grierson et Long, Fl. Bhutan 2(2): 755. 1999. Haines, Bot. Bihar et Orissa Pt. IV: 443. 1922.

Creeping, small herbs, branched. Leaves with petiole; blade oblong spatulate 2.3 – 9.3 × 2.4 – 5.6 mm, tip acute, base cuneate, entire. Flowers solitary, rarely axillary. Hypanthium covered with trichomes; calyx tube 1 – 2.2 mm in diameter; corolla white; style 2.4 – 7.6 mm. Fruit compressed, densely multicellular villose.

Flowering: August – November

Fruiting: November – February

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Orissa, Jharkhand, west Bengal), Bhutan, Sri Lanka, Myanmar, Singapore, Malayan Island.

Status:Least concern (IUCN).

Uses: Leaf juice is used for blood pressure.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.1478]

Dentella repens var. *serpyllifolia* (Wall. ex Craib) Verdcourt in Kew Bull. 37: 545 1983; Grierson et Long in Fl. Bhutan 2(2): 755. 1999. *Dentella serpyllifolia* Wall. ex Craib in Fl. Siam. 2: 27. 1932.

Small creeping herbs, branched; Leaves with petiole; blade small, oblong, spatulate, 2.8 – 8.2 × 2.2 – 7.5 mm, tip acute, base cuneate, entire; stipules triangular. Flowers solitary in forks, rarely axillary. Inflorescence glabrous hypanthium; calyx tube 1.4 mm diameter; corolla white; style 2.3 – 7.7 mm. Fruit compressed lobose.

Flowering: August – November

Fruiting: November – February

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India, Bhutan, Sri Lanka, Myanmar, Singapore, Malayan Island

Status:Least concern (IUCN).

Uses: Leaf juice is used for blood pressure and sugar.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 25.12.2018, et al. [Field No.2480]

HALDINA Ridsdale in Blumea 24: 360. 1978.

Haldina cordifolia (Roxb.) Ridsd. in Blumea 24: 361. 1978; Grierson et Long in Fl. Bhutan 2(2): 739. 1999. *Nauclea cordifolia* Roxb. in Pl. Corom. t. 53. 1796; Hook. f. in Fl. Brit. Ind. 3: 24. 1880. *Nauclea cordifolia* Willd. ex Roxb. in Pl. Corom. I: 40, t. 53 (1795); Takasi Yamazaki in Hara in Fl. E. Himal. 1: 306. 1966.

Deciduous trees;. Leaves 14 – 15 cm across, cordate at base; petiole 6 – 9 cm long; stipule ca. 1.3 cm long, obovate, obtuse. Heads 3 cm across, globose, 3 – 5 together, axillary, peduncled; receptacle hispid; flowers 1.0 – 1.2 cm long, sessile; calyx tube obovoid; corolla tube 0.8 cm long, 6 ridged, small; stamens 5, exserted; ovules many; style 1.2 cm long, stigma subglobose. Capsule ovoid.

Flowering: October – December

Fruiting: November – March

Local Distribution: Moist deciduous forests of terai and duars.

General Distribution: India (Sikkim, Assam, West Bengal, Tripura); Myanmar, Sri Lanka and Indo–China.

Status: Least concern (IUCN).

Uses: Plant is used as tribals medicine like bone fracture.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 4830]

HEDYOTIS L., Sp. Pl. 1: 101. 1753.

Hedyotis wallichii Walpers in Repert. Bot. Syst. 2: 498. 1843. *Oldenlandia hispida* (Retz.) Lam. in Encycl. 4: 536. 1798. *Scleromitron crassifolium* Miq. in Fl. Ned. Ind. 2: 185. 1857. *Hedyotis verticillata* (L.) Lam. in Tabl. Encycl. 1: 271. 1792.

Prostrate diffuse, annual, herbs, up to 28 cm. Leaves sessile, opposite; lamina thinly leathery, lanceolate to elliptic 2.3 – 5.6 × 1.7 – 2.3 cm, acuminate, cuneate base; stipules hairy, connate at base. Flowers sessile; calyx tube conical; lobes 5, lanceolate; corolla white; stamens inserted at corolla tube; anthers exserted; style apex inflated; capsule obovate. Seeds many.

Flowering: March – August

Fruiting: July – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, Gujarat, West Bengal); Nepal, Vietnam, Malaysia, Indonesia.

Status: Common

Uses: It is used in treatment of angina pectoris and ischemic stroke.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.1012]

IXORA L. in Sp. Pl. 110. 1753.

Ixora coccinea L. in Sp. Pl. 110. 1753; Hook. f. in Fl. Brit. Ind. 3: 145. 1880; Grierson et Long in Fl. Bhutan 2(2): 739. 1999.

Woody small shrubs. Leaves subsessile to sessile, oblong, 5.9 × 2.7 – 3.6 cm, base cordate, apex acute. Cymes corymbiform; flowers dense; calyx lobed; corolla red to purple, tube 3 – 3.5 cm long. Berry red, subglobose.

Flowering: February – July

Fruiting: June – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, Arunachal Pradesh); Nepal, Bhutan, Bangladesh.

Status: Common

Uses: It is traditionally used for astringent, dysentery and tuberculosis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1029]

Ixora nigricans R. Br. ex Wight et Arn. In Prodr. 428.1834; Hook. f. In Fl. Brit. Ind. 3: 148. 1880; Grierson et Long in Fl. Bhutan 2(2): 738. 1999.

Shrubs, shoots glabrous. Leaves 14 – 17 × 6 – 5 cm, oblanceolate to elliptic, acuminate, subattenuate at base; nerves 9 – 10 pairs; stipule ovate, acute to acuminate. Cymes in 10 cm across; peduncles 5 – 8 cm long; flowers many; calyx lobes minute, acuminate; corolla tube slender, lobes ovate, acuminate; style very long. Fruit drupe, globose.

Flowering: December – February

Fruiting: January – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Subtropical India, Bangladesh, Myanmar, Malesia.

Status: Common

Uses: Plant parts are used to treat astringent, treat dysentery and tuberculosis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1030]

MITRACARPUS Zuccarini in Schultes, Mant. 3: 210. 1827.

Mitracarpus hirtus (L.) DC. in Prodr. 4: 572. 1830; in Grierson et Long in Fl. Bhutan 2(2):739. 1999. *Spermacoce hirta* L. in Sp. Pl. ed. 2: 148. 1762. *Mitracarpus villosus* (Sw.) DC. in Prodr. 4: 572. 1830. *Spermacoce villosa* Sw. in Prodr. 29. 1788. *Mitracarpus verticillatus* (Schum. et Thonn.) Vatke in Linnaea 40: 196. 1876; Sebastine et Ramam. in Bull. Bot. Surv. India 9:921. 1968. [Photo Plate –III]

Herbs, 50 – 60 cm high, unbranched; stems 6 – angled. Leaves to 5 – 5.5 × 1.8 – 3 cm, elliptic, acute, sessile, 3 – 5 – nerved, plicate; stipules connate, membranous, fimbriate. Flowers minute, in axillary clusters; calyx lobes 5, unequal; corolla ca. 2.5 mm long, white, tube slender, lobes ovate, obtuse; stamens 5, anthers sessile; ovary 2 – 3 celled; ovule solitary in each cell; style 3 – fid at apex. Capsule 3 mm long, ovoid, with persistent calyx lobes; seeds 3, oblong.

Flowering: July – September

Fruiting: October – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Forest tropical and subtropical India, Tropical Africa and America.

Status: Common

Uses: It is toused to treat ringworm, rashes, eczema, toothache, itch and venereal diseases.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1478]

MORINDA L. in Sp. Pl. 1: 176. 1753.

Morinda angustifolia Roxb. in Pl. Coromandel 3(2): 32 .1815. *Morinda angustifolia* Roth in Nov. Pl. Sp. 147 .1821. [Photo Plate –IV]

Erect shrubs or small trees 6.2 m tall; branches quadrangular, glabrous. Leaves opposite, or solitary opposite an inflorescence; petiole 0.5 – 1.2 cm, glabrous; blade drying papery, matte on both surfaces, brownish green, elliptic–oblong, elliptic, oblong–lanceolate, or oblanceolate 15.1 – 30.2 × 6.1 – 10.1 cm, adaxially glabrous, abaxially scabrous to glabrous or sometimes sparsely hirtellous on veins, base acute to attenuate, apex acute to acuminate; stipules interpetiolar, free or shortly united to petioles, triangular, acuminate or acute. Inflorescence solitary and leaf–opposed; flowering head 1, subglobose to cylindrical; bracteoles subulate. Flowers fused only shortly at base, distylous; calyx glabrous; corolla white, salverform, outside glabrous, tube cylindrical to slenderly funnellform, lobes 5, ovate, lanceolate, acute; ovary 4-celled.

Flowering: March–June

Fruiting: July–October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim), Laos, Myanmar, Nepal, Thailand.

Status: Common

Uses: It is used as folk medicine like leaves are boiled with other herbs and bathing with the boiled water at evening helps in curing jaundice.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 14.09.2018, Mallick, et al. [Field No. 4572]

MEYNA Roxb. ex Link in Jahrb. Gewächsk. 1(3): 32.1820.

Meyna spinosa Roxb. ex Link in Jahrb. Gewächsk. 1(3): 32. 1820. *Pyrostria spinosa* Miq. in Fl. Ned. Ind. 2: 313. 1857. *Vangueria spinosa* (Roxb. ex Link) Roxb. in Fl. Ind. 2: 172. 1824. *Vangueria spinosa* var. *mollis* Hook.f. in Fl. Brit. Ind. 3: 136. 1880.

A small tree with ascending branches. Leaves opposite, glabrous. Stem is covered with long spines. Flowers pale white. Fruit berry, greenish-yellow, yellow when ripe.

Flowering: March – June

Fruiting: June – September

Local distribution: Found in semi evergreen to deciduous forests of terai duars.

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim), Myanmar and Thailand.

Status: Threatened (IUCN 2019).

Uses: Plant is used for the treatment of skin infection, diabetes, headache, disorder, hepatic dysentery, indigestion and painful urination.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 17.06.2019, Mallick, et al. [Field No. 408].

MUSSAENDA L. in Sp. Pl. 177. 1753.

Mussaenda roxburghii Hook. f. in Fl. Brit. Ind. 3: 87.1880; Takasi Yamazaki Hara in Fl. E. Himal. 1: 312. 1966. '*Musenda*'

Herbs, up to 12 m tall; branchlets angular, greenish, densely pubescent. Leaves simple, opposite decussate; stipules triangular, acuminate; petioles densely hairy; lamina 5 – 14 × 3 – 9 cm, oblong–lanceolate, acute to acuminate at base, entire, pubescent underneath; secondary nerves 6 – 15 pairs. Flowers white 0.4 – 0.8 cm across in terminal subcapitate cymes; peduncles pubescent; bracts ovate acuminate; calyx lobes filiform, 0.6 – 1 × 0.1 – 0.8 cm; petaloid sepals oblong–lanceolate; corolla lobes ovate 0.2 – 0.5 cm acuminate. Berries subglobose, sparsely appressed pubescent. Seeds ellipsoid or globose, reticulate.

Flowering: May – August

Fruiting: September – December

Local distribution: Common in forests, moist and shaded stream-bank, forest-edges.

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim), Nepal, Bangladesh, Myanmar.

Status: Common

Uses: Root and Leaves are used for Cytotoxicity, anti-inflammatory, antiviral, antioxidant and antibacterial properties

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 2438]

NEOLAMARCKIA Bosser in 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; Grierson et Long in Fl. Bhutan 2(2): 739. 1999. *Samama cadamba* (Roxb.) Kuntze in Revis. Gen. Pl. 1: 296. 1891. *Anthocephalus cadamba* (Roxb.) Miquel in Fl. Ned. Ind. 2: 135. 1856. '**Kadam**'

Deciduous trees ; branches horizontally spreading. Lamina elliptic to oblong, 14 – 25 × 6 – 15 cm, leathery, acute; stipules lanceolate. Flowering heads solitary, terminal; peduncles stout; calyx tube subglabrous; lobes suboblong, hairy; corolla yellowish white, funnel form; lobes lanceolate. Fruiting yellow green at maturity. Seeds nearly 3-5 angled.

Flowering: May – August

Fruiting: June – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India; Sikkim, Assam, West Bengal, Tripura; Myanmar, Sri Lanka and Indo–China.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 19.06.2019, Mallick, et al. [Field No. 1702]

OLDENLENDIA L., Sp. Pl. 1: 119. 1753.

Oldenlandia corymbosa L in Sp. Pl. 1: 119. 1753; Hook. f. in Fl. Brit. Ind. 3: 64. 1880; Takasi Yamazaki in Hara, Fl. E. Himal. 1: 309. 1966; Grierson et Long, Fl. Bhutan 2(2): 766. 1999. Prain in Bengal Pl. 1: 559. 1903 (Rep. ed. 1999). Guha Bakshi in Fl. Mur. Dist. 154. 1984. *Hedyotis biflora* var. *corymbosa* (L.) Kurz in J. Asiat. Soc. Bengal 46(2): 133. 1877.

Annual diffuse, herbs, up to 45 cm. Leaves, sessile opposite; lamina membranous, linear lanceolate, 2 – 3 × 0.5 – 0.9 cm, acute, entire, cuneate base; stipules membranous. Inflorescence axillary, corymbose, 3 to 5 flowered; bracts minute. Flowers 4-5 merous; calyx tube globose; lobes triangular; corolla white, tubulate. Stamens inserted at corolla tube; stigma 3 lobed. Fruit capsule, subglobose.

Flowering: January – August

Fruiting: July – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: Throughout India, Sri Lanka, Tropical Asia, Africa, America.

Status: Least concern (IUCN).

Uses The plant is heat and toxins, activate blood pressure, diuresis and relieve stranguria. It is also active against hepatitis, appendicitis, pneumonia.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 25.12.2018, et al. [Field No.4509]

Oldenlandia diffusa (Willd.) Roxb. in Hort. Bengal 11. 1814; Fl. Ind. 1: 444.1820; Prain in Bengal Pl. 1:559.1903; Hook. f. in Hook. f. in Fl. Brit. Ind. 3: 65.1880. *Hedyotis duffusa* Willd. in Sp. Pl. 1: 566. 1798; Panda et Das in Fl. Sambalp.,172. 2004. *Oldenlandia diffusa* var. *extensa* Hook.f. in Fl. Brit. Ind. 3: 65. 1880.

Diffuse, annual herbs; stems flattened. Leaves opposite, subsessile; lamina membranous, linear, 2 – 6 × 0.3 mm, acute. Flowers tetramerous, solitary; pedicels stout; calyx tube subglobose, ciliate; corolla white, tabulate; lobes ovate oblong; stamens inserted at corolla tube; anthers exerted, oblong; stigma 2-3 lobed, lobes spreading. Capsule subglobose. Seeds 3-angled.

Flowering: January – August

Fruiting: July – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical and sub-tropical India, S. China, Japan, Malaysia, Borneo and Philippines.

Status: Common

Uses: Plant parts are used as pain killer.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.4806]

Oldenlandia verticillata L. in Mant. Pl. 1: 40. 1767. *Hedyotis verticillata* (L.) Lam. in Tabl. Encycl. 1: 271. 1792; Grierson et Long in Fl. Bhutan 2(2): 763. 1999. *Hedyotis*

wallichii Walpers, Repert. Bot. Syst. 2: 498. 1843. *Oldenlandia hispida* (Retz.) Lam. in Encycl. 4: 536. 1798. *Scleromitron crassifolium* Miq. in Fl. Ned. Ind. 2: 185. 1857. *Hedyotis verticillata* (L.) Lam. in Tabl. Encycl. 1: 271. 1792.

Annual, prostrate diffuse herb, up to 27 cm. Leaves opposite, subsessile; lamina leathery, lanceolate to elliptic, 3 – 6 × 2 – 4 cm, acute to acuminate, base cuneate; stipules, connate at base. Flowers subsessile; calyx tube conical; lobes 5, lanceolate; corolla white, lobes; stamens inserted at corolla tube; anthers exerted; style apex inflated. Fruit capsule, obovate. seeds many.

Flowering: March – August

Fruiting: July – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, Gujarat, West Bengal), Nepal, Vietnam, Malaysia, Indonesia.

Status: Common

Uses: Uses as anti-inflammatory, antiviral, cytotoxicity, antioxidant and antibacterial properties.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.4706]

OPHIORRHIZA L. in Sp. Pl. 1: 150. 1753.

Ophiorrhiza fasciculata D. Don in Prodr. Fl. Nepal. 136. 1825.

Herbs or subshrubs, erect, to 0.7 m tall. Stems pilosulous or puberulent to glabrescent. Leaves in subequal pairs; petiole 1 – 1.5 cm, puberulent. Inflorescences congested cymose to subfasciculate, several flowered, densely pilosulous; peduncle 1 – 7.5 cm; branched portion 1 – 2.5 cm; bracts ligulate – lanceolate, 6.5 – 12.5 mm, persistent. Flowers with biology unknown, subsessile; calyx densely puberulent; hypanthium compressed cylindrical, 1.5 – 2.5 mm; lobes ovate to deltoid; corolla white sometimes flushed with pink; lobes ovate – oblong. Capsules compressed rhombic, 2.5 – 4.5 × 4 – 11.5 mm, puberulent or hirtellous.

Flowering: August – November

Fruiting: September – January

Local Distribution: Throughout Forest floors of terai and duars.

Generation Distribution: India (West Bengal, Assam, Meghalaya, Nagaland, Manipur); Bhutan, Bangladesh.

Status: Not Evaluated (IUCN)

Uses: Root, Stem and leaves are used to treat bone fracture.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 28.09.2020, Mallick et. al. [Field No. 2578]

PAEDERIA L. in Syst. Nat., ed. 12, 2: 135, 189; Mant. Pl. 1: 7, 52. 1767; *nom. cons.*
Paederia foetida L. in Mant. Pl. 1: 52. 1767; Fl. Ind. 2:517. 1824; Clarke in Hook. f. in Fl. Brit. Ind. 3:195. 1881; Grierson et Long, Fl. Bhutan 2 (2): 812. 1991. *Paederia foetida* var. *sessiliflora* (Poir.) Baker in Fl. Mauritius 158. 1877. '**Gondhopata**'

Climbers. Leaves opposite; lamina lanceolate, 6.3 – 11.5 × 2.3 – 4.7 cm, acute, cordate; stipules lanceolate, bifid. Panicles terminal to axillary; bracteoles minute. Flowers sessile. Calyx lobes triangular. Corolla pubescence; lobes ovate with undulate margin. Fruits subglobose.

Flowering: January – June

Fruiting: May – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, Gujarat, West Bengal); Nepal, Malaysia, Indonesia.

Status: Least concern (IUCN).

Uses: This plant used in the treatment of intestinal complaints like abdominal pain, cramps, colic dysentery and flatulence.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.1013]

PAVETTA L. in Sp. Pl. 110. 1753.

Pavetta indica L. in Sp. Pl. 110. 1753. *Ixora indica* (L.) Baill. in Hist. Pl. 7: 278. 1880. *Ixora paniculata* Lam. in Encycl. 3: 344. 1789. *Ixora roxburghii* Kuntze in Revis. Gen. Pl. 1: 286. 1891. *Pavetta alba* Vahl in Symb. Bot. 3: 11. 1794.

Shrub erect, hairy or nearly smooth 2 – 5 m. Leaves 5 – 14 cm long, elliptic–oblong to elliptic–lanceolate, pointed at both ends. Flowers fragrant, white, borne in considerable numbers; sepals toothed, small; flower tube 1 – 2 cm long, slender. Fruit black, somewhat rounded when dry 4 – 6 mm in diameter.

Flowering: May – July

Fruiting: June – August

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India, Sri Lanka, China, Australia.

Status: Not Evaluated (IUCN 2019).

Uses: Used to treat haemorrhoids, dropsy, pain of piles.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6017]

Pavetta polyantha (Hook. f.) Wall. ex Bremek. in Repert. Spec. Nov. Regni Veg. 37: 103. 1934. *Pavetta indica* var. *polyantha* Hook. f. in Fl. Brit. Ind. 3: 150. 1880. '**Jui**'
Shrubs 1 – 4 m tall; young branches subterete to compressed, puberulent or glabrescent. Petiole puberulent 8 – 26 mm; lamina narrowly obovate or lanceolate; stipules 4 – 8 mm, ovate–triangular, shortly aristate, glabrescent or puberulent. Inflorescences terminal on developed branches, laxly corymbose, strigillose to glabrescent. Flowers pedicellate; calyx 1 – 2 mm, densely strigillose, with hypanthium portion ellipsoid; limb sparsely strigillose; corolla outside glabrous, white; tube bearded in throat, lobe narrowly ligulate, rounded to obtuse. Style 28 mm. Drupe glabrous, globose.

Flowering: April – June

Fruiting: July – September

Local Distribution: Roadside area of three MPCAs of North Bengal

General Distribution: Throughout India; Bhutan, Myanmar, Indonesia, Philippines.

Status: Common

Uses: Used to treat haemorrhoids, dropsy, the pain of piles.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 99]

RICHARDIA L. in Sp. Pl. 1: 330. 1753.

Richardia scabra L. in Sp. Pl. 330. 1753. *Spermacoce hirsuta* Willd. ex Roem. et Schultes in Syst. Veg. 3: 531. 1818. *Plethyrsis glauca* Raf. in Autik. Bot. 13. 1840. *Richardia pilosa* Ruiz et Pavon in Fl. Peruv. 3: 50. 1802. *Richardsonia cubensis* Richard in Hist. Fis. Cuba, Bot. 11: 31. 1850.

Annual decumbent herbs; lamina lanceolate, 2 – 6 × 2 – 3 cm, thickly papery, bluntly acute, ciliate, base attenuate; stipules fused with petioles into a sheath. Inflorescence a terminal, sessile capitulum of many flowers, bracts ovate. Flowers 5 merous; calyx tube constricted at apex; lobes usually 6, lanceolate; corolla white, lobes 6; stamens 6; ovary usually 4 celled, stigma capitate, 3 lobed. Fruit pericarp ovoid.

Flowering: February – March

Fruiting: May –

July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, West Bengal); Bhutan, India, Laos, Myanmar, Nepal, Thailand.

Status: Least concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 14.09.2018, Mallick, et al. [Field No. 1409]

SPERMACOCE L. in Sp. Pl. 1: 102. 1753.

Spermacoce ocymoides Burm. f. in Fl. Ind. 34. 1768; Long in Grierson et Long, Fl. Bhutan 2(2): 819. 1999. *Bigelovia parviflora* Spreng. in Syst. Veg. 1: 405. 1824. *Borreria ocymoides* (Burm. f.) DC. in Prodr. 4: 544. 1830.

Diffuse herbs, stem distinctly 4 angled. Lamina lanceolate to elliptic – oblong, Flower 2 – 4 × 1 – 2 cm, acute, base cuneate; stipules membranous. Flowers in axillary clusters, sessile; tube cylindrical, limb 4 lobed; corolla funnellform, white; style 5 – 7 mm long, stigma 3, lobes linear. Fruit ellipsoid.

Flowering: May – July

Fruiting: June– July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam); Bhutan, Myanmar, Indonesia, Philippines.

Status:Threatened (IUCN 2021).

Uses: Leaves are applied for the treatment of headache and wounds.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 102]

Spermacoce alata Aub. in Hist. Pl. Guiane 60. 1775; Grierson et Long, Fl. Bhutan 2(2): 818. 1999. *Borreria alata* (Aub.) Candolle in Prodr. 4: 544. 1830.

Diffuse herbs, stem 4 angled, angles winged. Lamina oblong, obtuse, entire, base broadly cuneate; stipules triangular. Flowers in axillary clusters, subsessile; tube cylindrical, limb 5 lobed; corolla white; style 5 – 7 mm long, stigma 3, lobes linear. Capsule obovoid. Seeds ovoid to subglobose.

Flowering: May – July

Fruiting: June – November

Local Distribution:Throughout the forest area of terai and duars.

General Distribution:Throughout India(West Bengal, Bihar, Assam, Orissa) Asia, Tropical Africa, Australia and America.

Status: Common

Uses: It is used to heal stomach ailments and also used as anti dandruff and tonic.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, et al. [Field No.1483]

Spermacoce hispida L. in Sp. Pl. 1: 102. 1753; Fl. Brit. Ind. 3: 59. 1880. *Spermacoce hispida* L. in Sp. Pl. 1: 102. 1753.

Herbs or subshrubs, prostrate; stems subterete to usually quadrate. Leaves sessile to shortly petiolate; blade drying papery to leathery, margin scaberulous or ciliate and often revolute, apex acute, obtuse, or rounded. Inflorescences axillary; bracts linear or infrequently stipuliform 1 – 5 mm; calyx puberulent to hirtellous or scaberulous; hypanthium portion ellipsoid; lobes 4, linear–lanceolate to narrowly triangular, ciliate or ciliate; corolla pink, purple, or white, funnellform, glabrous or hispidulous to pilosulous on upper part; throat glabrous; lobes elliptic–oblong, lanceolate, or triangular 1–1.8 mm. Capsules ellipsoid to subglobose, puberulent.

Flowering: November – February

Fruiting: January – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim), Asia, Tropical Africa, Australia and America.

Status: Common

Uses: It is used to treat heal stomach ailments and anti dandruff.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, et al. [Field No.4580]

SOLANALES Juss. ex Berchtoldet in J. Presl. 1820.

CONVOLVULACEAE Juss. in Gen. Pl. 132. 1789; *nom. cons.*

ARGYREIA Lour. in Fl. Cochinch. 1: 95, 134. 1790.

Argyrea roxburghii (Wall.) Arn. ex Choisy in Soc. Phys. Geneve 6: 419. 1833.
Argyrea burneyi Gage in Rec. Bot. Surv. Ind. 3: 78. 1905. *Convolvulus roxburghii*
Wall in Numer. List: 1415. 1829.

Leaves acute ovate–cordate villous on both surfaces, peduncles equal to the petioles, corymbs dense, bracts narrow, sepals 4 – 3 in. lanceolate. Leaves peduncles leaves large sparsely hairy, cymes lax irregularly compound, one or more of the outer bracts often leaflike petioled.

Flowering: February – April

Fruiting: April – June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Andhra Pradesh, Arunachal Pradesh, Tripura, Haryana, Karnataka, Sikkim), Tropical and sub-tropical parts of the world.

Status: Threatened (IUCN 2019).

Uses: Uses in Ethnic/Tribal Medicine and pharmacological aspects.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.7330]

CUSCUTA L. in Sp. Pl. 1: 124. 1753.

Cuscuta reflexa Roxb. in Pl. Corom. 2: 3, t. 104. 1798; Hook. f. in Fl. Brit. Ind. 4: 225. 1883; Grierson et Long, Fl. Bhutan 2(2): 863. 1999. *Monogynella reflexa* (Roxb.) Holub in Folia Geobot. Phytotax. 12(4): 429. 1977. *Cuscuta hookeri* Sweet in Hort. Brit. 290. 1826. '*Swarnalata*'

Stems, stout. Inflorescences lateral; bracts bractoles both scalelike. Calyx cupular; sepals 5, ovate, equal; corolla, fragrant; lobes early deciduous, often reflexed, triangular-ovate; stamens; filaments shorter than anthers; anthers elliptic-ovate; ovary ovate-conical, stigma divergent. Capsule subglobose.

Flowering: February – June

Fruiting: May – October.

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (throughout); Bhutan, Nepal, Sri Lanka, Malaysia. Afghanistan, Indonesia, Myanmar, Thailand.

Status: Threatened (IUCN 2018).

Uses: It is used for fevers and externally in the treatment of pains and itchy skin.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.2018]

Cuscuta chinensis Lam. in Encycl. 2(1): 229. 1786. *Cuscuta carinata* R. Br. in Prodr. 491. 1810. *Cuscuta chinensis* var. *carinata* (R. Br.) Engelman in Trans. Acad. Sci. St. Louis 1(3): 480. 1859. *Cuscuta fimbriata* Bunge ex Engelman in Trans. Acad. Sci. St. Louis 1: 480. 1859. '*Swarnalata*'

Stems terete. Inflorescences lateral, compact cymose many flowered; bracts and bracteoles scale like. Calyx copular, sepals, obtuse; corolla white, lobes persistent,

reflexed; stamens inserted, scales oblong; ovary subglobose, styles 2, equal or unequal, stigma globose. Capsule enclosed, globose. Seeds 4 – 5, grey, obovoid.

Flowering: March – June

Fruiting: April – November

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Assam, West Bengal, Orissa, bihar, Uttar Pradesh), Bhutan, Nepal, Sri Lanka, Malaysia. Afghanistan, Indonesia, Myanmar, Thailand.

Status: Threatened (IUCN 2018).

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 2048]

EVOLVULUS L. in Sp. Pl. ed. 2. 391. 1762.

Evolvulus alsinoides L. in Sp Pl. 1: 392. 1762. *Breweria alsinoides* (L.) Merr. In Interpr. Herb. Amboin. 46. 1917. *Convolvulus alsinoides* L. in Sp. Pl. 157. 1753. [Photo Plate –VI]

Hairy herb, stem Slender, more branched, spreading. Leaves densely clothed with appressed, white, and silky hairs, variable clothed, lanceolate to ovate, and usually 0.5 – 1.5 cm length, tip blunt. Flowers pale blue, 6 – 10 mm in diameter. Fruit rounded, and usually contains 4 seeds.

Flowering: March– May

Fruiting: June – december

Local distribution: All over the forest area of terai and duars.

General Distribution: India (West Bengal ,Assam, Bihar, Chatissgarh); Bhutan, Nepal, Sri Lanka, Malaysia, Afghanistan, Indonesia, Myanmar, Thailand.

Status: Threatened (IUCN 2018).

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1103]

IPOMOEA L. in Sp. Pl. 1: 159. 1753.

Ipomoea aquatica Forsskal in Fl. Aegypt. Arab. 44. 1775; Clark in Hook. f. in Fl. Brit. Ind. 4: 210. 1883; Majumder, Bull. Bot. Soc. Bengal 19: 13. 1965. *Ipomoea repens* Roth in Nov. Pl. Sp. 110. 1821. *Ipomoea natans* Dinteret Suess in Mitt. Bot. Staatssamml. Monchen 4: 112. 1952. '*Kolmi Saak*'

Annual herbs or floating. Stem terete, thick, rooting at nodes. Petiole glabrous; lamina variable, ovate to ovate-lanceolate, 5 – 18 × 2 – 9 cm, acute or acuminate, entire, base cordate, sagittate to hastate, occasionally truncate. Inflorescences 2 to 4 flowered. Sepals equal, subglabrous; outer 2 ovate mucronulate; inner 3 ovate ;corolla pink; stamens unequal; ovary subconical, glabrous, stigma 3 lobed. Capsule obovoid to subglobose.

Flowering: March – May **Fruiting:** June – December

Local Distribution: All over the marshy areas of forest areas.

General Distribution: Throughout peninsu Tropical Asia, Australia and Africa.

Status: Threatened (IUCN 2013)

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1136]

Ipomoea fisulosa Mart. ex Choisy in de Candolle in Prodr. 9: 349. 1845. *Ipomoea carnea* Jacq. in Enum. Syst. Pl. 13. 1760; Mill in Grierson et Long in Fl. Bhutan 2(2): 851. 1999. *Ipomoea fruticosa* Kuntze in Revis. Gen. Pl. 2: 444. 1891. *Ipomoea crassicaulis* (Benth.) B. L. Robinson in Proc. Amer. Acad. Arts 51(10): 530. 1916. *Ipomoea carnea* f. *albiflora* Moldenke in Phytologia 2: 224. 1947. *Batatas crassicaulis* Benth. in Bot. Voy. Sulphur 134. 1845. **‘Dhalkolmi’**

Shrubs with milky sap, stem ascending or erect; glabrous. Lamina oblong, acuminate apex; Inflorescences axillary or terminal; calyx shorter than the pedicels; bracts very minute, caduceus. Capsule brown, finely pubescent, ovoid, mucronate, 3-celled, 5-valved. Seeds 3 or less, black sericeous.

Flowering: March– May **Fruiting:** June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout the peninsular India, Tropical Asia, Australia.

Status: Threatened (IUCN 2018).

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1047].

Ipomoea hederifolia L. in Syst. Nat. (ed. 10) 925. 1759. *Ipomoea hederifolia* L. in Sp.Pl. ed. 1. 159.1753; Grierson et Long, Fl. Bhutan 2(2): 850.1991. *Ipomoea*

phoenicea Roxb. in Fl. Ind. (ed. Carey) 2: 92. 1824. *Ipomoea angulata* Lam. in Tabl. Encycl. 1: 464. 1791. *Ipomoea coccinea* var. *hederifolia* (L.) Gray in Syn. Fl. N. Amer. 2(1): 209. 1878.

Annual climber, up to 3 m, subglabrous. Leaves alternate; lamina ovate, 3 – 12 × 2 – 8cm, acute and mucronulate, base cordate. Cymes terminal and axillary. Pedicels erect; sepals oblong-rectangular, erect at anthesis, herbaceous, inserted; corolla scarlet, narrowly infundibular, glabrous; tube 3 cm, very slender. Stamens and style exserted. Fruit capsule subglobose. Seeds 5, black.

Flowering: July – August

Fruiting: August – January

Local Distribution: lower regions of area of terai and duars.

General Distribution: India (Assam, Bihar, Chattisgarh, Uttar Pradesh) Tropical Asia, Australia and Africa.

Status: Threatened (IUCN 2018).

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1414]

MERREMIA Dennstedt ex Endlicher in Gen. Pl. 1: 1403. 1841; *nom. cons.*

Merremia hirta (L.) Merrill in Philipp. J. Sci. 7(4): 244-245. 1912; Mill in Grierson et Long in Fl. Bhutan 2(2): 854. 1999. *Ipomoea linifolia* Bl. in Bijdr. Fl. Ned. Ind. 13: 721. 1825. *Convolvulus hirtus* L. in Sp. Pl. 1: 159. 1753. *Convolvulus caespitosus* Roxb. in Fl. Ind., ed. 1832 1: 483-484. 1832. '*Vitachhara*'

Herbs climbing, stem rooting at nodes. Lamina linear, mucronulate or acute, base truncate entire, rounded. Inflorescences 3 to 6 flowered. Sepals elliptic unequal; corolla whitish, broadly campanulate; ovary subglabrous. Capsule globose. Seeds brown- black, trigonous-elliptic.

Flowering: July – September

Fruiting: September – January

Local Distribution: All over the forest area

General Distribution: India (West Bengal, Andhra Pradesh, Nagaland, Arunachal Pradesh, Tripura, Haryana, Karnataka, Mizoram, Sikkim); Tropical Asia, Australia and Africa.

Status: Threatened Plants (IUCN 2018)

Uses: Used to treat impairment for sexual function.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019.
Mallick, et al. [Field No.1021]

Merremia hederacea (Burm f.) Hallier f. in Bot. Jahrb. Syst. 18(1-2): 118. 1893; Grierson et Long in Fl. Bhutan 2(2): 854. 1999. *Evolvulus hederaceus* Burm. f. in Fl. Ind. 77, pl. 30, f. 2: 77. 1768. *Convolvulus lapathifolius* Spreng. in Syst. Veg. 1: 604. 1825. *Convolvulus flavus* Willd. in Sp. Pl. 1(2):852-853. 1797.

Herbs; rooting at nodes. Lamina ovate, 3 – 8.5 × 1.5 – 6 cm, 4-lobed, entire to irregularly crenate. Inflorescences flowered, umbelliform. Sepals ovate to oblong, unequal. Corolla yellowish, campanulate. Stamens as long as corolla. Ovary subglobose, glabrous; stigma globose. Capsule depressed globose to broadly conical. Seeds trigonous-subglobose.

Flowering: July – September

Fruiting: September – January

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Bangladesh, Nepal, , Sri Lanka, Bhutan, Pakistan, Cambodia, Indonesia, Philippines, Thailand, Vietnam, Africa.

Status: Threatened (IUCN 2019).

Uses: Used to treat febrile disease, colds, sunstroke, tonsil inflammation, laryngitis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019.
Mallick, et al. [Field No.1036]

Merremia vitifolia (Burm. f.) Hallier in Bot. Jahrb. Syst. 16(4-5): 552. 1893; Grierson et Long in Fl. Bhutan 2(2): 852. 1999. *Convolvulus vitifolius* Burm. f. in Fl. Ind. 45. 1768. *Convolvulus vitifolius* Burm. f. in Fl. Ind. 45-46, pl. 18, f. 1: 45. 1768. *Ipomoea vitifolia* (Burm. f.) Blume in Bijdr. Fl. Ned. Ind. 13: 709. 1825. *Convolvulus angularis* Burm. f. in Fl. Ind. 46. 1768. '*Vitachhara*'

Herbs twining . Lamina obovate in outline, 6 – 19 × 5 – 10 cm, acute palmately 3 – 5 lobed, lobes lanceolate or triangular, base cordate. Inflorescences 2 to 5 flowered; sepals oblong to oblong, leathery, acute to obtuse; corolla yellowish; limb 6 angled; anthers spirally twisted; ovary subglabrous. Fruit capsule sgrey colored, subglobose; seeds black-brown, trigonous-obovoid.

Flowering and Fruiting: Throughout the year.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical hemisphere

Status: Least Concern (IUCN).

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019.
Mallick, et al. [Field No.1487]

PORANOPSIS Roberty in Candollea 14: 26. 1952.

Poranopsis paniculata (Roxb.) Roberty, in Candollea 14: 26. 1953. *Porana paniculata* Roxb. in Pl. Coromandel 3: 31, pl. 235. 31, 1819; Grierson et Long in Fl. Bhutan 2(2): 857. 1999.

Woody climbers. Lamina cordate, rugulose, base cordate. Flowers in axillary cymes. Sepals lanceolate-linear, concave, equal. Fruiting calyx reddish, clasping loosely; outer 5 sepals ovate, margin free. Corolla white to cream, narrowly funnel form, 5 lobed; stamens, equal; ovary glabrous, style obsolete, stigma sessile. Fruit brownish with darker lines, globose-ellipsoid. Seeds brown, subglobose-ellipsoid.

Flowering: October – December

Fruiting: December – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland); Bhutan, , Cambodia ,Bangladesh, Nepal, Pakistan Sri Lanka, Malaysia, Indonesia Myanmar, Philippines, Thailand, Vietnam, Africa.

Status: Threatened (IUCN 2019).

Uses: Used to treat febrile disease, colds, sunstroke, tonsil inflammation, laryngitis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019.
Mallick, et al. [Field No.1036]

SOLANACEAE Juss. in Gen. Pl. 124. 1789; *nom. cons.*

DATURA L. in Sp. Pl. 1: 179. 1753.

Datura metel L. in Sp. Pl. 179. 1753; Hook. f. in Fl. Brit. Ind. 4: 243. 1883; Ohashi in Hara in Fl. E. Himal. 1: 283. 1966; Grierson et Long, Fl. Bhutan 2(3): 1067. 2001.

Datura nigra Hasskarl in Cat. Hort. Bot. Bogor. 142. 1844. *Datura fruticosa* Horn. in Hort. Bot. Hafn. 1: 212. 1813. *Datura alba* Mueller, in Fragm. 6: 144. 1868. '**Dhutro**'

Annual undershrubs erect, branched, up to 3m. Leaves petiolate, lamina ovate to elliptic, 6 – 21 × 5 – 17 cm, acuminate, cuneate base. Flowers solitary, erect, axillary; calyx tubular; corolla purplish, campanulate; lobes elongate. Fruit capsule ovoid, pericarp spiny. Seed black eniform.

Flowering: March – July

Fruiting: June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland); Bhutan, Nepal, Bangladesh, Sri Lanka, Pakistan, Cambodia, Indonesia, Malaysia, Myanmar, Philippines.

Status: Least concern (IUCN 2019)

Uses: Leaves, stem and roots used to treat febrile disease, colds, sunstroke.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1456]

Datura stramonium L. in Sp. Pl. 179.1753; Clark in Hook. f. in Fl. Brit. Ind. 4: 242. 1883; Grierson et Long in Fl. Bhutan 2(3): 1067. 2001. *Datura laevis* L. f. in Suppl. Pl. 146. 1782. *Stramonium spinosum* Lam. in Fl. Frann. 256. 1779. *Datura parviflora* Salisb. in Prodr. Stirp. Chap. Allerton 131.1796. '**Dhutro**'

Shrubs upto 3 m. Lamina ovate, 9 – 17 × 5 – 15 cm, membranous, acute, asymmetric, cuneate at base. Flowers erect. Calyx tubular, 3-angular; corolla whitish, green at base, sometimes purple distally, campanulate; lobes 7 – 11 cm, mucronate at apex; filaments 2.9 – 3.5 cm. Fruit capsules erect, subglobose to obovoid, with copious prickles, dehiscent by 3 equal valves. Seeds ovate black,.

Flowering: April – July

Fruiting: June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland); Bhutan, Nepal, Bangladesh, Sri Lanka, Myanmar, Vietnam; Africa.

Status: Least concern (IUCN 2020)

Uses: Used to treat bone fracture.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1411]

NICOTIANA L. in Sp. Pl. 1: 180. 1753.

Nicotiana plumbaginifolia Viviani, Planch in Pl. Hort. Dinagro, 26. t. 5, 1802 and Elench. Pl. 26, pl. 1, 5 26 1802; Clarke in Hook. f. in Fl. Brit. Ind. 4: 246. 1883; Mill in Grierson et Long in Fl. Bhutan 2(3): 1074. 2001; Prain in Bengal Pl. 2: 559. 1903; Guha Bakshi in Fl. Mur. Dist. 218. 1984. *Nicotiana pusilla* L. in Syst. Nat. (ed. 10) 2: 933. 1759. *Nicotiana cavanillesii* Dunal in Prodr. 13(1): 572. 1852. *Nicotiana plantaginea* Dunal in Prodr. 13(1): 559. 1852. '**Ban tamak**'

Annual herb. Lamina radical, sessile, spatulate or ovate, rounded or obtuse at apex; sessile, elliptic, lanceolate, oblong, acute or acuminate at apex. Flowers in racemes. Pedicels 8 – 10 mm long. Fruit capsule 1 cm long, oval, 2 or 4 valved. Seeds dark grey.

Flowering: March – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland, West Bengal, Bihar, Panjab, Uttar Pradesh); Bhutan, Nepal, Bangladesh, Sri Lanka, Myanmar, Philippines, Thailand and Vietnam.

Status: Endangered Species (IUCN 2021)

Uses: Used to treat bone fracture.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.09.2019. Mallick, et al. [Field No.1411]

PHYSALIS L.in Sp. Pl. 1: 182. 1753.

Physalis divaricata D. Don in Prodr. Fl. Nep. 97. 1825. Schoenbeck-Temesy in Rech. f.in Fl. Iran. 100: 25, t.4.1972.

Annual tall, subglabrous to pubescent. Leaves, ovate, sinuate, repand or sinuate–dentate to subentire, acute or acuminate, base cordate to oblique. Petiole up to 40 mm long, slender. Flowers solitary axillary. Pedicel 10 mm long. Calyx. 2.5 mm long, campanulate. inflated, globular–avoid, membranous and up to 25 mm in fruit, pubescent; corolla 5 mm long, shortly tubular, yellow; lobes acute, pubescent; anthers 1.3 mm long, filaments 2 mm long; ovary 2.1 mm long, style linear, stigma sub capitate. Fruit berry globose, orange. Seeds subreniform, compressed.

Flowering: May – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Afghanistan, Nepal and Ind.

Status: Threatened (IUCN 2018).

Uses: It is used as an anti-inflammatory medicine.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No. 9007]

SOLANUM L in Sp. Pl. 1: 184. 1753.

Solanum aculeatissimum Jacq. in Icon. Pl. Rar. 1: 5. 1781. *Solanum aculeatissimum* Sendtn. in Fl. Bras. 10: 89. 1846. *Solanum aculeatissimum* var. *denudatum* Dunal. in Prodr. 13(1): 244. 1852.

Perennial herb up to 120 m tall. Stems and branches terete, erect, hairs 2.5 mm, armed with recurved flat prickles 1.5 – 5 × 2.2 – 10.2 mm and sometimes straight spines. Leaves unequal paired; petiole, stout 3 – 7.5 cm, copiously prickly. Inflorescences extra-axillary, short 1 – 4 flowered scorpioid racemes; peduncle obsolete to 1 cm.; calyx campanulate, lobes oblong-lanceolate, hairy; corolla white, lobes lanceolate; filaments 1 – 2.2 mm, anthers lanceolate, acuminate; ovary glabrous or minutely stipitate glandular. Fruit berry pale yellow, globose.

Flowering: March – July

Fruiting: June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: It is native of Brazil. It was widely spread in Africa, Asia.

Status: Common

Uses: The whole plant parts are used to treat bronchitis and rheumatism.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No.36987]

Solanum americanum Miller in Gard. Dict. (ed. 8) no. 5 no. 5. 1768. *Solanum nigrum* L. in Sp. Pl. 1:186. 1753; Clarke in Hook. f. in Fl. Brit. Ind. 4: 229. 1883; Grierson et Long in Fl. Bhutan 2(3): 1052. 2001; Guha Bakshi in Fl. Mur. Dist. 221. 1984. *Solanum nodiflorum* Jacq. in Icon. Pl. Rar. 2: 11, pl. 326, 11. 1786. *Solanum nigrum* var. *minor* Hook. f. in Trans. Linn. Soc. London 20: 201. 1847.

Annual green herbs, erect, up to 110 cm. Lamina ovate, 5 – 10 × 3 – 5 cm, membranous, apex acute, entire or dentate, base truncate to cuneate. Inflorescences - axillary. Calyx cupshaped; lobes obovate, ciliate; corolla whitish; lobes obovate-oblong; filaments. Berry black, subglobose.

Flowering: November – December

Fruiting: January – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India; native of Brazil and widely spread in Africa, Asia.

Status: Not evaluated (IUCN 2018).

Uses: The whole plant parts are used to treat bronchitis and rheumatism.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 22.02.2020, Mallick, et al. [Field No.3697]

Solanum nigrum L. in Sp. Pl. 1:186. 1753; Clarke in Hook. f. in Fl. Brit. Ind. 4: 229. 1883; Mill in Grierson et Long in Fl. Bhutan 2(3): 1052. 2001; Guha Bakshi, Fl. Mur. Dist. 221. 1984. *Solanum nodiflorum* Jacq. in Icon. Pl. Rar. 11(2): 326. 1786. *Solanum nigrum* var. *minor* Hook. f. in Trans. Linn. Soc. London 20: 201. 1847.

Annual herbs, green, mostly erect. Lamina ovate, 5 – 8 × 8 – 12 cm, membranous, apex cuneate. Inflorescences axillary. Calyx bell shaped; lobes ovate, ciliate; corolla pinkish; lobes ovate–oblong;. Berry shiny brown, occasionally. Seeds discoid.

Flowering: November – March

Fruiting: January – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland); S. E. Asia, Tropical Africa, Australia and America.

Status: Common

Uses: It is used in the treatment of sugar, blood pressure.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.12.2019, Mallick, et al. [Field No.6542]

Solanum pimpinellifolium L. in Cent. Pl. I 1: 8. 1755. *Lycopersicon pimpinellifolium* (L.) Miller in Gard. Dict. (ed. 8) no. 4. 1768. *Lycopersicon esculentum* Miller in Gard. Dict. (ed.8) n.2. 1768; Hook. f. in Fl. Brit. Ind. 4:237.1883; Grierson et Long in Fl. Bhutan 2(3): 1063. 2001. *Solanum lycopersicum* L. in Sp. Pl. 185.1753. '**Chhoto tomato**'

Annual, sprawling, herbs up to 1.5 m, odorous. Lamina mostly pinnately compound to divided, 30 – 45 cm, obtuse, base oblique, cuneate; leaflets mostly unequal, obovate to oblong, entire to irregularly dentate. Racemes 3 – 8 flowered. Calyx rotate-campanulate, lobes lanceolate; corolla lobes oblong, yellow. Berry , subglobose, fleshy, juicy, shiny. Seeds straw colored.

Flowering: May – July

Fruiting: August –

November

Local Distribution: All over the forest area of terai and duars

General Distribution: Mexico and South America;

Status: Common

Uses: It is used as first aid treatment for scalds, burns and sunburn.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No.6580]

Solanum rude-pannum Dunal in Prodr. 13(1): 264-265. 1852. *Solanum torvum* Swartz in Prodr. 47. 1788; Clarke in Hook. f. in Fl. Brit. Ind. 4: 234. 1883; Mill in Grierson et Long in Fl. Bhutan 2(3): 1055. 2001. *Solanum torvum* var. *ochraceo-ferrugineum* Dunal in Prodr. 13(1): 260-261. 1852. *Solanum diversifolium* Schltde in Linnaea 19: 297-298. 1847. *Solanum auctosepalum* Rusby in Descr. S. Amer. Pl. 114. 1920

‘Gotbegun, Titbegun’

Shrubs, up to 2 m, armed. Leaves solitary; lamina elliptic to obovate, acute, usually 5 – 7-lobed, base cuneate. Inflorescences extra axillary, racemose panicles. Flowers andromonoecious; calyx bell-shaped; lobes ovate lanceolate; corolla white, rotate; lobes ovate-lanceolate. Berry yellow, smooth, glabrous.

Flowering: November – January

Fruiting: January – August

Local Distribution: All over the forest area of terai and duars.

General Distribution: Tropical India, China, Malaysia, Philippines and Tropical America.

Status: Common

Uses: It is used to treat cough, enlarged spleen, diuretic, Possess sedative and digestive properties.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No.3257]

Solanum sisymbriifolium Lam. in Tab. Encyl. 2: 25. 1794. *Solanum sisymbriifolium* f. *ililacinum* Kuntze in Revis. Gen. Pl. 3(3): 227. 1898.

Herbs, copiously armed. Leaves simple ; lamina oblong to ovate, 6 – 11 × 3.5 – 6 cm; lobes pinnately lobed or dentate, apex acuminate. Inflorescences axillary and extra-axillary scorpioid racemes. Calyx bell-shaped; lobes ovate-lanceolate; corolla white, stellate; lobes ovate; anthers lanceolate; ovary pubescent. Fruiting calyx longer than fruit, densely prickly, enveloping most berry. Berry bright red, subglobose. Seeds filliform.

Flowering: February – January

Fruiting: January – August

Local Distribution: All over the forest area of terai and duars.

12.1 cm with prickles. Male flowers white and borne in 1–5 flowered racemes. Flower stalks 4.1 – 6.2 mm; sepal tube bell-shaped, 10.2 × 7.1 mm, sepals oblong to lanceolate, 0.5 – 1.3 mm, hairy. Female flowers white or green; petals lanceolate. Berry globose, yellow.

Flowering: March – April

Fruiting: May – June

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Africa, Asia South America, Oceania, North America, Europe.

Status: Common

Uses: Fruit is used to treat asthma, coughs and colds.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 16.06.2018, Mallick, et at. [Field No.9019]

Solanum villosum Miller, in Gard. Dict. (ed. 8) no. 2. 1768; Grierson et Long in Fl. Bhutan 2(3):1052. 2001. *Solanum miniatum* Bernh. ex Willd. in Enum. Pl. 1: 236. 1809. Herbs erect up to 120 cm. Lamina ovate, 5 – 14 × 5 – 9 cm, obtuse, entire pubescent or coarsely cuneate base, dentate. Inflorescences axillary umbels. Calyx bell-shaped; lobes deltate, ciliate; corolla white; lobes oblong, ciliate, spreading; filaments 1.6 mm. long, anthers oblong; style 6 mm. Berry, globose. Seeds discoid.

Flowering: March – July

Fruiting: June – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Bihar, Nagaland, Sikkim and West Bengal); Africa; Asia South America, Oceania, North America and Europe.

Status: Common

Uses: Leaves and fruit are used to treat asthma, coughs and colds.

Specimen examined: West Bengal, Jalpaiguri, Sursuti (MPCA). 08.04.2018, Mallick, et at. [Field No.2105]

LAMIALES Bromhead, in Mag. Nat. Hist. 2: 210. 1838.

OLEACEAE Hoffmanns. and Link in Fl. Portug. 1: 62. 1809.

JASMINUM L. in Sp. Pl. 1: 7.1753.

Jasminum acuminatum Pers. in Syn. Pl. 1: 7. 1805. *Jasminum acuminatum* R.Br. in Prodr. Fl. Nov. Holland. 521. 1810.

Climbing shrub 2 – 4 m long. Leaves opposite, pinnately cut or compound with 5 – 9 leaflets., leaflet ovate, base cuneate or blunt, apex acute, acuminate, or blunt, sometimes mucronate. Flowers on cymes, fragrant in leaf axils, or at branch-ends. Bracts are

linear, 2 – 3 mm. Branchlets are round in cross–section, angular or grooved. Flowers white, opening flat–faced, tube 1.3 – 2.5 cm; sepals slender linear, 5 – 10 mm.; petals often 5, oblong, 1.3 – 2.2 cm.

Flowering: August – October.

Fruiting: September –

December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical India; Nepal, Bhutan, Bangladesh, Pakistan and Australia.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.02.2018, Mallick, et al. [Field No. 4429]

Jasminum multiflorum Roth in Nov. Pl. Sp. 6. 1821. *Jasminum multiflorum* Andrews in Bot. Repos. t. 496. *Jasminum multiflorum* var. *nicobaricum* Thoth. in Bull. Bot. Surv. Ind. 5(1): 99. 1963. '*Chameli*'

Shrubs, scrambler or weak climbers to 3 m. Branchlets terete, densely pilose. Leaves opposite, simple; petiole 5 – 10 mm, densely pilose; leaf blade ovate-cordate, often broadly so 3 – 8 × 1.5 – 5 cm, papery, glabrescent, base cordate, apex acute to acuminate; primary veins 3 or 4 on each side of midrib. Inflorescences terminal on side shoots, many flowered, congested; bracts leafy. Calyx densely pilose; tube 1 mm, lobes 6 – 9, filiform, 5 – 7 mm.; corolla white, sweetly scented; tube 1.2 – 1.5 cm; lobes 7 – 9, acute, 1 – 1.5 cm.

Flowering: August – September

Fruiting: October – December

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (throughout); Bangladesh, Laos, Myanmar, Nepal, Thailand, Vietnam, West Himalaya.

Status: Common

Uses: It is used in the treatment of wound, headache and poisoning

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 29.05.2018, Mallick, et al. [Field No. 4174]

Jasminum laurifolium Roxb ex Hornem in Fl. Ind. 1: 91. 1820. *Jasminum laurifolium* Roxb. ex Hornem in Hort. Bot. Hafn. 112. 1819. *Jasminum laurifolium* var. *brachylobum* Kurz. in Forest Fl. Burma 2: 152. 1877. *Jasminum laurifolium* var.

genuinum (Roxb. ex Hornem.) Kurz. in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46: 241. 1877. '**Raj Chameli**'

An evergreen or semi-evergreen shrub 2.5 – 4.6 m long. Leaves opposite, pinnately cut or compound with 4 – 8 leaflets. Leaf stalks 0.5–4 cm, leaflet blade ovate, 0.7.3 – 3.8 × 0.5 – 1.2 cm, base cuneate or blunt, apex acute, acuminate, or blunt, sometimes mucronate. Flowers borne in 2 – 9-flowered cymes, in leaf axils. Flowers in cyme, white, opening flat-faced, tube 1.3 – 2.5 cm. Bracts linear, sepals slender, linear; petals often 5, oblong.

Flowering: August–October.

Fruiting: July – November

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Nagaland, Assam, Tripura, West Bengal, Uttam Pradesh, Madhya Pradesh, Kashmir, Tamil Nadu); throughout the world.

Status: Common

Uses: It is used to treat headache, wound and poisoning.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.07.2019, Mallick, et al. [Field No. 4429]

Jasminum scandens (Retz.) Vahl. in Symb. Bot. (Vahl) 3: 2. 1794. *Jasminum scandens* Griff. in Itin. Pl. Khasyah Mts. 102. 1848. *Nyctanthes scandens* Retz. in Observ. Bot. (Retzius) 9. 1788.

Trees or erect shrubs, evergreen or deciduous. Leaves opposite or alternate, simple 3 – 4 foliolate, or odd-pinnate. Flowers bisexual, usually heterostylous; calyx campanulate, cupular, or funnelform; corolla white, yellow or rarely red, salverform or funnelform; lobes 5 – 15, imbricate in bud, sometimes doubled in cultivation; stamens 2, included, inserted with corolla tube; filaments short; anthers dorsifixed, introrse. ovules 1 or 2; style filiform, stigma capitate 2-lobed. Fruit berry, didymous. Seeds without endosperm; radicle downward.

Flowering: February – March

Fruiting: April – May

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Tropical India, Nepal, Bhutan, Bangladesh, Pakistan and Australia.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 17.05.2018, Mallick, et al. [Field No. 4224]

GESNERIACEAE Rich. and Juss. in *Essai Propr. Méd. Pl.*, ed. 2: 192. 1816.

Aeschynanthus micranthus C.B. Clarke in *Monogr. Phan.* 5: 27. 1883.

Stems glabrous. Leaves opposite, lamina lanceolate, 10 – 13 × 2.4 – 2.8 cm, leathery, glabrous, abaxially not punctate, base cuneate, margin entire, denticulate, apex attenuate. Cymes pseudoterminal, 8 -flowered; peduncle absent; bracts deciduous. Pedicel 1 cm, glabrous. Calyx 1.2 – 1.5 cm, 5 -lobed, lobes triangular, glabrous; corolla puberulent apically, limb indistinctly 2 -lipped; stamens exerted, filaments 2.2 – 3.4 cm, anthers coherent, staminode; pistil 3 cm, ovary glabrous, style 1.7 cm, puberulent. Capsule 20 – 30 cm.

Flowering: October – December

Fruiting: December –

February

Local Distribution: Throughout the forest.

General distribution: India (Assam, Sikkim, West Bengal); Bhutan, Nepal, Bangladesh Myanmar.

Status: Near Threatened Species (IUCN 2020)

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.05.1019, Mallik, et al. [Field No. 7605]

PLANTAGINACEAE Juss. in *Gen. Pl.*: 89. 1789. *sp. nov.*

MECARDONIA Ruiz and Pav. in *Fl. Peruv. Prodr.*: 95. 1794.

Mecardonia procumbens (Mill.) Small in *Fl. S.E. U.S.* 1065, 1338. 1903. *Mecardonia procumbens* var. *caespitosa* (Cham.) V.C.Souza in *Acta Bot. Brasil.* 11(2): 188.1997. *Mecardonia procumbens* var. *flagellaris* (Cham. and Schltld.) V.C.Souza in *Acta Bot. Brasil.* 11(2): 186. 1997.

Diffuse herbs. Stem 4 – 5 angled. Leaves 1.3 – 1.4 × 0.7 – 1 cm, ovate-lanceolate, base acute, margin serrate, apex acute, sessile. Flowers axillary, solitary; pedicels to 1.4 cm long, bractioles 2, 4.3 mm long, oblong; calyx deeply 5/6-partite, lobes unequal; outer 3, 6.2 × 3.6 mm, ovate-lanceolate; inner 2, 4.2 × 1.3 mm, narrower; corolla yellow, 7.2 mm long, obscurely 2-lipped, lobes unequal; stamens 4, didynamous; anther stipitate; stigma lamellate. Capsule oblong-cylindric 2-valved. Seeds with reticulate testa.

Flowering: June – July

Fruiting: September – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland), Nepal, Bhutan, Bangladesh, Pakistan and Australia.

Status: Common

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.06.2018, Mallick, et al. [Field No. 5102]

SCROPHULARIACEAE Juss. in Gen. Pl.: 117. 1789.

LINDENBERGIA Lehm. in Sem. Hort. Bot. Hamburg. 1829: 6. 1829.

Lindenbergia indica (L.) O. Kuntze Oesterr. in Bot. Z. 25: 10. 1875. *Lindenbergia indica* Kuntze, in Revis. Gen. Pl. 2: 462. 1891.

Annual herbs, 15–30 cm tall; stem glandular-villous. Leaves opposite, acute, crenate-serrate, pubescent below; lateral nerves 5 pairs; petiole to 2 cm long. Flowers solitary, axillary, subsessile; calyx 0.5 cm long, glandular villous, ovate-oblong, obtuse; corolla sparsely pubescent, throat villous, yellow with purple blotches at mouth, 2-lipped; stamens didynamous, anther cells 2, stalked, both perfect; ovary ovoid, glabrous, style filiform. Capsule 3–5 mm long, oblong, hairy at apex; seeds minute, ellipsoid-oblong.

Flowering: May–June

Fruiting: July–September

Local Distribution: In open areas, over the forests of North Bengal

General Distribution: Africa, Asia, and is most abundant in Ind.

Status: Common

Uses: Leaves are used for antiseptics.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.5806]

SCOPARIA L. in Sp. Pl. 1: 116. 1753.

Scoparia dulcis L. in Sp. Pl. 1: 116. 1753. *Capraria dulcis* (L.) Kuntze in Revisio Generum Plantarum 2: 459. 1891.1891. *Gratiola micrantha* Nutt. Amer. J in Sci. Arts 5(2): 287. 1822.

Herbs or subshrub, erect, to 1 m tall. Leaves petiolate; leaf blade rhomboid–ovate to rhomboid–lanceolate, glabrous, glandular punctate, base cuneate, margin toothed above middle, slightly double serrate, or subentire, apex obtuse. Flowers usually axillary; calyx lobed to base, lobes 4, ovate-oblong 2 mm, margin ciliate, apex obtuse; corolla white, 4 mm. in diameter, tube densely hairy at throat; stamens exerted; style erect, stigma truncate to 2-parted. Fruit capsules, 2–3 cm in diameter.

Flowering: February – July

Fruiting: March – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Mauritius, Philippines, New Guinea, Africa and Europe
Status

Status: Near Threatened Species (IUCN 2018).

Uses: It is used in the treatment of sugar, blood pressure.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick, et al.[Field No.3231]

LINDERNIACEAE Borsch, Kai Müll. and Eb.Fisch. in Pl. Biol. (Stuttgart) 7(1): 76.
2005.

BONNAYA Link and Otto in Icon. Pl. Select. 25.1828.

Bonnaya ciliata (Colsm.) Spreng. in Syst. Veg. 1: 41. 1825. *Gratiola ciliata* Colsm. in Prodr. Descr. Gratiol.: 14. 1793. *Lindernia ciliata* (Colsm.) Pennell in Brittonia 2(3): 182. 1936.

Erect to ascending, diffuse herbs, up to 15 cm. Leaves ciliate serrate, sessile or shortly petiolate; leaf blade oblong to lanceolate-oblong, 0.5 – 4.5 × 0.5 – 1.2 cm, glabrous. Inflorescence raceme, terminal; bracts lanceolate. Flowers white, 8 mm. Capsules linear-cylindrical.

Flowering: July – September

Fruiting: August – October

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (All states); Cambodia, India, Japan, Laos, Malaysia, Myanmar, Philippines, Vietnam; N Australia.

Status: Common

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA).
18.09.2019, Mallick, et al.[Field No.38790]

Bonnaya ruellioides (Colsm.) Spreng. in Syst. Veg. 1: 41. 1825 [1824]. *Lindernia ruellioides* (Colsm.) Penn. in Britt., 2: 182. 1936. *Gratiola ruellioides* Colsm. in Prodr. Descr. Grat.: 12. 1793.

Green, creeping, herbs with stolons present. Leaves serrate, obovate-elliptic, 1–5 X 0.5–2 cm, petiolate; petiolate up to 0.5 cm; serrations up to 20 pairs. Inflorescence raceme; pedicels up to 10 pairs. Flowers magenta, pedicillate, bracteate, opposite, 1–1.5 cm, anthers 2, staminodes 2. Fruits linear-cylindrical.

Flowering: June – October

Fruiting: June – November

Local Distribution: Marshy areas of MPCAs of terai and duars.

General Distribution: India (Himalayas and Western Ghats); Cambodia, India, Indonesia, Japan, Malaysia, Myanmar, New Guinea, Philippines, Vietnam.

Status: Common

Uses: None.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al.[Field No.3987]

Bonnaya gracilis A. Pal, Sardesai and M.Chowdhury in Nordic J. Bot. 2021(e03292): 4, figs. 1-4 (2021)

Small, green, glabrous, creeping, herbs, up to 20 cm high. Stem creeping, branches ascending. Leaves linear-lanceolate to obovate-lanceolate, 15–45 × 5–15 mm, serrate; serrations 7–11 pairs; petioles obscure. Inflorescence lax raceme, with up to 15 pairs of pedicels. Flowers pedicillate, bracteate, pale blue to magenta, anthers 2, staminodes 2, hairy. Fruits linear-cylindrical.

Flowering and fruiting: Throughout the year

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (Kerala, Karnataka, Maharashtra, Poducherry, West Bengal), Nepal, Bangladesh, Myanmar.

Status: Common

Uses: None.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No.7898]

Torenia crustacea (L.) Cham. and Schldl. in Linnaea 2(4): 570. 1827. *Capraria crustacea* L. in Syst. Nat. (ed. 12) 2: 419. 1767. *Lindernia crustacea* (L.) F. Muell. in Syst. Census Austral. Pl. 1: 97. 1882 [1882/1883]. *Vandellia crustacea* (L.) Benth. in Scroph. Ind.: 35. 1835.

Small diffuse herb, glabrous or sub-glabrous, up to 40 cm. Leaves ovate-lanceolate, acute or obtuse, cuneate, rounded or subtruncate; venation pinnate; serrations 3 – 5. Calyx tubular; sepals connate. Flowers purple or bluish-white, tubular. Anthers 4, 2 short, 2 long. Fruit a capsule.

Flowering and fruiting: Throughout the year

Local Distribution: Throughout the forests of terai and duars.

General Distribution: India (all states), Tropical and Sub-Tropical World.

Status: Common

Uses: None.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al.[Field No.7805]

BIGNONIACEAE Juss. in Gen. P11. 137. 1789; *nom. cons.*

STEREOSPERMUM Chamisso, Linnaea in 7: 720. 1833.

Stereospermum colais (Buch.-Ham. ex Dillwyn) Mabberley, in Taxon 27: 553. 1978. *Bignonia colais* Buch.-Ham. ex Dillwyn in Rev. Hort. Malab. 28. 1839. *Spathodea campanulata* Beauv. in Fl. Oware 1: 47. 1805. *Stereospermum tetragonum* DC. in Prodr. 9: 210. 1845; Gamble, Fl. Pres. Madras 998(701). 1924; Clarke in Hook. f. in Fl. Brit. Ind. 4: 383. 1884.

Trees, bark transversally rugose. Leaves 31.5 – 38 cm long, 2-pinnate; lamina 11.3 – 13.4 × 4.4 – 4.5 cm, 5 – 7 pairs, ovate, entire of serrate, obtuse at base, slightly unequal-sided, petiolulate; nerves 7 – 10 pairs. Flowers in panicles; calyx bell shaped, shallowly lobed; corolla yellow, bilabiate, lobes subequal, crisped; stamens 6, filaments pubescent at base; ovary sessile, oblong, 3-celled, ovules many, style slender, stigmas 2, spoon shaped. Capsule, tetragonous, splitting.

Flowering: February – April

Fruiting: March – July

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India, Bangladesh, Bhutan, Cambodia, Indonesia, Laos, Malaysia.

Status: Least Concern (IUCN).

Uses: This is used for diuretic, Lithotropic, cardio tonic and aphrodisiac.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al.[Field No.3232]

OROXYLUM Ventenat, in Decas Gen. Nov. 8. 1808.

Oroxylum indicum (L.) Benth. ex Kurz in Forest Fl. Burma 2: 237. 1877; Aitken in Grierson et Long in Fl. Bhutan 2(3): 1241. 2001. *Bignonia indica* L. in Sp. Pl. 2: 625. 1753. *Bignonia tuberculata* Roxb. ex Candolle in Prodr. 9: 177. 1845. *Bignonia pentandra* Lour. in Fl. Cochinch. 379. 1790. *Spathodea indica* (L.) Pers. in Syn. Pl. 2: 173. 1807. '**Totala**'

Medium trees; to 15.3 m high; bark 5.2 – 6.3 mm thick, surface brownish–grey; blaze yellowish–green; bole smooth. Leaves compound 2 – 4 pinnate, pinnae 4 – 8; rachis 55 – 95 cm, glabrous; leaflets 3 – 5 in each pinnae, opposite; petiolule 3.6 – 20.2 mm, glabrous, slender; lamina 7.5 – 15.3 × 4.1 – 9.2 cm, ovate, base cordate, oblique or truncate, apex acuminate, margin entire, glabrous, chartaceous; lateral nerves 4 – 6 pairs. Flowers bisexual, in lax terminal racemes, reddish–purple outside, pinkish–yellow within, racemes to 30 – 50 cm long; calyx campanulate, coriaceous, glabrous, limb truncate or obscurely toothed; corolla campanulate, lobes 5; stamens 5, filaments inserted below the base, filaments hairy at base; connective with a short mucrone; ovary subsessile, contracted at the base; ovule many; style slender; stigma 2–lobed. Capsule compressed, tapering at both end.

Flowering: September – October

Fruiting: November–December

Local Distribution: Throughout the forest area of Terai and Duars.

General Distribution: India (Assam, Bihar, Sikkim, West Bengal); Bhutan, Indonesia Nepal,, Myanmar, Laos, Philippines, Cambodia and Thailand .

Status: Common.

Uses: Useful in diarrhoea and dysentery.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 2144]

SPATHODEA Beauv. in Fl. Oware 1: 46, t. 27. 1805.

Spathodea nilotica Seemon, in J. Bot. 3: 333.1865. *Spathodea tulipifera* (Schuman) G. Don, in Gen. Hist. 4: 223. 1838. *Bignonia tulipifera* Schuman, Beskr. in Guin. Pl. 273. 1827.

Trees, up to 18 m. Leaves imparipinnate, estipulate; rachis grooved above, swollen at base; leaflets 10 – 29, opposite; lamina 6 – 15 × 5– 8.5 cm, elliptic-oblong acuminate, margin entire, base round to oblique. Flowers bisexual, terminal racemes; calyx spathaceous, recurved; corolla; lobes 6, deltoid; Stamens equal, unequally inserted at the base of swollen portion of the tube; staminodium small; ovary superior, ovate-oblong, pubescent; style slender; stigma 3-lipped, lips flattened. Fruit a capsule, woody, 3-valved; seeds, winged.

Flowering: May – August

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Bihar, Orissa , West -Bengal,); Nepal ,Bhutan, Indonesia, Thailand Cambodia, and Vietnam.

Status: Least Concern (IUCN 2020).

Uses: Useful in diarrhoea and dysentery.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al.[Field No.4211]

VERBENACEAE Juss., in Ann. Mus. Hist. Nat. Paris 7: 64. 1806; *nom. cons.*

LANTANA L. in Sp. Pl. 2: 626. 1753.

Lantana camara L., Sp. Pl. 2: 627. 1753; Grierson et Long in Fl. Bhutan 2(2): 914. 1999. *Camara vulgaris* Benth., Bot. Voy. Sulphur 154. 1846. *Lantana urticifolia* Miller in Gard. Dict. ed. 8: 5. 1768. *Lantana undulata* Raf., Sylva Tellur. 82. 1838. *Lantana Mexicana* Turner in Flor. Kingd. 181.1876.

Shrubs armed, stout recurved prickles, pubescent. Petiole 2 cm, pubescent; lamina oblong, 4 – 8 × 1.5 – 4 cm, papery, wrinkled, with short stiff hairs, aromatic when crushed, base rounded to cordate, margin crenate; lateral veins 6 pairs, prominent, elevated. Capitula terminal, 2 cm across. Flowers multicolour ovary glabrous. Drupes globose.

Flowering and Fruiting: Throughout the year.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, handigarh, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Puducherry, Sikkim, Tripura, Uttar Pradesh, West Bengal), America, often naturalized in other tropical and subtropical regions.

Status: Common

Uses: Leaves have important role in fungicidal, antimicrobial and insecticidal properties

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 3778]

PHYLA Lour. in Fl. Cochinch. 1: 66. 1790.

Phyla nudiflora (L.) Greene, in Pittonia 4: 46. 1899; Grierson et Long in Fl. Bhutan 2(2): 916. 1999; Guha Bakshi in Fl. Mur. Dist. 250. 1984. *Verbena nodiflora* L. in Sp. Pl. 1: 20. 1753. *Lippia nodiflora* (L.) Michaux, in Fl. Bor. Amer. 2: 15. 1803. *Phyla chinensis* Lour. in Fl. Cochinch. 66. 1790.

Annual herbs. Branched, rooting at distal nodes, minutely strigose. Leaves sessile, lamina spatulate, 1 – 4 × 1 – 1.5 cm, papery, pubescent, base cuneate, margin distally serrate, veins inconspicuously 4 paired. Inflorescences cylindrical to ovate capitula, 1 – 2 cm; corolla pink purple, glabrous.

Flowering: January – April **Fruiting:** May – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Sikkim, Tripura, Uttar Pradesh, West Bengal), Nepal, Bhutan, Bangladesh.

Status: Least Concern (IUCN).

Uses: It is used for pain in knee joints and kidney

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.02.2018, Mallick, et al [Field No. 3778]

LAMIACEAE Lindl. in Nat. Syst. ed. 2. 275. 1836

AJUGA L. in Sp. Pl. 2: 561. 1753.

Ajuga macrosperma Wall. ex Benth. in Pl. Asiat. Rar. 1: 58. 1830; Grierson et Long in Fl. Bhutan 2(2): 944. 1999. *Bulga macrosperma* (Wall. ex Benth.) Kuntze in Revis. Gen. Pl. 2: 512. 1891.

Annual erect herbs, up to 50 cm, subglabrous, densely white villous. Lamina obovate-lanceolate to elliptic-obovate, 5 – 14 × 3 – 6 cm, strigose, acuminate to acute, irregularly undulate-crenate, ciliate, base cuneate. Inflorescence verticillasters 7 – 15 flowered, in axillary and apically forming spikes; obovate-lanceolate; calyx funneliform, teeth ovate; corolla blue to purple, tubular; upper lip oblong; middle lip cordate, apex emarginate.

Flowering: January – March **Fruiting:** March – May

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Andhra Pradesh, Arunachal Pradesh, Bihar, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Puducherry, West Bengal), Bhutan, Nepal, Laos, Myanmar, Thailand, Vietnam.

Status: Least Concern (IUCN).

Uses: It is used for pain in knee joints and kidney.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.02.2018, Mallick, et al [Field No. 3707]

ANISOMELES R. Br. in Prodr. 503. 1810.

Anisomeles indica (L.) Kuntze in Revis. Gen. Pl. 2: 512. 1891. *Nepeta indica* L. in Sp. Pl. 571. 1753. *Anisomelis indica* L. in Sp. Pl. 1: 571. 1753; Bora et Kumar in Flor. Div. Assam. 267. 2003. *Ajuga disticha* (L.) Roxb. in Hort. Ben. 44. 1814. *Ballota disticha* L. in Mant. Pl. 1: 83. 1767. '*Apang*'

Annual aromatic woody herbs 2 – 3.5 m high, stem quadrangular, grooved, densely pubescent. Leaves 4 – 8 × 3.5 – 5.5 cm, broadly obovate to ovate, base tuncate, margin coarsely serrate-crenate, apex acuminate, tomentose; petiole to 5 cm long. Flowers cluster interrupted spikes. Calyx campanulate, lobes obovate, ciliate on margin; corolla pink, 2-lipped; stamens 4, didynamous, exserted, anthers of upper pair 2-celled, of lower 2-celled; ovary 4-partite, style slender, stigma 2-fid, disc entire. Nutlets 4, lenticular, brown.

Flowering: August – September

Fruiting: September – November

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Madhya Pradesh, Sikkim, Tripura, Uttar Pradesh, West Bengal), China, Japan and southwards from Malaysia to Australia.

Status: Common

Uses: Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3029]

CLERODENDRUM L. in Sp. Pl. 2: 637. 1753.

Clerodendrum indicum (L.) Kuntze in Rev. Gen. Pl. 2: 586. 1891; Grierson et Long in Fl. Bhutan 2(2): 931. 1999. *Siphonanthus indicus* L. in Sp. Pl. 1: 109. 1753. *Clerodendrum siphonanthud* R. Br. in Aiton f. in Hort. Kew. 4: 65. 1812; Clarke in Hook. f. in Fl. Brit. Ind. 4: 593. 1885. *Clerodendrum verticillatum* Don in Prodr. Fl. Nepal. 102. 1825. *Clerodendrum indicum* f. *semiserratum* (Wall.) Moldenke in Phytologia 22(3): 214. 1971.

Shrubs, up to 5 m. Branchlets purple, smooth. Leaves whorled with 5 – 7 per node, sessile; leaf blade lanceolate to oblong, 11 – 21 × 2 – 3 cm, membranous, base

attenuate, margin entire, apex acute; midvein prominent. Inflorescences terminal; cymes reddish-purple; bracts linear-lanceolate; calyx densely minute round subglandular, apex acuminate; corolla whitish pink, tube funnel shaped, curved, lanceolate oblong to elliptic, apex obtuse; stamens long exserted; ovary subglabrous. Fruiting calyx, leathery. Fruit drupes brown.

Flowering: June – November

Fruiting: November – February

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland, Kerala, Jharkhand, West Bengal), Bhutan, Bangladesh, Sri Lanka, Myanmar, Nepal, Malaysia. Bhutan, China, Myanmar and Malaysia.

Status: Common

Uses: Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1109]

Clerodendrum infortunatum L. in Sp. Pl. 637. 1753. *Clerodendrum viscosum* Ventenat, Jord. in Malm.f. 1803; Debet al. Fl. Ass. 3: 487. 1939; Long in Grierson et Long in Fl. Bhutan 2(2): 934. 1999; Prain in Bengal Pl. 2: 82. 1903. *Clerodendrum viscosum* Ventenat in Jard. Malmaison t. 25. 1803. '*Vant*'

Shrubs, up to 2 m. Branchlets 4 angled. Leaves opposite; petiole up to 6 cm, densely pubescent; lamina cordate, 5 – 12 × 6 – 16 cm, sparsely pubescent, cordate at base, margin sparsely serrulate to dentate, acuminate to obtuse. Inflorescences terminal flowers; bracts and bractlets red or green; calyx reddish, 5 lobed, pubescent; lobes obovate-lanceolate; corolla red; lobes oblong. Fruit drupes globose.

Flowering: January – August

Fruiting: September – November

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland West Bengal), Bhutan, Bangladesh, Sri Lanka, Myanmar, Nepal, Malaysia, Bhutan, Myanmar and Malaysia.

Status: Common

Uses: Leaf and root are used as antipyretic, antidandruff, laxative, ascaricide, vermifuge, anticonvulsant and antidiabetic.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.4508]

Clerodendrum japonicum (Thunb.) Sweet in Hort. Brit. 822. 1826; Grierson et Long in Fl. Bhutan 2(2): 934. 1999. *Volkameria japonica* Thunb. in Syst. Nat. ed. 14: 578. 1784. *Volkameria dentata* Roxb. in Fl. Ind. ed. 3: 61. 1832. *Clerodendrum coccineum* Lam in Verben. Malay. Archip. 296. 1919. *Volkameria japonica* Thunb. in Nova Acta Regiae Soc. Sci. Upsal. 3: 203. 1780. '**Bara Vant's**

Subshrubs, up to 3 m tall. Branchlets quadrangular, nodes villous. Petiole up to 19 cm, densely brown; lamina cordate, 9 – 15 × 7 – 25 cm, sparsely pubescent, cordate, margin sparsely dentate, apex acute. Inflorescences terminal; bracts and bractlets usually reddish. Calyx red, deeply 6 lobed, pubescent, lobes lanceolate; corolla red, lobes oblong; Drupes green when young, blue-black at maturity, globose.

Flowering: May – July

Fruiting: April – October

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland West Bengal); Bhutan, Bangladesh, Myanmar, Nepal, Malaysia, Myanmar and Malaysia.

Status: Common

Uses: Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.2280]

CALLICARPA L. in Sp. Pl. 1: 111. 1753.

Callicarpa arborea Roxb. in Fl. Ind. 1: 405. 1820; Grierson et Long in Fl. Bhutan 2(2): 919. 1999. *Callicarpa arborea* Roxb. ex Clarke in Hook. f. in Fl. Brit. Ind. 4: 567. 1885; Grierson et. Long in Fl. Bhutan 2(2): 919. 1999. *Premna arborea* (Roxb.) Roth in Nov. Pl. Sp. 287. 1821. *Aganum umbellata* Raf. in Sylva Tellur. 161. 1838. *Callicarpa magna* Schauer in Prodr. 11: 641. 1847.

Trees, up to 9 m; Inflorescences, and petioles tomentose, hairs stellate. Lamina elliptic to ovate, 16 – 45 × 8 – 12 cm, leathery, brown, stellate tomentose, adaxially, base cuneate to rounded, margin subentire. Cymes 7 – 14 cm across;; calyx cup-shaped, truncate, outside densely gray stellate tomentose; corolla purple; ovary stellate tomentose. Fruit reddish black.

Flowering: April – July

Fruiting: June – November

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland West Bengal), Bhutan, China, Myanmar, Malaysia.

Status: Common

Uses: Leaves and roots are used to treat various disorders like polydipsia, tumour, diarrhoea, diabetes, dysentery, fever.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1109]

HOLMSKIOLDIA Retz. in Observ. Bot. 6: 31. 1791.

Holmskioldia sanguinea Retz. in Obs. 6:31. 1791. Clarke in Hook. f. in l.c. 596; Collett in Fl. Siml. 380. 1921; Parker in l.c. 399; Bor and Raizada in l.c. 142; Cooke in l.c. 518.

Large evergreen, scandent shrub, slightly pubescent, quadrangular. Leaves ovate or elliptic-ovate, 5.5 – 12.3 cm long, 2.5 – 8.3 cm broad, entire to coarsely dentate; petiole 1.7 – 3.6 cm long; bracts lanceolate, 4.3 – 5.4 mm long. Cymes axillary, pedunculate. Flowers brick-red to orange, 6 mm across; pedicels 5.2 mm long. Calyx petaloid, 1.8 cm across. Corolla-tube curved; limb sub-bilabiate unequally 5-lobed. Drupe 5.3 – 8.4 mm long, obovoid, 5-lobed, subfleshy, enclosed by persistent, enlarged, coloured calyx.

Flowering: October – December

Fruiting: November – February

Local distribution: Throughout the forest area of terai and duars.

General Distribution: Sub Himalayan tracts of India (Sikkim, Assam, Nagaland and West Bengal); Bhutan, Nepal and Bangladesh.

Status: Common

Uses: Leaves and roots are used to treat various disorders like tumour, diarrhoea, diabetes and fever.08.05.2021, Mallick, et al. [Field No.5557]

GMELINA L. in Sp. Pl. 2: 626. 1753.

Gmelina arborea Roxb. in Hort. Bengal 46. 1814; Pl. Corom. 3: 4. t. 246. 1815; Clarke in Hook.f. in Fl. Brit. Ind. 4: 581. 1885; Ohashi in Hara in Fl. E. Himal. 2: 113. 1971; Hara et al. in Enn. Fl. Pl. Nep. 3: 147. 1982; Grierson et Long in Fl. Bhutan 2(2): 928. 1999. *Gmelina arborea* var. *canescens* Haines, Forest Fl. Chota Nagpur 82.1910. '**Gamari**'

Annual trees, up to 17 m; bark brown; leaf blade broadly ovate, 9 – 10 × 7 – 15 cm, base cordate, apex acuminate. Inflorescences terminal, narrow thyrses; calyx patches;

teeth 5, sharply triangular; corolla yellow, 2-lipped, glandular; ovary subglabrous, subglandular. Stigma equally 2 cleft. Drupes yellow ovoid-ellipsoid.

Flowering: February – June

Fruiting: April – September

Local distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Nagaland, West Bengal), Bhutan, Nepal, Sri Lanka and Philippines.

Status: Common

Uses: Whole plants are used as antimicrobial, anthelmintic, anti-aging, anti-diabetic, analgesic, diuretic, protective and antiepileptic agent

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.5014]

MESOSPHAERUM P. Browne in Civ. Nat. Hist. Jamaica 257. 1756.

Mesosphaerum suaveolens (L.) Kuntze in Revis. Gen. Pl. 2: 525. 1891. *Hyptis suaveolens* (L.) Poiteau in Ann. Mus. Hist. Nat. 7: 472. 1806. Long in Fl. Bhutan 2(2): 990. 1999. *Ballota suaveolens* L. in Syst. Nat. 102: 1100. 1759. *Schaueria graveolens* (Bl.) Hasskarl in Flora 25: 25. 1842. *Mesosphaerum suaveolens* (L.) Kuntze in Revis. Gen. Pl. 2: 525. 1891. *Marrubium indicum* Blanco in Fl. Filip. 477. 1837. *Bystropogon graveolens* Bl. in Bijdr. 824. 1826.

Erect herb, branched, robust aromatic. Lamina obovate to ovate 3.5 – 11 × 1.4 – 9 cm, adaxially green, abaxially pilose, acute to obtuse, serrulate, base cordate, oblique. Cymes 5 to 4 flowered, in racemes or panicles; calyx villous, veins elevated; teeth broadly triangular; corolla blue, upper lip lobes reflexed, middle. Nutlets dark brown.

Flowering: July – October

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Naturalized in Central America and the West Indies, presently widely naturalized.

Status: Common

Uses: Leaves are used for antiseptics.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, Mallick, et al. [Field No.9098]

ISODON (Schrad. ex Benth.) Spach in Hist. Nat. Veg. Phan. 9: 162. 1840.

Isodon rugosus (Wall. ex Benth) Codd in Taxon 17: 239. 1968; Grierson et Long in Fl. Bhutan 2(2): 997. 1999. *Plectranthus rugosus* Wall. ex Benth. in Pl. Asiat. Rar. 2: 17. 1830. *Rabdosia rugosa* (Wall. ex Benth.) Hara in J. Jap. Bot. 47: 199. 1972. *Ocimum densiflorum* Roth in Nov. Pl. Sp. 275. 1821. *Isodon plectranthoides* Schrader ex Benth. in Labiat. Gen. Spec. 43. 1832.

Annual erect shrubs, branched, up to 3 m; stellate tomentose. Stem leaves opposite; lamina elliptic to ovate, 2 – 4 × 0.5 – 2 cm, papery, densely stellate tomentose, obtuse, crenulate, base broadly cuneate to rounded. Cymes axillary, flowered, apical cymes 3–5 flowered; calyx campanulate; teeth triangular, equal; corolla white, tinged rose. Nutlets dark red, oblong.

Flowering: July – October **Fruiting:** September – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (kerala, Assam, Tripura, West Bengal); Bhutan, Bangladesh, Nepal, Pakistan and Afghanistan

Status: Common

Uses: Stem and leaves are used for antiseptics and oil preparation.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3609].

LEONURUS L. in Sp. Pl. 2: 584. 1753.

Leonurus sibiricus L. in Sp. Pl. 584. 1753. *Phlomis sibirica* (L.) Medik. in Bot. Beob. 124. 1784. *Leonurus sibiricus* var. *grandiflorus* Benth. in Prodr. 12: 502. 1849. *Leonurus occidentalis* Colla in Mem. Reale Accad. Sci. Torino 33: 154. 1829.

‘Raktadron’

Erect annuals herbs, up to 1.3 m. Stem leaves deciduous. Lamina ovate, 8 – 7 × 3 – 4 cm, sparsely strigose, lobes narrowly oblong-rhombic, 4 lobulate, base broadly cuneate. Verticillasters many flowered, 3 palmati sect; bracteoles reflexed, shorter than calyx tube, strigose. Flowers subsessile; calyx campanulate; corolla rarely white; filaments sparsely scaly. Nutlets, oblong.

Flowering: July – August **Fruiting:** August – September

Local Distribution: All over the forest area of terai and duars.

General Distribution: India throughout; China, Bangladesh, Nepal, Bhutan, Mongolia, Russia.

Status: Common

Uses: Stem and leaves are used anti-inflammatory, antibacterial and antioxidant activity

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick,

Et al. [Field No. 4308]

LEUCAS R. Br. in Prodr. 504. 1810.

Leucas indica (L.) Br. ex Vatke in Oesterr in Bot. Zeits. 25: 95. 1875; Grierson et Long in Fl. Bhutan 2(2): 963. 1999. *Leonurus indicus* L. in Syst. ed 10: 1101. 1760. *Leucas linifolia* (Roth) Spreng. in Syst. 2: 743. 1825; Hook. f. in Fl. Brit. Ind. 4: 690. 1885; Prain in Bengal Pl. 2: 856. 1903. *Leucas indica* (L.) R. Br. ex Sm. in Cycl. 20: 5. 1812. *Phlomis indica* L. in Sp. Pl. 586. 1753. '**Madhuful**'

Herbs, up to 40 cm. Lamina linear, 5.5 – 6 × 1.2 – 1.3 cm, crenate to subentire. Verticillasters globose, few flowered, densely hispid; bracts linear; calyx tubular, mouth oblique, erect, teeth straight, narrowly triangular; corolla white. Nutlets oblong.

Flowering and Fruiting: Throughout the Year.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India; China, Bangladesh, Nepal, Bhutan, Mongolia and Russia.

Status: Least concern (IUCN 2020).

Uses: It is used for Anti-inflammatory, anti-diarrheal, antimicrobial, analgesic, antioxidant, and insecticidal activities

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 06.02.2017, Mallick, et al. [Field No. 3219]

Leucas aspera (Willd.) Link in Enum. Hort. Berol. Alt. 2: 113. 1822; Grierson et Long in Fl. Bhutan 2(2): 963. 1999. *Phlomis aspera* Willd. in Enum. Pl. 621. 1809. *Leucas dimidiata* Benth. in Prodr. 12: 532. 1848. *Leucas obliqua* Buch.-Ham. ex Dillwyn, Rev. Hortus Malab. 57. 1839. *Phlomis obliqua* Buch.-Ham. ex Hook. f. in Fl. Brit. Ind. 4: 690. 1885. '**Madhuful**'

Erect herbs, 35 – 40 cm. Lamina linear to linear, 2.6 – 7 × 1.25 – 1.7 cm, obtuse, margin sparsely entire. Verticillasters compactly subglobose, hispid; bracts linear, as long as calyx, margin hispid ciliate; calyx tubular, mouth narrowly oblique, erect; teeth straight, triangular; corolla white, than calyx tube. Nutlets oblong.

Flowering and Fruiting: Throughout the Year.

Local Distribution: Throughout the study areas of North Bengal

General Distribution: India (throughout); China, Bangladesh, Nepal, Bhutan, Mongolia, Russia.

Status: Least concern (IUCN).

Uses: Stem and leaves are used for antimicrobial, Anti-inflammatory, anti-diarrheal, antioxidant, and insecticidal activities

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 14.11.2019, Mallick, et al. [Field No. 2078]

OCIMUM L. in Sp. Pl. 2: 597. 1753.

Ocimum basilicum L. in Sp. Pl. 1: 597. 1753; Hook. f. in Fl. Brit. Ind. 4: 608. 1885; Prain in Bengal Pl. 2: 842. 1903; Grierson et Long in Fl. Bhutan 2(2): 1001. 1999.

Ocimum album L. in Mant. Pl. 1: 85. 1767. *Ocimum ciliare* B. Heyne ex Hook. f. in Fl. Brit. Ind. 4: 608. 1885. *Ocimum caryophyllatum* Roxb. in Fl. Ind. ed. 1832 3: 16. 1832.

Ocimum basilicum var. *album* (L.) Benth. in Pl. Asiat. Rar. 2: 13. 1830. '**Tulsi**'

Annual erect, herbs, up to 110 cm. Lamina obovate 2.8 – 6 × 2 – 2.3 cm, obtuse to acuminate, irregularly dentate or subentire, attenuate at base. Thyrses 11 – 21 cm; bracts subsessile, lanceolate, ciliate, acute; calyx campanulate, mucronate; corolla white, stamens free, slightly exserted, posterior 2 dentate. Nutlets dark Brown, obvoid.

Flowering: July – September

Fruiting: September –

December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Tripura, Nagaland, Bihar, Odisha and West Bengal); China, Bangladesh, Nepal, Bhutan, Mongolia and Russia.

Status: Least concern (IUCN).

Uses: Leaves, stem and root are used for antimicrobial, Anti-inflammatory, antioxidant, and insecticidal activities

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.02.2018, Mallick, et al. [Field No. 1006]

Ocimum tenuiflorum L. in Sp. Pl. 2: 597. *Ocimum sanctum* L. in Mant. Pl. 1: 85. 1767.

Ocimum subserratum Heyne ex Hook. f. in Fl. Brit. Ind. 4: 609. 1885. *Ocimum sanctum*

var. hirsutum (Benth.) Hook. *f.* in Fl. Brit. Ind. 4: 609. 1885. *Ocimum scutellarioides* Willd. ex Benth. in Linnaea 11: 344. 1837. '**KaloTulsi**'

Erect, subshrubs, 1 – 1.5 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 funnel form, villous, middle oblate, lateral teeth broadly triangular, lip teeth; corolla white to reddish purple, slightly exerted; stamens slightly exerted, free; posterior filaments puberulent at base. Nutlets oblong.

Flowering: February – July

Fruiting: June – August

Local Distribution: MPCAs area of terai and duars.

General Distribution: India (Assam, Kerala, Tripura, Nagaland, West Bengal), Malaysia, Myanmar, Philippines and Thailand

Status: Common

Uses: It is used for aiding cough, asthma, diarrhea, dysentery, fever, eye diseases, indigestion, arthritis, gastric ailments

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1908]

POGOSTEMON Desf. in Mém. Mus. Hist. Nat. 2: 154. 1815.

Pogostemon amaranthoides Benth. in Candolle, Prodr. 12: 153. 1848; Clarke in Hook. *f.* in Fl. Brit. Ind. 4: 634. 1885; Ohashi in Hara in Fl. E. Himal. 280. 1966; Grierson et Long in Fl. Bhutan 2(2): 985. 1999.

Annual herbs; stems erect or pubescent – tomentose in young. Leaves obovate – lanceolate, acute, base cuneate-attenuate, numerous glands on lower surface. Calyx ovoid; corolla pink. Nutlets ovoid.

Flowering: September – October

Fruiting: September – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (throughout), China, Nepal, Bhutan, Mongolia, Russia.

Status: Common

Uses: Leaves has antioxidant and antimicrobial activities.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 08.12.2018, Mallick, Et al. [Field No. 979]

PREMNA L. in Mant. Pl. 154. 1771; *nom. cons.*

Premna barbata Wall. ex Voigt in Hort. Suburb. Cal. 468.1845. *Premna barbata* Wall. ex Schauer in Prodr. 11: 636. 1847. *Premna barbata* Wall. in Numer. List 1768.1829.

Erect shrubs, sometimes reaching the size of a small tree, 2 – 5 m tall, deciduous, with grey bark. Leaves 5 – 15 cm. × 2.5 – 10 cm., ovate, acuminate, obscurely toothed, drying green, glabrescent above, minutely villous beneath. Flowers 3 mm across, greenish; bracts small, linear, deciduous. Calyx 2 mm long, subequally 4 lobed, hardly or not enlarged in fruit but persistent; corolla 3 – 4 mm long, sub-bilabiate with 4, short, spreading lobes. Drupe globose, glabrous, somewhat verrucose.

Flowering: March– June

Fruiting: July–November.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Sub-Himalayan tracts, Ind. Bhutan, Nepal and Bangladesh.

Status: Not evaluated (IUCN)

Uses: A paste of the wood is applied to cuts and wounds. The bark juice is used in the treatment of fevers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 2427]

Premna bengalensis Clarke in Hook. f. in Fl. Brit. Ind. 4(12): 577. 1885. Grierson et Long in Fl. Bhutan 2(2): 925. 1999; Prain in Bengal Pl. 2: 83. 1903.

Tree 30 – 60 ft tall; branches and branchlets quadrangular, flattened, young parts pubescent with yellowish stellate hairs and glabrous when mature. Leaves simple opposite, lanceolate–ovate to elliptic 7.5 – 24 × 4 – 15 cm across, base acute or obtuse, margins entire or slightly undulate, apex shallow acuminate to acute. Inflorescence terminal corymbose panicles, dichotomously branched, composed of 3 – 6 pairs of opposite branched cymes 12 – 20 × 10.1 – 15.2 cm across, peduncles flattened, pubescent with yellowish brown stellate hairs, obtusely quadrangular 3.2 – 7.3 mm long, bracts linear lanceolate 2 – 6 mm long, Flowers lax, numerous, bisexual, zygomorphic, pedicel 1.2 mm long, calyx campanulate 5 toothed, teeth acute, pubescent outside, corolla infundibular 4 lobed, 2 lipped, white 2 mm long, lower lip 3 lobed, midlobe obovate, apex obtuse 2 × 1 mm long, glabrous outside, densely pubescent in the throat, stamens 4, didynamous, filaments glabrous, filiform 3 mm long, anthers globose; ovary ovoid or globose, style slender, filiform, stigma bilobed, Fruit drupaceous, obovoid.

Flowering: March– June

Fruiting: July–November.

Local Distribution: North Sevoke MPCAs.

General Distribution: India, Bangladesh, Myanmar and Nepal.

Status: Common

Uses: Its Stem bark In throat pain; leaves improve immune system.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4567]

Premna herbacea Roxb. in Fl. Ind. ed. 1832, 3: 80. 1832; Grierson et Long in Fl. Bhutan 2(2): 925. 1999. *Gumira herbacea* (Roxb.) Kuntze in Revis. Gen. Pl. 2: 507. 1891. *Premna obovata* Merrill in J. Arnold Arbor. 32: 77. 1951.

Shrubs 3 – 5 cm. Rhizomes timbered. Leaves rosulate; lamina obovate to spatulate, 3 – 11 × 2 – 9 cm, pubescent and yellowish green, glandular, cuneate base, margin serrate, sparsely crenulate, tip rounded. Inflorescences capitate corymbs, paniculate; peduncle puberulent; bracts linear lanceolate; calyx campanulate, pubescent, yellow glandular; corolla purple, slightly 2 lipped, 4 lobed, puberulent.

Flowering: March – June

Fruiting: July – November.

Local Distribution: throughout the MPCAs area of terai and duars.

General Distribution: India (Assam, Meghalaya, Sikkim, West Bengal); Myanmar and Nepal

Status: Common

Uses: Leaves, roots used in kidney diseases, venereal infections, fevers, dysentery.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4567]

Premna mollissima Roth in Nov. Pl. Sp. 286.1821. *Premna mucronata* Roxb. in Hort. Bengal [95]; Fl. Ind. iii. 80.

Small tree; branches spiny; bark thin, pale and exfoliating. Leaves ovate or ovate–oblong, long–acuminate, base rounded, cordate; blade 7 – 15 cm long; petiole 2.5 cm long. Flowers terminal, corymbose, trichotomous panicles, greenish. Calyx with 4 or 5 sepals, with rounded and nearly equal teeth; corolla lobes are equal or bilabiate, upper lip retuse or emarginate, lower lip of 3 equal lobes and throat closed with white hairs. Fruit globose drupe, green when young, dark at maturity 3.5 – 4.5 mm in diameter.

Flowering: April – May

Fruiting: May – June.

Local Distribution: North Sevoke MPCA.

General Distribution: India (Kerala, Sikkim, Assam, Jharkhand, Tripura, West Bengal), Bangladesh, Bhutan, Myanmar, Nepal and Thailand.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4192]

TECTONA L. f. in Suppl. Pl. 151. 1781; *nom. cons.*

Tectona grandis L. f. in Suppl. Pl. 151. 1782; C.B. Clarke in Hook. f. in Fl. Brit. Ind. 4: 570. 1885; Grierson et Long in Fl. Bhutan 2(2): 921. 1999. *Tectona theca* Lour. in Fl. Cochinch. 137. 1790. *Theka grandis* (L. f.) de Lam. in Tabl. Encycl. 2: 111. 1797. *Jatus grandis* (L. f.) Kuntze, in Revis. Gen. Pl. 2: 508. 1891. '*Segun*'

Trees, 33 – 40 m. Branch gray to grayish yellow, 4 angled, tomentose. Petiole robust, 4.4 cm; lamina ovate to elliptic, 15 – 51 × 8 – 27 cm, abaxially grayish to yellowish, papery, minutely tomentose, base cuneate, margin entire, tip acuminate veins 7 – 13 pairs. Panicles 35– 41 cm. Flowers fragrant; calyx tube white with stellate hairs; corolla white, puberulent, lobes obtuse; ovary strigose, style 3.6 mm long. Fruit minutely tomentose.

Flowering: June – September

Fruiting: August –

December

Local Distribution: North Sevoke MPCA.

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

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 14.06.2018, Mallick, et al. [Field No. 4159]

VITEX L. in Sp. Pl. 2: 638.1753.

Vitex quinata (Lour.) Williams in Bull. Herb. Boissier II, 5: 431. 1905. *Cornutia quinata* Lour. in Fl. Cochinch. 387. 1790. *Vitex altmannii* Moldenke in Phytologia 4: 59. 1952. *Vitex celebica* Koord. in Meded. Lands Plantentuin 19: 645. 1898. *Vitex heterophylla* Roxb. in Fl. Ind. ed. 1832 3: 75. 1832.

Evergreen trees, 4 – 12 m tall; bark brown. Branchlets at youth glandular and pubescent. Leaves 3 – 5 foliolate; petiolules 0.5 – 2 cm; petiole 2.5 – 6 cm; leaflets thickly papery, obovate to obovate–elliptic, apex acute, acuminate or obtuse, base cuneate; central leaflet 5 – 20 × 2.5 – 8.5 cm. Panicles 9 – 18 cm; calyx rudimentarily, dentate,

glandular; corolla 2-lipped, yellowish, 5-lobed, glandular and pubescent outside; ovary glandular; stamens exserted, truncate fruiting calyx. Fruit black, obovoid to globose.

Flowering: May – July

Fruiting: August – September

Local Distribution: Throughout the MPCAs of terai and duars.

General Distribution: India (Assam, Jharkhand, Orissa, Kerala, Sikkim, West Bengal); Indonesia, Phillipines and China.

Status: Common

Uses: Used as a stomachic and as a tonic.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 339]

Vitex peduncularis Wall. ex Schauer in Prodr. 11: 687, 1847; *Vitex peduncularis* Wall. in Numer. List n. 1753. 1828; *Vitex peduncularis* f. *roxburghiana* (Clarke) Moldenke in Phytologia 37: 275. 1977. *Vitex peduncularis* var. *roxburghiana* Clarke in Fl. Brit. Ind. 4: 587. 1885.

Trees 5–17 m tall. Branchlets sparsely pubescent, glabrescent. Leaves 3-foliolate; petiole 3.5–7 cm; petiolules 5–13 mm; leaflets broadly lanceolate to oblong and glabrous, abaxially densely glandular, base cuneate and are slightly oblique, margins are entire or slightly undulate and ciliate, apex are acuminate to acute; central leaflet 9.5 – 15 × 4 – 5 cm. Thyrses 7 – 18 cm; calyx 1.6 – 2.5 cm, outside pubescent and glandular, inside glabrous. Corolla white, outside puberulent, lower lip is pilose inside. Stamens are included; filaments glabrous. Fruiting calyx minutely dentate to subtruncate. Fruits subglobose.

Flowering: March – June

Fruiting: July – August.

Local distribution: MPCAs area of terai and duars of north Bengal

General Distribution: India (Andhra Pradesh, Tamil Nadu, Tripura, Uttar Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Odisha, West Bengal); Nepal, Bhutan and Australlia.

Status: Common

Uses: Used for traditional medicine to treat for the malarial and black fevers.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 4359]

LAMIALES Bromhead. 1838

ACANTHACEAE Juss. in Gen. Pl. 102. 1789; *nom. cons.*

PERISTROPHE Nees in Wall. in Pl. Asiat. Rar. 3: 77. 112. 1832.

Peristrophe paniculata (Forsskal) Brummitt in Kew Bull. 38: 451. 1983. *Dianthera paniculata* Forssk. in Fl. Aeg.-Arab. 7. 1775. *Peristrophe bicalyculata* (Retz.) Nees in Wall. in Pl. Asiat. Rar. 3: 113. 1832; Clarke in Hook. f. in Fl. Brit. Ind. 4: 554. 1885; Takasi Yamazaki in Hara in Fl. E. Himal. 1:303.1966.

Erect herbs, stem 6-angular. Leaves 4.5 – 6.7 × 2.3 – 3.7 cm, ovate, apex acute, base rounded, glabrous above, tomentose below. Inflorescence axillary panicles; pedicels 1.7 – 2.6 cm long; bracts 2, bracteoles 4, linear, unequal, hirsute; calyx lobes linear; corolla tube 5 – 7.3 mm long, pubescent, lobes 6 – 7.3 mm long; filaments hairy; ovary oblong. Fruit capsule, tomentose.

Flowering: December – January

Fruiting: January –

February

Local Distribution: All over the forest area.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, Nepal, Cambodia, Indonesia, Malaysia, Thailand and Australia.

Status: Common

Uses: It is used to treat malarial and black fevers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No.5016]

ERANTHEMUM L. in 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 in Fl. E. Himal. 2:123. 1969. *Daedalacanthus griffithii* Anders. in J. Linn. Soc. 9: 486. 1867; Carke in Hook. f. in l. Brit. Ind. 4: 418.1884.

Herbs 0.5 – 1 m. Stems 4 angled. Lamina lanceolate to oblong, 7–20 × 2–5.2 cm, glabrous, attenuate, entire, acuminate. Spikes 3.3 – 8.2 cm; bracts yellowish white, oblong to lanceolate; bracteoles lanceolate. Calyx 5 – 7.5 mm, outside pilose; lobes lanceolate; Corolla blue to light green; filaments glabrous; Ovary pubescent; style hirsute. Fruit capsule 1–2.5 cm.

Flowering: December – March

Fruiting: February - April

Local Distribution: Throughout forest area of Terai and Duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, Nepal, Cambodia, Indonesia, Malaysia, Thailand, Vietnam; tropical Africa, Australia.

Status: Least Concern (IUCN 2020)

Uses: It is used in malarial and black fevers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 5016]

ASYSTASIA Bl. in Bijdr. 796. 1826.

Asystasia macrocarpa Nees in Wall. in Pl. As. Rar. 3: 89. 1832; Clarke in Hook. f. in Fl. Brit. Ind. 4: 495. 1885; Ohashi in Hara in Fl. E. Himal. 1: 300. 1966; Grierson et Long in Fl. Bhutan 2(3): 1282. 2001. *Mackaya macrocarpa* (Nees) Das in Fl. Assam 3: 447. 1939.

Ascending branched herbs. Lamina elliptic to ovate 4 – 11 × 2 – 5.3 cm, acuminate, glabrous, entire, truncate to rounded. Inflorescence racemes axillary, terminal; bracts triangular; calyx lobes linear to lanceolate, margin ciliate; corolla tube cylindrical; lobes obovate. Stamens included; ellipsoid ovary; stigma faintly capitate, 2-lobed. Fruit capsule. Seeds obovate.

Flowering: June – August

Fruiting: July – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, Nepal, Cambodia, tropical Africa, Australia.

Status: Least Concern (IUCN).

Uses: It is used as Antioxidant and Antidiabetic.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 4506]

BARLERIA L. in Sp. Pl. 2: 636. 1753.

Barleria cristata L. in Sp. Pl. 636.1753; Clarke in Hook. f. in Fl. Brit. Ind. 4:488. 1884; Grierson et Long in Fl. Bhutan 2(3): 1281. 2001. *Barleria alba* Lodd. in Bot. Cab. 4: t. 360. 1820. *Barleria ciliata* Roxb. in Fl. Ind. 3: 38. 1832. *Barleria dichotoma* Roxb. in Fl. Ind. ed. 1832 3: 39. 1832. *Barleria laciniata* Wall. in Pl. Asiat. Rar. 3: 91. 1832. *Barleria indica* L. ex Anderson in J. Linn. Soc., Bot. 7: 115. 1864. '**Jaati**'

Branched herbs. Leaves caducous; lamina ovate to elliptic 2 – 11 × 1 – 5 cm, acute to shortly acuminate, papery, entire, cuneate and decurrent. Flowers usually 2, leaf

clustered on branched shoots. Calyx segments ovate to lanceolate; margin ciliate; corolla purple; limb 5 lobed; fertile stamens 4, didynamous; ovary compressed, elliptic.

Flowering: November – November **Fruiting:** November – December

Local Distribution: MPCAs forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, West Bengal); Bhutan, Nepal, Cambodia, tropical Africa, Australia.

Status: Least Concern (IUCN).

Uses: It is used in anti-inflammatory, burns, diuretic, blood purifier, stomatitis, dental caries, wounds, cracking heel.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al [Field No. 4879]

Barleria strigosa Willd. in Sp. Pl. 3: 379. 1800; Grierson et Long in Fl. Bhutan 2(3): 1281. 2001. *Barleria caerulea* Roxb. in Fl. Ind. 3: 39. 1832. *Barleria polystachya* Hook. ex Nees in Prodr. 11: 226. 1847. *Barleria strigosa* var. *polystachya* (Nees) Clarke in Fl. Brit. Ind. 4: 490. 1884. *Barleria strigosa* var. *terminalis* (Nees) Clarke in Fl. Brit. Ind. 4: 490. 1884. [Photo plate –I]

Subshrubs. Grow upto 90 cm in height. Stems are coarsely fulvous strigose. Petiole brownish yellowish. Lamina ovate to elliptic. Flowers in terminal dense spikes and in axillary to 8 cm. Bracts elliptic–oblong to oblong, Outer calyx ovate, lobes purple, 4.2 × 1.6 cm, base rounded, margin dentate to subentire, apex acute, inner calyx yellowish brown, lanceolate, both the surfaces strigose, 1.5×0.2 cm., inner calyx lanceolate, yellowish brown, apex acute and both surfaces strigose; corolla purplish red, tube basally cylindrical. Capsule ellipsoid, glabrous.

Flowering: August – November **Fruiting:** December – February.

Local Distribution: MPCAs area of North Bengal

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal), Bhutan, Nepal and Cambodia.

Status: Common

Uses: It is used to treat Snake bites, boils, sores.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3704]

DICLIPTERA Juss. in Ann. Mus. Natl. Hist. Nat. 9: 267. 1807; *nom. cons.*

Dicliptera bupleuroides Nees in Wall. in Pl. As. Rar. 3: 111. 1832; Ohashi in Hara in Fl. E. Himal. 1:301. 1966; Grierson et Long in Fl. Bhutan 2(3): 1292. 2001. *Dicliptera roxburghii* Anderson in J. Linn. Soc., Bot. 9: 519. 1867. *Justicia canescens* Wall. in Numer. List 72: n. 2423. 1830. *Dicliptera cardiocarpa* Nees in Pl. Asiat. Rar. 3: 111. 1832.

Herbs pubescent; branches hairy. Leaves opposite decussate, simple; margin 1–12 × 0.6 – 7 cm, ovate to lanceolate, cuneate, acuminate, thinly soft pubescent to glabrate. Flowers pink with purplish tinge, in terminal and axillary clustered cymes; bracts variable in shape, obovate, elliptic–oblong or linear–lanceolate, thinly pubescent, cuneate entire, obtuse to acute, mucronate, ciliate, calyx lobes linear. Capsule clavate, stipitate, puberulous or glabrate.

Flowering: January – March

Fruiting: April – May

Local Distribution: All over the forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal), Bhutan, Nepal and Cambodia.

Status: Common

Uses: It is used in cut wound to stop bleeding.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.1478]

HYGROPHILA R. Br. in Prodr. 479. 1810.

Hygrophila auriculata (Schumach.) Heine in Kew Bull. 16(2): 172. 1962; Majumdar in Bull. Bot. Soc. Bengal 19(1): 13. 1965; Guha Bakshi in Fl. Mur. Dist. 239. 1984. Cook, Aqua. Wetl. Pl. Ind. 35. 1996. *Astercanthus longifolia* (L.) Nees in Wall. in Pl. As. Rar. 3: 90. 1832 and Candolle in Prodr. 11: 247. 1887. '**Kulekhara**'

A stout, suffrutescent, 70 – 80 cm tall herb, armed with 8 axillary 1.8 – 3.5 cm long, straight or curved thorns at each node. Leaves in pseudo-whorls of 8, outer 2 larger, sessile, lanceolate, 5 – 2 × 1.5 – 2.5 cm, white–hairy, margins quietly dentate, base cuneate. Flowers in axillary, 2.5 cm long; bracts lanceolate 2.2 – 2.6 cm long, hairy; bracteoles linear, pilose; calyx 4 lobed, lanceolate, acute, limb 2–lipped, 4–lipped, lips subequal, higher lip 2–lobed, lower trilobite, lobes obtuse. Stamens 4, fertile; anthers oblong; ovary oblong, 8–ovuled, style filiform. Capsule oblong.

Flowering: May – August

Fruiting: September - November

Local Distribution: Throughout forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal), Bhutan, Nepal and Cambodia.

Status: Common

Uses: It is used in kidney infections, rheumatic arthritis, oedema, jaundice, gout and aphrodisiac.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4244]

Hygrophila polysperma (Roxb.) Anderson in J. Linn. Soc. (Bot.) 9: 456. 1867; Clarke in Hook. f. in Fl. Brit. Ind. 4: 406. 1884; Prain in Bengal Pl. 2: 597. 1903; Grierson et Long in Fl. Bhutan 2(3): 1252. 2001; Majumdar in Bull. Bot. Soc. Bengal 20(2): 112. 1966.

A stout suffrutescent herbs, 70 – 83 cm tall herb, armed 8 axillary, 2.3 – 4.5 cm long, curved thorns at each node. Leaves in pseudo-whorls 8, outer 2 larger, lanceolate. sessile, 5 – 3.3 × 1.5 – 3.5cm, hairy, margins dentate, base cuneate. Flowers axillary, 3.7 cm long; bracts lanceolate 3.2 – 2.8 cm long, hairy; bracteoles linear, 5–9.6 mm long. Calyx lanceolate with 4 lobed; stamens 4; anthers oblong; 8–ovuled, style filiform. Fruit capsule oblong.

Flowering: May – July

Fruiting: August – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Common

Uses: It is used in rheumatism, inflammation, jaundice, hepatic obstruction, pain, gout and aphrodisiac.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4844]

Hygrophila phlomoides Nees in Wall. in Pl. Asiat. Rar. 3: 80. 1832; Wood in Grierson et Long, Fl. Bhutan 2(3): 1252. 2001. *Cardanthera longifolia* Buch.-Ham. ex Nees in Prodr. 11: 90. 1847. *Ruellia phlomoides* Wall. in Numer. List 2376. 1830.

Perennial, erect herbs. 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 oblong, hirsute. Calyx white hirsute, 5-lobed; lobes linear; corolla

pinkish, pubescent, lower lip oblong, 3-lobed; upper lip triangular; stamens 4; ovary glabrous, style pubescent. Fruit capsule, pilose.

Flowering: October – November

Fruiting: November – January

Local Distribution: MPCAs area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Common

Uses: It is used to cure sore eyes, flatulence, fungal infections of skin.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3244]

JUSTICIA L. in Sp. Pl. 1: 15. 1753.

Justicia adhatoda L. in Sp. Pl. 1: 15. 1753, Grierson et Long in Fl. Bhutan 2(3): 1287. 2001. *Adhatoda vasica* Nees in Pl. As. Rar., 3: 103. 1832; Clarke in Hook. f. in Fl. Brit. Ind. 4: 540. 1885. *Adhatoda zeylanica* Medik. in Hist. and Commentat. Acad. Elect. Sci. Theod.-Palat. 6: 393. 1790. *Dianthera latifolia* Salisb. in Prodr. Stirp. Chap. Allerton 103. 1796. '**Basak**'

Shrubs, 2 – 3 m. Petiole puberulent; lamina elliptic, vate, 5 – 16 × 2 – 7.3 cm, entire, acuminate, base approximately cuneate. Inflorescence spikes terminal; bracts ovate to oblong; bracteoles linear to lanceolate. Calyx lobe linear to oblong, 5; lobes; corolla creamy white, tubular; upper lip ovate to oblong; lower lip oblong, circular, 3lobed; stamens exerted; anther thecae ellipsoid; ovary pubescent; style recurved. Fruit capsule, obovoid.

Flowering: January – March

Fruiting: April – June

Local Distribution: Throughout forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Common

Uses: It is used in asthma, cough, colds, bronchial catarrh, bronchodilator, bronchitis, and tuberculosis.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3254]

Justicia gendarussa Burm. f. in Fl. Ind. 10. 1768; Clarke in Hook. f. in Fl. Brit. Ind. 4: 532. 1885; Grierson et Long in Fl. Bhutan 2(3): 1287. 2001. *Gendarussa vulgaris* Nees in Wall. in Pl. As. Rar. 3: 104. 1832. *Justicia gandarussa* L. f. in Suppl. Pl. 85. 1782. *Ecbolium gendarussa* (Burm. f.) Kuntze in Revis. Gen. Pl. 2: 487. 1891. '**Kalakasunda**' Shrubs, 1 – 1.5 cm tall, ample branched. Stems swollen at nodes. Leaf margin lanceolate, 5 – 11 × 1 – 2.7 cm, glabrous, subsinuate, acute to just acuminate, base cuneate. Inflorescence spikes terminal, axillary, panicle; bracts triangular. Calyx 5 – 7 lobed; corolla creamy yellow, lower lip violet, cuneate-obovate, 3 lobed, upper lip violet. Fruit capsule clavate.

Flowering: January – March

Fruiting: April – June

Local Distribution: MPCAs area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Common

Uses: It is used in antispasmodic, carminative, antiperiodic, diaphoretic, chronic rheumatism.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3434]

Justicia diffusa Willd. in Sp. Pl. 1: 87. 1797; Clarke in Hook. f. in Fl. Brit. Ind. 4: 538. 1885; Grierson et Long in Fl. Bhutan 2(3): 1288. 2001. *Justicia procumbens* L. in Sp. Pl. 1: 15. 1753. *Rostellaria diffusa* (Willd.) Nees in Pl. Asiat. Rar. 3: 100. 1832.

Woody stems procumbent herbs. Petioles 2.6 mm; lamina lanceolate to suborbicular, 3 – 5.3 cm, minutely pubescent. Inflorescence spikes cymes, slender; bracts oblong-lanceolate. Calyx 5 parted, base splitting; 4 segments lanceolate; calyx segments and bracts ciliate, small; corolla small. Fruit capsule glabrous, oblong.

Flowering: July – August

Fruiting: September – November

Local Distribution: Throughout MPCAs area lower hills.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Endangered Species (IUCN).

Uses: It is used in coughs, asthma, and rheumatism.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3734]

Justicia japonica Thunb. in Fl. Jap. 20. 1784. *Justicia simplex* Don in Prodr. Fl. Nepal. 118. 1825; Clarke in Hook. f. in Fl. Brit. Ind. 4: 539. 1885; Grierson et Long in Fl. Bhutan 2(3): 1288. 2001. *Justicia japonica* Thunb. in Fl. Jap. 20.1784. *Rostellaria mollissima* Nees in Pl. Asiat. Rar. 3: 101. 1832.

Annual herbs. Leaves scariously hirsute, orbicular, blade 1.6 cm, apex rounded, with medium petioles. Spike dense, small. Bracts minutely short, base caudate, margin ciliate. Calyx 5-parted, segments not slender. Fruit capsule with pure white, pubescent.

Flowering: August – September

Fruiting: October – November

Local Distribution: Throughout forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Common

Uses: It is used in fever, asthma, pneumonia, rheumatism, tuberculosis, diuretic, antispasmodic, antiseptic.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3714]

LEPIDAGATHIS Willd. in Sp. Pl. 3: 400. 1800.

Lepidagathis incurva Buch.-Ham. ex Don in Prodr. Fl. Nepal. 119. 1825; Ohashi in Hara in Fl. Nep. 3:142.1982; Hara in Fl. E. Himal. 1: 303. 1966; Grierson et Long in Fl. Bhutan 2(3): 1286. 1991. *Lepidagathis hyaline* Nees in Wall. in Pl. As. Rar. 3: 95. 1832; Clarke in Hook. f. in Fl. Brit. Ind. 4: 521. 1885.

Ascending anisophyllous herbs, up to 87 cm. Stems sulcate, 4-angled. Leaf margin ovate to elliptic, 3 – 10 × 1 – 7 cm, base cuneate, entire, slightly sinuate, shortly acuminate. Spikes second, elongate; bracts lanceolate, long acuminate. Calyx glabrescent; posterior lobe and lateral lobes lanceolate; anterior lobes connate at base. Corolla pinkish white. Stamens marginally exserted. Ovary pubescent. Fruit capsule 5.3 mm, pubescent. Seeds subcircular.

Flowering: September – October

Fruiting: October – November

Local Distribution: All over the forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Vulnerable Species (IUCN)

Uses: It is used in diuretic, antispasmodic, antiseptic.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3794]

NELSONIA R.Br. in Prodr. 480. 1810.

Nelsonia canescens (Lam.) Sprengel in L. in Syst. Veg. ed. 16. 1: 42. 1824; Grierson et Long in Fl. Bhutan 2(3): 1250. 2001. *Nelsonia campestris* R. Br. in Prodr. Fl. Nov. Hall. 1: 481. 1810; Clarke in Hook. f. in Fl. Brit. Ind. 4: 394. 1884; Prain in Bengal Pl. 2: 594.1903.

Annual creeping, prostrate herbs. Stems villous, subterete. Basal leaves 6 – 11 × 3 – 7 cm, both surfaces villous, entire, base cuneate, acute. lamina elliptic to ovate, 1 – 3 × 1 – 1.5cm, inflorescence spikes 3 – 45.3 cm; bracts elliptic. Calyx 2-lobed; corolla bluish red; tube cylindric, filaments and ovary glabrous; ovules 4 – 11 in each locule. Fruit capsule, 6 – 17 ellipsoid seeded.

Flowering: February – May

Fruiting: April – July

Local Distribution: All over the forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Not Evaluated (IUCN)

Uses: It is used in managing pain and inflammation.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7694]

PHAULOPSIS Willd., Sp. Pl. 3: 4, 342. 1800; *nom. cons.*

Phaulopsis imbricata (Forsskal) Sweet in Hort. Brit. Ed. 1. 327.1826; Grierson et Long in Fl. Bhutan 2(3): 1275. 2001. *Phaulopsis parviflora* Willd. in Sp. Pl. 3: 342. 1800. *Aetheilema reniforme* Nees in Pl. Asiat. Rar. 3: 94. 1832.

Ascending anisophyllous herbs, 42 – 50 cm. Stems ascending, 5-angled. Petiole 4–7.3 cm; ovate, elliptic, 7 – 10 × 3 – 7.3 cm, acuminate, papery, entire, base cuneate, attenuate, slightly oblique. Spikes terminal with orbicular reniform bracts. Calyx ovate to elliptic. Corolla cremmy white; lower lip 3 with ovate-oblong lobed. Staminal filaments glabrous. Fruit capsule ellipsoid.

Flowering: October – December

Fruiting: December – February

Local Distribution: Throughout forest area.

General Distribution: India (Sikkim, Assam, Nagaland, Manipur, West Bengal); Bhutan, Nepal, Cambodia.

Status: Least Concern (IUCN)

Uses: It is used in pain, rheumatism, skin diseases, diarrhoea, dysentery, stomachache.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 7234]

PHLOGACANTHUS Nees in Wall. in Pl. Asiat. Rar. 3: 76, 99. 1832.

Phlogacanthus thyriformis (Roxb. ex Hardw.) Mabberley in Bot. Hist. Ohashi in Hara in Fl. E. Himal. 1: 303. 1966; Hara et al. in Enn. Fl. Pl. Nep. 3:143.1982; Grierson et Long in Fl. Bhutan 2(3): 1284. 1991. '*Jaglibasak*'

Shrub 2 – 8 ft tall. Leaves large, hairless, lance shaped 2 cm wide 20 cm long, tapering at both ends. Flowers 10 – 30 cm long, borne in thyrses. Sepals densely velvet-hairy, linear 6 – 8 mm long, bracts 6 mm long. Flowers 2-lipped, wide-tube-shaped, closely hairy, orange. Tube curved, broad from the base; lower lip spreading and upper lip nearly erect; stamens slightly hairy at base of filaments or hairy; style hairless. Fruit capsule hairless, somewhat quadrangular.

Flowering: February – March

Fruiting: February – April.

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland, Shillong) Nepal, Bhutan and Bangladesh.

Status: Not Evaluated (IUCN)

Uses: Used to treat cough, menorrhagia, fevers, asthma, pox, sore, scabies etc.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 4343]

RUNGIA Nees in Wall. in Pl. Asiat. Rar. 3: 77, 109. 1832.

Rungia pectinata (L.) Nees in Candolle in Prodr. 11: 470. 1847; Grierson et Long in Fl. Bhutan 2(3): 1291. 2001. Guha Bakshi in Fl. Mur. Dist. 244. 1984. *Justicia pectinata* L. in Torner, Cent. II: Pl. 3. 1756; Amoen. in Acad. 4: 299. 1760. *Dicliptera pectinata* (L.) Juss. in Ann. Mus. Hist. Nat. 9: 169. 1807.

Annual, prostrate herbs, rooting from nodes, 41 – 50 cm. Leaf margin oblong to elliptic, 1 – 4 × 0.5 – 2.3 cm, acute, glabrous, entire, base cuneate. Inflorescence terminal and axillary, 1 sided, to compound to solitary; bracts dimorphic; sterile bracts green, elliptic;

fertile bracts circular, obovate, pubescent, roughly hyaline. Calyx pubescent; lobes linear to lanceolate, narrowly hyaline; corolla lip 3-lobed, triangular; upper lip ovate; staminal filaments short, glabrous. Fruit capsule, ellipsoid.

Flowering: March – May

Fruiting: April – September

Local Distribution: Throughout the forest area.

General distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland, Shillong); Nepal, Bhutan and Bangladesh.

Status: Not Evaluated (IUCN)

Uses: It is used to treat small pox, relieve pain and reduce swelling.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 9843]

THUNBERGIA Retz. in Physiogr. Salsk. Handl. 1(3): 163. 1780; *nom. cons.*

Thunbergia fragrans Roxb. in Pl. Coromandel 1: 47. 1795; Grierson et Long in Fl. Bhutan 2(3): 1247. 2001. *Roxburghia rostrata* Russell ex Nees in Prodr. 11: 57. 1847. *Thunbergia volubilis* Pers. in Syn. Pl. 2: 179. 1806.

Large herbaceous. Stems sulcate, 4-angled. Petiole hirsute; lamina ovate to oblong, lanceolate, 5 – 15 × 2.3 – 7 cm, glabrous, palmately 3 – 7veined, acuminate, sinuate to coarsely dentate, base rounded to cuneate. Flowers solitary, axillary; bracteoles ovate. Calyx dentate; corolla greenish yellow, cylindrical; lobes obovate; staminal filaments long, glabrous; anther divergent; style exerted; stigma funnel like. Fruit capsule.

Flowering: May – July

Fruiting: August – September

Local Distribution: All over the MPCAs of lower hills.

General distribution: India (Assam, Sikkim, West Bengal, Tripura); Nepal, Bhutan and Bangladesh

Status: Not Evaluated (IUCN)

Uses: It is used as antifungal, antinociceptive, antipyretic, antimutagenic, antibacterial, antidiabetic, anti-inflammatory, antioxidant, anti-drug, antidote.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 9343]

Thunbergia grandiflora (Roxb. ex Rottler) Roxb. in Bot. Reg. 6: 495. 1820; Grierson et Long in Fl. Bhutan 2(3): 1248. 2001. *Flemingia grandiflora* Roxb. ex Rottler in Neue

Schriften Ges. Natur f. in Freunde Berlin 4: 202. 1803. *Thunbergia chinensis* Merrill in Philipp. J. Sci. 21(5): 510. 1922. *Thunbergia cordifolia* Nees in Prodr. 11: 35. 1847.

Large, woody vines 11 – 15 m. Stems 5-angled. Petiole furrowed; lamina ovate to triangular 5 – 17 × 3 – 11 cm, papery, palmately 3 – 9 veined, undulate, acute to acuminate, base cordate to truncate. Flowers solitary, arranged in terminal racemes. flowers 2 – 6; bracts subulate. Calyx lobed, campanulate. Corolla bluish white; limb actinomorphic; lobes ovate. filaments 6 – 10.2 mm; anther pubescent. Style glabrous. Seeds ovate.

Flowering: May – August

Fruiting: July – September

Local Distribution: Throughout the forest area of terai and duars.

General distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland); Nepal, Bhutan and Bangladesh.

Status: Not Evaluated (IUCN)

Uses: It is used in hedges and for fuelwood.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 1243]

CAMPANULIDS

APIALES Nakai 1930.

APIACEAE Lindley in Nat. Syst. ed. 2. 21. 1836; *nom. cons.*

CENTELLA L. in Sp. Pl., ed. 2, 2. 1393. 1763.

Centella asiatica (L.) Urb. in Mart. Fl. Brass. 11: 287. 1879; Datta et Majumder in Bull. Bot. Soc. Bengal 20(2): 93. 1966. Guha Bakshi in Fl. Mur. Dist. 149. 1984. *Hydrocotyle asiatica* L. in Sp. Pl. 1: 234. 1753; Clarke in Hook. f. in Fl. Brit. Ind. 2: 669. 1879; Grierson et Long in Fl. Bhutan 2(2): 446. 1999; Prain in Bengal Pl. 1: 391. 1903.

‘Thankuni’

Fleshy, weak, numerous roots, creeping herbs. Lamina reniform, orbicular, peduncle very short. flower erect small, ovate embracing, pink. Inflorescence axillary, simple, umbel 3 – 7 with flowers. Pericarps not condensed. Seeds compressed.

Flowering: July – August

Fruiting: September – January

Local Distribution: Throughout the forest area of Terai and Duars.

General Distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland); Bhutan, China, Nepal, Pakistan, Indonesia, Japan, Korea, Laos and Malaysia.

Status: Endangered species (IUCN 2020)

Uses: It is used for the treatment of several skin diseases such as leprosy, lupus, varicose ulcers, psoriasis, diarrhoea, fever etc.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3658]

ERYNGIUM L. in Sp. Pl. 1: 232. 1753.

Eryngium foetidum L. in Sp. Pl. 1: 232. 1753; Grierson et Long in Fl. Bhutan 2(2): 447. 1999. '*Belati dhoniya*'

Herbs, 20 – 35 rosette. Stem green. Basal leaves plentiful; petiole obsolete; lamina lanceolate, 5 – 35 × 2 – 5.2 cm, obtuse, crenate, finely serrate, base decurrent to cuneate. Upper leaves sessile. Inflorescence trifurcate. Flower heads cylindrical; margin 1–5 serrate, spinulose. Calyx teeth acute, ovate to lanceolate; petals white to yellow; styles erect. Fruit ovoid to oblong.

Flowering: April – July

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland, Shillong); Bhutan, China, Nepal.

Status: Not Evaluated

Uses: It is used for fevers, burns, earache, constipation, hypertension, fits, asthma, stomachache, worms, snake bites, diarrhea, and malaria.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3648]

OENANTHE L. in Sp. Pl. 1: 254. 1753.

Oenanthe javanica (Bl.) Candolle in Prodr. 4: 138. 1830; Grierson et Long in Fl. Bhutan 2(2):486. 1999. *Sium javanicum* Bl. in Bijdr. 15: 881. 1826. *Oenanthe bengalensis* Benth. et Hook. in Gen. Pl. 1: 906: 1862; Clarke in Hook. f. in Fl. Brit. Ind. 2: 696. 1879; Prain in Bengal Pl. 1: 394. 1903.

Herbs, growing in wet places, particularly in shade places. Lamina 1 – 5 pinnate, secondary, lanceolate, deeply pinnatifid, ovate, pale green. Flowers polygamous. Calyx minute. Fruit ellipsoid, furrowed, terete.

Flowering: January – April

Fruiting: March – May

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland, Shillong); Bhutan, China, Nepal,

Status: Not Evaluated

Uses: It is used for treating jaundice, alcohol hangovers, abdominal pain, acute hepatitis, and inflammatory conditions.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3148]

SESELI L. Sp. Pl. 1: 259. 1753

Seseli diffusum (Roxb. ex Sm.) Santapou et Wagh in Bull. Bot. Surv. Ind. 5(2): 108. 1963. *Ligusticum diffusum* Roxb. ex Sm. in Rees Cyclop 21: 11. 1812. *Cnidium diffusum* Candolle in Prodr. 4: 153. 1830. *Seseli indicum* Wight et Arn. in Prodr. 371. 1874; Clarke in Hook. f. in Fl. Brit. Ind. 2: 693. 1879; Prain in Bengal Plants 1: 393. 1903. '*Ban Jowan*'

Annual Erect or diffuse herb with pubescent branches. Lamina lanceolate, oblong, petiolate, pinnate with 2 – 5 pairs; cauline, smaller, crisped, allhairy, especially short hairs. Flowers pink, compound umbels. Fruit globose, glabrous.

Flowering: January – March

Fruiting: February – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland); Bhutan, China, Nepal.

Status: Not Evaluated

Uses: It is used for treating jaundice, alcohol hangovers, acute hepatitis.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 3658]

ARALIACEAE Juss. in Gen. Pl. 217. 1789.

HYDROCOTYLE L. in Sp. Pl. 1: 234. 1753.

Hydrocotyle sibthorpioides Lam. in Encycl. Meith. 3:153. 1789; Ohashi in Hara in Fl. E. Himal. 1:230.1966; Hara et al. in Enn. Fl. Pl. Nep. 2:187. 1979; Grierson et Long in Fl. Bhutan 2(2):444. 1999. *Hydrocotyle rotundifolia* Roxb. ex Candolle in Prodr. 4:64. 1830; Hook. f. in Fl. Brit. Ind. 2:668. 1879. '*Chhotomanimuni*'

Strongly creeping aromatic herbs. Stem slender, weak, filiform. margin reniform, 0.5 – 1.5× 0.9 – 2.3 cm; membranous, shallowly 5–9 rounded lobed. Inflorescence solitary, each inflorescence contain 5–10 flowered. Petals greenish yellow. Fruit globose.

Flowering: April – July

Fruiting: June – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Tripura, Nagaland, Shillong); Bhutan, China, Nepal.

Status: Not Evaluated

Uses: It is used treatment coughs, influenza, boils, bruises, cirrhosis, colds, hepatitis, hepatoma, itch, jaundice, sore throat.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3518]

CAMPANULACEAE A. Jussieu in Gen. Pl. 1789; *nom. cons.*

LOBELIA Linnaeus in Sp. Pl. 2: 929. 1753.

Lobelia alsinoides Lam. in Dict. Bot. 3: 588. 1791. *Lobelia trigona* Roxb. in Hort. Bengal 85. 1814; Prain in Bengal Pl. 1: 633. 1903; Cook, Aquat. in Wetl. Pl. Ind. 82. 1996.

Helophytes; prostrate or decumbent, glabrous herbs. Stem winged. Leaves alternate; lamina cordate, serrate. Calyx lobe linear; corolla 2-lipped, blue; stamens connate above middle of filaments. Capsule with trigonous seeds.

Flowering: September – November

Fruiting: November – December

Local Distribution: Throughout the forests of terai and duars.

General Distribution: Throughout India, SE Asia, Sri Lanka, Laos, New Guinea, Japan.

Status: Common

Uses: It is used for breathing problems.

Specimen Examined: West Bengal, Darjeeling, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No. 6064]

Lobelia zeylanica L. in Sp. Pl. 2: 932. 1753; Cook in Aqua. Wetl. Pl. Ind. 82. 1996.

Lobelia affinis Wallich and Don in Gen. Hist. 3: 709, descr. 1834.

Lobelia succulenta Blume in Bijdr. Fl. Ned. Ind. 13: 728. 1826.

Helophytes; succulent, prostrate herbs. Stems 4-angular, glabrous or puberulent. Leaves alternate; lamina deltoid-ovate, abaxially sparsely scaberulose along veins, serrulate. Flowers solitary or axillary; calyx campanulate, puberulent, ciliate; corolla 2-lipped, purple- white; Filaments connate into a tube; ovary inferior. Capsule broadly ellipsoid.

Flowering: September – December **Fruiting:** November – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India, SE Asia, Sri Lanka, Laos, New Guinea, Japan

Status: Common

Uses: It is used for breathing problems.

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.6064]

WAHLENBERGIA Schumacher, Beskr. Guin. Pl. 387. 1827.

Wahlenbergia marginata (Thunberg) A. DC. in Mon. Camp. 143. 1830; Majumder in Ind. Agr. 6: 156. 1962. *Campanula marginata* Thunberg in Fl. Jap. 89. 1784. *Wahlenbergia gracilis* Schreber in Blumend. 38. 1827; Hooker f., Fl. Brit. Ind. 3: 429. 1881; Prain in Bengal Pl. 1: 468. 1903.

Helophytes; annual, glabrous or sparsely hairy, erect or procumbent herbs. Lamina oblanceolate, margin undulate, denticulate, sparsely pilose. Flowers on long pedicel, erect; calyx linear; corolla campanulate, blue. Capsules obconical; seeds compressed – ellipsoid.

Flowering: September – December **Fruiting:** November – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India, SE Asia, Sri Lanka, Laos, Japan, Korea, Papua New Guinea; naturalized in the Pacific islands and N America.

Status: Common

Specimen Examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.6064]

ASTERALES Link. 1829

ASTERACEAE Link in Handb. 1: 731. 1829;

ACMELLA Rich. in Syn. Pl. 2: 472. 1807.

Acmella paniculata (Wall. ex Candolle) Jansen in Syst. Bot. Monogr. 8: 67. 1985; Grierson et Long in Fl. Bhutan 2(3): 1605. 2001. *S. paniculata* Wallich ex Candolle in Prodr. 5: 625. 1836. *S. acmella* var. *paniculata* (Wall. ex Candolle) Clarke in Comp. Ind. 139. 1876.

Annual ascending branched herbs. Petiole 1 – 3.6 cm; lamina ovate to lanceolate, 2 – 5 × 1 – 4.2 cm, base cuneate, crenate, serrate, acute tip. Capitula solitary, discoid, terminal; phyllaries 9 – 11, ovate to lanceolate. Florets 110 – 210; corollas minute, tubular, 4 to 5 lobed. Achenes obovoid, 3 angled.

Flowering: June – August

Fruiting: August – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Sikkim, Assam, Nagaland, Tripura); Bhutan, Bangladesh, Nepal, Sri Lanka, Indonesia, Laos, Malaysia.

Status: Least concern (IUCN).

Uses: Its uses for spices, as antiseptic, antifungal, antibacterial and antimalarial.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.02.2018, Mallick, et al [Field No. 1478]

Acmella calva (Candolle) Jansen in Syst. Bot. Monogr. 8: 41. 1985; Grierson et Long in Fl. Bhutan 2(3): 1605. 2001. *Spilanthes calva* Candolle in Contr. Bot. Ind. 19. 1834; Ohashi in Fl. E. Himal. 2: 141. 1971. *Spilanthes acmella* var. *calva* (Candolle) Clarke in Comp. Ind. 138. 1876; Clarke in Hook. f. in Fl. Brit. Ind. 3: 307. 1881

Perennial creeping prostrate herbs. Stems 55 – 65 cm. Petiole 4 – 8.3 mm; margin lanceolate, 3 – 8 × 1 – 3.3 cm, base cuneate, acuminate. Capitula conical, ovoid; phyllaries 7 – 11, 2 seriate, subequal, ciliate, ovate; receptacle conical. Corollas yellow; lamina short, obovate, shallowly 3-lobed; disk florets bisexual, 4 to 5 toothed.

Flowering: July – August

Fruiting: August – October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland); Bhutan, Bangladesh, Nepal, Sri Lanka.

Status: Common

Uses: Its uses for toothache pain. Inflammation of the mouth, Diuretic, Gastric ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 21.06.2019, Mallick, et al [Field No. 5578]

Acmella uliginosa (Swartz) Cassini in Dict. Sci. Nat., ed. 2. 24: 331. 1822.
Ceratocephalus acmella var. *uliginosa* Kuntze in Revis. Gen. Pl. 1: 326. 1891.
Spilanthes acmella L. in Syst. Veg., ed. 13. 610. 1774.

Herbs root creeping at nodes, 1.3 – 1.8 m high; stems subglabrous. Leaves ovate, obtuse, attenuate, undulate, 1.7 – 6.2 × 1.3 – 3.8 cm, both surfaces glabrous. Heads radiate, ovoid, sub paniculate, 4 – 7.2 × 3 – 6.3 mm elongate; peduncles 1.1 – 5.7 cm long. Involucral bracts 4 – 10, uniseriate, ovate, lanceolate, obtuse, fimbriate at the margins. Inflorescence ray florets, 5; corolla 2 – 3 rounded lobes; tip – 3.5 mm long; style short. Disc florets many; corolla funnel like, 2.7 mm long, 4 lobed. Fruit achenes, dimorphic, margins sparsely ciliate.

Flowering: June – August

Fruiting: August – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland); Bhutan, Bangladesh, Nepal, Sri Lanka.

Status: Common

Uses: Its uses for toothache pain. and Gastric ulcers.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, det al. [Field No. 3580]

AGERATINA Spach in Hist. Nat. Veg. Phan. 10: 286. 1841.

Ageratina adenophora (Spreng.) King and Robins. in Phytologia 19: 211. 1970.
Eupatorium adenophorum Spreng. in Syst. Veg. 3: 420. 1826; Uniyal in Fl. Ind. 12: 350. 1995. *Eupatorium glandulosum* Kunth in Nov. Gen. Sp. 4: 122, t. 346. 1820; Matthew in Rec. Bot. Surv. Ind. 20:135. 1969.

Shrubs with violet-blue stem, glandular hairy; leaves opposite, 7 – 8 × 4.2 – 4.8 cm, acute, ovate, serrate; petiole 2.3 cm long. Heads 7 – 8.6 mm across. Terminal inflorescence panicle, corymbose; bracts 3 -seriate, strongly 3-ribbed, lanceolate; bisexual flower; corolla whiteish yellow, tube narrow, campanulate 5-lobed. Fruit achenes ellipsoid, curved, 5 angled, brown red in colour; pappus 5 – 12.

Flowering: February – June

Fruiting: April – August

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Tripura); Bhutan, Bangladesh, Nepal, Sri Lanka.

Status: Least concern (IUCN 2021).

Uses: It is used in wound, skin diseases, itching, measles, uterine bleeding.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.06.2018, Mallick, et al [Field No. 5578]

AGERATUM L. in Sp. Pl. 2: 839. 1753.

Ageratum conyzoides L. in Sp. Pl. 2: 839. 1753; Clarke in Fl. Brit. Ind. 3: 243. 1881; Hajra et al. in Fl. Ind. 12: 348. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1627. 2001. *Ageratum arsenei* Robinson in Contr. Gray Herb. 64 3. 1922. '*Uchunti jhar*'.

Annual erect branched herbs, 72 – 80 cm. Leaves ovate/triangular; leaves 2 – 6 × 2 – 5.3 cm; upper leaves small; both surfaces densely pubescent, base cordate, crenate, acute. floescence corymbose. Capitula 6 – 19; involucre campanulate; corolla tubular; limb purplish yellow; lobes pubescent.

Flowering: June – July

Fruiting: August – October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Sikkim, Tripura, Nagaland); Bhutan, Bangladesh, Nepal, Sri Lanka, Myanmar.

Status: Common.

Uses: It is used to treat fever, headache, rheumatism, dyspepsia, wounds caused by burns, uterine disorders and pneumonia.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 11.03.2019, Mallick, et al [Field No. 7778]

Ageratum houstonianum Mill. in Gard. Dict. ed. 8, Ageratum no. 2. 1768; Grierson et Springate in Fl. Bhutan 2(3): 1627. 2001. *A. conyzoides* var. *mexicanum* (Sims) Candolle in Prodr. 5: 108. 1836. *Carelia houstoniana* (Miller) Kuntze in Revis. Gen. Pl. 1: 325. 325. 1891. *Ageratum cordifolium* Roxb. in 415. 1832. [Photoplate -IV] '*Uchuntijhar*'.

Annual erect herbs. Stems simple robust, stems and branches greenish yellow, thickly spreading long tomentose. Leaves alternate; margin ovate, elliptic, oblong, 3 – 9 × 2 – 7 cm; upper leaves smaller, oblong, base obtuse, cuneate, crenate, acute. Capitula 4 – 13; involucre campanulate; phyllaries 2 seriate, lanceolate; corollas limb, 5 lobed. Fruit achenes blackish white.

Flowering: February – March

Fruiting: May – October

Local Distribution: MPCAs area of terai and duars of North Bengal

General Distribution: India (Sikkim, West Bengal, Assam, Tripura); Bhutan, Thailand, Bangladesh, Nepal and Indonesia.

Status: Common.

Uses: It is used to cure burns and wounds.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 11.06.2019, Mallick, et al [Field No. 7778]

ARTEMISIA L. in Sp. Pl. 2: 845. 1753.

Artemisia indica Willd. in Sp. Pl. ed. 4, 3(3): 1846. 1803; Hara et al. in Enn. Fl. Pl. Nep. 3: 12. 1982; Hajra et al. in Fl. Ind. 12: 27. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1559. 2001. *A. indica* var. *indica* Willd. in Sp. Pl., ed. 4. 3: 1846. 1803. '*Nagnishinda*'.

Perennial, much branched, subshrubs, of 2 m height. Leaves shortly petiolate, tomentose, ovate to oblong-ovate, 9 – 15 × 5 – 7 cm, pinnati partite. Capitula sessile. Involucre oblong, broadly ovoid; phyllaries puberulent. Florets 16 – 21. Female florets 4 – 10; corolla tubular, Disk florets bisexual, 9 – 15, base glandular. Achene brown, oblong or obovoid.

Flowering: August – October

Fruiting: September – November

Local Distribution: Forest areas of MPCAs.

General Distribution: India (West Bengal, Assam, Sikkim, Tripura, Manipur); Bangladesh, Bhutan, Myanmar, Nepal and Sri Lanka.

Status: Common.

Uses: It is used in anthelmintic, antispasmodic, antiseptic, expectorant and stomachic.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.06.2018, Mallick, et al [Field No. 7865]

BIDENS L. in Sp. Pl. 831. 1753.

Bidens pilosa L. in Sp. Pl. ed. 2: 832. 1753; Clarke in Fl. Brit. Ind. 3: 309. 1881; Hara et al. Enn. Fl. Pl. Nep. 3: 15. 1982; Grierson et Springate in Fl. Bhutan 2(3): 1619. 2001. *Bidens alba* (L.) Candolle in Prodr. 5: 605. 1836. *Coreopsis alba* L. in Sp. Pl. 2: 908. 1753.

Annual, erect or ascending, herbs, of 1 m. Lamina ovate to broadly lanceolate, 40 – 100 × 12 – 27 mm, 3 – 7-lobed, truncate to cuneate, serrate or entire, attenuate. Inflorescence solitary capitula or lax corymbs. Capitula radiate; bracts spatulate to

linear; phyllaries 8 to 10, lanceolate to narrowly oblanceolate. Florets yellow or whitish. Achenes red-brown or blackish.

Flowering: June – July

Fruiting: August – September

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Bhutan, Bangladesh, Nepal, Sri Lanka, Myanmar.

Status: Common

Uses: It is used in Anti-inflammation, Antimalarial Diuretic, Antibacterial treatment.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 18.07.2019, Mallick, et al [Field No. 7555]

BLUMEA Candolle in Arch. Bot. (Paris) 2: 514. 1833.

Blumea lacera (Burm. f.) Candolle in Contr. Bot. Ind., 14. 1834; Hook. f. in Fl. Brit. Ind. 3: 263. 1881; Hajra et al. in Fl. Ind. 13: 128. 1995. *B. hieraciifolia* Hook. f. et Thom. in Fl. Brit. Ind. 3(8): 267. 1881. *B. lacera* var. *cinerascens* (Candolle) Hook. f. in Fl. Brit. Ind. 3(8): 263. 1881. *B. hieraciifolia* Hook. f. et Thomson in Fl. Brit. Ind. 3(8): 267. 1881. '*Kukur mota*'

Biennial or annual, erect, few branched, herbs, of 1 m long. Leaves sessile or petiolate, elliptic or oblong, 12 – 16 × 3 – 5 cm, attenuate, obtuse. Capitula dense, in axillary-terminal panicles. Involucres cylindric-campanulate; phyllaries 2 or 3-seriate. Receptacle convex, glabrous. Florets 2 – 5 lobed, yellow. Achene oblong.

Flowering: March – May

Fruiting: April – June

Local Distribution: Forest areas of MPCAs.

General Distribution: India (Assam, Sikkim, West Bengal); Bangladesh, Bhutan, Nepal and Sri Lanka.

Status: Common

Uses: It is used in antipyretic, bronchitis, fevers, burning and thirst sensations.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.08.2018, Mallick, et al [Field No. 7755]

CHROMOLAENA Candolle in Prodr. 5: 133. 1836.

Chromolaena odorata (L.) King et Harold Robinson in Phytologia 20: 204. 1970; Grierson et Springate in Fl. Bhutan 2(3): 1628. 2001. *Eupatorium odoratum* L. in Syst.

Nat. ed. 10: 1205. 1759; Clarke in Fl. Brit. Ind. 3: 244. 1881; Uniyal in Fl. Ind. 12: 354.1995. '*Assamlata*'.

Procumbent, perennial herbs. Stem erect, to 3 m. Leaves opposite, ovate-triangular, 4 – 10 × 3 – 5 cm, 3-veined basally, truncate to cordate, coarsely crenate or serrate, acute. Capitula in simple or compound corymbs, numerous. Florets white. Achenes black-brown.

Flowering: April – June

Fruiting: June - December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Assam, West Bengal, Sikkim, Nagaland, Manipur); Bhutan, Bangladesh, Nepal, Sri Lanka, Myanmar.

Status: Common.

Uses: It is used in wound healing, burns, and skin infections.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 13.04.2018, Mallick, et al [Field No. 7665]

CRASSOCEPHALUM Moench in Methodus 516. 1794.

Crassocephalum crepidioides (Benth.) Moore in J. Bot. 50: 211.1912; Hara et al. in Enn. Fl. Pl. Nep. 3: 22. 1982; Hajra et al. in Fl. Ind. 13: 201. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1597. 2001. *Gynura crepidioides* Benth. in Fl. Niger. 438. 1849.

Erect, annual, herbs, up to 1.3 m. Lamina oblong-elliptic to elliptic, 9 – 12 × 3 – 5 cm, cuneate, pinnately lobed at base, acuminate, serrate. Capitula numerous, in terminal cymes. Involucres cylindrical. Phyllaries uniseriate, linear-lanceolate. Floret tubular, red-brownish. Achenes brownish, narrowly oblong.

Flowering: April – July

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, West Bengal, Manipur); Bhutan, Bangladesh, Nepal, Sri Lanka, Myanmar.

Status: Common.

Uses: It is used to treat indigestion, stomach, headaches, epilepsy.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.04.2019, Mallick, et al [Field No. 7965]

CYANTHILLIUM Bl. in Bijdr., Fl. Ned. Ind. 15: 889. 1826.

Cyanthillium cinereum (L.) Robinson in Proc. Biol. Soc. Wash. 103: 252. 1990; Grierson et Springate in Fl. Bhutan 2(3): 1488. 2001. *Conyza cinerea* L. in Sp. Pl. 2: 862. 1753.

Annual, few branched, erect, herbs, up to 1 m. Leaves petiolate, rhombic-oblong to oblong, 4 – 7 × 2 – 3 cm, attenuate into winged petiole, acute. Heads terminal, many. Involucre cylindric-campanulate; phyllaries 4-seriate. Florets 15 – 30, tubular, reddish purple. Achenes cylindric. Pappus whitish.

Flowering: January – August

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Sikkim, Nagaland, Manipur); Bhutan, Bangladesh, Nepal, Sri Lanka.

Status: Common

Uses: It is used in asthma, cancer, cholera, colic pain, cough, dysentery, impotency and night-blindness.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.04.2018, Mallick, et al [Field No. 7965]

ECLIPTA L. in Mant. Pl. 157, 286. 1771.314.

Eclipta prostrata (L.) L. in Mant. Pl. 2: 286. 1771; Hajra et al. in Fl. Ind. 12: 381. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1623. 2001. *Verbesina prostrata* L. in Sp. Pl. 2: 902.1753. *Verbesina alba* L. in Sp. Pl. 2: 902.1753. '**Kesut**'.

Erect, ascending or prostrate, annual herbs, up to 50 cm. Leaves lanceolate, 4 – 11 × 1 – 2 cm, papery, cuneate, serrulate, acuminate. Capitula axillary-terminal; involucre campanulate; phyllaries 2-seriate, 4 to 6, oblong. Achenes ribbed.

Flowering: January – July

Fruiting: August – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, Nagaland, West Bengal, Manipur); Bhutan, Bangladesh, Nepal, Sri Lanka.

Status: Common.

Uses: It is used in hemoptysis, hematuria, epistaxis, hematemesis, and uterine bleeding.

Specimen examined: West Bengal, Darjeeling, North Sevok (MPCA). 12.04.2019, Mallick, et al [Field No. 7965]

ELEPHANTOPUS L. in Sp. Pl. 2: 814. 1753.

Elephantopus scaber L. in Sp. Pl. 2: 814. 1753; Ben. Pl. 1: 590. 1903. *E. scaber* var. *albiflorus* Kuntze in Revis. Gen. Pl. 1: 335. 1891. '**Hasti Pada**'

Herbs, perennial. Rhizomes with fibrous roots, procumbent or obliquely ascending. Stems dichotomously branched, erect, densely hirsute, slightly scabrid. Basal leaves persistent by anthesis, rosulate, spatulate or oblanceolate, abaxially densely hirsute and glandular, 4.9 – 17.8 × 2.1–3.8 cm, base gradually attenuate into short, adaxially sparsely hirsute, margin crenate–serrate, broad petiole, apex shortly acute or rounded; cauline leaves small and few, progressively smaller towards apex, oblanceolate or oblong–lanceolate. Synflorescence surrounded by leaflike bracts, densely aggregated in compound heads; bracts oblong–ovate or broadly ovate, glandular and hirsute, with conspicuously raised veins, apex acuminate. Involucre narrow; phyllaries apically purple–red or green 1 – 3 veined, hirtellous and glandular, oblong–lanceolate, apex spinescent and acuminate. Capitula many. Florets herbaceous, purplish or pink; corolla 7.1 – 9.2 mm. Achenes oblong–linear, puberulent. Pappus of 5/6 basally widened bristles, sordid white.

Flowering: October – January

Fruiting: October – January

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: America, India (Assam, Meghalaya, Orissa, Uttar Pradesh); Nepal, Bhutan, Nagaland and Tripura.

Status: Common

Uses: Used to treat diuresis, fever, bladder stones, nephritis, scabies, edema, dampness, and leukemia.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 22.02.2020, Mallick, et al. [Field No.3686]

ELEUTHERANTHERA Poiteau in Bull. Sci. Soc. Philom. Paris 3(no. 66): 137. 1802.

Eleutheranthera ruderalis (Sw.) Sch.-Bip. in Bot. Zeitung (Berlin) 24: 165. 1866; Grierson et Springate in Fl. Bhut, 2(3): 1606. 2001. *Melampodium ruderalis* Sw. in Fl. Ind. Occid. 3: 1372. 1806. *Gymnopsis microcephala* Gardner in London Jour. Bot. 7 292. 1848. [Photo Plate -VI]

Annual, small, erect, herbs, up to 40 cm. Petiole green, 1– 3 cm; lamina ovate, 3 – 8 × 2 – 4 cm, 3-veined, pubescent, obtuse, acute to acuminate, entire or crenulate-dentate. Inflorescence terminal-axillary. Capitula discoid; phyllaries 2-seriate. Florets 2 – 6; anthers black. Achenes angled.

Flowering: June – August

Fruiting: August – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, West Bengal, Sikkim, Nagaland, Manipur); Bhutan, Bangladesh, Sri Lanka, Nepal.

Status: Common.

Uses: It is used high blood pressure, cuts, wounds, rheumatic pain.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.04.2018, Mallick, et al [Field No. 8765]

EMILIA Cassini in Bull. Sci. Soc. Philom. Paris: 68. 1817.

Emilia sonchifolia (L.) Candolle ex Candolle in ‘Wight, Contr. Bot. Ind.,’ 24. 1834; Prain in Bengal Pl. 1: 444.1903; Hajra et. al. in Fl. Ind. 13: 212. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1598. 2001. *Cacalia sonchifolia* L. in Sp. Pl.: 835. 1753; Hook. f. in Fl. Brit. Ind. 3: 336. 1881.

Annual, ascending or erect herbs, of 40 cm height. Leaves green, often purple, 6 – 12 × 3 – 7 cm; lobes large, ovate-triangular, obtuse, irregularly dentate; oblong-lanceolate, obtuse or acute, bluntly dentate. Leaves sessile, small, ovate-lanceolate; upper leaves linear. Capitula erect, usually 3 – 5. Phyllaries 8 or 9, oblong to linear. Florets purplish or pinkish. Achenes cylindrical.

Flowering: June – August

Fruiting: July – October

Local Distribution: All over area of forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka and Myanmar.

Status: Common.

Uses: It is used in diarrhea, nyctopia, gastropathy, ophthalmic, fevers and asthma.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 17.08.2018, Mallick, et al [Field No. 8765]

ENYDRA Lour. in Fl. Cochinch. 2: 510. 1790.

Enydra fluctuans Lour. in Fl. Cochinch. 511. 1790; Clarke in Fl. Brit. Ind. 3: 304. 1881; Hajra et al. in Fl. Ind. 12: 384. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1614. 2001. ‘*Helencha*, *Hincha*’.

Biennial, fleshy, prostrate, herbs, to 70 cm long. Leaves sessile, oblong, 4 – 6 cm × 6 – 12 mm, glabrous, amplexicaul, serrate, obtuse or acute. Capitula terminal-axillary. Ray florets 3 or 4-lobed. Disk florets 5-lobed. Achenes cylindrical.

Flowering: November – February

Fruiting: February – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (West Bengal, Assam, Sikkim, Nagaland, , Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka, Myanmar.

Status: Least concern (IUCN).

Uses: It is used in ascites, anasarca, dropsy and snakebite.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 18.08.2018, Mallick, et al [Field No. 4565]

GALINSOGA Ruiz et Pav. in Fl. Peruv. Prodr. 110, plate 24. 1794.

Galinsoga parviflora Cavanilles in Icon. 3: 41. 1795; Grierson et Springate in Fl. Bhutan 2(3): 1610. 2001.

Erect or Suberect herbs, to 40 cm long. Lamina 1 – 15 × 1 – 8 cm. Peduncles 2 – 3 cm; involucre cylindrical-campanulate; phyllaries persistent, elliptic to obovate, 3-lobed. Ray florets 5, dull white. Disk florets 25 – 50. Pappus absent..

Flowering: July – September

Fruiting: October – December

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Common

Uses: It is used in wound healing, toothache, cold, flu, dermatological and eye diseases

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 17.08.2018, Mallick, et al [Field No. 4189]

GNAPHALIUM L. in Sp. Pl. 2: 850. 1753.

Gnaphalium luteo-album L. ssp. *affine* (Don) Koster in Blumea 4(3): 484.1941; Grierson et Springate in Fl. Bhutan 2(3): 1522. 2001. *G. affine* Don in Prodr. Fl. Nep. 173. 1825. *G. luteo-album* var. *multiceps* Candolle in Prodr. 6: 222. 1838; Hook. f., Fl. Brit. Ind. 3: 288. 1881.

Perennial herbs, densely white tomentose, to 44 cm long. Leaves thin, spatulate, 2 – 5 × 6 – 9cm, sessile, decurrent, rounded, angular, entire, white woolly. Heads aggregated

densely in terminal corymbs, numerous. Involucre campanulate, bracts 3-seriate, pale green. Florets many. Achene compressed, oblong, papillose. Pappus white.

Flowering: January – May

Fruiting: May – November

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Endangered species (IUCN 2020)

Uses: It is used to Breast cancer, diuretic, as astringent, cholagogue.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 16.08.2019, Mallick, et al [Field No. 7189]

Gnaphalium purpureum L. in Sp. Pl. 2: 854. 1753; Hook. f. in Fl. Brit. Ind 3: 289. 1881; Hajra et. al. in Fl. Ind. 13: 92. 1995. *Gamochaeta purpurea* (L.) Cabrera in Bol. Soc. Argent. Bot. 9: 377. 1961; Grierson et Springate in Fl. Bhutan 2(3): 1523. 2001. *Gnaphalium littorale* Banks et Solander ex Hook.f. in 310. 1846. *Gamochaeta rosacea* (Johnston) Anderberg in Opera Bot. 104: 157. 1991.

Annual, erect to ascending, few branched, herbs. Leaves oblanceolate to spatulate, 2 – 6 × 6 – 14 mm, upper smaller. Capitula bracteate. Involucre cylindric; phyllaries in 4 – 5 rows. Florets purplish. Achene oblong.

Flowering: June – August

Fruiting: September – November

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Common.

Uses: It is used to relief of stomach diseases, wounds, swelling, prostatism, neuritis, and angina ache.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 16.08.2019, Mallick, et al [Field No. 7129]

GRANGEA Adanson in Fam. 2: 121. 1763.

Grangea maderaspatana (L.) Poir. in Encycl. Suppl. 2: 825. 1812; Hook. f. in Fl. Brit. Ind. 3: 247.1881; Prain in Bengal Pl. 1: 442.1903; Grierson et Long in Fl. Bhutan 2(3): 1529. 2001. *Artemisia maderaspatana* L. in Sp. Pl. 2: 849. 1753.

Biannual slender, procumbent, herbs, of 30 cm height. Leaves obovate to oblanceolate, 3 – 7 × 1.3 – 4 cm, sessile, dissected-lobed, auriculate, lobes obovate, coarsely dentate. Capitula solitary, terminal. Phyllaries 2- or 3-seriate. Marginal ray florets yellow; disk florets campanulate. Achenes compressed.

Flowering: May – June **Fruiting:** July – August.

Local Distribution: Forest areas of MPCAs.

General Distribution: India (Assam, Manipur, Nagaland, Sikkim, West Bengal); Nepal, Bhutan, Bangladesh, Sri Lanka, Myanmar.

Status: Least concern (IUCN 2019).

Uses: It is used in antipyretic, antiseptic, anthelmintic, diuretic, stomachic, deobstruent.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 15.07.2018, Mallick, et al [Field No. 7190]

LAPHANGIUM (Hillard et. Burt) Tzvelev in Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 98(6): 105. 1994.

Laphangium affine (Don) Tzvelev in Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 98(6): 105.1994. *Gnaphalium affine* Don in Prodr. Fl. Nepal. 173 1825. *G. luteo-album* Linnaeus var. *multiceps* Candolle in Prodr. 6: 222.1838; Hook.f. in Fl. Brit. Ind 3: 288. 1881. *G. luteoalbum* L. in Sp. Pl. 2: 851. 1753; Hook. f. in Fl. Brit. Ind 3: 288. 1881.

Biennial, small, erect, herbs, to 40 cm. Stems white lanate. Leaves (cauline) spatulate, 3 – 8 × 5 – 12 cm, white lanate, entire, rounded. Capitula densely aggregated in terminal corymbs, numerous. Phyllaries 3-seriate, ovate, obtuse. Terminal florets many. Central florets 5 – 10. Achene compressed, oblong. Pappus white.

Flowering: June – July

Fruiting: August – November

Local Distribution: All over the forest area of terai and duars.

General Distribution: India (West Bengal, Sikkim, Assam, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka, Myanmar.

Status: Common.

Uses: Leaves and stem are used to treat diuresis, fever, scabies, edema, dampness and leukemia

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 25.08.2018, Mallick, et al [Field No. 7132]

MIKANIA Willd. in Sp. Pl. ed. 4, 3: 1742. 1803; *nom. cons.*

Mikania micrantha Kunth in Nov. Gen. Sp. 4: 134. 1820; Hajra et al in Fl. Ind. 12: 357. 1995; Grierson et Springate in Fl. Bhutan 2(3): 1625. 2001. 318

Slender, much branched vines. Petiole 1 – 5 cm long. Leaves opposite, ovate, 6 – 16 × 5 – 8 cm, glabrate, cordate, entire or dentate, acuminate. Inflorescence corymbose panicle. Phyllaries oblong. Flowers white. Achenes 4-ribbed. Pappus pale white.

Flowering: June – August

Fruiting: September – December.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Manipur); Nepal, Bhutan, Bangladesh and Sri Lanka.

Status: Common.

Uses: It is used as anti-inflammatory, anti-stress, antimicrobial, and anti-diabetic.

Specimen examined: West Bengal, Jalpaiguri, North Sevoke (MPCA). 28.08.2019, Mallick, et al [Field No. 317]

PARTHENIUM L. in Sp. Pl. 988. 1753; Gen. Pl. ed. 5, 426. 1754.

Parthenium hysterophorus L. in Sp. Pl. 2: 988. 1753; Hajra et al. in Fl. Ind. 12: 403. 1995; Grierson et Long in Fl. Bhutan 2(3): 1622. 2001.

Bi-annual, much branched, erect herbs, of 1m height. Lamina ovate to elliptic, 5 – 15 × 1 – 5 cm, pinnately many lobed. Inflorescences open panicles. Capitula radiate; elliptic to lanceolate. Ray florets 5. Disk 15 – 40. Achenes obovoid.

Flowering: April - June

Fruiting: July – December.

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur), Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Least concern (IUCN).

Uses: It is used in skin inflammation, dysentery, diarrhoea, malaria, rheumatic pain, urinary tract infections.

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 18.07.2018, Mallick, et al [Field No. 4382]

PSEUDOGNAPHALIUM Kirp. in Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 9: 33. 1950.

Pseudognaphalium affine (D. Don) Anderberg in Opera Bot. 104: 146. 1991; Grierson et Long in Fl. Bhutan 2(3):1522. 2001. *Laphangium affine* (Don) Tzvelev in Byull.

Moskovsk. Obshch. Isp. Prir., Otd. Biol. 98(6): 105.1994. *Gnaphalium luteoalbum* L. in Sp. Pl. 2: 851. 1753; Hook. f. in Fl. Brit. India 3: 288. 1881.

Erect, biennial herbs. Stem white lanate tomentose. Leaves green, thin, spatulate, white lanate, angular, entire, rounded, mucronate. Capitula in corymbs, dense, numerous. Involucre globose-campanulate; phyllaries in 3 rows, yellow. External florets many. Internal florets 5 – 10. Achenes compressed, oblong. Pappus white.

Flowering: May – June

Fruiting: July – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Throughout), Indo-Chin, Australia, Africa, Europe, Philippines and New Guinea.

Status: Threatened Plants (IUCN).

Uses: It is used in the treatment of sore throat, influenza, productive coughing,

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.04]

SONCHUS L. in Sp. Pl. 2: 793. 1753.

Sonchus asper (L.) Hill in Herb. Brit. 1: 47. 1769; Hook. f., Fl. Brit. India 3: 414. 1881; Grierson et Long in Fl. Bhutan 2(3): 1479. 2001. *Sonchus oleraceus* L. var. *asper* L. in Sp. Pl. 2: 794. 1753.

Semi erect or procumbent, annual herbs. Leaves extremely variable, lamina obovate, spatulate to elliptic, 6 – 12 × 2 – 5 cm, irregularly pinnatisect, base attenuate, margin spinulosely dentate, acute to acuminate. Involucre campanulate. Phyllaries abaxially glabrous, acute. Corolla 1 cm. Achene compressed.

Flowering: November – January

Fruiting: December – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Pantropic

Status: Least concern (IUCN 2020).

Uses: Leaves are used to treat as painkiller of head.

Specimen examined: West Bengal, Alipurduar, North Rajabhatkhawa (MPCA). 18.09.2019, et al. [Field No.1014]

SYNEDRELLA Gaertn. in Fruct. Sem. Pl. 2: 456. 1791.

Synedrella nodiflora (L.) Gaertn. in Fruct. Sem. Pl. 2: 456. 1791; Grierson et Long in Fl. Bhutan 2(3): 1607. 2001. *Verbesina nodiflora* L. in Cent. Pl. 1: 28. 1755.

Suberect to ascending, annuals herbs. Leaves cauline, opposite; lamina ovate to elliptic, 3–10 × 2–4 cm, scabrid both surfaces, base cuneate-rounded, margin toothed. Capitula radiate or axillary solitary; involucre cylindrical to campanulate; phyllaries persistent; receptacle convex. Ray florets 2–9, female, fertile; corollas yellowish. Disk florets bisexual, fertile; corollas yellowish.

Flowering: January – June

Fruiting: June – December

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Common.

Uses: It is used to treat anticonvulsant, epilepsy, neuropharmacological effects.

Specimen examined: West Bengal, Jalpaiguri, North Sevoke (MPCA). 18.07.2019, Mallick, et al [Field No. 4442]

TRIDAX L. in Sp. Pl. 900. 1753.

Tridax procumbens (L.) L. in Sp. Pl. 2: 900. 1753; Hook. f. in Fl. Brit. India 3: 311. 1881; Grierson et Long in Fl. Bhutan 2(3): 1611. 2001. *Balbisia elongate* Willd. in Sp. Pl. 3: 2214. 1803.

Annual to perennial, procumbent, hispid herbs. Lamina ovate-lanceolate, 3 – 5.4 cm, pinnatisect, base cuneate. Capitula solitary; ray florets creamy. Disk florets yellow. Cypselas oblong.

Flowering: November – February

Fruiting: February – March

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur), Nepal, Bhutan, Bangladesh and Sri Lanka.

Status: Common

Uses: It is used in wound healing, anticoagulant, antifungal and insect repellent

Specimen examined: West Bengal, Darjeeling, North Sevoke (MPCA). 14.08.2019, Mallick, et al [Field No. 6542]

WEDELIA Jacq. in Enum. Syst. Pl. 8, 28. 1760.

Wedelia trilobata (L.) Hitchc. in Rep. Missouri Bot. Gard. 4: 99. 1898; Chowdhery in Hajra et al., Fl. India 12: 426. 1995. *Silphium trilobatum* L. in Syst. (ed. 10) 1232. 1759.

Decumbent herbs, glabrous or pubescent, rooting at nodes. Lamina elliptic to ovate, 3 – 7cm long, 3 angular lobes, margins toothed, base cuneate, apex acute. Heads radiate, solitary; peduncles strigose; ray florets 5 – 8; corolla bright yellow; ovary trigonous; stigma bilobed; disc florets many; anthers black. Achenes warty, crowned with pappus cup.

Flowering: May – August

Fruiting: August – September

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh, Sri Lanka.

Status: Least concern (IUCN).

Uses: It is used in arthritis rheumatic symptoms, swellings muscle cramps.

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.02.2018, Mallick, et al [Field No. 6322]

XANTHIUM L. in Sp. Pl. 2: 987. 1753.

Xanthium strumarium L. in Sp. Pl. 2: 987. 1753; *Xanthium indicum* Koen. ex Roxb., Fl. Ind. 3: 601. 1832; Grierson et Long in Fl. Bhutan 2(3): 1620. 2001; Hook. f., Fl. Brit. Ind. 3: 303. 1881. '*Okra*'

Erect, annual, erect, up to 100 cm long. Leaves ovate-deltate, 9 – 25 cm, papery, densely scabrid, base cordate to cuneate, irregularly dentate, 3-lobed. Capitula monoecious. Male capitula in terminal umbels; outer paleae oblong-lanceolate; corolla white, tubular. Female capitula axillary. Fruits ellipsoid, sessile, oblong.

Flowering: August – September

Fruiting: September – April

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: Throughout India; pantropical weed.

Status: Common

Specimen examined: West Bengal, Jalpaiguri, North Sevok (MPCA). 12.02.2018, Mallick, et al [Field No. 2570]

YOUNGIA Cass. in Ann. Sci. Nat. 23: 88. 1831.

Youngia japonica (L.) Candolle in Prodr. 7: 194. 1838; Grierson et Long in Fl. Bhutan 2(3): 1457. 2001. *Prenanthes japonica* L., Mant. Pl. 1: 107. 1767.

Branched, annual, herbs. Lamina oblanceolate, 16 – 25 × 4 – 6 cm; base attenuate, margin sinuate-dentate, lobes few to many. Heads in corymbiform. Capitula with 15 – 20

florets. Involucre cylindric. Anther tube dark green; style yellow. Achene bracteate, purplish; pappus white.

Flowering: April – July

Fruiting: August – October

Local Distribution: Throughout the forest area of terai and duars.

General Distribution: India (Assam, Sikkim, West Bengal, Nagaland, Manipur); Nepal, Bhutan, Bangladesh and Sri Lanka.

Status: Very Common.

Uses: It has many medicinal properties like cooling, anthelmintic, fattening, tonic, digestive, improves appetite.

Specimen examined: West Bengal, Jalpaiguri, North Sevak (MPCA). 12.02.2018, Mallick, et al [Field No. 9122]

5. 3. Analysis of The Flora (Discussion):

Medicinal Plants Conservation Areas (MPCAs) areas are the virgin broad leaf forest with rich vegetation diversity with significant population size . These area belongs to the Bio-Geographical zone of Terai and Duars of North Bengal (Rodgers and Panwar, 1988). The term MPCA refers to a patch of forest land of about 200 ha for the purpose of conservation of diversity of medicinal plant populations in their own natural habitat. This is an *in-situ* practices where the conventional forest practices are minimized, thereby allowing the medicinal plant populations to flourish. Gorumara National Park, Buxa Tiger Reserve, Buxa National Park, Jaldapara National Park, Chapramari wildlife Sanctuary and Mahananda wildlife sanctuary etc. with medium and small rivers and rivulets which have twisted pockets of grass land.

The MPCAs have enormous importance in view of their being situated in the middle of the elephant migratory route between the rivers Teesta, Torsa and others river flowing through the conservatories areas of North Bengal The area also has a great significant in the forest landscape of the Alipurduar, Jalpaiguri and Darjeeling districts along with their forest and riverine ecosystem. The complete flora and the vegetation structure of three MPCAs are not clearly known earlier. So, an attempt was initiated in 2008 to recorded the flora of these areas that have enough potential for conservation.

5.3.1. Recorded Flora:

After the comprehensive floristic survey, it is noted that the three MPCAs are covering enormously rich medicinal flora. Present detailed study records 626 species under 397 genera belonging to 102 families of vascular plants (Table 12, 13 and 14). 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 water is received almost in all other months of the year. This type of distribution of precipitation helpful to maintain as a very good broad leaf floristic wealth. The analysis of the flora exposed that there are numerous tropical, subtropical and event temperate elements those are common with the North East Himalayan region. The beels, nalahas, low-laying areas, scrubs and forests etc. provided enormous variety of habitats and that is reflected in the richness of medicinal flora. The detailed analyses of the total spermatophytes medicinal flora of the forest distribution and variation in dicots have much dominance over the monocots.

The flora of MPCAs is further revealed that their existence directly or indirectly is beneficial to the human sustenance. Most of the species having varied potential as food, medicines etc. MPCAs are extra ordinarily rich repository of various plant resources that also includes valuable and durable timber-yielding trees.

Table 12: Number of genus and species of the dicot family

Dicot Family	Genus	Species
Chloranthaceae	1	1
Lauraceae	8	20
Annonaceae	3	4
Magnoliaceae	1	1
Myristicaceae	2	4
Aristolochiaceae	1	3
Piperaceae	2	8
Menispermaceae	5	7
Papaveraceae	2	2
Ranunculaceae	2	2
Trochodendraceae	1	1
Dilleniaceae	2	3
Vitaceae	5	12

Cucurbitaceae	8	12
Bigoniaceae	1	1
Fabaceae	26	47
Cannabaceae	1	1
Moraceae	4	10
Rhamnaceae	3	5
Rosaceae	2	2
Ulmaceae	1	1
Urticaceae	7	10
Celastraceae	1	1
Achariaceae	1	1
Clusiaceae	1	1
Euphorbiaceae	12	16
Hypericaceae	1	1
Passifloraceae	1	1
Phyllanthaceae	7	15
Salicaceae	1	1
Violaceae	1	1
Pandanaceae	1	1
Elaeocarpaceae	1	1
Oxalidaceae	2	5
Brassicaceae	2	2
Bixaceae	1	1
Capparaceae	2	3
Dipterocarpaceae	1	1
Malvaceae	16	20
Anacardiaceae	2	2
Meliaceae	5	5
Rutaceae	6	8
Amaranthaceae	9	16
Caryophyllaceae	3	5
Droseraceae	1	1
Molluginaceae	1	2

Nyctaginaceae	3	3
Plumbaginaceae	1	1
Polygonaceae	3	11
Portulacaceae	1	1
Crassulaceae	1	1
Cornaceae	1	1
Balsaminaceae	1	2
Boraginaceae	2	2
Ebenaceae	1	1
Icacinaceae	1	1
Lecythidaceae	1	1
Primulaceae	2	2
Sapotaceae	1	1
Theaceae	2	2
Apocynaceae	13	14
Rubiaceae	19	25
Convolvulaceae	6	11
Solanaceae	4	13
Oleaceae	1	4
Gesneriaceae	1	1
Plantaginaceae	1	1
Scrophulariaceae	2	2
Linderniaceae	2	4
Bignoniaceae	3	3
Verbenaceae	2	2
Lamiaceae	15	23
Acanthaceae	14	20
Apiaceae	4	4
Araliaceae	1	1
Campanulaceaea	2	3
Asteraceae	27	31
Total	305	460

Table 13: Number of genus and species of the monocot family

Monocot Family	No. of Genus	No. of Species
Acoraceae	1	1
Araceae	7	11
Areaceae	4	5
Amaryllidaceae	1	1
Asparagaceae	1	1
Hypoxidaceae	1	2
Commelinaceae	5	15
Pontederiaceae	1	2
Dioscoreaceae	1	5
Smilacaceae	1	4
Pandanaceae	1	1
Cyperaceae	9	30
Poaceae	25	37
Costaceae	1	1
Marantaceae	1	1
Zingiberaceae	5	10
Orchidaceae	15	25
Total	80	152

Table. 14. Number of genus and species of the pteridophyte family

Name of the Family	No. of Genus	No. of Species
Cyatheaceae	1	1
Marattiaceae	2	2
Ophioglossaceae	2	2
Polypodiaceae	2	2
Pteridaceae	3	5
Schizaeaceae	1	1
Thelypteridaceae	1	1
Total	12	14

5.3.2. Epiphytic Elements:

The high diversity of vascular epiphytic elements of the three MPCAs of North Bengal is has most striking characteristics of humid montane forests and tropical rain forests. Epiphytic elements are plants that germinate and complete their life upon another host plant showing commensalism. Over 33 species of plants, in 3 families and 26 genera are epiphytes (Table. 15, Fig. 14) accounting for about 626 of all plant species of the three MPCAs such as North Rajabhatkhawa MPCA, Sursuti MPCA and North Sevoke MPCA. The majority of epiphytic elements are ferns which include 3 family 6 genus and 8 species and monocots which particularly includes orchids and a member of the family Apocynaceae.

In these three MPCAs, vascular epiphytic elements are most and major significance for a great numbers of reasons:

1. They contribute substantially to production, nutrient cycles and ecosystem diversity North Bengal
2. They provide appreciable energy and nutrient sources to associated organisms such as, bats, pollinating birds and mutualistic ants, insects and others.
3. They act as a major and important global indicators for climate change of Eastern Himalayan region of North Bengal
4. Vascular epiphytic elements create an arena for important role of observational and experimental studies on a wide range of biological as well as taxonomic questions including diversity patterns, plant interactions, systematics, mechanisms of evolutionary change and ecophysiology of Himalayan Bio Diversity Hotspot.

Table 15. Name and No. of ephytic species of Three MPCAs of North Bengal

Name of the genus	No. species
<i>Hoya</i>	1
<i>Ichnocarpus</i>	1
<i>Marsdenia</i>	1
<i>Acampe</i>	1
<i>Aerides</i>	1
<i>Bulbophyllum</i>	2
<i>Coelogyne</i>	1
<i>Cymbidium aloifolium</i>	2
<i>Dendrobium</i>	9
<i>Eria</i>	1

<i>Papilionanthe</i>	1
<i>Pholidota</i>	1
<i>Rhynchostylis</i>	1
<i>Aeschynanthus</i>	1
<i>Microsorium</i>	1
<i>Drynaria</i>	1
<i>Pyrrosia</i>	1
<i>Adiantum</i>	1
<i>Piper</i>	6
Total	33

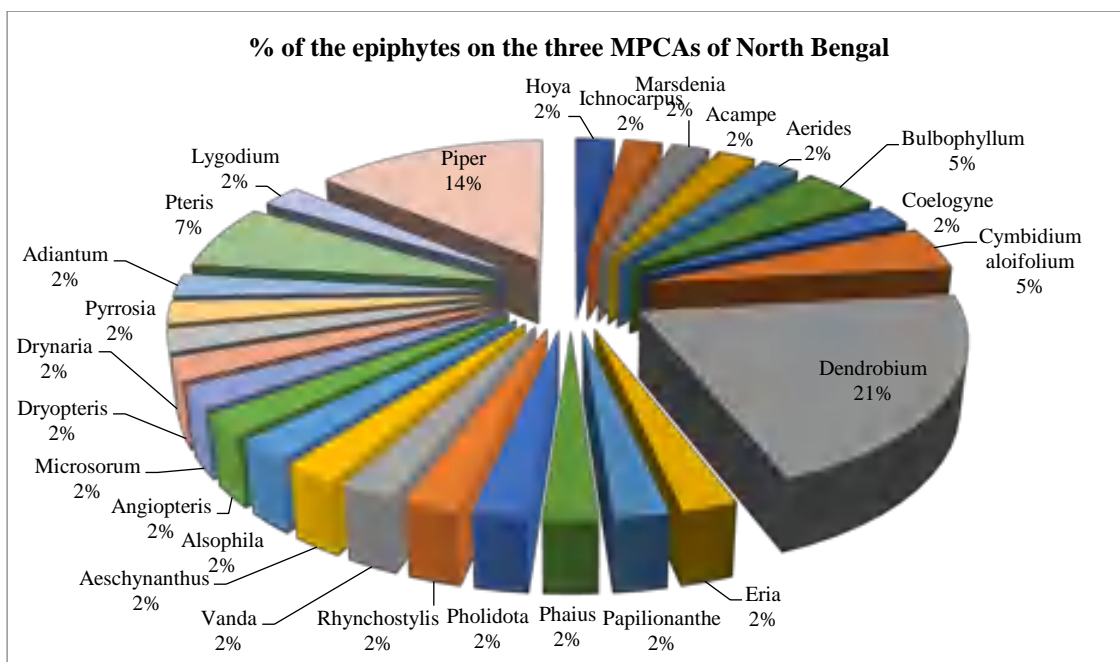


Fig. 15: % of the epiphytes on the three MPCAs of North Bengal

5.3.3. Endemic elements

Indian biodiversity is quit rich and it is considered as one of the 12 mega biodiversity countries, which signifies 11% of world’s flora in about 2.3% of global land mass. Approximately 28.3% of the total Indian flora and 33.2% of angiosperms occurring in India are endemic (Chitale et al. 2014; Corlett 2012; Chitale and Behera 2014). The floristic diversity of the three MPCAs of West Bengal have a great alliance with the Himalayan endemic elements. Around 38 (34 %) of endemic species of monocot and dicot species are acknowledged to be exclusively endemic to the Darjeeling foothills and adjoining area of Terai and Doars region of West Bengal like *Globba racemosa*,

and other endemic elements such as *Carex filicina*, *C. decora*, *Amorphophallus napalensis*, *A. paeoniifolius*, *Calamus latifolius*, *C. erectus*, *C. mahanandensis*, *C. pseudoerectus*, *C. leptospadix*, *Phoenix rupicola*, *Tupistra nutans*, *Carex vesiculosa*, *Dioscorea prazeri*, *Eriocaulon edwardii*, *Molineria crassifolia*, *Zingiber rubens*, *Hedychium densiflorum*, *H. coccineum*, *Curcuma aromatica* and *Bulbophyllum spathulatum* etc are observed from the three MPCAs of North Bengal

5.3.4. Thraetened elements

MPCAs are the part of Himalayan biodiversity hotspot and several species growing in this habitats are under threatened category. The studied floral elements includes about 77 species of RET category plants. Threatended status of the recorded taxa have been matched with Red data book, IUCN websites and local flora. Out of 77 threatened species 32 were recorded through the quadrat sampling within the MPCAs and remaining 45 species were recorded through random sampling (Table 16).

Among the 77 threatened species, 45 are under Least Concern (LC) like *Cryptocarya amygdalina*, *Litsea laeta*, *Machilus duthiei*, *Knema erratica*, *Acorus calamus*, *Calamus tenuis*, *Smilax ovalifolia*, *Murdania japonica*, *Curculigo capitulatae*, *Gloriosa superba*, *Asparagus racemosus*, *Codariocalyx motorius*, *Rauwolfia serpentina*, *Mucuna pruriens* etc. whereas, 12 species are under Near Threatened (NT) like *Actinodaphne sikkimensis*, *Cinnamomum impressinervium*, *Areca triandra*, *Daemonorops jenkinsiana*, *Monochoria hastate*, *Bambusa balcooa*, *Phrynium pubinerve*, *Alpinia calcarata* etc. 10 Vulnerable (VU) species like *Microsorium punctatum*, *Fimbristylis aestivalis*, *Schoenoplectiella juccoides*, *Sccharum arundinaceum*, *Saccharum spontaneum*, *Sporobolus diander*, *Cissus repens*, *Duchesnea indica*, *Hoya parasitica* etc. are growing within thr territory of the three MPCAs of North Bengal plains. Seven Endangered Species (EN) like *Beilschmiedia assamica*, *Leucaena leucocephala*, *Morus indica*, *Drymaria cordata*, *Polycarpon prostratum*, *Justicia diffusa* and *Centella asiatica*. *Piper peepuloides*, *Staria palmifolia* and *Curcuma caesia* are Critically Endangered species (CR) found in the three MPCAs of North Bengal

Table 16: Threatened species recorded from Study area

FAMILY	Taxa	IUCN Status
Piperaceae	<i>Piper peepuloides</i>	Critically Endangered

Caryophyllaceae	<i>Setaria palmifolia</i>	Critically Endangered
Zingiberaceae	<i>Curcuma caesia</i>	Critically Endangered
Lauraceae	<i>Beilschmiedia assamica</i>	Endangered
Fabaceae	<i>Leucaena leucocephala</i>	Endangered
Moraceae	<i>Morus indica</i>	Endangered
Caryophyllaceae	<i>Drymaria cordata</i>	Endangered
Caryophyllaceae	<i>Polycarpon prostratum</i>	Endangered
Acanthaceae	<i>Justicia diffusa</i>	Endangered
Polypodiaceae	<i>Microsorium punctatum</i>	Vulnerable
Cyperaceae	<i>Fimbristylis aestivalis</i>	Vulnerable
Cyperaceae	<i>Schoenoplectiella juncooides</i>	Vulnerable
Poaceae	<i>Sccharum arundinaceum</i>	Vulnerable
Poaceae	<i>Saccharum spontaneum</i>	Vulnerable
Poaceae	<i>Sporobolus diander</i>	Vulnerable
Vitaceae	<i>Cissus repens</i>	Vulnerable
Rosaceae	<i>Duchesnea indica</i>	Vulnerable
Apocynaceae	<i>Hoya parasitica</i>	Vulnerable
Lauraceae	<i>Actinodaphne sikkimensis</i>	Near Threatened
Lauraceae	<i>Cinnamomum impressinervium</i>	Near Threatened
Arecaceae	<i>Areca triandra</i>	Near Threatened
Arecaceae	<i>Daemonorops jenkinsiana</i>	Near Threatened
Pontederiaceae	<i>Monochoria hastate</i>	Near Threatened
Poaceae	<i>Bambusa balcooa</i>	Near Threatened
Marantaceae	<i>Phrynium pubinerve</i>	Near Threatened
Zingiberaceae	<i>Alpinia calcarata</i>	Near Threatened
Lauraceae	<i>Cryptocarya amygdalina</i>	Least Concern
Lauraceae	<i>Litsea laeta</i>	Least Concern
Lauraceae	<i>Machilus duthiei</i>	Least Concern
Myristicaceae	<i>Knema erratica</i>	Least Concern
Acoraceae	<i>Acorus calamus</i>	Least Concern
Arecaceae	<i>Calamus tenuis</i>	Least Concern
Smilacaceae	<i>Smilax ovalifolia</i>	Least Concern

Commelinaceae	<i>Murdania japonica</i>	Least Concern
Hypoxidaceae	<i>Curculigo capitulatae</i>	Least Concern
Colchicaceae	<i>Gloriosa superba</i>	Least Concern
Asparagaceae	<i>Asparagus racemosus</i>	Least Concern
Fabaceae	<i>Codariocalyx motorius</i>	Least Concern
Apocynaceae	<i>Rauvolfia serpentina</i>	Least Concern
Fabaceae	<i>Mucuna pruriens</i>	Least Concern
Poaceae	<i>Eragrostis unioloides</i>	Least Concern

5.3.5. Exotic elements

The vegetation of Himalayas and its foothill regions are affected with a rich number i.e., 190 invasive alien species representing 112 genera of 47 families (Chandra Sekar 2012). Out of the 626 species of recorded flora, 89 species has been enlisted as exotics species mainly found in marginal and road side area of the three MPCAs of North Bengal. The taxonomic distribution of these exotic plants (few) are given in Table. 17 and 18.

Table 17: Name of the exotic species and their origin and status

Name	Family	Origin of country	Status
<i>Ageratum conyzoides</i>	Asteraceae	South America	Naturalized
<i>Ageratum houstonianum</i>	Asteraceae	Mexico	Naturalized
<i>Alternanthera paronychioides</i>	Amaranthaceae	Brazil	Naturalized
<i>Argemone Mexicana</i>	Papaveraceae	Mexico	Naturalized
<i>Bidens pilosa</i>	Asteraceae	America	Naturalized
<i>Senna alata</i>	Fabaceae	South America	Naturalized
<i>Senna tora</i>	Fabaceae	America	Naturalized
<i>Cassia javanica</i> subsp. <i>nodosa</i>	Fabaceae	Sumatra, Java	Semi-naturalized
<i>Dysphania ambrosioides</i>	Amaranthaceae	Mexico	Naturalized
<i>Chromolaena odorata</i>	Asteraceae	Jamaica	Naturalized
<i>Cinnamomum verum</i>	Lauraceae	Sri Lanka	Cultivated
<i>Cissampelos pareira</i>	Menispermaceae	Neo-tropical	Naturalized
<i>Cleome rutidosperma</i>	Cleomaceae	West Africa	Naturalized
<i>Corchorus aestuans</i>	Malvaceae	America	Naturalized
<i>Crassocephalum crepidioides</i>	Asteraceae	America	Naturalized

<i>Croton bonplandianus</i>	Euphorbiaceae	Paraguay	Naturalized
<i>Datura metel</i>	Solanaceae	America	Naturalized
<i>Delonix regia</i>	Fabaceae	Madagascar	Semi-naturalized
<i>Digitaria ciliaris</i>	Poaceae	America	Naturalized
<i>Eclipta prostrata</i>	Asteraceae	South America	Naturalized
<i>Emilia sonchifolia</i>	Asteraceae	Africa, Asia	Naturalized
<i>Eragrostis tenella</i>	Poaceae	Africa, Asia	Naturalized
<i>Euphorbia hirta</i>	Euphorbiaceae	America	Naturalized
<i>Evolvulus nummularius</i>	Convolvulaceae	West Indies	Naturalized
<i>Fumaria indica</i>	Papaveraceae	America	Naturalized
<i>Galinsoga parviflora</i>	Asteraceae	America	Naturalized
<i>Gnaphalium purpurium</i>	Asteraceae	America	Naturalized
<i>Hyptis suaveolens</i>	Lamiaceae	South America	Naturalized
<i>Ipomoea carnea</i> ssp. <i>fistulosa</i>	Convolvulaceae	South America	Naturalized
<i>Jatropha curcas</i>	Euphorbiaceae	America	Naturalized
<i>Lagerstroemia indica</i>	Lythraceae	China	Cultivated
<i>Lantana camara</i>	Verbenaceae	West Indies	Naturalized
<i>Lippia javanica</i>	Verbenaceae	America	Naturalized
<i>Malvaviscus arboreus</i>	Malvaceae	Mexico	Cultivated
<i>Mecardonia procumbens</i>	Plantaginaceae	America	Naturalized
<i>Mikania micrantha</i>	Asteraceae	America	Naturalized
<i>Mimosa invisa</i>	Fabaceae	America	Naturalized
<i>Mimosa pudica</i>	Fabaceae	Brazil	Naturalized
<i>Nicotiana plumbaginifolia</i>	Solanaceae	America	Naturalized
<i>Oxalis corniculata</i>	Oxalidaceae	South Europe	Naturalized
<i>Oxalis latifolia</i>	Oxalidaceae	Brazil	Naturalized
<i>Peperomia pellucida</i>	Piperaceae	America	Naturalized
<i>Persicaria hydropiper</i>	Polygonaceae	America	Naturalized
<i>Physalis minima</i>	Solanaceae	South America	Naturalized
<i>Portulaca oleracea</i>	Portulacaceae	Europe, Africa	Naturalized
<i>Pupalia lappacea</i>	Amaranthaceae	Afro-Asia	Naturalized
<i>Ricinus communis</i>	Euphorbiaceae	Africa	Naturalized
<i>Scoparia dulcis</i>	Plantaginaceae	South America	Naturalized

<i>Senna occidentalis</i>	Fabaceae	South America	Naturalized
<i>Senna sophera</i>	Fabaceae	America	Naturalized
<i>Sida cordata</i>	Malvaceae	America	Naturalized
<i>Solanum sisymbriifolium</i>	Solanaceae	Brazil	Naturalized
<i>Spathodea campanulata</i>	Bignoniaceae	Tropical Africa	Semi-naturalized
<i>Stachytarpheta indica</i>	Verbenaceae	South America	Naturalized
<i>Stellaria media</i>	Caryophyllaceae	Europe	Naturalized
<i>Synedrella nodiflora</i>	Asteraceae	America	Naturalized
<i>Tamarindus indica</i>	Fabaceae	Tropical Africa	Naturalized
<i>Tridax procumbens</i>	Asteraceae	South America	Naturalized
<i>Xanthium strumarium</i>	Asteraceae	South America	Naturalized

Table 18: No. of monocotyledons and dicotyledons family of exotic elements of three MPCAs

Family	Semi Naturalized	Naturalized	Total
Dicotyledons	12	75	87
Monocotyledonous	0	2	2

Photo Plate - I



Achyranthus aspera



Barleria strigosa



Dendrocnide sinuata



Murraya koenigii



Crotalaria alata



Desmodium gangeticum



Eranthemum griffithii



Chromolaena odorata



Mesosphaerum suaveolens



Caesalpinia cucullata



Caesalpinia cucullata



Castanopsis tribuloides

Photo Plate -II



Alangium chinensis



Pupalia lappacea



Ardisia solanacea



Deeringia amaranthoides



Spermacoce alata



Lantana camara



Rungia pectinata



Meyna spinosa



Phlogacanthus thyriformis

Photo Plate -III



Sida acuta



Phaulopsis imbricata



Mitracarpus hirtus



Solanum americanum



Mikania micrantha



Lepidagathis incurva



Ageratum houstonianum



Pueraria phaseoloides



Piper chaba

Photo Plate -IV



Bridelia retusa



Crotalaria alata



Wedelia trilobata



Morinda angustifolia



Barleria strigosa



Holmskioldia sanguinea



Cheilocostus speciosus



Dicliptera bupleuroides



Ziziphus rugosa

Photo Plate - V



Amorphophallus napalensis



Amaranthus viridis



Artocarpus chaplasha



Spermacoce ocemoides



Chloranthus elatior



Clerodendrum japonicum



Croton bonplandianus



Toona ciliata



Polyalthia simiarum

Photo Plate - VI



Curculigo orchioides



Cynotis vaga



Dioscorea bulbifera



Elatostema monandrum



Eleutheranthera ruderalis



Eranthemum griffithii



Holarrhena pubescens



Evolvulus alsinoides



Crateva religiosa

Photo Plate - VII



Aesculus assamica



Ailanthus excelsa



Bauhinia purpurea



Castanopsis indica



Macaranga denticulata



Abroma angusta



Callicarpa arborea



Mallotus philippinensis

Photo Plate -VIII



Gynocardia odorata



Actinodaphne obovata



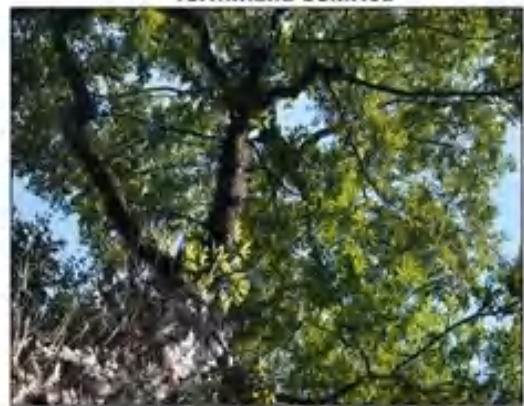
Artocarpus chama



Terminalia bellirica



Terminalia arjuna



Toona hexandra



Pterygota alata

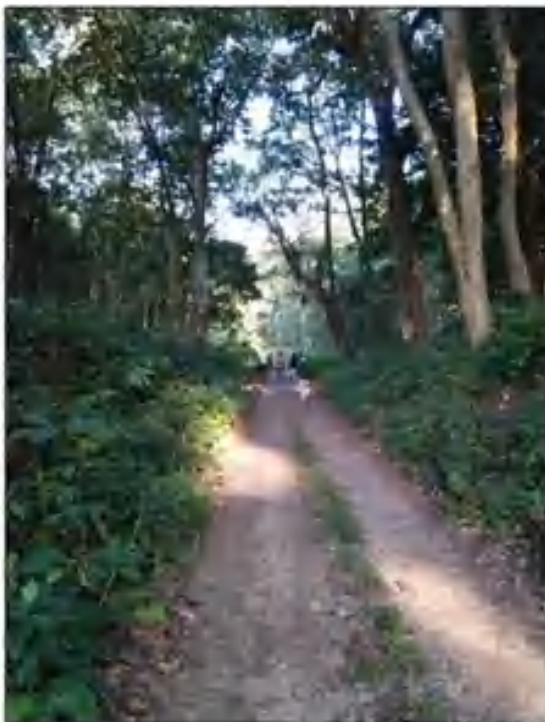


Ziziphus jujuba

Photo Plate -IX



Forest and marshy habitat at Sursuti MPCA



Forest Trail



Riverine habitat



Survey team

Photo Plate -X



Survey team at North Sevoke MPCA



Forest canopy



Forest base

Photo Plate -XI



Survey team inside the Mahananda Wildlife Sanctuary

Photo Plate -XII



Survey team at North Rajabhatkhaoya MPCA



Conversations with local community



Forest trail



Forest canopy

CHAPTER-6

PHYTOSOCIOLOGY

6.1. INTRODUCTION

The natural climatic and habitat factors determine the growth and development of plants and their associates and Phytosociology is a discipline of ecology to understand the community structure of a certain vegetation of an area (Konatowska et al. 2019). Phytosociological study describes the vegetation and individual communities (Matuszkiewicz, 2002). The quantitative values of quadrat data grows over time provided that the locations of the plants are well documented to allow repeated studies in the same place. In other words, Phytosociology means the study of vegetation and their social unity in a unit area and that outcome helps us to realize the actual vegetation structure of that area (Blanquet, 1932) and the analysed data shows the great correlation among the plants in their association (Philip, 1959; Rai, 2006; Chowdhury, 2009).

The phytosociological data analysis for specific plant communities is one of the important ecological studies and the analysed data reflects the likings and disliking among the species association of a unit area. The analysed data also useful to understand the functioning of habitat or degree of change in vegetation or the kind of succession which can make possible in formulating the proper strategy for conservation of different species or the total community. All The three MPCAs of North Bengal plains are located within the well protected conservatories and vegetation type and ecosystems of those areas are quite stable. Biological diversity is also very rich and diversified. All the strata include huge tree layers with variable canopies and full of different epiphytes; middle or shrubs layer with diversified biota and ground of the areas are full of dense herbal vegetation.

The phytosociological study of the different these forested MPCAs, nested quadrates were plotted and minimum of 0.03 % areas were covered under quadrat sampling for the better assessment of Biodiversity. For tree layer 20 × 20 m, shrubs and climbers 5 × 5 m and herbs 1 × 1 m quadrates were plotted in random methods. As most of the herbal species are annual or half-annual, for herb layer quadrat were done in Monsoon and in summer season for significant outcomes. The present phytosociological study records all the angiosperms except epiphytes. The Land and epiphytic pteridophytes and lower groups were not considered in quadrat for this phytosociological study.

The quadrat data are gathered and analyzed through computing for percentage of Frequency, Abundance, Density, Relative Frequency, Relative Density, Relative Abundance and Important Value Index for all the recorded plant species. Using these

data, concentration of species (Simpsons Index 1949), Species Richness (Margalef Index 1958 and Menhinick Index 1964), and Species Diversity (Shannon-Weiner Index 1963) etc. has been determined.

To understand the community structure 336 sample plots were distributed in 3 tropical MPCAs of *in-situ* conservatories of National importance in terai-Duars of North Bengal Plains tropical forest in random basis and several species of tree, shrubs and herbs were recorded. Quantitative data analysis for the three tiers of trees, shrubs and herbs layers were done independently for the MPCAs. Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) or Relative Dominance (RDm) [for tree layer only] and Importance Value Index (IVI) were analyzed to understand the importance of diverse species in forest community. The mostly use indices for evaluating various diversity and richness were computed for these MPCAs. Comparisons of species similarity between different vegetation types, their taxonomic distribution of medicinal plants and endemic, exotic and threatened status have been computed, which are discussed in detail below.

6.2. RESULT AND DISCUSSION

Phytosociological works have been made in random way in the three studied MPCAs of Mahananda wildlife sanctuary, Buxa National Park and Gorumara National Park of North Bengal Terai and duars. The data was calculated for three prominent stratas of tree, shrubs and climber, and ground cover entities i.e, herbs. The quadrat data were used to calculate the phytosociological studies that includes frequency (F), dominance (D), Abundance (A) and their relativeness for recorded species. By summing up the relativeness of frequency (F), dominance (D) and Abundance (A) gives the important value index (IVI) for each recorded species. The same quadrat data also used to calculate the various diversity indices for the studied MPCAs.

6.2.1. TREE LAYER

Trees are the permanent entities of the forest. 20m x 20m quadrates were plotted in random way in few subsequent years within the limited areas of MPCAs in all the three-study area. The selected MPCAs are less disturbed area with very high diversity and rich in plants population. High population of various stages of trees including seedlings, young trees, mature and immature trees, old and dead/decomposed trees of various species show the healthy ecosystem within the study areas. The well-established

matured trees are found with different epiphytic orchids, ferns and mosses. The calculated phytosociological values for the tree layer were discussed below.

6.2.1.1. North Sevoke MPCA, Mahananda Wildlife Sanctuary

A total 11 quadrat sampling has been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure.

Studied quadrates, which recorded 73 species of tree species and the analysis of recorded data is shown in Table 19.

The calculating data shows highest Frequency and Relative Frequency by *Aglaia spectabilis* (Miq.) S.S.Jain & S.Bennet [F=70 & RF=6.21] followed by *Bischofia javanica* Bl. [F=50 & RF=4.44], *Dillenia pentagyna* Roxb., *Ficus hispida* L.f., *Lagerstroemia speciosa* (L.) Pers. and *Shorea robusta* Gaertn. with same value [F=30 & RF=2.66].

Aglaia spectabilis (Miq.) S.S.Jain & S. Bennet shows highest Density and Relative Density [D=236.36 & RD=5.63], followed by *Lagerstroemia speciosa* (L.) Pers [D=163 & RD=3.90], *Bischofia javanica* Bl. [D=154.55 & RD=3.68], *Shorea robusta* Gaertn [D=118.18 & RD=2.81], *Duabanga grandiflora* [D=109 & RD=2.60], *Cinnamomum bejolghota* (Hamilton) Sweet and *Vitex quinata* (Lour.) F.N.Williams [D=100 & RD=2.38].

Macaranga denticulate (Bl.) Mull. Arg. shows highest Abundance and Relative Abundance [A=9 & RA=2.91] followed by *Litsea glutinosa* (Loureiro) Robinson, *Crateva religiosa* Forst. f., *Dalbergia pinnata* (Loureiro) Prain, *Dalbergia stipulacea* Roxb., *Telauma hodgsonii* Hook.f. & Thomson with same value [A=8 & RA=2.59].

Maximum IVI value shows by *Aglaia spectabilis* (Miq.) S.S.Jain & S.Bennet [IVI=13.30], and followed by *Bischofia javanica* Bl. [IVI=9.39], *Lagerstroemia speciosa* (L.) Pers. [IVI=8.68], *Shorea robusta* Gaertn. [IVI=7.02], *Duabanga grandiflora* (Roxb. ex DC.) Walp. [IVI=6.45], where as *Chukrasia tabularis* A.Juss, *Firmiana colorata* (Roxb.) R. Br., *Trewia nudiflora* Linnaeus, [IVI=1.45] shows the minimum value.

Table 19: Analysis of Tree layer data of North Sevok MPCA

TREE TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Acacia catechu</i> (L.f.) Willd.	18	3	27.27	163.64	6.00	2.42	3.90	1.94	8.26

<i>Actinodaphne obovata</i> (Nees) Blume	8	2	20.00	72.73	4.00	1.77	1.73	1.30	4.80
<i>Aesculus assamica</i> Griffith	7	1	10.00	63.64	7.00	0.89	1.52	2.27	4.67
<i>Aglaia spectabilis</i> (Miq.) Jain & Bennet	26	7	70.00	236.36	3.71	6.21	5.63	1.20	13.04
<i>Albizia lucidior</i> (Steud.) Nielson ex Hara	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Alstonia scholaris</i> (Linnaeus) R. Brown	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Antidesma acuminatum</i> Wight	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Aphanamixis polystachya</i> (Wall.) Parker	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Artocarpus chama</i> Buch.Ham.	9	2	20.00	81.82	4.50	1.77	1.95	1.46	5.18
<i>Baccaurea ramiflora</i> Loureiro	6	1	10.00	54.55	6.00	0.89	1.30	1.94	4.13
<i>Bauhinia purpurea</i> L.	5	2	20.00	45.45	2.50	1.77	1.08	0.81	3.67
<i>Bauhinia racemosa</i> Lam.	5	2	20.00	45.45	2.50	1.77	1.08	0.81	3.67
<i>Bischofia javanica</i> Blume	17	5	50.00	154.55	3.40	4.44	3.68	1.10	9.22
<i>Bixa orellana</i> L.	3	2	20.00	27.27	1.50	1.77	0.65	0.49	2.91
<i>Bombax ceiba</i> L.	2	1	10.00	18.18	2.00	0.89	0.43	0.65	1.97
<i>Callicarpa arborea</i> Roxburgh	9	2	20.00	81.82	4.50	1.77	1.95	1.46	5.18
<i>Carallia brachiata</i> (Lour.) Merr.	5	1	10.00	45.45	5.00	0.89	1.08	1.62	3.59
<i>Careya arborea</i> Roxb.	8	2	20.00	72.73	4.00	1.77	1.73	1.30	4.80
<i>Cassia fistula</i> L.	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A. DC.	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Celastrus paniculatus</i> Willdenow	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Chukrasia tabularis</i> A.Juss.	1	1	10.00	9.09	1.00	0.89	0.22	0.32	1.43
<i>Cinnamomum bejolghota</i> (Buch.-Ham.) Sweet	11	2	20.00	100.00	5.50	1.77	2.38	1.78	5.94
<i>Citrus maxima</i> (Burm.) Merr.	2	1	10.00	18.18	2.00	0.89	0.43	0.65	1.97
<i>Cocculus laurifolius</i> DC.	5	1	10.00	45.45	5.00	0.89	1.08	1.62	3.59
<i>Cordia grandis</i> Roxb.	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Crateva religiosa</i> Forst.f.	8	1	10.00	72.73	8.00	0.89	1.73	2.59	5.21
<i>Dalbergia pinnata</i> (Lour.) Prain	8	1	10.00	72.73	8.00	0.89	1.73	2.59	5.21
<i>Dalbergia stipulacea</i> Roxb.	8	1	10.00	72.73	8.00	0.89	1.73	2.59	5.21
<i>Dillenia indica</i> L.	5	2	20.00	45.45	2.50	1.77	1.08	0.81	3.67
<i>Dillenia pentagyna</i> Roxb.	9	3	30.00	81.82	3.00	2.66	1.95	0.97	5.58
<i>Dipterocarpus retusus</i> Blume	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Duabanga grandiflora</i> (Roxb. ex DC.) Walp.	12	2	20.00	109.09	6.00	1.77	2.60	1.94	6.31
<i>Elaeocarpus lanceifolius</i> Roxb.	5	1	10.00	45.45	5.00	0.89	1.08	1.62	3.59
<i>Ficus hispida</i> L.f.	10	3	30.00	90.91	3.33	2.66	2.16	1.08	5.91
<i>Firmiana colorata</i> (Roxb.) R.Br.	1	1	10.00	9.09	1.00	0.89	0.22	0.32	1.43
<i>Garuga gamblei</i> King ex Smith	6	1	10.00	54.55	6.00	0.89	1.30	1.94	4.13
<i>Glochidion thomsonii</i> (Müll.Arg.) Hook.f.	7	1	10.00	63.64	7.00	0.89	1.52	2.27	4.67
<i>Gmelina arborea</i> Roxb. ex Sm.	7	2	20.00	63.64	3.50	1.77	1.52	1.13	4.42
<i>Grewia asiatica</i> L.	7	1	10.00	63.64	7.00	0.89	1.52	2.27	4.67
<i>Gynocardia odorata</i> R.Br.	4	1	10.00	36.36	4.00	0.89	0.87	1.30	3.05
<i>Holarrhena antidysenterica</i> Wall.	6	1	10.00	54.55	6.00	0.89	1.30	1.94	4.13

<i>Lagerstroemia speciosa</i> (L.) Pers	18	3	30.00	163.64	6.00	2.66	3.90	1.94	8.50
<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	8	1	10.00	72.73	8.00	0.89	1.73	2.59	5.21
<i>Litsea monopetala</i> (Roxb.) Persoon	8	2	20.00	72.73	4.00	1.77	1.73	1.30	4.80
<i>Litsea polyantha</i> Juss.	6	2	20.00	54.55	3.00	1.77	1.30	0.97	4.04
<i>Macaranga denticulate</i> (Blume) Müll.Arg.	9	1	10.00	81.82	9.00	0.89	1.95	2.91	5.75
<i>Machilus villosa</i> (Roxb.) Hook.f.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Mallotus pallidus</i> (Airy Shaw) Airy Shaw	8	2	20.00	72.73	4.00	1.77	1.73	1.30	4.80
<i>Mallotus philippensis</i> (Lam.) Müll.Arg	10	2	20.00	90.91	5.00	1.77	2.16	1.62	5.56
<i>Mallotus repandus</i> (Willd.) Müll.Arg.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Michelia champaka</i> L.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Michelia excelsa</i> (Blume) Kuntze	2	2	20.00	18.18	1.00	1.77	0.43	0.32	2.53
<i>Mimosa himalayana</i> Gamble	5	1	10.00	45.45	5.00	0.89	1.08	1.62	3.59
<i>Morinda angustifolia</i> Roxb.	6	2	20.00	54.55	3.00	1.77	1.30	0.97	4.04
<i>Oroxylum indicum</i> (L.) Kurz	2	1	10.00	18.18	2.00	0.89	0.43	0.65	1.97
<i>Phoebe attenuata</i> Miq. ex Meisn.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Premna mucronata</i> Roxb.	6	2	20.00	54.55	3.00	1.77	1.30	0.97	4.04
<i>Sapindus rarak</i> DC.	7	1	10.00	63.64	7.00	0.89	1.52	2.27	4.67
<i>Sapium baccatum</i> Roxb.	6	1	10.00	54.55	6.00	0.89	1.30	1.94	4.13
<i>Schima wallichii</i> (DC.) Korthals	5	1	10.00	45.45	5.00	0.89	1.08	1.62	3.59
<i>Shorea robusta</i> Gaertn	13	3	30.00	118.18	4.33	2.66	2.81	1.40	6.88
<i>Sterculia villosa</i> Roxb.	2	1	10.00	18.18	2.00	0.89	0.43	0.65	1.97
<i>Streblus asper</i> Loureiro	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Tectona grandis</i> L.f.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Telauma hodgsonii</i> Hook.f. & Thomson	8	1	10.00	72.73	8.00	0.89	1.73	2.59	5.21
<i>Termanalia tomentosa</i> Wight & Arn.	2	1	10.00	18.18	2.00	0.89	0.43	0.65	1.97
<i>Terminalia belerica</i> (Gaertn.) Roxb.	5	2	20.00	45.45	2.50	1.77	1.08	0.81	3.67
<i>Terminalia chebula</i> Retz.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Toona ciliata</i> M.Roem.	3	1	10.00	27.27	3.00	0.89	0.65	0.97	2.51
<i>Trewia nudiflora</i> L.	1	1	10.00	9.09	1.00	0.89	0.22	0.32	1.43
<i>Vitex quinata</i> (Lour.) F.N.Williams	11	2	20.00	100.00	5.50	1.77	2.38	1.78	5.94
<i>Wrightia arborea</i> (Dennstaedt) Mabberley	7	1	10.00	63.64	7.00	0.89	1.52	2.27	4.67
TOTAL	462	113	1127	4200	308.78	100.00	100.00	100.00	300.00

6.2.1.2. North Rajabhatkhawa (NRVK) MPCA, Buxa National Park

A total 11 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure. Studied quadrates, which recorded 63 species of tree species and the analysis of recorded data is shown in Table 20.

The calculating data shows highest Frequency and Relative Frequency by *Flacourtia jangomas* (Lour.) Raeuschel [F=50 & RF=4.04] followed by *Chukrasia tabularis* A.

Jussieu, *Ficus racemosa* L., *Persea glaucescens* (Nees) Long., *Premna mucronata* Roxb., *Sapindus rarak* DC., *Wrightia arborea* (Dennstaedt) Mabberley with the same value [F= 40 & RF=3.23] further followed by *Actinodaphne obovata* (Nees) Blume, *Bauhinia variegata* L., *Combretum decandrum* Roxburgh, *Litsea cubeba* (Lour.) Persoon, *Mesua ferrea* L., *Schima wallichii* (DC.) Korthals, *Shorea robusta* Gaert. f., *Toddalia asiatica* (L.) Lam., *Vitex peduncularis* Schauer, *Zizyphus mauritiana* Lamarck with same value [F=30 & RF=2.42].

Wrightia arborea (Dennstaedt) Mabberley shows highest Density and Relative Density [D=190 & RD=4.14], followed by *Chukrasia tabularis* A. Jussieu, *Ficus racemosa* L. [D=180 & RD=3.92], *Persea glaucescens* (Nees) Long, *Vitex peduncularis* Schauer with the same value [D=170 & RD=2.42] and *Flacourtia jangomas* (Lour.) Raeuschel, *Schima wallichii* (DC.) Korthals with same value [D=160 & RD=1.60].

Zanthoxylum rhetsa (Roxburgh) DC shows highest Abundance and Relative Abundance [A=9 & RA=3.84] followed by *Bridelia sikkimensis* Gehrmann, *Litsea monopetala* (Roxb.) Persoon [A=8 & RA=3.41], *Baccaurea ramiflora* Lour., *Clausena excavata* Burm.f., *Garuga gamblei* King ex Smith, *Litsea glutinosa* (Lour.) Robinson, *Pterygota alata* (Roxburgh) R. Brown with same value [A=7 & RA=2.98] and *Dillenia indica* Linnaeus [A=6.50 & RA=2.77].

Maximum IVI value shows by *Wrightia arborea* (Dennstaedt) Mabberley [IVI=9.40], and followed by *Chukrasia tabularis* A. Jussieu, *Ficus racemosa* L. [IVI=9.07], *Flacourtia jangomas* (Lour.) Raeuschel [IVI=8.89], *Persea glaucescens* (Nees) Long [IVI=8.75], *Vitex peduncularis* Schauer [IVI=8.54], *Schima wallichii* (DC.) Korthals with the equal values [IVI=8.10], futher followed by *Sapindus rarak* DC. [IVI=8.10], *Actinodaphne obovata* (Nees) Blume [IVI=7.82] where as *Callicarpa arborea* Roxb., *Holarrhena pubescens* (Buch-Ham.) G. Don, *Phoebe lanceolata* (Nees) Nees, *Terminalia bellirica* (Gaertner) Roxburgh, *Terminalia myriocarpa* Heurck & Mueller [IVI=1.83] shows the minimum value.

Table 20: Analysis of Tree layer data of North Rajabhatkhawa (NRVK) MPCA

TREE TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Acacia catechu</i> (L.f.) Willdenow	4	1	9.09	36.36	4.00	0.73	0.79	1.71	3.23
<i>Actinodaphne obovata</i> (Nees) Blume	15	3	30.00	150.00	5.00	2.42	3.27	2.13	7.82
<i>Aesculus assamica</i> Griffith	6	2	20.00	60.00	3.00	1.61	1.31	1.28	4.20
<i>Alstonia scholaris</i> (L.) R. Brown	2	1	10.00	20.00	2.00	0.81	0.44	0.85	2.10
<i>Antidesma acuminatum</i> Wight	5	1	10.00	50.00	5.00	0.81	1.09	2.13	4.03
<i>Antidesma buniis</i> (L.) Sprengel	4	2	20.00	40.00	2.00	1.61	0.87	0.85	3.34

<i>Aphanamixis polystachya</i> (Wallich) Parker	5	2	20.00	50.00	2.50	1.61	1.09	1.07	3.77
<i>Baccaurea ramiflora</i> Loureiro	7	1	10.00	70.00	7.00	0.81	1.53	2.98	5.32
<i>Bauhinia purpurea</i> L.	3	1	10.00	30.00	3.00	0.81	0.65	1.28	2.74
<i>Bauhinia variegata</i> L.	14	3	30.00	140.00	4.67	2.42	3.05	1.99	7.46
<i>Bischofia javanica</i> Blume	11	2	20.00	110.00	5.50	1.61	2.40	2.35	6.36
<i>Bridelia sikkimensis</i> Gehrmann	8	1	10.00	80.00	8.00	0.81	1.74	3.41	5.96
<i>Callicarpa arborea</i> Roxb.	1	1	10.00	10.00	1.00	0.81	0.22	0.43	1.45
<i>Careya arborea</i> Roxb.	6	2	20.00	60.00	3.00	1.61	1.31	1.28	4.20
<i>Caryota urens</i> L.	3	1	10.00	30.00	3.00	0.81	0.65	1.28	2.74
<i>Celastrus paniculatus</i> Willdenow	10	2	20.00	100.00	5.00	1.61	2.18	2.13	5.93
<i>Chukrasia tabularis</i> A. Jussieu	18	4	40.00	180.00	4.50	3.23	3.92	1.92	9.07
<i>Clausena excavata</i> Burm.f.	7	1	10.00	70.00	7.00	0.81	1.53	2.98	5.32
<i>Cocculus laurifolius</i> DC.	8	2	20.00	80.00	4.00	1.61	1.74	1.71	5.06
<i>Combretum decandrum</i> Roxb.	7	3	30.00	70.00	2.33	2.42	1.53	0.99	4.94
<i>Crateva religiosa</i> Forst.f.	5	2	20.00	50.00	2.50	1.61	1.09	1.07	3.77
<i>Dillenia indica</i> L.	13	2	20.00	130.00	6.50	1.61	2.83	2.77	7.22
<i>Erythrina stricta</i> Roxb.	8	2	20.00	80.00	4.00	1.61	1.74	1.71	5.06
<i>Ficus hispida</i> L.f.	4	1	10.00	40.00	4.00	0.81	0.87	1.71	3.38
<i>Ficus racemosa</i> L.	18	4	40.00	180.00	4.50	3.23	3.92	1.92	9.07
<i>Ficus religiosa</i> L.	2	1	10.00	20.00	2.00	0.81	0.44	0.85	2.10
<i>Ficus semicordata</i> J.E.Smith	5	1	10.00	50.00	5.00	0.81	1.09	2.13	4.03
<i>Flacourtia jangomas</i> (Lour.) Raeuschel	16	5	50.00	160.00	3.20	4.04	3.49	1.36	8.89
<i>Garuga gamblei</i> King ex Smith	7	1	10.00	70.00	7.00	0.81	1.53	2.98	5.32
<i>Grewia asiatica</i> L.	6	2	20.00	60.00	3.00	1.61	1.31	1.28	4.20
<i>Holarrhena pubescens</i> (Buch.-Ham.) G. Don	1	1	10.00	10.00	1.00	0.81	0.22	0.43	1.45
<i>Lannea coromandelica</i> (Houttuyn) Merrill	6	2	20.00	60.00	3.00	1.61	1.31	1.28	4.20
<i>Litsea cubeba</i> (Loureiro) Persoon	10	3	30.00	100.00	3.33	2.42	2.18	1.42	6.02
<i>Litsea glutinosa</i> (Loureiro) Robinson	7	1	10.00	70.00	7.00	0.81	1.53	2.98	5.32
<i>Litsea monopetala</i> (Roxb.) Persoon	8	1	10.00	80.00	8.00	0.81	1.74	3.41	5.96
<i>Mallotus philippensis</i> (Lamarck) Mueller	4	1	10.00	40.00	4.00	0.81	0.87	1.71	3.38
<i>Mesua ferrea</i> L.	6	3	30.00	60.00	2.00	2.42	1.31	0.85	4.58
<i>Michelia champaca</i> L.	3	1	10.00	30.00	3.00	0.81	0.65	1.28	2.74
<i>Micromelum integerrimum</i> (Roxb.) Roemer	3	2	20.00	30.00	1.50	1.61	0.65	0.64	2.91
<i>Oroxylum indicum</i> (L.) Ventenat	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Persea glaucescens</i> (Nees) Long	17	4	40.00	170.00	4.25	3.23	3.71	1.81	8.75
<i>Phoebe lanceolata</i> (Nees) Nees	1	1	10.00	10.00	1.00	0.81	0.22	0.43	1.45
<i>Phyllanthus emblica</i> L.	3	2	20.00	30.00	1.50	1.61	0.65	0.64	2.91
<i>Polyalthia simiarum</i> (Buch.-Ham. ex Hook.f. & Thomson) Hook.f. & Thomson	6	2	20.00	60.00	3.00	1.61	1.31	1.28	4.20
<i>Premna barbata</i> Wallich	4	1	10.00	40.00	4.00	0.81	0.87	1.71	3.38
<i>Premna mucronata</i> Roxb.	13	4	40.00	130.00	3.25	3.23	2.83	1.39	7.45
<i>Pterygota alata</i> (Roxb.) R. Brown	7	1	10.00	70.00	7.00	0.81	1.53	2.98	5.32
<i>Sapindus rarak</i> DC.	15	4	40.00	150.00	3.75	3.23	3.27	1.60	8.10

<i>Schima wallichii</i> (DC.) Korthals	16	3	30.00	160.00	5.33	2.42	3.49	2.27	8.18
<i>Shorea robusta</i> Gaertner f.	8	3	30.00	80.00	2.67	2.42	1.74	1.14	5.30
<i>Sterculia villosa</i> Roxb.	10	2	20.00	100.00	5.00	1.61	2.18	2.13	5.93
<i>Streblus asper</i> Lour.	2	2	20.00	20.00	1.00	1.61	0.44	0.43	2.48
<i>Syzygium cumini</i> (L.) Skeels	4	2	20.00	40.00	2.00	1.61	0.87	0.85	3.34
<i>Telauma hodgsonii</i> Hook.f. & Thomson	3	2	20.00	30.00	1.50	1.61	0.65	0.64	2.91
<i>Terminalia bellirica</i> (Gaertner) Roxb.	1	1	10.00	10.00	1.00	0.81	0.22	0.43	1.45
<i>Terminalia myriocarpa</i> Heurck & Meuller	1	1	10.00	10.00	1.00	0.81	0.22	0.43	1.45
<i>Toddalia asiatica</i> (L.) Lamarck	10	3	30.00	100.00	3.33	2.42	2.18	1.42	6.02
<i>Toona ciliata</i> M.Roem.	5	2	20.00	50.00	2.50	1.61	1.09	1.07	3.77
<i>Trema orientalis</i> (L.) Blume	3	1	10.00	30.00	3.00	0.81	0.65	1.28	2.74
<i>Vitex peduncularis</i> Schauer	17	3	30.00	170.00	5.67	2.42	3.71	2.42	8.54
<i>Wrightia arborea</i> (Dennstaedt) Mabberley	19	4	40.00	190.00	4.75	3.23	4.14	2.03	9.40
<i>Zanthoxylum rhetsa</i> (Roxb.) DC	9	1	10.00	90.00	9.00	0.81	1.96	3.84	6.61
<i>Zizyphus mauritiana</i> Lamarck	9	3	30.00	90.00	3.00	2.42	1.96	1.28	5.66
TOTAL	459	124	1239.09	4586.36	234.53	100.00	100.00	100.00	300.00

6.2.1.3. Sursuti MPCA, Gorumara National Park

A total 12 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure.

Studied quadrates, which recorded 66 species of tree species and the analysis of recorded data is shown in Table 21. The calculating data shows highest Frequency and Relative Frequency by *Aglaia spectabilis* (Miq.) S.S.Jain & S. Bennet, *Baccaurea ramiflora* Lour. and *Dillenia pentagyna* Roxb. with the equal value [F=60 & RF=3.77] followed by *Sapindus rarak* DC. [F=50 & RF=3.14], *Castanopsis indica* (Roxb. ex Lindl.) A. DC., *Grewia asiatica* Linnaeus, *Litsea salicifolia* (Nees) Hook.f., *Wrightia arborea* (Dennstaedt) Mabberley, *Zizyphus rugosa* Lam. with same value [F=40 & RF=2.51].

Baccaurea ramiflora Lour. shows highest Density and Relative Density [D=230 & RD=4.15], followed by *Aglaia spectabilis* (Miq.) S.S.Jain & S.Bennet [D=210 & RD=3.79], *Sapindus rarak* DC. [D=190 & RD=3.43], *Grewia asiatica* L. [D=150 & RD=2.70], *Castanopsis indica* (Roxb. ex Lindl.) A.DC. and *Dillenia pentagyna* Roxb. [D=140 & RD= 2.52].

Actinodaphne obovata (Nees) Blume and *Micromelum integerrimum* (Roxburgh) Roemer shows highest Density and Relative Density [A=7 & RA=2.95] followed by

Telauma hodgsonii Hook.f. & Thomson [A=6.5 & RA=2.74], and *Lannea coromandelica* (Houttuyn) Merrill [A=5.5 & RA=2.32].

Maximum IVI value shows by *Baccaurea ramiflora* Lour. [IVI=9.53], and followed by *Aglaia spectabilis* (Miq.) S.S.Jain & S.Bennet [IVI=9.03], *Sapindus rarak* DC. [IVI=8.17], *Dillenia pentagyna* Roxb. [IVI=7.27], *Grewia asiatica* L. [IVI=6.80], *Castanopsis indica* [IVI=6.51], and *Zizyphus rugosa* Lam. [IVI=5.94], where as *Antidesma acidum* Retzius, *Pterospermum acerifolium* (L.) Willd., *Terminalia bellirica* (Gaertner) Roxb. and *Terminalia myriocarpa* Heurck & Meuller [IVI=1.83] shows the minimum value.

Table 21: Analysis of Tree layer data of Sursuti MPCA

TREE TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Acacia catechu</i> (L.f.) Willdenow	14	4	33.3	117	3.5	2.09	2.10	1.48	5.67
<i>Acacia pennata</i> (L.) Willdenow	4	1	10	40	4	0.63	0.72	1.69	3.04
<i>Actinodaphne obovata</i> (Nees) Blume	7	1	10	70	7.00	0.63	1.26	2.95	4.84
<i>Aesculus assamica</i> Griffith	9	2	20	90	4.5	1.26	1.62	1.90	4.78
<i>Aglaia spectabilis</i> (Miq.) S.S.Jain & S.Bennet	21	6	60	210	3.5	3.77	3.79	1.48	9.03
<i>Alstonia scholaris</i> (L.) R. Brown	10	2	20	100	5	1.26	1.80	2.11	5.17
<i>Antidesma acidum</i> Retz.	2	1	10	20	2	0.63	0.36	0.84	1.83
<i>Antidesma acuminatum</i> Wight	8	2	20	80	4	1.26	1.44	1.69	4.39
<i>Antidesma buniis</i> (L.) Spreng.	13	3	30	130	4.33	1.88	2.34	1.83	6.06
<i>Aphanamixis polystachya</i> (Wallich) Parker	5	2	20	50	2.5	1.26	0.90	1.06	3.21
<i>Artocarpus chama</i> Buch.-Ham.	3	2	20	30	1.5	1.26	0.54	0.63	2.43
<i>Baccaurea ramiflora</i> Lour.	23	6	60	230	3.83	3.77	4.15	1.62	9.53
<i>Bischofia javanica</i> Blume	8	2	20	80	4	1.26	1.44	1.69	4.39
<i>Bombax ceiba</i> L.	8	3	30	80	2.67	1.88	1.44	1.13	4.45
<i>Bridelia retusa</i> (L.) Sprengel	13	3	30	130	4.33	1.88	2.34	1.83	6.06
<i>Bridelia sikkimensis</i> Gehrm.	4	1	10	40	4	0.63	0.72	1.69	3.04
<i>Callicarpa arborea</i> Roxb.	9	2	20	90	4.5	1.26	1.62	1.90	4.78
<i>Careya arborea</i> Roxb.	10	2	20	100	5	1.26	1.80	2.11	5.17
<i>Caryota urens</i> L.	4	2	20	40	2	1.26	0.72	0.84	2.82
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	14	4	40	140	3.5	2.51	2.52	1.48	6.51
<i>Celastrus paniculatus</i> Willdenow	10	2	20	100	5.00	1.26	1.80	2.11	5.17
<i>Clausena excavata</i> Burm.f.	3	2	20	30	1.5	1.26	0.54	0.63	2.43
<i>Cocculus laurifolius</i> DC.	13	3	30	130	4.33	1.88	2.34	1.83	6.06
<i>Combretum decandrum</i> Roxb.	6	3	30	60	2	1.88	1.08	0.84	3.81
<i>Crateva religiosa</i> Forst.f.	11	3	30	110	3.67	1.88	1.98	1.55	5.41
<i>Dillenia indica</i> L.	12	3	30	120	4	1.88	2.16	1.69	5.73
<i>Dillenia pentagyna</i> Roxb.	14	6	60	140	2.33	3.77	2.52	0.98	7.27
<i>Dysoxylum mellissimum</i> Blume	8	2	20	80	4	1.26	1.44	1.69	4.39

<i>Erythrina stricta</i> Roxb.	12	5	50	120	2.4	3.14	2.16	1.01	6.31
<i>Ficus benghalensis</i> L.	7	2	20	70	3.5	1.26	1.26	1.48	3.99
<i>Ficus religiosa</i> L.	5	2	20	50	2.5	1.26	0.90	1.06	3.21
<i>Ficus semicordata</i> J.E.Smith	4	1	10	40	4	0.63	0.72	1.69	3.04
<i>Garuga gamblei</i> King ex Smith	6	2	20	60	3	1.26	1.08	1.27	3.60
<i>Grewia asiatica</i> L.	15	4	40	150	3.75	2.51	2.70	1.58	6.80
<i>Lagerstroemia parviflora</i> Roxb.	8	3	30	80	2.67	1.88	1.44	1.13	4.45
<i>Lannea coromandelica</i> (Houttuyn) Merrill	11	2	20	110	5.5	1.26	1.98	2.32	5.56
<i>Litsea cubeba</i> (Lour.) Pers.	8	2	20	80	4	1.26	1.44	1.69	4.39
<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	9	2	20	90	4.5	1.26	1.62	1.90	4.78
<i>Litsea monopetala</i> (Roxb.) Persoon	5	1	10	50	5	0.63	0.90	2.11	3.64
<i>Litsea salicifolia</i> (Nees) Hook.f.	13	4	40	130	3.25	2.51	2.34	1.37	6.23
<i>Michelia champaca</i> L.	5	1	10	50	5	0.63	0.90	2.11	3.64
<i>Micromelum integerrimum</i> (Roxb.) Roemer	7	1	10	70	7	0.63	1.26	2.95	4.84
<i>Morinda angustifolia</i> Roxb.	6	2	20	60	3	1.26	1.08	1.27	3.60
<i>Nyctanthes arbor-tristis</i> L.	13	3	30	130	4.33	1.88	2.34	1.83	6.06
<i>Oroxylum indicum</i> (L.) Kurz	8	2	20	80	4	1.26	1.44	1.69	4.39
<i>Persea glaucescens</i> (Nees) Long	9	3	30	90	3	1.88	1.62	1.27	4.77
<i>Phoebe lanceolata</i> (Nees) Nees	4	2	20	40	2	1.26	0.72	0.84	2.82
<i>Premna barbata</i> Wallich	4	2	20	40	2	1.26	0.72	0.84	2.82
<i>Pterocarpus marsupium</i> Roxb.	13	3	30	130	4.33	1.88	2.34	1.83	6.06
<i>Pterospermum acerifolium</i> (L.) Willdenow	2	1	10	20	2	0.63	0.36	0.84	1.83
<i>Pterygota alata</i> (Roxb.) R. Brown	4	2	20	40	2	1.26	0.72	0.84	2.82
<i>Sapindus rarak</i> DC.	19	5	50	190	3.8	3.14	3.43	1.60	8.17
<i>Schima wallichii</i> (DC.) Korthals	9	2	20	90	4.5	1.26	1.62	1.90	4.78
<i>Shorea robusta</i> Gaertner f.	4	2	20	40	2	1.26	0.72	0.84	2.82
<i>Sterculia villosa</i> Roxb.	5	2	20	50	2.5	1.26	0.90	1.06	3.21
<i>Stereospermum colais</i> (Dillwyn) Mabblerley	4	1	10	40	4	0.63	0.72	1.69	3.04
<i>Streblus asper</i> Loureiro	8	3	30	80	2.67	1.88	1.44	1.13	4.45
<i>Syzygium cumini</i> (L.) Skeels	3	1	10	30	3	0.63	0.54	1.27	2.43
<i>Telauma hodgsonii</i> Hook.f. & Thomson	13	2	20	130	6.5	1.26	2.34	2.74	6.34
<i>Tephrosia candida</i> (Roxb.) DC.	5	1	10	50	5.00	0.63	0.90	2.11	3.64
<i>Terminalia bellirica</i> (Gaertner) Roxb.	2	1	10	20	2	0.63	0.36	0.84	1.83
<i>Terminalia myriocarpa</i> Heurck & Meuller	2	1	10	20	2	0.63	0.36	0.00	5.67
<i>Toona ciliata</i> Roemer	6	2	20	60	3	1.26	1.08	1.27	3.60
<i>Vitex peduncularis</i> Wall. ex Schauer	10	2	20	100	5	1.26	1.80	2.11	5.17
<i>Wrightia arborea</i> (Dennst.) Mabb.	11	4	40	110	2.75	2.51	1.98	1.16	5.65
<i>Zizyphus rugosa</i> Lamarck	12	4	40	120	3	2.51	2.16	1.27	5.94
TOTAL	557	160	1593	5547	237	100	100	100.00	300.00

6.2.2. SHRUB LAYER

6.2.2.1. North Sevoke MPCA, Mahananda Wildlife Sanctuary

A total 30 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure.

Studied quadrates, which recorded 116 species of tree species and the analysis of recorded data is shown in Table 22. The calculating data shows highest Frequency and Relative Frequency by *Dendrocnide amplissima* (Bl.) Chew. [F=33.3 & RF=3.7] followed by *Ardisia* and *Coffea benghalensis* B.Heyne ex Schult. with same value [F=23.3 & RF=2.6], *Stephania glabra* (Roxb.) Miers [F=20 & RF=2.2], *Clerodendrum viscosum* Ventenat, *Hemidesmus indicus* (L.) R. Br., *Piper longum* L., *Sida acuta* Burm. f., *Thunbergia fragrans* Roxb., [F=16.7 & RF=1.8] and further followed by *Clerodendrum infortunatum* L. and *Hoya parasitica* (Roxb.) Wight, *Ocimum americanum* L., *Phlogacanthus thyriformis* (Roxb. ex Hardw.) Mabb, *Smilax zeylanica* L., *Stephania japonica* (Thunb.) Miers and *Tinospora cordifolia* (Loureiro) Merrill. [F=13.3 & RF=1.5].

Hoya parasitica (Roxburgh) Wight shows highest Density and Relative Density [D=0.9 & RD=2.7], followed by *Coffea benghalensis* B.Heyne ex Schult. and *Phlogacanthus thyriformis* (Roxb. ex Hardw.) [D=0.8 & RD=3.79], *Hemidesmus indicus* (L.) R. Br., *Sida acuta*, *Dendrocnide amplissima* (Blume) Chew., *Thunbergia fragrans*, *Clerodendrum infortunatum* L. with same value [D=0.7 & RD=2.2].

Clerodendrum indicum (L.) Kuntze shows highest Abundance and Relative Abundance [A=9 & RA=2.3] followed by *Scindapsus officinalis* (Roxb.) Schott [A=8.5 & RA=2.1], *Barleria cristata*, *Dioscorea belophylla* Voigt ex Haines and *Piper chuyva* (Miquel) C. DC. [A=8 & RA=2], *Zanthoxylum armatum* DC. [A=7.5 & RA=1.9], *Sauropus androgynus* (L.) Merrill [A=7 & RA=1.8].

Maximum IVI value shows by *Dendrocnide amplissima* (Blume) Chew. [IVI=6.5], and followed by *Coffea benghalensis* B.Heyne ex Schult. [IVI=6.2], *Hoya parasitica* (Roxb.) Wight [IVI=5.9], *Phlogacanthus thyriformis* [IVI=5.7], *Ardisia demissa* Miq., *Hemidesmus indicus* (L.) R.Br., *Sida acuta* [IVI=5.3] where as *Euphorbia heyneana* Sprengel and *Lasia spinosa* (Linnaeus) Thwaites [IVI=0.97] shows the minimum value.

Table 22: Analysis of Shrub and Climber layer data of North Sevoke MPCA

SHRUB AND CLIMBER TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Abelmoschus moshatus</i> Medikus	7	1	3.3	0.2	7.0	0.4	0.7	1.8	2.9
<i>Abroma augustum</i> (L.) L.f.	4	3	10.0	0.1	1.3	1.1	0.4	0.3	1.9
<i>Abrus pulchellus</i> Wallich ex Thwaites	10	3	10.0	0.3	3.3	1.1	1.1	0.8	3.0
<i>Acacia pennata</i> (L.) Willd.	5	2	6.7	0.2	2.5	0.7	0.5	0.6	1.9
<i>Ardisia demissa</i> Miq.	19	7	23.3	0.6	2.7	2.6	2.0	0.7	5.3
<i>Alpinia galanga</i> (L.) Willd.	6	3	10.0	0.2	2.0	1.1	0.6	0.5	2.2
<i>Anisomeles indica</i> (L.) Kuntze	19	3	10.0	0.6	6.3	1.1	2.0	1.6	4.7
<i>Argyrea roxburghii</i> Choisy	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Aristolochia indica</i> L.	10	2	6.7	0.3	5.0	0.7	1.1	1.3	3.1
<i>Aristolochia saccata</i> Wallich	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Barleria cristata</i> L.	8	1	3.3	0.3	8.0	0.4	0.8	2.0	3.2
<i>Bauhinia scandens</i> Blanco	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Bauhinia vahlii</i> (Wight & Arn.) Benth.	7	3	10.0	0.2	2.3	1.1	0.7	0.6	2.4
<i>Buddleja asiatica</i> Lour.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Caesalpinia cucullata</i> Roxb.	6	2	6.7	0.2	3.0	0.7	0.6	0.8	2.1
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	8	3	10.0	0.3	2.7	1.1	0.8	0.7	2.6
<i>Cissampelos pareira</i> L.	6	1	3.3	0.2	6.0	0.4	0.6	1.5	2.5
<i>Citrus medica</i> L.	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Clerodendrum indicum</i> (L.) Kuntze	9	1	3.3	0.3	9.0	0.4	1.0	2.3	3.6
<i>Clerodendrum infortunatum</i> L.	20	4	13.3	0.7	5.0	1.5	2.1	1.3	4.8
<i>Clerodendrum viscosum</i> Ventenat	16	5	16.7	0.5	3.2	1.8	1.7	0.8	4.3
<i>Coffea benghalensis</i> B.Heyne ex Schult.	25	7	23.3	0.8	3.6	2.6	2.6	0.9	6.1
<i>Combretum decandrum</i> G.Don	6	3	10.0	0.2	2.0	1.1	0.6	0.5	2.2
<i>Cryptolepis buchanani</i> R. Br. ex Roemer & Schultes	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Cryptolepis sinensis</i> (Loureiro) Merrill	2	2	6.7	0.1	1.0	0.7	0.2	0.3	1.2
<i>Cuscuta reflexa</i> Roxb.	4	2	6.7	0.1	2.0	0.7	0.4	0.5	1.7
<i>Deeringia amaranthoides</i> (Lamarck) Merrill	3	2	6.7	0.1	1.5	0.7	0.3	0.4	1.4
<i>Dendrocnide amplissima</i> (Blume) Chew	21	10	33.3	0.7	2.1	3.7	2.2	0.5	6.4
<i>Dioscorea belophylla</i> Voigt ex Haines	8	1	3.3	0.3	8.0	0.4	0.8	2.0	3.2
<i>Dioscorea bulbifera</i> L.	5	1	3.3	0.2	5.0	0.4	0.5	1.3	2.2
<i>Dioscorea pentaphylla</i> L.	12	2	6.7	0.4	6.0	0.7	1.3	1.5	3.5
<i>Dioscorea prazeri</i> Prain & Burkill	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Ecbolium viride</i> (Forssk.) Alston	12	3	10.0	0.4	4.0	1.1	1.3	1.0	3.4
<i>Evolvulus alsinoides</i> (L.) L.	4	2	6.7	0.1	2.0	0.7	0.4	0.5	1.7
<i>Flemingia strobilifera</i> (L.) W.T.Aiton	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Flueggea virosa</i> (Willdenow) Voigt	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Glycosmis pentaphylla</i> (Retzius) DC.	5	3	10.0	0.2	1.7	1.1	0.5	0.4	2.1
<i>Grewia serrulate</i> DC.	6	3	10.0	0.2	2.0	1.1	0.6	0.5	2.2
<i>Gynocardia odorata</i> R. Brown	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Hedyotis scandens</i> Roxb.	5	1	3.3	0.2	5.0	0.4	0.5	1.3	2.2
<i>Hemidesmus indicus</i> (L.) R.Br.	22	5	16.7	0.7	4.4	1.8	2.3	1.1	5.3
<i>Hoya parasitica</i> (Roxb.) Wight	26	4	13.3	0.9	6.5	1.5	2.7	1.6	5.9

<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Jasminum multiflorum</i> (Burm.f.) Andrews	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Jasminum scandens</i> (Retz.) Vahl	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Lantana camara</i> L.	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Lasia spinosa</i> (L.) Thwaites	15	3	10.0	0.5	5.0	1.1	1.6	1.3	3.9
<i>Leea asiatica</i> (L.) Ridsdale	7	2	6.7	0.2	3.5	0.7	0.7	0.9	2.4
<i>Leea macrophylla</i> Roxb. ex Hornem.	15	3	10.0	0.5	5.0	1.1	1.6	1.3	3.9
<i>Luffa aegyptiaca</i> Miller	10	2	6.7	0.3	5.0	0.7	1.1	1.3	3.1
<i>Maesa indica</i> Hook.f.	2	2	6.7	0.1	1.0	0.7	0.2	0.3	1.2
<i>Melastoma melabathricum</i> L.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Merremia vitifolia</i> (Burm.f.) Hallier f.	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Meyna spinosa</i> Roxb. ex Link	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Mikania scandens</i> (L.) Willd.	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Milletia extensa</i> (Benth.) Benth. ex Baker	5	2	6.7	0.2	2.5	0.7	0.5	0.6	1.9
<i>Mimosa himalayana</i> Gamble	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Momordica charantia</i> L.	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Morus laevigata</i> Brandis	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Murraya paniculata</i> (L.) Jack	6	3	10.0	0.2	2.0	1.1	0.6	0.5	2.2
<i>Mussaenda roxburghii</i> Hook.f.	11	3	10.0	0.4	3.7	1.1	1.2	0.9	3.2
<i>Naravelia zeylanica</i> (L.) DC.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Natsiatum herpeticum</i> Buch.-Ham. ex Arn.	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Ocimum americanum</i> L.	16	4	13.3	0.5	4.0	1.5	1.7	1.0	4.2
<i>Oesbeckia nepalensis</i> Hooker	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Paederia foetida</i> L.	3	2	6.7	0.1	1.5	0.7	0.3	0.4	1.4
<i>Pandanus unguifer</i> Hook.f.	6	1	3.3	0.2	6.0	0.4	0.6	1.5	2.5
<i>Pavetta indica</i> L.	2	2	6.7	0.1	1.0	0.7	0.2	0.3	1.2
<i>Pavetta polyantha</i> (Hook.f.) Wall. ex Bremek.	7	2	6.7	0.2	3.5	0.7	0.7	0.9	2.4
<i>Phlogacanthus thysiformis</i> (Roxb. ex Hardw.)	25	4	13.3	0.8	6.3	1.5	2.6	1.6	5.7
<i>Piper betle</i> L.	6	2	6.7	0.2	3.0	0.7	0.6	0.8	2.1
<i>Piper chuyva</i> (Miquel) C. DC.	8	1	3.3	0.3	8.0	0.4	0.8	2.0	3.2
<i>Piper hamiltonii</i> C.DC.	3	2	6.7	0.1	1.5	0.7	0.3	0.4	1.4
<i>Piper longum</i> L.	17	5	16.7	0.6	3.4	1.8	1.8	0.9	4.5
<i>Piper peepuloides</i> Roxb.	13	2	6.7	0.4	6.5	0.7	1.4	1.6	3.7
<i>Piper retrofractum</i> Vahl	7	2	6.7	0.2	3.5	0.7	0.7	0.9	2.4
<i>Piper sylvaticum</i> Roxb.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Pothos cathcarti</i> Schott	5	1	3.3	0.2	5.0	0.4	0.5	1.3	2.2
<i>Pothos scandens</i> L.	15	3	10.0	0.5	5.0	1.1	1.6	1.3	3.9
<i>Premna barbata</i> Wall. ex Schauer	12	3	10.0	0.4	4.0	1.1	1.3	1.0	3.4
<i>Psilanthus bengalensis</i> (Schultes) Leroy	5	1	3.3	0.2	5.0	0.4	0.5	1.3	2.2
<i>Psychotria erratica</i> Hook.f.	9	3	10.0	0.3	3.0	1.1	1.0	0.8	2.8
<i>Randia sikkimensis</i> Hook.f.	5	2	6.7	0.2	2.5	0.7	0.5	0.6	1.9
<i>Rauvolfia serpentina</i> (L.) Bentham ex Kurtz	10	2	6.7	0.3	5.0	0.7	1.1	1.3	3.1
<i>Sarcopyramis napalensis</i> Wall.	9	2	6.7	0.3	4.5	0.7	1.0	1.1	2.8
<i>Sauropus androgynus</i> (L.) Merrill	7	1	3.3	0.2	7.0	0.4	0.7	1.8	2.9

<i>Sauropus quadrangularis</i> (Willd.) Müll.Arg.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Scindapsus officinalis</i> (Roxb.) Schott	17	2	6.7	0.6	8.5	0.7	1.8	2.1	4.7
<i>Sida acuta</i> Burm.f.	22	5	16.7	0.7	4.4	1.8	2.3	1.1	5.3
<i>Sida cordifolia</i> L.	12	3	10.0	0.4	4.0	1.1	1.3	1.0	3.4
<i>Sida rhombifolia</i> L.	10	2	6.7	0.3	5.0	0.7	1.1	1.3	3.1
<i>Smilax lanceaeifolia</i> Roxb.	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Smilax zeylanica</i> L.	12	4	13.3	0.4	3.0	1.5	1.3	0.8	3.5
<i>Solanum aculeatissimum</i> Jacquin	3	1	3.3	0.1	3.0	0.4	0.3	0.8	1.4
<i>Solanum torvum</i> Swartz	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Stephania glabra</i> (Roxb.) Miers	16	6	20.0	0.5	2.7	2.2	1.7	0.7	4.6
<i>Stephania japonica</i> (Thunberg) Miers	17	4	13.3	0.6	4.3	1.5	1.8	1.1	4.3
<i>Tabernaemontana divaricata</i> (L.) Roemer & Schultes	7	2	6.7	0.2	3.5	0.7	0.7	0.9	2.4
<i>Tephrosia candida</i> (Roxb.) DC.	8	3	10.0	0.3	2.7	1.1	0.8	0.7	2.6
<i>Tetracera sarmentosa</i> (L.) Vahl	7	3	10.0	0.2	2.3	1.1	0.7	0.6	2.4
<i>Tetrastigma serrulatum</i> (Roxb.) Planch.	5	2	6.7	0.2	2.5	0.7	0.5	0.6	1.9
<i>Thunbergia fragrans</i> Roxb.	21	5	16.7	0.7	4.2	1.8	2.2	1.1	5.1
<i>Thunbergia grandiflora</i> Roxb.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Tinospora sinensis</i> (Loureiro) Merrill.	17	4	13.3	0.6	4.3	1.5	1.8	1.1	4.3
<i>Toddalia asiatica</i> (L.) Lam.	11	3	10.0	0.4	3.7	1.1	1.2	0.9	3.2
<i>Trichosanthes cordata</i> Roxb.	15	3	10.0	0.5	5.0	1.1	1.6	1.3	3.9
<i>Trichosanthes tricuspidata</i> Loureiro	5	2	6.7	0.2	2.5	0.7	0.5	0.6	1.9
<i>Triumfetta rhomboidei</i> Jacq.	1	1	3.3	0.0	1.0	0.4	0.1	0.3	0.7
<i>Uraria picta</i> (Jacq.) Desv. ex DC.	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Urena lobata</i> L.	5	3	10.0	0.2	1.7	1.1	0.5	0.4	2.1
<i>Vallis solanacea</i> (Roth) O. Kuntze	18	3	10.0	0.6	6.0	1.1	1.9	1.5	4.5
<i>Ventilago denticulate</i> Willd.	7	2	6.7	0.2	3.5	0.7	0.7	0.9	2.4
<i>Wattakaka volubilis</i> (L.f.) Stapf	14	3	10.0	0.5	4.7	1.1	1.5	1.2	3.8
<i>Zanonia indica</i> L.	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
<i>Zanthoxylum armatum</i> DC.	15	2	6.7	0.5	7.5	0.7	1.6	1.9	4.2
<i>Zanthoxylum nitidum</i> (Roxb.) DC	2	1	3.3	0.1	2.0	0.4	0.2	0.5	1.1
TOTAL	946	272	906.7	31.5	396.7	100.0	100.0	100.0	300.0

6.2.2.2. North Rajabhatkhawa (NRVK) MPCA, Buxa National Park

A total 33 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure. Studied quadrates, which recorded 89 species of tree species and the analysis of recorded data is shown in Table 23. The calculating data shows highest Frequency and Relative Frequency by *Chloranthus elatior* Link [F=45.45 & RF=3.66] followed by *Dendrocnide amplissima* (Bl.) Chew., *Pothos cathcarti* Schott [F=27.27 & RF=2.20], *Psilanthus bengalensis* (Schultes) Leroy *Tephrosia candida* (Roxb.) DC. [F=24.24 & RF=1.95] *Luffa aegyptiaca* Miller, *Mucuna pruriens* (L.) DC., *Pandanus unguifer*

Hook.f., *Stephania japonica* (Thunb.) Miers., *Tinospora sinensis* (Lour.) Merrill., *Vallisneria spiralis* (L.) O. Kuntze, *Wattakaka volubilis* (L.f.) Stapf with same value [F=21.21 & RF=1.22], further followed by *Dendrocnide*, *Clerodendrum viscosum* Ventenat, *Hemidesmus indicus* (L.) R. Br. ex Schult, *Piper longum* L., *Sida acuta* Thunb. with equal value [F=27.27 & RF=2.20].

Chloranthus elatior Link shows highest Density and Relative Density [D=1.45 & RD=4.39], followed by *Pothos cathcarti* Schott [D=0.85 & RD=2.56], *Dendrocnide amplissima* (Bl.) Chew, *Dioscorea prazeri* Prain & Burkill [D=0.79 & RD=2.38], *Tinospora sinensis* (Lour.) Merrill. [R=0.76 & RD=2.29] and *Pericampylus glaucus* (Lam.) Merrill, *Tephrosia candida* (Roxburgh) DC., *Wattakaka volubilis* (L.f.) Stapf and *Zanthoxylum armatum* DC. with equal value [D=0.73 & RD=2.19].

Hemidesmus indicus shows highest Density and Relative Abundance [A=8 & RA=119.93] followed by *Pericampylus glaucus* (Lam.) Merrill, *Zanthoxylum armatum* DC. [A=4.80 & RA=179.89], *Murraya paniculata* (L.) Jack [A=4.67 & RA=174.89], *Sauropus compressus* Mueller [A=4.50 & RA=168.65], *Dioscorea prazeri* Prain & Burkill [A=4.33 & RA=162.40] further followed by *Cissampelos pareira* L., *Tinospora sinensis* (Lour.) Merrill. With equal values [A=6.67 & RA=133.85].

Maximum IVI value shows by *Zanthoxylum armatum* DC. and *Pericampylus glaucus* (Lam.) Merrill. [IVI=184.21], followed by *Murraya paniculata* (L.) Jack [IVI=177.77], *Sauropus compressus* Mueller [IVI=170.79], *Dioscorea prazeri* Prain & Burkill [IVI=167.06], *Cissampelos pareira* L. [IVI=143.59] and *Tinospora sinensis* (Lour.) Merrill. [IVI=138.52] where as *Gomphostemma parviflorum* Wall. ex Benth. and *Ludwigia poctavulvis* (Jacq.) P.H. Raven [IVI=0.75] shows the minimum value.

Table 23: Analysis of Shrubs and climber layer data of North Rajabhatkhawa (NRVK) MPCA

SHRUB AND CLIMBER TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Abelmoschus moshatus</i> Medikus	13	5	15.15	0.39	2.60	1.22	1.19	97.44	99.85
<i>Abrus pulchellus</i> Wallich ex Thwaites	7	2	6.06	0.21	3.50	0.49	0.64	131.17	132.30
<i>Argyreia roxburghii</i> Choisy	13	5	15.15	0.39	2.60	1.22	1.19	97.44	99.85
<i>Aristolochia indica</i> L.	12	4	12.12	0.36	3.00	0.98	1.10	112.43	114.50
<i>Aristolochia saccata</i> Wallich	7	4	12.12	0.21	1.75	0.98	0.64	65.59	67.20
<i>Caesalpinia cucullata</i> Roxb.	16	5	15.15	0.48	3.20	1.22	1.46	119.93	122.61
<i>Cissampelos pareira</i> L.	15	4	12.12	0.45	3.75	0.98	1.37	140.54	142.89
<i>Citrus medica</i> L.	14	6	18.18	0.42	2.33	1.46	1.28	87.45	90.19
<i>Clerodendrum indicum</i> (L.) Kuntze	12	4	12.12	0.36	3.00	0.98	1.10	112.43	114.50

<i>Clerodendrum viscosum</i> Ventenat	10	4	12.12	0.30	2.50	0.98	0.91	93.69	95.58
<i>Chloranthus elatior</i> Link	48	15	45.45	1.45	3.20	3.66	4.39	119.93	127.97
<i>Cryptolepis buchmanii</i> R. Br. ex Roemer & Schultes	12	6	18.18	0.36	2.00	1.46	1.10	74.95	77.51
<i>Cryptolepis sinensis</i> (Loureiro) Merrill	8	5	15.15	0.24	1.60	1.22	0.73	59.96	61.91
<i>Daphne involucreta</i> Wallich	9	4	12.12	0.27	2.25	0.98	0.82	84.32	86.12
<i>Deeringia amaranthoides</i> (Lamarck) Merrill	5	2	6.06	0.15	2.50	0.49	0.46	93.69	94.64
<i>Dendrocnide amplissima</i> (Blume) Chew.	26	9	27.27	0.79	2.89	2.20	2.38	108.27	112.84
<i>Dioscorea belophylla</i> Voigt ex Haines	11	5	15.15	0.33	2.20	1.22	1.01	82.45	84.67
<i>Dioscorea bulbifera</i> L.	13	4	12.12	0.39	3.25	0.98	1.19	121.80	123.96
<i>Dioscorea hispida</i> Dennstedt	14	6	18.18	0.42	2.33	1.46	1.28	87.45	90.19
<i>Dioscorea pentaphylla</i> Linnaeus	5	2	6.06	0.15	2.50	0.49	0.46	93.69	94.64
<i>Dioscorea prazeri</i> Prain & Burkill	26	6	18.18	0.79	4.33	1.46	2.38	162.40	166.24
<i>Entada rheedii</i> Sprengel	7	4	12.12	0.21	1.75	0.98	0.64	65.59	67.20
<i>Evolvulus alsinoides</i> (L.) Linnaeus	10	3	9.09	0.30	3.33	0.73	0.91	124.92	126.57
<i>Flemingia strobilifera</i> (L.) Aiton	5	2	6.06	0.15	2.50	0.49	0.46	93.69	94.64
<i>Flueggea virosa</i> (Willdenow) Voigt	15	5	15.15	0.45	3.00	1.22	1.37	112.43	115.02
<i>Gynocardia odorata</i> R. Brown	16	6	18.18	0.48	2.67	1.46	1.46	99.94	102.86
<i>Hedyotis scandens</i> Roxb.	13	4	12.12	0.39	3.25	0.98	1.19	121.80	123.96
<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	16	5	15.15	0.48	3.20	1.22	1.46	119.93	122.61
<i>Hoya parasitica</i> (Roxb.) Wight	17	5	15.15	0.52	3.40	1.22	1.55	127.42	130.20
<i>Ichnocarpus frutescens</i> (L.) Aiton	5	2	6.06	0.15	2.50	0.49	0.46	93.69	94.64
<i>Ipomoea aquatica</i> Forssk.	8	3	9.09	0.24	2.67	0.73	0.73	99.94	101.40
<i>Jasminum multiflorum</i> (Burm.f.) Andrews	10	5	15.15	0.30	2.00	1.22	0.91	74.95	77.09
<i>Jasminum scandens</i> Vahl	8	3	9.09	0.24	2.67	0.73	0.73	99.94	101.40
<i>Lantana camara</i> L.	7	5	15.15	0.21	1.40	1.22	0.64	52.47	54.33
<i>Leea aequata</i> L.	9	3	9.09	0.27	3.00	0.73	0.82	112.43	113.99
<i>Leea asiatica</i> (L.) Ridsdale	9	5	15.15	0.27	1.80	1.22	0.82	67.46	69.50
<i>Leea indica</i> (Burman f.) Merrill	5	2	6.06	0.15	2.50	0.49	0.46	93.69	94.64
<i>Luffa aegyptiaca</i> Miller	20	7	21.21	0.61	2.86	1.71	1.83	107.08	110.61
<i>Melastoma melabathricum</i> L.	10	6	18.18	0.30	1.67	1.46	0.91	62.46	64.84
<i>Merremia hirta</i> (L.) Merrill	10	4	12.12	0.30	2.50	0.98	0.91	93.69	95.58
<i>Merremia vitifolia</i> (Burm.f.) Hallier f.	8	5	15.15	0.24	1.60	1.22	0.73	59.96	61.91
<i>Meyna spinosa</i> Link	11	4	12.12	0.33	2.75	0.98	1.01	103.06	105.04
<i>Mikania micrantha</i> Kunth	14	5	15.15	0.42	2.80	1.22	1.28	104.94	107.44
<i>Mimosa himalayana</i> Gamble	11	6	18.18	0.33	1.83	1.46	1.01	68.71	71.18
<i>Mimosa pudica</i> L.	2	1	3.03	0.06	2.00	0.24	0.18	74.95	75.38
<i>Momordica charantia</i> L.	10	5	15.15	0.30	2.00	1.22	0.91	74.95	77.09
<i>Momordica cochinchinensis</i> Sprengel	7	3	9.09	0.21	2.33	0.73	0.64	87.45	88.82
<i>Morus laevigata</i> Brandis	10	6	18.18	0.30	1.67	1.46	0.91	62.46	64.84
<i>Mucuna pruriens</i> (L.) DC.	12	7	21.21	0.36	1.71	1.71	1.10	64.25	67.05
<i>Murraya koenigii</i> (L.) Sprengel	7	2	6.06	0.21	3.50	0.49	0.64	131.17	132.30
<i>Murraya paniculata</i> (L.) Jack	14	3	9.09	0.42	4.67	0.73	1.28	174.89	176.90
<i>Mussaenda roxburghii</i> Hook.f.	5	3	9.09	0.15	1.67	0.73	0.46	62.46	63.65
<i>Naravelia zeylanica</i> (L.) DC.	21	6	18.18	0.64	3.50	1.46	1.92	131.17	134.55

<i>Natsiatum herpeticum</i> Arnott	7	4	12.12	0.21	1.75	0.98	0.64	65.59	67.20
<i>Oesbeckia nepalensis</i> Hooker	12	4	12.12	0.36	3.00	0.98	1.10	112.43	114.50
<i>Paederia foetida</i> L.	10	4	12.12	0.30	2.50	0.98	0.91	93.69	95.58
<i>Pandanus unguifer</i> Hook.f.	20	7	21.21	0.61	2.86	1.71	1.83	107.08	110.61
<i>Pericampylus glaucus</i> (Lam.) Merrill	24	5	15.15	0.73	4.80	1.22	2.19	179.89	183.30
<i>Phlogacanthus thyrsoformis</i> (Hardwicke) Mabberley	7	3	9.09	0.21	2.33	0.73	0.64	87.45	88.82
<i>Piper betle</i> L.	6	2	6.06	0.18	3.00	0.49	0.55	112.43	113.47
<i>Piper chuyva</i> (Miquel) C. DC.	12	4	12.12	0.36	3.00	0.98	1.10	112.43	114.50
<i>Piper longum</i> L.	4	3	9.09	0.12	1.33	0.73	0.37	49.97	51.07
<i>Piper peepuloides</i> Roxb.	11	4	12.12	0.33	2.75	0.98	1.01	103.06	105.04
<i>Piper retrofractum</i> Vahl	2	1	3.03	0.06	2.00	0.24	0.18	74.95	75.38
<i>Pothos cathcarti</i> Schott	28	9	27.27	0.85	3.11	2.20	2.56	116.60	121.35
<i>Psilanthus bengalensis</i> (Schultes) Leroy	21	8	24.24	0.64	2.63	1.95	1.92	98.38	102.25
<i>Randia sikkimensis</i> Hook.f.	7	3	9.09	0.21	2.33	0.73	0.64	87.45	88.82
<i>Rauvolfia serpentina</i> (L.)Bentham ex Kurtz	12	6	18.18	0.36	2.00	1.46	1.10	74.95	77.51
<i>Sauropus androgynus</i> (L.) Merrill	18	6	18.18	0.55	3.00	1.46	1.65	112.43	115.54
<i>Sauropus compressus</i> Mueller	9	2	6.06	0.27	4.50	0.49	0.82	168.65	169.96
<i>Smilax lanceaeifolia</i> Roxb.	15	6	18.18	0.45	2.50	1.46	1.37	93.69	96.53
<i>Smilax ovalifolia</i> Roxb.	8	4	12.12	0.24	2.00	0.98	0.73	74.95	76.66
<i>Solanum aculeatissimum</i> Jacquin	13	6	18.18	0.39	2.17	1.46	1.19	81.20	83.85
<i>Solanum torvum</i> Swartz	8	4	12.12	0.24	2.00	0.98	0.73	74.95	76.66
<i>Solanum viarum</i> Dunal	14	4	12.12	0.42	3.50	0.98	1.28	131.17	133.43
<i>Stephania glabra</i> (Roxb.) Miers	6	3	9.09	0.18	2.00	0.73	0.55	74.95	76.23
<i>Stephania japonica</i> (Thunberg) Miers	17	7	21.21	0.52	2.43	1.71	1.55	91.02	94.28
<i>Tabernaemontana divaricata</i> (L.) Roem. & Schultes	11	5	15.15	0.33	2.20	1.22	1.01	82.45	84.67
<i>Tephrosia candida</i> (Roxb.) DC.	24	8	24.24	0.73	3.00	1.95	2.19	112.43	116.58
<i>Tetracera sarmentosa</i> (L.) Vahl	13	5	15.15	0.39	2.60	1.22	1.19	97.44	99.85
<i>Tinospora sinensis</i> (Loureiro) Merrill.	25	7	21.21	0.76	3.57	1.71	2.29	133.85	137.84
<i>Trichosanthes cordata</i> Roxb.	14	5	15.15	0.42	2.80	1.22	1.28	104.94	107.44
<i>Trichosanthes tricuspidata</i> Loureiro	13	6	18.18	0.39	2.17	1.46	1.19	81.20	83.85
<i>Uraria picta</i> Desv.	2	1	3.03	0.06	2.00	0.24	0.18	74.95	75.38
<i>Vallisneria spiralis</i> (L.) O. Kuntze	19	7	21.21	0.58	2.71	1.71	1.74	101.72	105.17
<i>Wattakaka volubilis</i> (L.f.) Stapf	24	7	21.21	0.73	3.43	1.71	2.19	128.49	132.39
<i>Zanonia indica</i> L.	4	2	6.06	0.12	2.00	0.49	0.37	74.95	75.81
<i>Zanthoxylum armatum</i> DC.	24	5	15.15	0.73	4.80	1.22	2.19	179.89	183.30
<i>Zanthoxylum nitidum</i> (Roxb.) DC	2	1	3.03	0.06	2.00	0.24	0.18	74.95	75.38
TOTAL	1094	410	1242.42	33.15	2.67	100.00	100.00	100.00	300.00

6.2.2.3. Sursuti MPCA, Gorumara National Park

A total 30 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure.

Studied quadrates, which recorded 116 species of tree species and the analysis of recorded data is shown in Table 24. The calculating data shows highest Frequency and Relative Frequency by *Dioscorea pentaphylla* L. [F=63.33 & RF=4.73] followed by *Dioscorea hispida* Dennstedt [F=60 & RF=4.48], *Dioscorea bulbifera* L. [F=56.67 & RF=4.23], *Deeringia amarantoides* (Lamarck) Merrill [F=50 & RF=3.73], *Dendrocnide amplissima* (Bl.) Chew., *Clerodendrum viscosum* Ventenat, *Piper longum* L., *Sida acuta* Burm. f., with same value [F=46.67 & RF=3.48] and further followed by *Daphne involucrata* Wallich *Cuscuta reflexa* Roxb. [F=40 & RF=2.99].

Chloranthus elatior Link shows highest Density and Relative Density [D=1.13 & RD=3.94], followed by *Clerodendrum indicum* (L.) Kuntze [D=0.97 & RD=3.36], followed by *Psilanthus bengalensis* (Schultes) Leroy [D=0.83 & RD=2.90], *Dendrocnide amplissima* (Bl.) Chew, *Leea asiatica* (L.) Ridsdale, *Piper chuyva* (Miquel) C. DC. and *Rauwolfia serpentina* (L.) Benth. ex Kurz [D=0.77 & RD=2.67].

Chloranthus elatior Link shows highest Density and Relative Abundance [A=6.8 & RA=2.84] followed by *Piper betle* L., *Solanum torvum* Swartz, *Zanthoxylum nitidum* (Roxb.) DC with same value [A=5.5 & RA=2.30], *Pothos cathcarti* Schott [A=5.0 & RA=2.09], *Tephrosia candida* (Roxb.) DC. [A=4.75 & RA=1.99], *Phyllanthus reticulatus* Poiret, *Zanthoxylum armatum* DC. [A=6.67 & RA=1.95].

Maximum IVI value shows by *Chloranthus elatior* Link [IVI=8.03], and followed by *Clerodendrum indicum* (L.) Kuntze [IVI=6.87], *Dendrocnide amplissima* (Bl.) Chew., [IVI=6.84], *Dioscorea pentaphylla* L. [IVI=6.38], *Psilanthus bengalensis* (Schultes) Leroy [IVI=6.13], *Piper betle* L. *Solanum torvum* Swartz [IVI=5.85], *Leea asiatica* (L.) Ridsdale, *Piper chuyva* (Miquel) C. DC. *Rauwolfia serpentina* (L.) Bentham ex Kurtz [IVI=5.76] where as *Abrus pulchellus* Wallich ex Thwaites, *Argyreia roxburghii* Choisy, *Dioscorea prazeri* Prain & Burkill, *Leea indica* (Burm. f) Merrill, *Piper retrofractum* Vahl, *Smilax lanceaefolia* Roxb. [IVI=0.78] shows the minimum value.

Table 24: Analysis of Shrubs and climber layer data of Sursuti MPCA

SHRUB AND CLIMBER TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Abelmoschus moshatus</i> Medikus	10	3	9.68	0.32	3.33	0.72	1.12	1.39	3.24
<i>Abrus pulchellus</i> Wallich ex Thwaites	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Anisomeles indica</i> (L.) Kuntze	4	3	10.00	0.13	1.33	0.75	0.46	0.56	1.77
<i>Argyreia roxburghii</i> Choisy	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Aristolochia indica</i> L.	9	2	6.67	0.30	4.50	0.50	1.04	1.88	3.42

<i>Aristolochia saccata</i> Wallich	5	3	10.00	0.17	1.67	0.75	0.58	0.70	2.02
<i>Caesalpinia cucullata</i> Roxb.	13	4	13.33	0.43	3.25	1.00	1.51	1.36	3.86
<i>Chloranthus erectus</i> (Buch.-Ham.) Wall.	34	5	16.67	1.13	6.80	1.24	3.94	2.84	8.03
<i>Cissampelos pareira</i> L.	9	6	20.00	0.30	1.50	1.49	1.04	0.63	3.16
<i>Citrus medica</i> L.	2	7	23.33	0.07	0.29	1.74	0.23	0.12	2.09
<i>Clerodendrum indicum</i> (L.) Kuntze	29	8	26.67	0.97	3.63	1.99	3.36	1.52	6.87
<i>Clerodendrum viscosum</i> Ventenat	15	8	26.67	0.50	1.88	1.99	1.74	0.78	4.51
<i>Cryptolepis buchanani</i> R. Br. ex Roemer & Schultes	11	10	33.33	0.37	1.10	2.49	1.28	0.46	4.22
<i>Cryptolepis sinensis</i> (Loureiro) Merrill	4	11	36.67	0.13	0.36	2.74	0.46	0.15	3.35
<i>Cuscuta reflexa</i> Roxb.	4	12	40.00	0.13	0.33	2.99	0.46	0.14	3.59
<i>Daphne involucrata</i> Wallich	10	13	43.33	0.33	0.77	3.23	1.16	0.32	4.72
<i>Dendrocnide amplissima</i> (Blume) Chew	23	14	46.67	0.77	1.64	3.48	2.67	0.69	6.84
<i>Deeringia amaranthoides</i> (Lamarck) Merrill	9	15	50.00	0.30	0.60	3.73	1.04	0.25	5.03
<i>Dioscorea belophylla</i> Voigt ex Haines	6	16	53.33	0.20	0.38	3.98	0.70	0.16	4.83
<i>Dioscorea bulbifera</i> L.	6	17	56.67	0.20	0.35	4.23	0.70	0.15	5.07
<i>Dioscorea hispida</i> Dennstedt	1	18	60.00	0.03	0.06	4.48	0.12	0.02	4.62
<i>Dioscorea pentaphylla</i> L.	12	19	63.33	0.40	0.63	4.73	1.39	0.26	6.38
<i>Holmskioldia sanguinea</i> Retz.	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Entada rheedii</i> Sprengel	3	1	3.33	0.10	3.00	0.25	0.35	1.25	1.85
<i>Evolvulus alsinoides</i> (L.) L.	4	1	3.33	0.13	4.00	0.25	0.46	1.67	2.39
<i>Flemingia strobilifera</i> (L.) Aiton	9	3	10.00	0.30	3.00	0.75	1.04	1.25	3.04
<i>Flueggea virosa</i> (Willdenow) Voigt	9	5	16.67	0.30	1.80	1.24	1.04	0.75	3.04
<i>Glycosmis pentaphylla</i> (Retzius) DC.	8	4	13.33	0.27	2.00	1.00	0.93	0.84	2.76
<i>Gynocardia odorata</i> R. Brown	3	1	3.33	0.10	3.00	0.25	0.35	1.25	1.85
<i>Hedyotis scandens</i> Roxb.	7	2	6.67	0.23	3.50	0.50	0.81	1.46	2.77
<i>Hoya parasitica</i> (Roxb.) Wight	7	3	10.00	0.23	2.33	0.75	0.81	0.98	2.53
<i>Ichnocarpus frutescens</i> (L.) Aiton	15	6	20.00	0.50	2.50	1.49	1.74	1.05	4.28
<i>Jasminum glandiflorum</i> L.	19	6	20.00	0.63	3.17	1.49	2.20	1.32	5.02
<i>Lantana camara</i> L.	11	4	13.33	0.37	2.75	1.00	1.28	1.15	3.42
<i>Leea aequata</i> L.	5	3	10.00	0.17	1.67	0.75	0.58	0.70	2.02
<i>Leea asiatica</i> (L.) Ridsdale	23	6	20.00	0.77	3.83	1.49	2.67	1.60	5.76
<i>Leea indica</i> (Burman f.) Merrill	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Luffa aegyptiaca</i> Miller	6	2	6.67	0.20	3.00	0.50	0.70	1.25	2.45
<i>Maesa indica</i> (Roxb.) A. DC.	4	3	10.00	0.13	1.33	0.75	0.46	0.56	1.77
<i>Melastoma melabathricum</i> L.	6	3	10.00	0.20	2.00	0.75	0.70	0.84	2.28
<i>Merremia hirta</i> (L.) Merrill	3	1	3.33	0.10	3.00	0.25	0.35	1.25	1.85
<i>Merremia vitifolia</i> (Burm.f.) Hallier f.	3	2	6.67	0.10	1.50	0.50	0.35	0.63	1.47
<i>Meyna spinosa</i> Link	9	5	16.67	0.30	1.80	1.24	1.04	0.75	3.04
<i>Mikania micrantha</i> Kunth	4	2	6.67	0.13	2.00	0.50	0.46	0.84	1.80
<i>Mimosa himalayana</i> Gamble	8	2	6.67	0.27	4.00	0.50	0.93	1.67	3.10
<i>Mimosa pudica</i> L.	17	5	16.67	0.57	3.40	1.24	1.97	1.42	4.64
<i>Momordica charantia</i> L.	3	1	3.33	0.10	3.00	0.25	0.35	1.25	1.85
<i>Momordica cochincinensis</i> Sprengel	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Morus laevigata</i> Brandis	12	4	13.33	0.40	3.00	1.00	1.39	1.25	3.64

<i>Murraya koenigii</i> (L.) Sprengel	18	6	20.00	0.60	3.00	1.49	2.09	1.25	4.83
<i>Murraya paniculata</i> (L.) Jack	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Naravelia zeylanica</i> (L.) DC.	3	1	3.33	0.10	3.00	0.25	0.35	1.25	1.85
<i>Natsiatum herpeticum</i> Arnott	3	2	6.67	0.10	1.50	0.50	0.35	0.63	1.47
<i>Oesbeckia nepalensis</i> Hooker	15	5	16.67	0.50	3.00	1.24	1.74	1.25	4.24
<i>Paederia foetida</i> L.	3	2	6.67	0.10	1.50	0.50	0.35	0.63	1.47
<i>Pandanus unguifer</i> Hook.f.	17	6	20.00	0.57	2.83	1.49	1.97	1.19	4.65
<i>Pavetta polyantha</i> Bremekamp	2	2	6.67	0.07	1.00	0.50	0.23	0.42	1.15
<i>Pericampylus glaucus</i> (Lam.) Merrill	4	1	3.33	0.13	4.00	0.25	0.46	1.67	2.39
<i>Phlogacanthus thyriformis</i> (Hardwicke)Mabberley	17	5	16.67	0.57	3.40	1.24	1.97	1.42	4.64
<i>Phyllanthus reticulatus</i> Poiret	14	3	10.00	0.47	4.67	0.75	1.62	1.95	4.32
<i>Piper betle</i> L.	22	4	13.33	0.73	5.50	1.00	2.55	2.30	5.85
<i>Piper chuyva</i> (Miquel) C. DC.	23	6	20.00	0.77	3.83	1.49	2.67	1.60	5.76
<i>Piper longum</i> L.	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Piper mullesua</i> D. Don	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Piper peepuloides</i> Roxb.	9	2	6.67	0.30	4.50	0.50	1.04	1.88	3.42
<i>Piper retrofractum</i> Vahl	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Piper sylvaticum</i> Roxb.	7	3	10.00	0.23	2.33	0.75	0.81	0.98	2.53
<i>Pothos cathcarti</i> Schott	10	2	6.67	0.33	5.00	0.50	1.16	2.09	3.75
<i>Pothos scandens</i> L.	6	2	6.67	0.20	3.00	0.50	0.70	1.25	2.45
<i>Psilanthus bengalensis</i> (Schultes) Leroy	25	7	23.33	0.83	3.57	1.74	2.90	1.49	6.13
<i>Randia sikkimensis</i> Hook.f.	18	5	16.67	0.60	3.60	1.24	2.09	1.51	4.84
<i>Rauwolfia serpentina</i> (L.)Bentham ex Kurtz	23	6	20.00	0.77	3.83	1.49	2.67	1.60	5.76
<i>Sauropus androgynus</i> (L.) Merrill	20	6	20.00	0.67	3.33	1.49	2.32	1.39	5.21
<i>Sauropus compressus</i> Mueller	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Smilax lanceaeifolia</i> Roxb.	1	1	3.33	0.03	1.00	0.25	0.12	0.42	0.78
<i>Smilax ovalifolia</i> Roxb.	2	1	3.33	0.07	2.00	0.25	0.23	0.84	1.32
<i>Solanum aculeatissimum</i> Jacquin	12	3	10.00	0.40	4.00	0.75	1.39	1.67	3.81
<i>Solanum torvum</i> Swartz	22	4	13.33	0.73	5.50	1.00	2.55	2.30	5.85
<i>Solanum viarum</i> Dunal	12	4	13.33	0.40	3.00	1.00	1.39	1.25	3.64
<i>Stephania glabra</i> (Roxb.) Miers	3	2	6.67	0.10	1.50	0.50	0.35	0.63	1.47
<i>Stephania japonica</i> (Thunberg) Miers	4	2	6.67	0.13	2.00	0.50	0.46	0.84	1.80
<i>Tabernaemontana divaricata</i> (L.)Roem. & Schultes	9	4	13.33	0.30	2.25	1.00	1.04	0.94	2.98
<i>Tephrosia candida</i> (Roxb.) DC.	19	4	13.33	0.63	4.75	1.00	2.20	1.99	5.18
<i>Tetracera sarmentosa</i> (L.) Vahl	21	5	16.67	0.70	4.20	1.24	2.43	1.76	5.44
<i>Tinospora sinensis</i> (Loureiro) Merrill.	12	3	10.00	0.40	4.00	0.75	1.39	1.67	3.81
<i>Trichosanthes cordata</i> Roxb.	7	2	6.67	0.23	3.50	0.50	0.81	1.46	2.77
<i>Uraria picta</i> Desv.	13	3	10.00	0.43	4.33	0.75	1.51	1.81	4.07
<i>Vallis solanacea</i> (Roth) O. Kuntze	6	2	6.67	0.20	3.00	0.50	0.70	1.25	2.45
<i>Wattakaka volubilis</i> (L.f.) Stapf	7	2	6.67	0.23	3.50	0.50	0.81	1.46	2.77
<i>Zanthoxylum armatum</i> DC.	14	3	10.00	0.47	4.67	0.75	1.62	1.95	4.32
<i>Zanthoxylum nitidum</i> (Roxb.) DC	11	2	6.67	0.37	5.50	0.50	1.28	2.30	4.07
TOTAL	863.00	402.00	1339.68	28.76	239.08	100.00	100.00	100.00	300.00

6.2.3. HURB LAYER

6.2.3.1. North Sevoke MPCA, Mahananda Wildlife Sanctuary

a. Survey during Monsoon

A total 30 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure. Studied quadrates, which recorded 68 species of tree species and the analysis of recorded data is shown in Table 25. The calculating data shows highest Frequency and Relative Frequency by *Globba multiflora* Wall. ex Baker [F=56.33 & RF=5.21] followed by *Achyranthes aspera* L [F=43.33 & RF=3.99], *Sida acuta* Burm.f. [F=40 & RF=3.68], *Cyperus rotundus* L. *Elephantopus scaber* L. *Mimosa pudica* [F=30 & RF=2.76], *Begonia* sp.. *Euphorbia hirta* L. *Synedrella nodiflora* (L.) Gaertn. and *Urena lobata* L. [F=26.67 & RF=2.45]

Ophiorrhiza fasciculata D.Don shows highest Density and Relative Density [D=16 & RD=5.06], followed by *Elatostema parvum* (Bl.) Bl. ex Miq. [D=15.25 & RD=4.82], *Elephantopus scaber* L. [D=14.33 & RD=4.53] *Oxalis corniculata* L. [R=10.80 & RD=3.42], *Achyranthes bidentata* Bl. [D=10.25 & RD=3.24], *Oplismenus burmanni* (Retz.) P.Beauv. [D=8.29 & RD=2.62], *Globba multiflora* Wall. ex Baker [D=7.06 & RD=2.23].

Ophiorrhiza fasciculata D.Don shows highest Density and Relative Abundance [A=16 & RA=5.06] followed by *Elatostema parvum* (Bl.) Bl. ex Miq. [A=15.25 & RA=24.82], *Elephantopus scaber* L. [A=14.33 & RA=4.53], *Oxalis corniculata* L. [A=10.80 & RA=3.42], *Achyranthes bidentata* Bl. [A=10.25 & RA=3.24] *Oplismenus burmannii* (Retz.) P.Beauv. [A=8.29 & RA=2.62], *Achyranthes aspera* L. [A=7.15 & RA=2.26], *Globba multiflora* Wall. ex Baker [A=7.06 & RA=2.23]

Maximum IVI value shows by *Ophiorrhiza fasciculata* D.Don [IVI=11.96], and followed by *Elephantopus scaber* L. [IVI=11.83], *Elatostema parvum* (Bl.) Bl. ex Miq. [IVI=10.87], *Globba multiflora* Wall. ex Baker [IVI=9.68], *Achyranthes aspera* L. [IVI=8.51], *Oxalis corniculata* L. [=8.36], *Achyranthes bidentata* Bl. [IVI=7.71] *Oplismenus burmani* (Retz.) P.Beauv. [IVI=7.39] *Sida acuta* Burm.f. [IVI=6.79] where as *Hydrocotyle sibthorpioides* Lam. *Murdannia spirata* (L.) G. Bruckn. and *Solanum nigrum* L. [IVI=1.88] shows the minimum value.

Table 25: Analysis of Herb layer data of North Sevok MPCA [Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthes aspera</i> L.	93	13	43.33	7.15	7.15	3.99	2.26	2.26	8.51
<i>Achyranthes bidentata</i> Blume	41	4	13.33	10.25	10.25	1.23	3.24	3.24	7.71
<i>Acmella uliginosa</i> (Sw.) Cass.	20	4	13.33	5.00	5.00	1.23	1.58	1.58	4.39
<i>Altemanthera sessilis</i> (L.) R.Br. ex DC.	18	5	16.67	3.60	3.60	1.53	1.14	1.14	3.81
<i>Arisaema propinquum</i> Schott	13	4	13.33	3.25	3.25	1.23	1.03	1.03	3.28
<i>Axonopus compressus</i> (Sw.) P.Beauv.	7	2	6.67	3.50	3.50	0.61	1.11	1.11	2.83
<i>Begonia ovatifolia</i> A.DC.	42	8	26.67	5.25	5.25	2.45	1.66	1.66	5.77
<i>Biophytum reinwardtii</i> (Zucc.) Klotzsch	22	4	13.33	5.50	5.50	1.23	1.74	1.74	4.71
<i>Boehmeria hamiltoniana</i> Wedd.	5	2	6.67	2.50	2.50	0.61	0.79	0.79	2.19
<i>Boehmeria glomerulifera</i> Miq.	3	1	3.33	3.00	3.00	0.31	0.95	0.95	2.20
<i>Calyptocarpus vialis</i> Less.	12	3	10.00	4.00	4.00	0.92	1.26	1.26	3.45
<i>Carex filicina</i> Nees	26	5	16.67	5.20	5.20	1.53	1.64	1.64	4.82
<i>Centella asiatica</i> (L.) Urb.	10	2	6.67	5.00	5.00	0.61	1.58	1.58	3.78
<i>Chloranthus elatior</i> Link	7	2	6.67	3.50	3.50	0.61	1.11	1.11	2.83
<i>Clerodendrum infortunatum</i> L.	32	7	23.33	4.57	4.57	2.15	1.45	1.45	5.04
<i>Colocasia esculenta</i> (L.) Schott	13	3	10.00	4.33	4.33	0.92	1.37	1.37	3.66
<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet	3	1	3.33	3.00	3.00	0.31	0.95	0.95	2.20
<i>Cyanotis vaga</i> (Lour.) Schult. & Schult.f.	18	4	13.33	4.50	4.50	1.23	1.42	1.42	4.07
<i>Cyclea barbata</i> Miers	19	5	16.67	3.80	3.80	1.53	1.20	1.20	3.94
<i>Cyperus brevifoloides</i> Thieret & Delahouss.	9	2	6.67	4.50	4.50	0.61	1.42	1.42	3.46
<i>Cyperus rotundus</i> L.	34	9	30.00	3.78	3.78	2.76	1.19	1.19	5.15
<i>Dendrocnide sinuata</i> (Blume) Chew	13	3	10.00	4.33	4.33	0.92	1.37	1.37	3.66
<i>Digitaria ciliaris</i> (Retz.) Koeler	20	4	13.33	5.00	5.00	1.23	1.58	1.58	4.39
<i>Elatostema parvum</i> (Blume) Blume ex Miq.	61	4	13.33	15.25	15.25	1.23	4.82	4.82	10.87
<i>Elephantopus scaber</i> L.	129	9	30.00	14.33	14.33	2.76	4.53	4.53	11.83
<i>Euphorbia hirta</i> L.	37	8	26.67	4.63	4.63	2.45	1.46	1.46	5.38
<i>Euphorbia hypericifolia</i> L.	7	2	6.67	3.50	3.50	0.61	1.11	1.11	2.83
<i>Globba multiflora</i> Wall. ex Baker	120	17	56.67	7.06	7.06	5.21	2.23	2.23	9.68
<i>Gomphostemma ovatum</i> Wall. ex Benth.	5	2	6.67	2.50	2.50	0.61	0.79	0.79	2.19
<i>Gomphostemma parviflorum</i> Wall. ex Benth.	4	1	3.33	4.00	4.00	0.31	1.26	1.26	2.84
<i>Gonostegia triandra</i> (Blume) Miq.	14	4	13.33	3.50	3.50	1.23	1.11	1.11	3.44
<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta	16	6	20.00	2.67	2.67	1.84	0.84	0.84	3.53
<i>Hydrocotyle sibthorpioides</i> Lam.	4	2	6.67	2.00	2.00	0.61	0.63	0.63	1.88
<i>Jasminum nepalense</i> Spreng.	10	4	13.33	2.50	2.50	1.23	0.79	0.79	2.81
<i>Mikania micrantha</i> Kunth	24	6	20.00	4.00	4.00	1.84	1.26	1.26	4.37
<i>Mimosa pudica</i> L.	23	9	30.00	2.56	2.56	2.76	0.81	0.81	4.38
<i>Murdannia japonica</i> (Thunb.) Faden	8	3	10.00	2.67	2.67	0.92	0.84	0.84	2.61
<i>Murdannia nudiflora</i> (L.) Brenan	21	6	20.00	3.50	3.50	1.84	1.11	1.11	4.05
<i>Murdannia spirata</i> (L.) G.Brückn.	4	2	6.67	2.00	2.00	0.61	0.63	0.63	1.88
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	22	7	23.33	3.14	3.14	2.15	0.99	0.99	4.13
<i>Ophiorrhiza fasciculata</i> D.Don	96	6	20.00	16.00	16.00	1.84	5.06	5.06	11.96
<i>Oplismenus burmannii</i> var. <i>albidulum</i> N.E.	58	7	23.33	8.29	8.29	2.15	2.62	2.62	7.39

Br.									
<i>Oplismenus compositus</i> (L.) P.Beauv.	24	4	13.33	6.00	6.00	1.23	1.90	1.90	5.02
<i>Oxalis corniculata</i> L.	54	5	16.67	10.80	10.80	1.53	3.42	3.42	8.36
<i>Oxalis debilis</i> Kunth	18	4	13.33	4.50	4.50	1.23	1.42	1.42	4.07
<i>Peliosanthes griffithii</i> Baker	12	6	20.00	2.00	2.00	1.84	0.63	0.63	3.11
<i>Persicaria chinensis</i> (L.) H.Gross	17	5	16.67	3.40	3.40	1.53	1.08	1.08	3.68
<i>Persicaria hydropiper</i> (L.) Delarbre	22	6	20.00	3.67	3.67	1.84	1.16	1.16	4.16
<i>Phlogacanthus thyrsoformis</i> (Roxb. ex Hardw.) Mabb.	36	6	20.00	6.00	6.00	1.84	1.90	1.90	5.64
<i>Phyllanthus reticulatus</i> Poir.	16	4	13.33	4.00	4.00	1.23	1.26	1.26	3.76
<i>Phyllanthus urinaria</i> L.	5	2	6.67	2.50	2.50	0.61	0.79	0.79	2.19
<i>Piper longum</i> L.	19	4	13.33	4.75	4.75	1.23	1.50	1.50	4.23
<i>Piper peepuloides</i> Roxb.	12	3	10.00	4.00	4.00	0.92	1.26	1.26	3.45
<i>Pupalia lappacea</i> (L.) Juss.	41	7	23.33	5.86	5.86	2.15	1.85	1.85	5.85
<i>Scoparia dulcis</i> L.	3	1	3.33	3.00	3.00	0.31	0.95	0.95	2.20
<i>Sida acuta</i> Burm.f.	59	12	40.00	4.92	4.92	3.68	1.55	1.55	6.79
<i>Sida cordata</i> (Burm.f.) Borss.Waalk.	25	5	16.67	5.00	5.00	1.53	1.58	1.58	4.70
<i>Solanum nigrum</i> L.	4	2	6.67	2.00	2.00	0.61	0.63	0.63	1.88
<i>Stephania japonica</i> (Thunb.) Miers	10	3	10.00	3.33	3.33	0.92	1.05	1.05	3.03
<i>Synedrella nodiflora</i> (L.) Gaertn.	30	8	26.67	3.75	3.75	2.45	1.19	1.19	4.83
<i>Thunbergia fragrans</i> Roxb.	16	5	16.67	3.20	3.20	1.53	1.01	1.01	3.56
<i>Torenia crustecea</i> (L.) Cham. & Schtdl.	4	1	3.33	4.00	4.00	0.31	1.26	1.26	2.84
<i>Triumfetta rhomboidei</i> Jacq.	15	5	16.67	3.00	3.00	1.53	0.95	0.95	3.43
<i>Urena lobata</i> L.	21	8	26.67	2.63	2.63	2.45	0.83	0.83	4.11
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	5	1	3.33	5.00	5.00	0.31	1.58	1.58	3.47
<i>Urochloa reptans</i> (L.) Stapf	13	3	10.00	4.33	4.33	0.92	1.37	1.37	3.66
<i>Zingiber rubens</i> Roxb.	16	7	23.33	2.29	2.29	2.15	0.72	0.72	3.59
<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	26	7	23.33	3.71	3.71	2.15	1.17	1.17	4.50
TOTAL	1666	326	1086.67	316.24	316.24	100.00	100.00	100.00	300.00

b. Survey during Post-Monsoon

During post-monsoon a total of 40 quadrates have been studied and recorded 87 species of plants. A total of 1524 individuals were counted, and the analysis of recorded data presented in Table 26.

Highest Frequency and Relative Frequency shows by *Achyranthus aspera* L. [F=22.50 & RF=3], followed *Achyranthus bidentata* Bl. and *Portulaca oleracea* L. [F=20 & RF=2.70), *Acmella calva* (DC.) Jansen, *Barleria strigosa* Willdnew, *Euphorbia hypericifolia* L., *Paspalum scrobiculatum* L., and *Physalis divaricata* D. Don [F=17.5 & RF=2.3].

Achyranthus bidentata Blume shows highest Density and Relative Density [D=1.5 & RD=4.1] and followed by *Achyranthus aspera* L. [D=1.3 & RD=3.5), *Acmella calva*

(DC.) Jansen, *Synedrella nudiflora* (L.) Gaertner, *Paspalum scrobiculatum* L. [D=1 & RD=2.8], *Euphorbia hypericifolia* L., *Physalis peruviana* L. [D=0.80 & RD=2.7].

Zingiber rubens Roxburgh shows highest Abundance and Relative Abundance [A=9 & RA=2.2], and followed by *Ampelocissus barbata* (Wallich) Planchon [A=8.7 & RA=2.1], *Colocasia esculenta* (L.) Schott [A=7.5 & RA=1.9], *Achyranthus bidentata* Blume, *Alternanthera sessilis* (L.) DC., *Hygrophila auriculata* (Schumacher) Heine, *Solanum nigrum* Linnaeus, *Chromolaena odoratum* (L.) King & Robinson [A=7.3 & RA=1.8].

Achyranthus bidentata Blume shows maximum IVI [IVI=8.6] and followed by *Achyranthus aspera* [IVI=7.9], *Acmella calva* (DC.) Jansen [IVI=6.6], *Synedrella nudiflora* (L.) Gaertner, *Paspalum scrobiculatum* L. [IVI=6.4], *Euphorbia hypericifolia* Linnaeus [IVI=5.8], *Physalis peruviana* L. [IVI=5.7], *Portulaca oleracea* Linnaeus [IVI=5.3], *Physalis divaricata* D. Don, *Chromolaena odoratum* (L.) King & Robinson [IVI=5.2], *Curculigo capitulata* (Lour.) O. Kuntze [IVI=5.1] where as *Euphorbia heyneana* Sprengel *Lasia spinosa* (Linnaeus) Thwaites [IVI=1.0] shows the minimum value.

Table 26: Analysis of Herbs layer data of North Sevok MPCA [Post-Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthus bidentata</i> Blume	58	8	20.0	1.5	7.3	2.7	4.1	1.8	8.6
<i>Acmella calva</i> (DC.) Jansen	40	7	17.5	1.0	5.7	2.3	2.8	1.4	6.6
<i>Acmella uliginosa</i> (Swartz) Cassini	13	2	5.0	0.3	6.5	0.7	0.9	1.6	3.2
<i>Achyranthes aspera</i> L.	50	9	22.5	1.3	5.6	3.0	3.5	1.4	7.9
<i>Ageratum conyzoides</i> L.	7	1	2.5	0.2	7.0	0.3	0.5	1.7	2.6
<i>Alocasia fallax</i> Schott	10	2	5.0	0.3	5.0	0.7	0.7	1.2	2.6
<i>Alternanthera sessilis</i> (L.) DC.	22	3	7.5	0.6	7.3	1.0	1.6	1.8	4.4
<i>Amorphophallus napalensis</i> (Wallich) Bogner & Mayo	5	2	5.0	0.1	2.5	0.7	0.4	0.6	1.6
<i>Ampelocissus barbata</i> (Wallich) Planchon	26	3	7.5	0.7	8.7	1.0	1.8	2.1	5.0
<i>Asparagus officinalis</i> L.	18	3	7.5	0.5	6.0	1.0	1.3	1.5	3.8
<i>Asparagus racemosus</i> Willdenow	16	6	15.0	0.4	2.7	2.0	1.1	0.7	3.8
<i>Barleria strigosa</i> Willdenow	22	7	17.5	0.6	3.1	2.3	1.6	0.8	4.7
<i>Biophytum reinwardtii</i> (Zuccarini) Klotzsch	8	3	7.5	0.2	2.7	1.0	0.6	0.7	2.2
<i>Cassia tora</i> L.	15	3	7.5	0.4	5.0	1.0	1.1	1.2	3.3
<i>Centella asiatica</i> (L.) Urban	8	3	7.5	0.2	2.7	1.0	0.6	0.7	2.2
<i>Chromolaena odoratum</i> (L.) King & Robinson	29	4	10.0	0.7	7.3	1.3	2.0	1.8	5.2
<i>Colocasia esculenta</i> (L.) Schott	15	2	5.0	0.4	7.5	0.7	1.1	1.9	3.6
<i>Commelina suffruticosa</i> Blume	23	4	10.0	0.6	5.8	1.3	1.6	1.4	4.4
<i>Costus speciosus</i> (Koenig ex Retzius) Smith	27	5	12.5	0.7	5.4	1.7	1.9	1.3	4.9

<i>Crinum amoenum</i> Roxb.	15	3	7.5	0.4	5.0	1.0	1.1	1.2	3.3
<i>Crotalaria alata</i> Buch-Ham ex D. Don	15	3	7.5	0.4	5.0	1.0	1.1	1.2	3.3
<i>Curculigo capitulata</i> (Loureiro) O. Kuntze	28	6	15.0	0.7	4.7	2.0	2.0	1.2	5.1
<i>Curculigo orchioides</i> Gaertn.	11	3	7.5	0.3	3.7	1.0	0.8	0.9	2.7
<i>Curcuma ceaesia</i> Roxb.	6	1	2.5	0.2	6.0	0.3	0.4	1.5	2.2
<i>Curcuma zedoaria</i> (Chirstmann) Roscoe	27	5	12.5	0.7	5.4	1.7	1.9	1.3	4.9
<i>Cyanotis axillaris</i> (L.) Sweet	12	5	12.5	0.3	2.4	1.7	0.8	0.6	3.1
<i>Cynodon dactylon</i> (L.) Persoon	20	3	7.5	0.5	6.7	1.0	1.4	1.7	4.1
<i>Cyperus rotundus</i> L.	14	2	5.0	0.4	7.0	0.7	1.0	1.7	3.4
<i>Dactyloctenium aegyptium</i> (L.) Willd.	18	4	10.0	0.5	4.5	1.3	1.3	1.1	3.7
<i>Dentella repens</i> J. & G. Forster	17	4	10.0	0.4	4.3	1.3	1.2	1.1	3.6
<i>Dicliptera bupleuroides</i> Nees	14	3	7.5	0.4	4.7	1.0	1.0	1.2	3.1
<i>Diplazium esculentum</i> (Retz.) Sw.	24	5	12.5	0.6	4.8	1.7	1.7	1.2	4.6
<i>Drosera burmanii</i> Vahl	24	6	15.0	0.6	4.0	2.0	1.7	1.0	4.7
<i>Echinochloa crussgalli</i> (L.) P.Beauv.	6	1	2.5	0.2	6.0	0.3	0.4	1.5	2.2
<i>Eclipta prostrata</i> (L.) L.	3	1	2.5	0.1	3.0	0.3	0.2	0.7	1.3
<i>Elephantopus scaber</i> L.	12	2	5.0	0.3	6.0	0.7	0.8	1.5	3.0
<i>Elusine indica</i> (L.) Gaertner	28	4	10.0	0.7	7.0	1.3	2.0	1.7	5.0
<i>Euphorbia heyneana</i> Sprengel	2	1	2.5	0.1	2.0	0.3	0.1	0.5	1.0
<i>Euphorbia hypericifolia</i> L.	33	7	17.5	0.8	4.7	2.3	2.3	1.2	5.8
<i>Flueggea virosa</i> (Willdenow) Voigt	7	1	2.5	0.2	7.0	0.3	0.5	1.7	2.6
<i>Hydrocotyle sibthorpioides</i> Lamarck	25	5	12.5	0.6	5.0	1.7	1.8	1.2	4.7
<i>Hygrophila auriculata</i> (Schumacher)Heine	22	3	7.5	0.6	7.3	1.0	1.6	1.8	4.4
<i>Hypericum japonicum</i> Murray	8	2	5.0	0.2	4.0	0.7	0.6	1.0	2.2
<i>Hyptis suaveolens</i> (L.) Poiteau	19	4	10.0	0.5	4.8	1.3	1.3	1.2	3.9
<i>Imperata cylindrica</i> (L.) Rauschel	13	2	5.0	0.3	6.5	0.7	0.9	1.6	3.2
<i>Jasminum pubescens</i> (Retzius) Willdenow	4	1	2.5	0.1	4.0	0.3	0.3	1.0	1.6
<i>Kyllinga nemoralis</i> (Steud.) Huygh	23	6	15.0	0.6	3.8	2.0	1.6	0.9	4.6
<i>Lasia spinosa</i> (L.) Thwaites	2	1	2.5	0.1	2.0	0.3	0.1	0.5	1.0
<i>Lepidagathis incurva</i> Buch.-Ham. ex D.Don	5	2	5.0	0.1	2.5	0.7	0.4	0.6	1.6
<i>Leucus indica</i> (L.) R. Brown ex Vatke	9	3	7.5	0.2	3.0	1.0	0.6	0.7	2.4
<i>Lindenbergia indica</i> (L.)O. Kuntze	9	2	5.0	0.2	4.5	0.7	0.6	1.1	2.4
<i>Mellilotus indica</i> (L.) Allioni	17	5	12.5	0.4	3.4	1.7	1.2	0.8	3.7
<i>Monochoria vaginalis</i> (Burman f.) Kunth	5	2	5.0	0.1	2.5	0.7	0.4	0.6	1.6
<i>Oldenlandia corymbosa</i> L.	5	1	2.5	0.1	5.0	0.3	0.4	1.2	1.9
<i>Oldenlandia diffusa</i> (Willdenow) Roxb.	11	3	7.5	0.3	3.7	1.0	0.8	0.9	2.7
<i>Ophioglossum reticulatum</i> L.	14	2	5.0	0.4	7.0	0.7	1.0	1.7	3.4
<i>Oxalis corniculata</i> L.	15	3	7.5	0.4	5.0	1.0	1.1	1.2	3.3
<i>Paspalum scrobiculatum</i> L.	38	7	17.5	1.0	5.4	2.3	2.7	1.3	6.4
<i>Persicaria barbata</i> (L.) Hara	6	2	5.0	0.2	3.0	0.7	0.4	0.7	1.8
<i>Persicaria chinensis</i> (L.) H. Gross	16	3	7.5	0.4	5.3	1.0	1.1	1.3	3.5
<i>Persicaria hydropiper</i> (L.) Spach	7	2	5.0	0.2	3.5	0.7	0.5	0.9	2.0
<i>Phyllanthus urinaria</i> L.	10	2	5.0	0.3	5.0	0.7	0.7	1.2	2.6
<i>Phyllanthus virgatus</i> Forster	7	2	5.0	0.2	3.5	0.7	0.5	0.9	2.0

<i>Physalis divaricata</i> D. Don	27	7	17.5	0.7	3.9	2.3	1.9	1.0	5.2
<i>Physalis peruviana</i> L.	33	6	15.0	0.8	5.5	2.0	2.3	1.4	5.7
<i>Polygonum hydropiper</i> L.	13	3	7.5	0.3	4.3	1.0	0.9	1.1	3.0
<i>Portulaca oleracea</i> L.	26	8	20.0	0.7	3.3	2.7	1.8	0.8	5.3
<i>Pouzolzia hirta</i> (Blume) Hasskarl	13	2	5.0	0.3	6.5	0.7	0.9	1.6	3.2
<i>Pouzolzia zeylanica</i> (L.) Bennet & Brown	13	4	10.0	0.3	3.3	1.3	0.9	0.8	3.1
<i>Pseudognaphalium affine</i> (D. Don) Anderberg	22	5	12.5	0.6	4.4	1.7	1.6	1.1	4.3
<i>Scoparia dulcis</i> L.	14	4	10.0	0.4	3.5	1.3	1.0	0.9	3.2
<i>Sida acuta</i> Burm.f.	18	4	10.0	0.5	4.5	1.3	1.3	1.1	3.7
<i>Sida rhombifolia</i> L.	6	3	7.5	0.2	2.0	1.0	0.4	0.5	1.9
<i>Solanum nigrum</i> L.	22	3	7.5	0.6	7.3	1.0	1.6	1.8	4.4
<i>Sonchus oleraceus</i> L.	16	5	12.5	0.4	3.2	1.7	1.1	0.8	3.6
<i>Spermacoce hispida</i> L.	8	2	5.0	0.2	4.0	0.7	0.6	1.0	2.2
<i>Synedrella nudiflora</i> (L.) Gaertner	39	6	15.0	1.0	6.5	2.0	2.8	1.6	6.4
<i>Torenia cordata</i> (Griffith) N.M. Datta	11	4	10.0	0.3	2.8	1.3	0.8	0.7	2.8
<i>Triumfetta rhomboidea</i> Jacquin	18	5	12.5	0.5	3.6	1.7	1.3	0.9	3.8
<i>Typhonium trilobatum</i> (L.) Schott	20	3	7.5	0.5	6.7	1.0	1.4	1.7	4.1
<i>Urena lobata</i> L.	21	4	10.0	0.5	5.3	1.3	1.5	1.3	4.1
<i>Vernonia cinerea</i> (L.) Less	21	5	12.5	0.5	4.2	1.7	1.5	1.0	4.2
<i>Xanthium strumarium</i> L.	9	3	7.5	0.2	3.0	1.0	0.6	0.7	2.4
<i>Zingiber rubens</i> Roxb.	9	1	2.5	0.2	9.0	0.3	0.6	2.2	3.2
TOTAL	1417	299	747.5	35.4	403.6	100.0	100.0	100.0	300.0

6.2.3.2. North Rajabhatkhawa (NRVK) MPCA, Buxa National Park

a. Survey during Monsoon

During monsoon a total of 33 quadrates have been studied and recorded 64 species of plants. A total of 1426 individuals were counted, and the analysis of recorded data presented in Table 27.

Highest Frequency and Relative Frequency shows by *Globba multiflora* Wall. ex Baker and *Sida acuta* Burm.f. [F=45.45 & RF=4.10], followed by *Colocasia esculenta* (L.) Schott, *Mimosa pudica* L. [F=39.39 & RF=3.55], *Clerodendrum infortunatum* L., *Urena lobata* L. [F=36.36 & RF=3.28], *Jasminum nepalense* Spreng. and *Synedrella nodiflora* (L.) Gaertn. [F=33.33 & RF=3.01].

Sida acuta Burm.f. shows highest Density and Relative Density [D=254.55 & RD=5.89], and followed by *Cyperus rotundus* L. [D=200 & RD=4.63], *Mimosa pudica* L. [D=181.82 & RD=4.21], *Clerodendrum infortunatum* L. and *Scoparia dulcis* L. [D=151.52 & RD=3.51], *Murdannia japonica* (Thunb.) Faden. [D=142.42 & RD=3.30], *Centella asiatica* (L.) Urb. [D=133.33 & RD=3.09] and *Globba multiflora* Wall. ex Baker [D=130.30 & RD=3.02].

Cyperus rotundus L. shows highest Abundance and Relative Abundance [A=7.33 & RA=2.98], and followed by *Bonnya ruelloides*, *Oxalis corniculata* L. [A=7 & RA=2.85], *Torenia crustacea* [A=6.5 & RA=2.64], *Murdannia spirata* (L.) G. Bruckn. [A=6.33 & RA=2.58], *Sida cordata* (Burm.f.) Borss. [A=6 & RA=2.44], *Murdannia japonica* (Thunb.) Faden. [A=5.88 & RA=2.39], *Cyperus alternifolius ssp. flabelliformis* Kuk. [A=5.67 & RA=2.31], *Sida acuta* Burm.f. [A=5.60 & RA=2.28], *Scoparia dulcis* L. [A=5.56 & RA=2.26] and *Centella asiatica* (L.) Urb. [A=5.50 & RA=2.24].

Sida acuta Burm.f. shows maximum IVI [IVI=12.27] and followed by *Cyperus rotundus* L. [IVI=10.07], *Mimosa pudica* L. [IVI=9.64], *Clerodendrum infortunatum* L. [IVI=8.48], *Globba multiflora* Wall. ex Baker [IVI=8.28], *Scoparia dulcis* L. [IVI=8.23], *Murdannia japonica* (Thunb.) Faden [IVI=7.87], *Centella asiatica* (L.) Urb. [IVI=7.51] where as *Gomphostemma parviflorum* Wall. ex Benth., *Alternanthera paronychioides* A. St.-Hil. and *Ludwigia poctavulvis* (Jacq.) P.H. Raven [IVI=0.75] shows the minimum value.

Table 27: Analysis of Herbs layer data of North Rajabhatkhawa (NRVK) MPCA [Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthes aspera</i> L.	28	7	21.21	84.85	4.00	1.91	1.96	1.63	5.50
<i>Achyranthes bidentata</i> Blume	6	2	6.06	18.18	3.00	0.55	0.42	1.22	2.19
<i>Acmella uliginosa</i> (Sw.) Cass.	39	8	24.24	118.18	4.88	2.19	2.73	1.98	6.90
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	16	5	15.15	48.48	3.20	1.37	1.12	1.30	3.79
<i>Axonopus compressus</i> (Sw.) P.Beauv.	10	4	12.12	30.30	2.50	1.09	0.70	1.02	2.81
<i>Biophytum reinwardtii</i> (Zucc.) Klotzsch	29	8	24.24	87.88	3.63	2.19	2.03	1.47	5.69
<i>Bonnya ciliata</i> (Colsm.) Spereng.	32	7	21.21	96.97	4.57	1.91	2.24	1.86	6.02
<i>Bonnya ruelloides</i> (Colsm.) Spereng.	7	1	3.03	21.21	7.00	0.27	0.49	2.85	3.61
<i>Calyptocarpus vialis</i> Less.	13	5	15.15	39.39	2.60	1.37	0.91	1.06	3.34
<i>Centella asiatica</i> (L.) Urb.	44	8	24.24	133.33	5.50	2.19	3.09	2.24	7.51
<i>Chloranthus elatior</i> Link	13	6	18.18	39.39	2.17	1.64	0.91	0.88	3.43
<i>Clerodendrum infortunatum</i> L.	50	12	36.36	151.52	4.17	3.28	3.51	1.70	8.48
<i>Colocasia esculenta</i> (L.) Schott	34	13	39.39	103.03	2.62	3.55	2.38	1.06	7.00
<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet	24	6	18.18	72.73	4.00	1.64	1.68	1.63	4.95
<i>Cyanotis vaga</i> (Lour.) Schult. & Schult.f.	14	4	12.12	42.42	3.50	1.09	0.98	1.42	3.50
<i>Cyperus alternifolius subsp. flabelliformis</i> Kük.	17	3	9.09	51.52	5.67	0.82	1.19	2.31	4.32
<i>Cyperus rotundus</i> L.	66	9	27.27	200.00	7.33	2.46	4.63	2.98	10.07
<i>Dendrocnide sinuata</i> (Blume) Chew	11	6	18.18	33.33	1.83	1.64	0.77	0.75	3.16
<i>Digitaria ciliaris</i> (Retz.) Koeler	30	7	21.21	90.91	4.29	1.91	2.10	1.74	5.76
<i>Drymaria cordata</i> (L.) Willd. ex Schult.	5	2	6.06	15.15	2.50	0.55	0.35	1.02	1.91

<i>Elatostema parvum</i> (Blume) Blume ex Miq.	10	4	12.12	30.30	2.50	1.09	0.70	1.02	2.81
<i>Elephantopus scaber</i> L.	33	8	24.24	100.00	4.13	2.19	2.31	1.68	6.18
<i>Euphorbia hirta</i> L.	23	5	15.15	69.70	4.60	1.37	1.61	1.87	4.85
<i>Euphorbia hypericifolia</i> L.	5	1	3.03	15.15	5.00	0.27	0.35	2.03	2.66
<i>Globba multiflora</i> Wall. ex Baker	43	15	45.45	130.30	2.87	4.10	3.02	1.17	8.28
<i>Gomphostemma ovatum</i> Wall. ex Benth.	4	2	6.06	12.12	2.00	0.55	0.28	0.81	1.64
<i>Gomphostemma parviflorum</i> Wall. ex Benth.	1	1	3.03	3.03	1.00	0.27	0.07	0.41	0.75
<i>Gonostegia triandra</i> (Blume) Miq.	5	1	3.03	15.15	5.00	0.27	0.35	2.03	2.66
<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta	28	9	27.27	84.85	3.11	2.46	1.96	1.27	5.69
<i>Hydrocotyle sibthorpioides</i> Lam.	8	4	12.12	24.24	2.00	1.09	0.56	0.81	2.47
<i>Jasminum nepalense</i> Spreng.	35	11	33.33	106.06	3.18	3.01	2.45	1.29	6.75
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	11	4	12.12	33.33	2.75	1.09	0.77	1.12	2.98
<i>Ludwigia perennis</i> Burm.f.	7	3	9.09	21.21	2.33	0.82	0.49	0.95	2.26
<i>Ludwigia pedunculosa</i> Michx.	1	1	3.03	3.03	1.00	0.27	0.07	0.41	0.75
<i>Mecardonia dianthera</i> (Sw.) Pennell	16	6	18.18	48.48	2.67	1.64	1.12	1.08	3.85
<i>Mikania micrantha</i> Kunth	19	5	15.15	57.58	3.80	1.37	1.33	1.55	4.24
<i>Mimosa pudica</i> L.	60	13	39.39	181.82	4.62	3.55	4.21	1.88	9.64
<i>Murdannia japonica</i> (Thunb.) Faden	47	8	24.24	142.42	5.88	2.19	3.30	2.39	7.87
<i>Murdannia nudiflora</i> (L.) Brenan	5	1	3.03	15.15	5.00	0.27	0.35	2.03	2.66
<i>Murdannia spirata</i> (L.) G.Brückn.	19	3	9.09	57.58	6.33	0.82	1.33	2.58	4.73
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	26	7	21.21	78.79	3.71	1.91	1.82	1.51	5.25
<i>Oplismenus burmanni</i> (Retz.) P.Beauv.	16	5	15.15	48.48	3.20	1.37	1.12	1.30	3.79
<i>Oplismenus compositus</i> (L.) P.Beauv.	7	3	9.09	21.21	2.33	0.82	0.49	0.95	2.26
<i>Oxalis corniculata</i> L.	35	5	15.15	106.06	7.00	1.37	2.45	2.85	6.67
<i>Oxalis debilis</i> Kunth	10	2	6.06	30.30	5.00	0.55	0.70	2.03	3.28
<i>Peliosanthes griffithii</i> Baker	20	4	12.12	60.61	5.00	1.09	1.40	2.03	4.53
<i>Persicaria chinensis</i> (L.) H.Gross	14	6	18.18	42.42	2.33	1.64	0.98	0.95	3.57
<i>Persicaria hydropiper</i> (L.) Delarbre	14	5	15.15	42.42	2.80	1.37	0.98	1.14	3.49
<i>Phaius tankervilleae</i> (Banks) Blume	17	4	12.12	51.52	4.25	1.09	1.19	1.73	4.01
<i>Phlogacanthus thyrsoformis</i> (Roxb. ex Hardw.) Mabb.	8	2	6.06	24.24	4.00	0.55	0.56	1.63	2.73
<i>Phyllanthus reticulatus</i> Poir.	38	7	21.21	115.15	5.43	1.91	2.66	2.21	6.79
<i>Pupalia lappacea</i> (L.) Juss.	10	4	12.12	30.30	2.50	1.09	0.70	1.02	2.81
<i>Scoparia dulcis</i> L.	50	9	27.27	151.52	5.56	2.46	3.51	2.26	8.23
<i>Sida acuta</i> Burm.f.	84	15	45.45	254.55	5.60	4.10	5.89	2.28	12.27
<i>Sida cordata</i> (Burm.f.) Borss.Waalk.	6	1	3.03	18.18	6.00	0.27	0.42	2.44	3.13
<i>Stephania japonica</i> (Thunb.) Miers	25	8	24.24	75.76	3.13	2.19	1.75	1.27	5.21
<i>Synedrella nodiflora</i> (L.) Gaertn.	40	11	33.33	121.21	3.64	3.01	2.81	1.48	7.29
<i>Thunbergia fragrans</i> Roxb.	10	4	12.12	30.30	2.50	1.09	0.70	1.02	2.81
<i>Torenia crustacea</i> (L.) Cham. & Schltldl.	39	6	18.18	118.18	6.50	1.64	2.73	2.64	7.02
<i>Triumfetta rhomboidea</i> Jacq.	29	9	27.27	87.88	3.22	2.46	2.03	1.31	5.80
<i>Urena lobata</i> L.	29	12	36.36	87.88	2.42	3.28	2.03	0.98	6.30
<i>Urochloa reptans</i> (L.) Stapf	8	4	12.12	24.24	2.00	1.09	0.56	0.81	2.47
<i>Zingiber rubens</i> Roxb.	15	3	9.09	45.45	5.00	0.82	1.05	2.03	3.91
<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	8	2	6.06	24.24	4.00	0.55	0.56	1.63	2.73
TOTAL	1426	366	1109.09	4321.21	245.81	100.00	100.00	100.00	300.00

b. Survey during Post-Monsoon

During post-monsoon a total of 40 quadrates have been studied and recorded 64 species of plants. A total of 1223 individuals were counted, and the analysis of recorded data presented in Table 28.

Highest Frequency and Relative Frequency shows by three species viz., *Ampelocissus barbata* (Wallich) Planchon, *Triumfetta rhomboidea* Jacquin., *Vernonia cinerea* (L.) Less [F=25 & RF=2.58], followed by *Hydrocotyle sibthorpioides* Lamarck, *Persicaria hydropiper* (L.) Spach [F=22.50 & RF=2.32], *Euphorbia hypericifolia* L., *Kyllinga nemoralis* (J.R. & G. Forster) Dandy ex Hutchinson & Dalziel, *Paspalum scrobiculatum* L., and *Zingiber rubens* Roxb. [F=20 & RF=2.06].

Euphorbia hypericifolia L. shows highest Density and Relative Density [D=197.50 & RD=6.46] and followed by *Ophiorrhiza fasciculata* D. Don [D=167.50 & RD=5.48], *Elephantopus scaber* L. [D=155 & RD=5.07], *Centella asiatica* (L.) Urban [D=92.5 & RD=3.03], *Triumfetta rhomboidea* Jacquin [D=80 & RD=2.52], *Vernonia cinerea* (Linnaeus) Less [D=77.50 & RD=2.53].

Ophiorrhiza fasciculata D. Don shows highest Abundance and Relative Abundance [A=16.75 & RA=6.15], and followed by *Elephantopus scaber* Linnaeus [A=10.33 & RA=3.79], *Euphorbia hypericifolia* Linnaeus [A=9.88 & RA=3.62], *Biophytum reinwardtii* (Zuccarini) Klotzsch [A=7.33 & RA=2.69], *Centella asiatica* (Linnaeus) Urban. [A=6.17 & RA=2.26] and *Curculigo orchioides* Gaertner [A=5 & RA=1.84].

Ophiorrhiza fasciculata D. Don shows maximum IVI [IVI=12.66], and followed by *Euphorbia hypericifolia* L. [IVI=12.15], *Elephantopus scaber* L. [IVI=10.41], *Centella asiatica* (L.) Urban [IVI=6.83], *Triumfetta rhomboidea* Jacquin [IVI=6.37], *Vernonia cinerea* (L.) Less [IVI=6.25], *Kyllinga nemoralis* (J.R. & G. Forster) Dandy ex Hutchinson & Dalziel [IVI=5.89], *Curculigo orchioides* Gaertner [IVI=5.83], *Alpinia nigra* (Gaertner) Burt and *Commelina suffruticosa* Blume [IVI=5.55] where as *Pseudognaphalium affine* (D. Don) Anderberg and *Scoparia dulcis* L. [IVI=0.71] shows the minimum value.

Table 28: Analysis of Herbs layer data of North Rajabhatkhawa (NRVK) MPCA [Post-Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthus bidentata</i> Blume	32	4	10.00	80.00	8.00	1.03	2.62	2.94	6.58
<i>Acmella calva</i> (DC.) Jansen	11	6	15.00	27.50	1.83	1.55	0.90	0.67	3.12
<i>Acmella uliginosa</i> (Swartz) Cassini	19	7	17.50	47.50	2.71	1.80	1.55	1.00	4.35
<i>Aerva sanguinolenta</i> (L.) Blume	12	5	12.50	30.00	2.40	1.29	0.98	0.88	3.15
<i>Ageratum conyzoides</i> L.	7	2	5.00	17.50	3.50	0.52	0.57	1.28	2.37
<i>Alocasia fallax</i> Schott	5	2	5.00	12.50	2.50	0.52	0.41	0.92	1.84
<i>Alpinia nigra</i> (Gaertner) Burttt	28	6	15.00	70.00	4.67	1.55	2.29	1.71	5.55
<i>Alternanthera sessilis</i> (L.) DC.	8	3	7.50	20.00	2.67	0.77	0.65	0.98	2.41
<i>Ampelocissus barbata</i> (Wallich) Planchon	23	10	25.00	57.50	2.30	2.58	1.88	0.84	5.30
<i>Asparagus officinalis</i> L.	8	2	5.00	20.00	4.00	0.52	0.65	1.47	2.64
<i>Asparagus racemosus</i> Willdenow	6	3	7.50	15.00	2.00	0.77	0.49	0.73	2.00
<i>Barleria strigosa</i> Willdnew	8	3	7.50	20.00	2.67	0.77	0.65	0.98	2.41
<i>Biophytum reinwardtii</i> (Zuccarini) Klotzsch	22	3	7.50	55.00	7.33	0.77	1.80	2.69	5.26
<i>Biophytum sensitivum</i> DC.	3	1	2.50	7.50	3.00	0.26	0.25	1.10	1.60
<i>Cassia tora</i> L.	6	2	5.00	15.00	3.00	0.52	0.49	1.10	2.11
<i>Centella asiatica</i> (L.) Urban	37	6	15.00	92.50	6.17	1.55	3.03	2.26	6.83
<i>Chromolaena odoratum</i> (L.) King & Robinson	5	2	5.00	12.50	2.50	0.52	0.41	0.92	1.84
<i>Colocasia esculenta</i> (L.) Schott	10	4	10.00	25.00	2.50	1.03	0.82	0.92	2.77
<i>Commelina suffruticosa</i> Blume	28	6	15.00	70.00	4.67	1.55	2.29	1.71	5.55
<i>Costus speciosus</i> (Koenig ex Retzius) Smith	27	6	15.00	67.50	4.50	1.55	2.21	1.65	5.41
<i>Crinum amoenum</i> Roxb.	18	5	12.50	45.00	3.60	1.29	1.47	1.32	4.08
<i>Crotalaria alata</i> Buch-Ham ex D. Don	14	3	7.50	35.00	4.67	0.77	1.14	1.71	3.63
<i>Curculigo capitulata</i> (Loureiro) O. Kuntze	5	3	7.50	12.50	1.67	0.77	0.41	0.61	1.79
<i>Curculigo orchioides</i> Gaertner	30	6	15.00	75.00	5.00	1.55	2.45	1.84	5.83
<i>Curcuma ceaesia</i> Roxb.	10	4	10.00	25.00	2.50	1.03	0.82	0.92	2.77
<i>Curcuma zedoaria</i> (Chirstmann) Roscoe	14	4	10.00	35.00	3.50	1.03	1.14	1.28	3.46
<i>Cyanotis axillaris</i> (L.) Sweet	6	3	7.50	15.00	2.00	0.77	0.49	0.73	2.00
<i>Cymbopogon jwarancusa</i> (Jones) Schultes	20	6	15.00	50.00	3.33	1.55	1.64	1.22	4.41
<i>Cynodon dactylon</i> (L.) Persoon	8	3	7.50	20.00	2.67	0.77	0.65	0.98	2.41
<i>Cyperus rotundus</i> L.	4	3	7.50	10.00	1.33	0.77	0.33	0.49	1.59
<i>Dactyloctenium aegypticum</i> (L.) P. Beauv.	4	1	2.50	10.00	4.00	0.26	0.33	1.47	2.05
<i>Dentella repens</i> J. & G. Forster	21	6	15.00	52.50	3.50	1.55	1.72	1.28	4.55

<i>Dicliptera bupleuroides</i> Nees	21	7	17.50	52.50	3.00	1.80	1.72	1.10	4.62
<i>Diplazium esculentum</i> (Retz.) Sw.	12	6	15.00	30.00	2.00	1.55	0.98	0.73	3.26
<i>Drosera burmannii</i> Vahl	5	2	5.00	12.50	2.50	0.52	0.41	0.92	1.84
<i>Drynaria quercifolia</i> (L.) J. Smith	6	3	7.50	15.00	2.00	0.77	0.49	0.73	2.00
<i>Echinochloa crussgalli</i> (L.) P.Beauv.	10	5	12.50	25.00	2.00	1.29	0.82	0.73	2.84
<i>Eclipta prostrata</i> (L.) L.	4	3	7.50	10.00	1.33	0.77	0.33	0.49	1.59
<i>Elephantopus scaber</i> L.	62	6	15.00	155.00	10.33	1.55	5.07	3.79	10.41
<i>Elusine indica</i> (L.) Gaertner	4	2	5.00	10.00	2.00	0.52	0.33	0.73	1.58
<i>Erigeron canadensis</i> (L.) Cronquist	4	3	7.50	10.00	1.33	0.77	0.33	0.49	1.59
<i>Euphorbia heyneana</i> Sprengel	10	4	10.00	25.00	2.50	1.03	0.82	0.92	2.77
<i>Euphorbia hirta</i> L.	13	6	15.00	32.50	2.17	1.55	1.06	0.80	3.40
<i>Euphorbia hypericifolia</i> L.	79	8	20.00	197.50	9.88	2.06	6.46	3.62	12.15
<i>Hydrocotyle sibthorpioides</i> Lamarck	24	9	22.50	60.00	2.67	2.32	1.96	0.98	5.26
<i>Hygrophila auriculata</i> (Schumacher)	16	5	12.50	40.00	3.20	1.29	1.31	1.17	3.77
Heine									
<i>Hypericum japonicum</i> Murray	6	3	7.50	15.00	2.00	0.77	0.49	0.73	2.00
<i>Hyptis suaveolens</i> (L.) Poiteau	6	4	10.00	15.00	1.50	1.03	0.49	0.55	2.07
<i>Imperata cylindrica</i> (L.) Rauschel	13	6	15.00	32.50	2.17	1.55	1.06	0.80	3.40
<i>Jasminum pubescens</i> (Retzius)	8	2	5.00	20.00	4.00	0.52	0.65	1.47	2.64
Willdenow									
<i>Kyllinga nemoralis</i> (J.R. & G. Forster)	30	8	20.00	75.00	3.75	2.06	2.45	1.38	5.89
Dandy ex Hutchinson & Dalziel									
<i>Lasia spinosa</i> (L.) Thwaites	5	4	10.00	12.50	1.25	1.03	0.41	0.46	1.90
<i>Leucus indica</i> (L.) R. Brown ex Vatke	5	3	7.50	12.50	1.67	0.77	0.41	0.61	1.79
<i>Lindenbergia indica</i> (L.) O. Kuntze	11	5	12.50	27.50	2.20	1.29	0.90	0.81	3.00
<i>Lygodium flexuosum</i> (L.) Swartz	7	5	12.50	17.50	1.40	1.29	0.57	0.51	2.37
<i>Melilotus indica</i> (L.) Allioni	11	4	10.00	27.50	2.75	1.03	0.90	1.01	2.94
<i>Monochoria vaginalis</i> (Burman f.) Kunth	11	5	12.50	27.50	2.20	1.29	0.90	0.81	3.00
<i>Oldenlandia corymbosa</i> L.	3	2	5.00	7.50	1.50	0.52	0.25	0.55	1.31
<i>Oldenlandia diffusa</i> (Willdenow) Roxb.	9	3	7.50	22.50	3.00	0.77	0.74	1.10	2.61
<i>Ophiorrhiza fasciculata</i> D.Don	67	4	10.00	167.50	16.75	1.03	5.48	6.15	12.66
<i>Ophioglossum reticulatum</i> L.	4	2	5.00	10.00	2.00	0.52	0.33	0.73	1.58
<i>Oxalis corniculata</i> L.	5	3	7.50	12.50	1.67	0.77	0.41	0.61	1.79
<i>Paspalum scrobiculatum</i> L.	19	8	20.00	47.50	2.38	2.06	1.55	0.87	4.49
<i>Persicaria barbata</i> (L.) Hara	15	7	17.50	37.50	2.14	1.80	1.23	0.79	3.82
<i>Persicaria chinensis</i> (L.) H. Gross	4	2	5.00	10.00	2.00	0.52	0.33	0.73	1.58
<i>Persicaria hydropiper</i> (L.) Spach	25	9	22.50	62.50	2.78	2.32	2.04	1.02	5.38
<i>Phyllanthus urinaria</i> L.	4	2	5.00	10.00	2.00	0.52	0.33	0.73	1.58
<i>Phyllanthus virgatus</i> Forster	8	3	7.50	20.00	2.67	0.77	0.65	0.98	2.41
<i>Physalis divaricata</i> D. Don	4	2	5.00	10.00	2.00	0.52	0.33	0.73	1.58
<i>Physalis peruviana</i> L.	7	4	10.00	17.50	1.75	1.03	0.57	0.64	2.25
<i>Polygonum hydropiper</i> L.	2	1	2.50	5.00	2.00	0.26	0.16	0.73	1.16
<i>Portulaca oleracea</i> L.	12	6	15.00	30.00	2.00	1.55	0.98	0.73	3.26
<i>Pouzolzia hirta</i> (Blume) Hasskarl	5	2	5.00	12.50	2.50	0.52	0.41	0.92	1.84

<i>Pouzolzia zeylanica</i> (L.) Bennet & R. Brown	3	2	5.00	7.50	1.50	0.52	0.25	0.55	1.31
<i>Pseudognaphalium affine</i> (D. Don) Anderberg	1	1	2.50	2.50	1.00	0.26	0.08	0.37	0.71
<i>Saccharum spontaneum</i> L.	9	2	5.00	22.50	4.50	0.52	0.74	1.65	2.90
<i>Scindapsus officinalis</i> (Roxb.) Schott	6	2	5.00	15.00	3.00	0.52	0.49	1.10	2.11
<i>Scoparia dulcis</i> L.	1	1	2.50	2.50	1.00	0.26	0.08	0.37	0.71
<i>Sida acuta</i> Burm.f.	3	2	5.00	7.50	1.50	0.52	0.25	0.55	1.31
<i>Sida rhombifolia</i> L.	2	1	2.50	5.00	2.00	0.26	0.16	0.73	1.16
<i>Solanum nigrum</i> L.	8	4	10.00	20.00	2.00	1.03	0.65	0.73	2.42
<i>Sonchus oleraceus</i> L.	9	6	15.00	22.50	1.50	1.55	0.74	0.55	2.83
<i>Spermacoce hispida</i> L.	7	5	12.50	17.50	1.40	1.29	0.57	0.51	2.37
<i>Synedrella nudiflora</i> (L.) Gaertner	5	4	10.00	12.50	1.25	1.03	0.41	0.46	1.90
<i>Torenia cordata</i> (Griffith) N.M. Datta	6	4	10.00	15.00	1.50	1.03	0.49	0.55	2.07
<i>Triumfetta rhomboidea</i> Jacquin	32	10	25.00	80.00	3.20	2.58	2.62	1.17	6.37
<i>Typhonium trilobatum</i> (L.) Schott	8	5	12.50	20.00	1.60	1.29	0.65	0.59	2.53
<i>Urena lobata</i> L.	11	4	10.00	27.50	2.75	1.03	0.90	1.01	2.94
<i>Vernonia cinerea</i> (L.) Less	31	10	25.00	77.50	3.10	2.58	2.53	1.14	6.25
<i>Xanthium strumarium</i> L.	9	4	10.00	22.50	2.25	1.03	0.74	0.83	2.59
<i>Zingiber rubens</i> Roxb.	21	8	20.00	52.50	2.63	2.06	1.72	0.96	4.74
<i>Zornia gibbosa</i> Spanoghe	16	5	12.50	40.00	3.20	1.29	1.31	1.17	3.77
TOTAL	1223	388	970.00	3057.50	272.48	100.00	100.00	100.00	300.00

6.2.3.3. Sursuti MPCA, Gorumara National Park

a. Survey during Monsoon

A total 33 quadrat samplings have been performed from this MPCA. The accumulated data were analysed through computer to get the total understanding of its community structure.

Studied quadrates, which recorded 68 species of tree species and the analysis of recorded data is shown in Table 29. The calculating data shows highest Frequency and Relative Frequency by *Sida acuta* Burm.f. [F=36.36 & RF=3.92] followed by *Calyptocarpus vialis* Less. [F=30.30 & RF=3.27], *Oxalis corniculata* L. [F=27.27 & RF=2.94], *Achyranthes aspera* L., *Chloranthus elatior* Link, *Colocasia esculenta* (L.) Schott, *Cyperus rotundus* L., *Digitaria ciliaris* (Retz.) Koeler, *Globba multiflora* Wall. ex Baker, *Jasminum nepalense* Spreng., *Ophiorrhiza fasciculata* D. Don, *Urena lobata* L. [F=24.24 & RF=2.61].

Ophiorrhiza fasciculata D. Don shows highest Density and Relative Density [D=2.48 & RD=5.98], followed by *Sida acuta* Burm.f. [D=2.03 & RD=4.88], *Oxalis corniculata* L.

[D=1.76 & RD=4.23 *Cyperus rotundus* L. [R=1.55 & RD=3.72], *Phyllanthus reticulatus* Poir., *Torenia crustacea* (L.) Cham. & Schltl. [D=1.15 & RD=2.77].

Ophiorrhiza fasciculata D. Don shows highest Density and Relative Abundance [A=10.25 & RA=5.51] followed by *Centella asiatica* (L.) Urb. [A=7.33 & RA=2.51], *Oxalis corniculata* L. [A=6.44 & RA=2.21], *Cyperus rotundus* L. [A=6.38 & RA=2.18], *Phyllanthus reticulatus* Poir., *Torenia crustacea* (L.) Cham. & Schltl. [A=6.33 & RA=2.17] *Alternanthera sessilis* (L.) R.Br. ex DC., *Murdannia nudiflora* (L.) Brenan [A=6 & RA=2.06]

Maximum IVI value shows by *Ophiorrhiza fasciculata* D.Don [IVI=12.10] and followed by *Sida acuta* Burm.f. [IVI=10.72], *Oxalis corniculata* L. [IVI=9.38], *Cyperus rotundus* L. [IVI=8.52], *Phyllanthus reticulatus* Poir., *Torenia crustacea* (L.) Cham. & Schltl., *Colocasia esculenta* (L.) Schott [IVI=6.90], *Elephantopus scaber* L. [=6.80], *Calyptocarpus vialis* Less. [IVI=6.59] where as *Hydrocotyle sibthorpioides* Lam, *Phaius tankervilleae* (Banks) Blume [IVI=1.16] shows the minimum value.

Table 29: Analysis of Herbs layer data of Sursuti MPCA [Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthes aspera</i> L.	32	8	24.24	0.97	4.00	2.61	2.33	1.37	6.32
<i>Achyranthes bidentata</i> Blume	7	3	9.09	0.21	2.33	0.98	0.51	0.80	2.29
<i>Acmella uliginosa</i> (Sw.) Cass.	14	3	9.09	0.42	4.67	0.98	1.02	1.60	3.60
<i>Alpinia calcarata</i> (Andrews) Roscoe	14	5	15.15	0.42	2.80	1.63	1.02	0.96	3.61
<i>Alpinia nigra</i> (Gaertner) B.L. Burtt	13	3	9.09	0.39	4.33	0.98	0.95	1.49	3.41
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	12	2	6.06	0.36	6.00	0.65	0.87	2.06	3.58
<i>Axonopus compressus</i> (Sw.) P.Beauv.	9	2	6.06	0.27	4.50	0.65	0.66	1.54	2.85
<i>Biophytum reinwardtii</i> (Zucc.) Klotzsch	17	5	15.15	0.52	3.40	1.63	1.24	1.17	4.04
<i>Boehmeria virgata</i> subsp. <i>macrophylla</i> (Homem.) Friis & Wilmot-Dear	6	2	6.06	0.18	3.00	0.65	0.44	1.03	2.12
<i>Bonnya ciliata</i> (Colsm.) Spereng.	17	3	9.09	0.52	5.67	0.98	1.24	1.94	4.16
<i>Bonnya gracilis</i> A.Pal, Sardesai & M.Chowdhury	13	3	9.09	0.39	4.33	0.98	0.95	1.49	3.41
<i>Calyptocarpus vialis</i> Less.	31	10	30.30	0.94	3.10	3.27	2.26	1.06	6.59
<i>Calyptocarpus vilis</i>	5	1	3.03	0.15	5.00	0.33	0.36	1.71	2.40
<i>Centella asiatica</i> (L.) Urb.	22	3	9.09	0.67	7.33	0.98	1.60	2.51	5.10
<i>Chlorophytum nepalense</i> (Lindl.) Baker	3	1	3.03	0.09	3.00	0.33	0.22	1.03	1.57
<i>Chloranthus elatior</i> Link	30	8	24.24	0.91	3.75	2.61	2.19	1.29	6.09
<i>Chlorophytum nepalensis</i> (Lindl.) Baker	13	4	12.12	0.39	3.25	1.31	0.95	1.11	3.37
<i>Clerodendrum infortunatum</i> L.	21	4	12.12	0.64	5.25	1.31	1.53	1.80	4.64
<i>Colocasia esculenta</i> (L.) Schott	37	8	24.24	1.12	4.63	2.61	2.70	1.59	6.90
<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet	18	4	12.12	0.55	4.50	1.31	1.31	1.54	4.16

<i>Cyanotis vaga</i> (Lour.) Schult. & Schult.f.	15	4	12.12	0.45	3.75	1.31	1.09	1.29	3.69
<i>Cyperus alternifolius</i> ssp. <i>flabelliformis</i> Kük.	21	4	12.12	0.64	5.25	1.31	1.53	1.80	4.64
<i>Cyperus rotundus</i> L.	51	8	24.24	1.55	6.38	2.61	3.72	2.18	8.52
<i>Dendrocnide sinuata</i> (Bl.) Chew	16	4	12.12	0.48	4.00	1.31	1.17	1.37	3.84
<i>Digitaria ciliaris</i> (Retz.) Koeler	30	8	24.24	0.91	3.75	2.61	2.19	1.29	6.09
<i>Elatostema parvum</i> (Bl.) Bl. ex Miq.	9	2	6.06	0.27	4.50	0.65	0.66	1.54	2.85
<i>Elephantopus scaber</i> L.	37	7	21.21	1.12	5.29	2.29	2.70	1.81	6.80
<i>Euphorbia hirta</i> L.	22	4	12.12	0.67	5.50	1.31	1.60	1.89	4.80
<i>Euphorbia hypericifolia</i> L.	14	3	9.09	0.42	4.67	0.98	1.02	1.60	3.60
<i>Globba multiflora</i> Wall. ex Baker	32	8	24.24	0.97	4.00	2.61	2.33	1.37	6.32
<i>Gomphostemma ovatum</i> Wall. ex Benth.	6	2	6.06	0.18	3.00	0.65	0.44	1.03	2.12
<i>Gomphostemma parviflorum</i> Wall. ex Benth.	3	1	3.03	0.09	3.00	0.33	0.22	1.03	1.57
<i>Gonostegia triandra</i> (Blume) Miq.	19	5	15.15	0.58	3.80	1.63	1.38	1.30	4.32
<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta	21	6	18.18	0.64	3.50	1.96	1.53	1.20	4.69
<i>Hydrocotyle sibthorpioides</i> Lam.	2	1	3.03	0.06	2.00	0.33	0.15	0.69	1.16
<i>Jasminum nepalense</i> Spreng.	24	8	24.24	0.73	3.00	2.61	1.75	1.03	5.39
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	23	6	18.18	0.70	3.83	1.96	1.68	1.31	4.95
<i>Mikania micrantha</i> Kunth	19	6	18.18	0.58	3.17	1.96	1.38	1.09	4.43
<i>Mimosa pudica</i> L.	27	7	21.21	0.82	3.86	2.29	1.97	1.32	5.58
<i>Murdannia japonica</i> (Thunb.) Faden	29	6	18.18	0.88	4.83	1.96	2.11	1.66	5.73
<i>Murdannia nudiflora</i> (L.) Brenan	6	1	3.03	0.18	6.00	0.33	0.44	2.06	2.82
<i>Murdannia spirata</i> (L.) G.Brückn.	16	4	12.12	0.48	4.00	1.31	1.17	1.37	3.84
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	17	3	9.09	0.52	5.67	0.98	1.24	1.94	4.16
<i>Oplismenus burmanni</i> (Retz.) P.Beauv.	16	4	12.12	0.48	4.00	1.31	1.17	1.37	3.84
<i>Oplismenus compositus</i> (L.) P.Beauv.	19	4	12.12	0.58	4.75	1.31	1.38	1.63	4.32
<i>Oxalis corniculata</i> L.	58	9	27.27	1.76	6.44	2.94	4.23	2.21	9.38
<i>Oxalis debilis</i> Kunth	28	5	15.15	0.85	5.60	1.63	2.04	1.92	5.59
<i>Ophiorrhiza fasciculata</i> D. Don	82	8	24.24	2.48	10.25	2.61	5.98	3.51	12.10
<i>Peliosanthes griffithii</i> Baker	17	5	15.15	0.52	3.40	1.63	1.24	1.17	4.04
<i>Persicaria chinensis</i> (L.) H.Gross	6	2	6.06	0.18	3.00	0.65	0.44	1.03	2.12
<i>Persicaria hydropiper</i> (L.) Delarbre	13	3	9.09	0.39	4.33	0.98	0.95	1.49	3.41
<i>Phaius tankervilleae</i> (Banks) Blume	2	1	3.03	0.06	2.00	0.33	0.15	0.69	1.16
<i>Phlogacanthus thyrsoformis</i> (Roxb. ex Hardw.) Mabb.	8	2	6.06	0.24	4.00	0.65	0.58	1.37	2.61
<i>Phrynium pubinerve</i> Blume	3	1	3.03	0.09	3.00	0.33	0.22	1.03	1.57
<i>Phyllanthus reticulatus</i> Poir.	38	6	18.18	1.15	6.33	1.96	2.77	2.17	6.90
<i>Pupalia lappacea</i> (L.) Juss.	13	4	12.12	0.39	3.25	1.31	0.95	1.11	3.37
<i>Scoparia dulcis</i> L.	21	5	15.15	0.64	4.20	1.63	1.53	1.44	4.60
<i>Sida acuta</i> Burm.f.	67	12	36.36	2.03	5.58	3.92	4.88	1.91	10.72
<i>Sida cordata</i> (Burm.f.) Borss.Waalk.	13	3	9.09	0.39	4.33	0.98	0.95	1.49	3.41
<i>Stephania japonica</i> (Thunb.) Miers	26	7	21.21	0.79	3.71	2.29	1.90	1.27	5.46
<i>Synedrella nodiflora</i> (L.) Gaertn.	28	6	18.18	0.85	4.67	1.96	2.04	1.60	5.60
<i>Thunbergia fragrans</i> Roxb.	9	3	9.09	0.27	3.00	0.98	0.66	1.03	2.66
<i>Torenia crustacea</i> (L.) Cham. & Schltdl.	38	6	18.18	1.15	6.33	1.96	2.77	2.17	6.90

<i>Triumfetta rhomboidea</i> Jacq.	10	3	9.09	0.30	3.33	0.98	0.73	1.14	2.85
<i>Urena lobata</i> L.	32	8	24.24	0.97	4.00	2.61	2.33	1.37	6.32
<i>Urochloa reptans</i> (L.) Stapf	7	2	6.06	0.21	3.50	0.65	0.51	1.20	2.36
<i>Zingiber rubens</i> Roxb.	11	3	9.09	0.33	3.67	0.98	0.80	1.26	3.04
<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	14	4	12.12	0.42	3.50	1.31	1.02	1.20	3.53
TOTAL	1372	306	927.27	41.58	291.77	100.00	100.00	100.00	300.00

b. Survey during Post-Monsoon

During post-monsoon a total of 40 quadrates have been studied and recorded 85 species of plants. A total of 1318 individuals were counted, and the analysis of recorded data presented in Table 30.

Highest Frequency and Relative Frequency shows by *Elephantopus scaber* L. [F=22.50 & RF=3.08], followed *Alternanthera sessilis* (L.) DC., *Sonchus oleraceus* L. [F=17.50 & RF=2.40], *Costus speciosus* (Koenig ex Retzius) Smith *Echinochloa crusgalli* (L.) P. Beauv., *Glinus oppositifolius* (L.) A. DC., *Lindenbergia indica* (Linnaeus) O. Kuntze [F=15 & RF=2.05].

Achyranthus bidentata Blume shows highest Density and Relative Density [D=1.58 & RD=4.78], followed by *Elephantopus scaber* L. [D=1.58 & RD=4.18], *Cyperus rotundus* Linnaeus [D=0.83 & RD=2.50], *Alternanthera sessilis* (L.) DC., *Lindenbergia indica* (L.) O. Kuntze [D=0.80 & RD=2.43], *Maranta arundinacea* L. [D=0.73 & RD=2.20] *Costus speciosus* (Koenig ex Retzius) Smith [D=0.70 & RD=2.12].

Achyranthus bidentata Blume shows highest Abundance and Relative Abundance [A=21 & RA=5.58], and followed by *Cyperus rotundus* L. [A=11 & RA=2.93], *Drosera burmanii* Vahl [A=9 & RA=2.39], *Leucus indica* (L.) R. Brown ex Vatke [A=7 & RA=1.86], *Persicaria chinensis* (L.) H. Gross [A=6.75 & RA=1.79], *Gloriosa superba* L. [A=6.33 & RA=1.68], *Elephantopus scaber* L. [A=6.11 & RA=1.63], *Acmella calva* (DC.) Jansen, *Eclipta prostrate* (L.) L. [A=6 & RA=1.60], *Achyranthus bidentata* Blume shows maximum IVI [IVI=11.39] and followed by *Elephantopus scaber* L. [IVI=8.88], *Cyperus rotundus* L. [IVI=6.46], *Alternanthera sessilis* (L.) DC. [IVI=6.04], *Lindenbergia indica* (L.) O. Kuntze [IVI=5.90], *Maranta arundinacea* L. [IVI=5.45], *Costus speciosus* (Koenig ex Retzius) Smith [IVI=5.42], *Persicaria chinensis* (L.) H. Gross [IVI=5.21], *Vernonia cinerea* (L.) Less [IVI=5.20] where as *Euphorbia heyneana* Sprengel *Pouzolzia zeylanica* (L.) Bennet & Brown [IVI=0.68] shows the minimum value.

Table 30: Analysis of Herbs layer data of Sursuti MPCA [Post-Monsoon]

HERB TAXA	NI	NQ	F	D	A	RF	RD	RA	IVI
<i>Achyranthus bidentata</i> Blume	63.00	3.00	7.50	1.58	21.00	1.03	4.78	5.58	11.39
<i>Acmella calva</i> (DC.) Jansen	18.00	3.00	7.50	0.45	6.00	1.03	1.37	1.60	3.99
<i>Acmella uliginosa</i> (Swartz) Cassini	12.00	3.00	7.50	0.30	4.00	1.03	0.91	1.06	3.00
<i>Aerva sanguinolenta</i> (L.) Blume	17.00	3.00	7.50	0.43	5.67	1.03	1.29	1.51	3.82
<i>Ageratum conyzoides</i> L.	19.00	4.00	10.00	0.48	4.75	1.37	1.44	1.26	4.07
<i>Alocasia fallax</i> Schott	22.00	4.00	10.00	0.55	5.50	1.37	1.67	1.46	4.50
<i>Alpinia calcarata</i> Roscoe	13.00	3.00	7.50	0.33	4.33	1.03	0.99	1.15	3.17
<i>Alpinia nigra</i> (Gaertner) Burt	18.00	5.00	12.50	0.45	3.60	1.71	1.37	0.96	4.04
<i>Alternanthera sessilis</i> (Linnaeus) DC.	32.00	7.00	17.50	0.80	4.57	2.40	2.43	1.22	6.04
<i>Amorphophallus napalensis</i> (Wall.) Bogner & Mayo	14.00	3.00	7.50	0.35	4.67	1.03	1.06	1.24	3.33
<i>Ampelocissus barbata</i> (Wallich) Planchon	2.00	1.00	2.50	0.05	2.00	0.34	0.15	0.53	1.03
<i>Asparagus officinalis</i> L.	18.00	4.00	10.00	0.45	4.50	1.37	1.37	1.20	3.93
<i>Asparagus racemosus</i> Willdenow	2.00	1.00	2.50	0.05	2.00	0.34	0.15	0.53	1.03
<i>Barleria strigosa</i> Willdnew	10.00	3.00	7.50	0.25	3.33	1.03	0.76	0.89	2.67
<i>Biophytum reinwardtii</i> (Zuccarini) Klotzsch	9.00	2.00	5.00	0.23	4.50	0.68	0.68	1.20	2.56
<i>Biophytum sensitivum</i> DC.	3.00	1.00	2.50	0.08	3.00	0.34	0.23	0.80	1.37
<i>Cassia tora</i> L.	2.00	1.00	2.50	0.05	2.00	0.34	0.15	0.53	1.03
<i>Centella asiatica</i> (L.) Urban	6.00	2.00	5.00	0.15	3.00	0.68	0.46	0.80	1.94
<i>Colocasia esculenta</i> (L.) Schott	13.00	3.00	7.50	0.33	4.33	1.03	0.99	1.15	3.17
<i>Commelina suffruticosa</i> Blume	16.00	3.00	7.50	0.40	5.33	1.03	1.21	1.42	3.66
<i>Costus speciosus</i> (Koenig ex Retzius) Smith	28.00	6.00	15.00	0.70	4.67	2.05	2.12	1.24	5.42
<i>Crinum amoenum</i> Roxb.	2.00	1.00	2.50	0.05	2.00	0.34	0.15	0.53	1.03
<i>Crotalaria alata</i> Buch-Ham ex D. Don	16.00	4.00	10.00	0.40	4.00	1.37	1.21	1.06	3.65
<i>Curculigo capitulata</i> (Loureiro)O. Kuntze	13.00	3.00	7.50	0.33	4.33	1.03	0.99	1.15	3.17
<i>Curculigo orchioides</i> Gaertner	14.00	5.00	12.50	0.35	2.80	1.71	1.06	0.74	3.52
<i>Curcuma ceaesia</i> Roxb.	8.00	2.00	5.00	0.20	4.00	0.68	0.61	1.06	2.36
<i>Curcuma zedoaria</i> (Chirstmann) Roscoe	18.00	4.00	10.00	0.45	4.50	1.37	1.37	1.20	3.93
<i>Cyanotis axillaris</i> (L.) Sweet	12.00	3.00	7.50	0.30	4.00	1.03	0.91	1.06	3.00
<i>Cynodon dactylon</i> (L.) Persoon	17.00	4.00	10.00	0.43	4.25	1.37	1.29	1.13	3.79
<i>Cyperus rotundus</i> L.	33.00	3.00	7.50	0.83	11.00	1.03	2.50	2.93	6.46
<i>Dentella repens</i> J. & G. Forster	17.00	3.00	7.50	0.43	5.67	1.03	1.29	1.51	3.82
<i>Dicliptera bupleuroides</i> Nees	11.00	2.00	5.00	0.28	5.50	0.68	0.83	1.46	2.98
<i>Drosera burmanii</i> Vahl	9.00	1.00	2.50	0.23	9.00	0.34	0.68	2.39	3.42
<i>Drynaria quercifolia</i> (L.) J. Smith	11.00	5.00	12.50	0.28	2.20	1.71	0.83	0.59	3.13
<i>Echinochloa crussgalli</i> (L.) P.Beauv.	23.00	6.00	15.00	0.58	3.83	2.05	1.75	1.02	4.82
<i>Eclipta prostrata</i> (L.) L.	12.00	2.00	5.00	0.30	6.00	0.68	0.91	1.60	3.19
<i>Elephantopus scaber</i> L.	55.00	9.00	22.50	1.38	6.11	3.08	4.17	1.63	8.88

<i>Elusine indica</i> (L.) Gaertner	11.00	3.00	7.50	0.28	3.67	1.03	0.83	0.98	2.84
<i>Erigeron canadensis</i> (L.) Cronquist	4.00	1.00	2.50	0.10	4.00	0.34	0.30	1.06	1.71
<i>Euphorbia heyneana</i> Sprengel	1.00	1.00	2.50	0.03	1.00	0.34	0.08	0.27	0.68
<i>Euphorbia hypericifolia</i> L.	16.00	4.00	10.00	0.40	4.00	1.37	1.21	1.06	3.65
<i>Girardinia diversifolia</i> (Link) Friis	21.00	4.00	10.00	0.53	5.25	1.37	1.59	1.40	4.36
<i>Glinus oppositifolius</i> (L.) A. DC.	17.00	6.00	15.00	0.43	2.83	2.05	1.29	0.75	4.10
<i>Gloriosa superba</i> L.	19.00	3.00	7.50	0.48	6.33	1.03	1.44	1.68	4.15
<i>Grangea maderaspatana</i> (L.) Poirlet	19.00	5.00	12.50	0.48	3.80	1.71	1.44	1.01	4.16
<i>Homalomena rubescens</i> (Roxb.) Kunth	5.00	2.00	5.00	0.13	2.50	0.68	0.38	0.66	1.73
<i>Hydrocotyle sibthorpioides</i> Lamarck	5.00	2.00	5.00	0.13	2.50	0.68	0.38	0.66	1.73
<i>Hypericum japonicum</i> Murray	10.00	2.00	5.00	0.25	5.00	0.68	0.76	1.33	2.77
<i>Hyptis suaveolens</i> (L.) Poiteau	19.00	4.00	10.00	0.48	4.75	1.37	1.44	1.26	4.07
<i>Imperata cylindrica</i> (L.) Rauschel	23.00	4.00	10.00	0.58	5.75	1.37	1.75	1.53	4.64
<i>Jasminum pubescens</i> (Retzius) Willdenow	2.00	1.00	2.50	0.05	2.00	0.34	0.15	0.53	1.03
<i>Kyllinga nemoralis</i> (J.R. & G. Forster) Dandy ex Hutchinson & Dalziel	14.00	4.00	10.00	0.35	3.50	1.37	1.06	0.93	3.36
<i>Lasia spinosa</i> (L.) Thwaites	10.00	3.00	7.50	0.25	3.33	1.03	0.76	0.89	2.67
<i>Leucus indica</i> (L.) R. Brown ex Vatke	14.00	2.00	5.00	0.35	7.00	0.68	1.06	1.86	3.61
<i>Lindenbergia indica</i> (L.) O. Kuntze	32.00	6.00	15.00	0.80	5.33	2.05	2.43	1.42	5.90
<i>Maranta arundinacea</i> L.	29.00	5.00	12.50	0.73	5.80	1.71	2.20	1.54	5.45
<i>Monochoria vaginalis</i> (Burman f.) Kunth	13.00	3.00	7.50	0.33	4.33	1.03	0.99	1.15	3.17
<i>Oldenlandia corymbosa</i> L.	14.00	4.00	10.00	0.35	3.50	1.37	1.06	0.93	3.36
<i>Oldenlandia diffusa</i> (Willdenow) Roxb.	21.00	4.00	10.00	0.53	5.25	1.37	1.59	1.40	4.36
<i>Oxalis corniculata</i> L.	7.00	2.00	5.00	0.18	3.50	0.68	0.53	0.93	2.15
<i>Paspalum scrobiculatum</i> L.	24.00	5.00	12.50	0.60	4.80	1.71	1.82	1.28	4.81
<i>Persicaria barbata</i> (L.) Hara	14.00	3.00	7.50	0.35	4.67	1.03	1.06	1.24	3.33
<i>Persicaria chinensis</i> (L.) H. Gross	27.00	4.00	10.00	0.68	6.75	1.37	2.05	1.79	5.21
<i>Persicaria hydropiper</i> (L.) Spach	22.00	4.00	10.00	0.55	5.50	1.37	1.67	1.46	4.50
<i>Persicaria orientalis</i> (L.) Spach	14.00	3.00	7.50	0.35	4.67	1.03	1.06	1.24	3.33
<i>Phyllanthus urinaria</i> L.	9.00	2.00	5.00	0.23	4.50	0.68	0.68	1.20	2.56
<i>Physalis divaricata</i> D. Don	12.00	4.00	10.00	0.30	3.00	1.37	0.91	0.80	3.08
<i>Physalis peruviana</i> L.	12.00	3.00	7.50	0.30	4.00	1.03	0.91	1.06	3.00
<i>Polygonum hydropiper</i> L.	20.00	5.00	12.50	0.50	4.00	1.71	1.52	1.06	4.29
<i>Polygonum plebeium</i> R. Brown	15.00	3.00	7.50	0.38	5.00	1.03	1.14	1.33	3.50
<i>Pouzolzia hirta</i> (Blume) Hasskarl	15.00	3.00	7.50	0.38	5.00	1.03	1.14	1.33	3.50
<i>Pouzolzia zeylanica</i> (L.) Bennet & R.Br.	1.00	1.00	2.50	0.03	1.00	0.34	0.08	0.27	0.68
<i>Pseudognaphalium affine</i> (D. Don) Anderberg	16.00	4.00	10.00	0.40	4.00	1.37	1.21	1.06	3.65
<i>Scoparia dulcis</i> L.	12.00	3.00	7.50	0.30	4.00	1.03	0.91	1.06	3.00
<i>Sida acuta</i> Burm.f.	14.00	4.00	10.00	0.35	3.50	1.37	1.06	0.93	3.36

<i>Sida rhombifolia</i> L.	4.00	2.00	5.00	0.10	2.00	0.68	0.30	0.53	1.52
<i>Solanum nigrum</i> L.	6.00	3.00	7.50	0.15	2.00	1.03	0.46	0.53	2.01
<i>Sonchus oleraceus</i> L.	13.00	7.00	17.50	0.33	1.86	2.40	0.99	0.49	3.88
<i>Synedrella nudiflora</i> (L.) Gaertner	18.00	5.00	12.50	0.45	3.60	1.71	1.37	0.96	4.04
<i>Triumfetta rhomboidea</i> Jacquin	20.00	5.00	12.50	0.50	4.00	1.71	1.52	1.06	4.29
<i>Typhonium trilobatum</i> (L.) Schott	23.00	5.00	12.50	0.58	4.60	1.71	1.75	1.22	4.68
<i>Urena lobata</i> L.	10.00	3.00	7.50	0.25	3.33	1.03	0.76	0.89	2.67
<i>Vernonia cinerea</i> (L.) Less	27.00	5.00	12.50	0.68	5.40	1.71	2.05	1.44	5.20
<i>Xanthium strumarium</i> L.	16.00	4.00	10.00	0.40	4.00	1.37	1.21	1.06	3.65
<i>Zingiber rubens</i> Roxb.	20.00	5.00	12.50	0.50	4.00	1.71	1.52	1.06	4.29
TOTAL	1318	292.00	730.00	32.95	376.06	100.00	100.00	100.00	300.00

6.2.4. DIVERSITY INDICES

6.2.4.1. Tree Layer

Different parameters regarding diversity and richness have been studied for three species during this dissertation. Analysing the quadrat data of all the three MPCAs were gives clear idea about the vegetation types. In case of NRVK, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.70 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.94 and 1.32 respectively (Fig. 15).

In case of Sursuti MPCAs, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.76 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.75 and 1.15 respectively.

In case of North Sevok, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.78 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 3.45 and 1.43 respectively.

Tree species are the permanent entities for natural forested MPCAs and the values for various diversity indices for tree vegetation of all three MPCAs shows very high Species Diversity and moderate Species Richness. On the other hand, vegetation tree layers exhibits very low Concentration of Dominance for the species. The values of different diversity indices for tree layer shows the vegetation of all the MPCAs are quite uniformly diversified and are satisfactory due to the minimum physical disturbance of the

vegetation. The study also shows that those patches are not yet too much exploited and follow the normal natural succession process.

6.2.4.2. Shrub and climber Layer

Different parameters regarding diversity and richness have been studied for three species during this dissertation. Analysing the quadrat data of all the three MPCAs were gives clear idea about the vegetation types. In case of NRVK, Simpson's Index for species Concentration of Dominance for is 0.01. The Shannon-Weiner Index for Species Diversity calculated at 1.88 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.70 and 2.67 respectively.

In case of Sursuti MPCAs, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.82 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 3.10 and 1.20 respectively.

In case of North Sevok, Simpson's Index for species Concentration of Dominance for is 0.01. The Shannon-Weiner Index for Species Diversity calculated at 1.94 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 3.69 and 1.31 respectively.

Shrubs, lianas and climber species are also the permanent entities for natural forested MPCAs and mostly occupy the middle layers and canopy of trees for their growth and developments. The values for various diversity indices for the vegetation of all three MPCAs show also very high Species Diversity and moderate Species Richness. On the other hand, vegetation tree layers exhibits very low Concentration of Dominance for the species. The values of different diversity indices for the layer shows the vegetation of all the MPCAs are quite uniformly diversified and are satisfactory due the minimum physical disturbance of the vegetation. The study also shows that those patches are not yet too much exploited and follow the normal natural succession process.

6.2.4.3. Herb Layer (Monsoon)

Different parameters regarding diversity and richness have been studied for three species during this dissertation. Analysing the quadrat data of all the three MPCAs were gives clear idea about the vegetation types. In case of NRVK, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species

Diversity calculated at 1.69 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.70 and 2.67 respectively.

In case of Sursuti MPCAs, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.82 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 1.69 and 0.82 respectively.

In case of North Sevok, Simpson's Index for species Concentration of Dominance for is 0.03. The Shannon-Weiner Index for Species Diversity calculated at 1.66 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 1.67 and 0.81 respectively.

Herbs species are the temporary entities (annual) for natural forested MPCAs and covers the forest floor. During Monsoon season, the values for various diversity indices for the vegetation of all three MPCAs show very high Species Diversity and Species Richness. On the other hand, vegetation exhibits very low Concentration of Dominance for the species. The values of different diversity indices for herb layer in monsoon shows the vegetation of all the MPCAs are quite uniformly diversified and are satisfactory due the minimum physical disturbance of the vegetation. The study also shows that those patches are not yet too much exploited and follow the normal natural succession process.

6.2.4.4. Herb Layer (Post-Monsoon)

Different parameters regarding diversity and richness have been studied for three species during this dissertation. Analysing the quadrat data of all the three MPCAs were gives clear idea about the vegetation types. In case of NRVK, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.81 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.33 and 1.02 respectively.

In case of Sursuti MPCAs, Simpson's Index for species Concentration of Dominance for is 0.02. The Shannon-Weiner Index for Species Diversity calculated at 1.97 for the vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.34 and 0.91 respectively.

In case of North Sevok, Simpson's Index for species Concentration of Dominance for is 0.03. The Shannon-Weiner Index for Species Diversity calculated at 1.66 for the

vegetation. Menhinick Index and Margalef Index for Species Richness NRVK MPCAs are 2.23 and 1.00 respectively.

Herbs species are the temporary entities (annual) for natural forested MPCAs and covers the forest floor. During Post-Monsoon season, the values for various diversity indices for the vegetation of all three MPCAs show moderate Species Diversity and low Species Richness due to dry season. On the other hand, vegetation exhibits very low Concentration of Dominance for the species. The values of different diversity indices for herb layer in monsoon shows the vegetation of all the MPCAs are quite uniformly diversified and are satisfactory due the minimum physical disturbance of the vegetation. The study also shows that those patches are not yet too much exploited and follow the normal natural succession process.

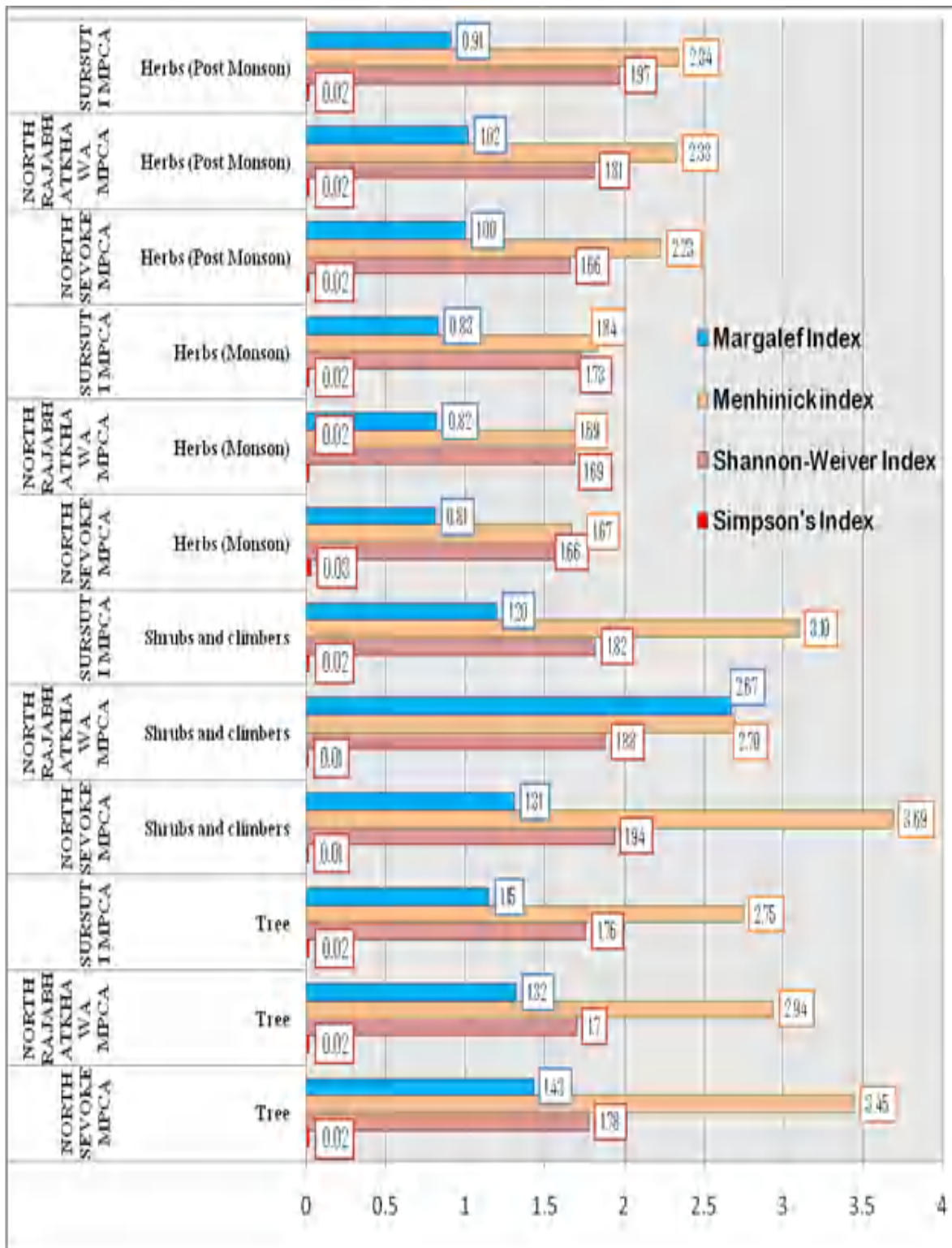


Fig. 16: Graphical representation of different indices among the studied MPCAs

6.2.5. SIMILARITY INDEX:

To determine the similarity Index among the vegetation Sursuti MPCA, North Rajabhatkhawa (NRVK) MPCA and North Sevoke MPCA were calculated by Sorensen's index (1968).

$$S = \frac{2C}{a + b}$$

[Where S = Index value; C = number of species common to both sites; a = number of species in site 'a'; b = number in site 'b']

I. Similarity Index between North Sevoke MPCA and Sursuti MPCA

Here, C = 518, a = 527 (North Sevoke MPCA) and b = 596 (Sursuti MPCA)

$$\begin{aligned} \text{So, } & (527 \times 2) / 527 + 596 \\ & = 1036 / 1123 = 0.92 \end{aligned}$$

The calculated value of S is 0.92 which more than 0.5 and less than 1.00. So, the similarity between the vegetation the North Sevoke MPCA and Sursuti MPCA is found quite good and satisfactory.

II. Similarity Index between North Rajabhatkhawa (NRVK) MPCA and North Sevoke MPCA

Here, C = 498, a = 562 (NRVK) and b = 527 (Sursuti MPCA)

$$\begin{aligned} \text{So, } & (509 \times 2) / 562 + 527 \\ & = 1018 / 1089 = 0.93 \end{aligned}$$

The calculated value of S is 0.93 which is more than 0.5 and less than 1.00. So, the similarity between the vegetation the North Rajabhatkhawa (NRVK) MPCA and North Sevoke MPCA is found quite good and satisfactory.

III. Similarity Index between Sursuti MPCA and North Rajabhatkhawa (NRVK) MPCA

Here, C = 523, a = 596 (Sursuti MPCA) and b = 562 (NRVK)

$$\begin{aligned} & \text{So, } (523 \times 2) / 596 + 562 \\ & = 1046 / 1158 = 0.90 \end{aligned}$$

The calculated value of S is more than 0.5 and less than 1.00 . So, the similarity between the vegetation of the Sursuti MPCA and North Rajabhatkhawa (NRVK) MPCA is found quite good and satisfactory.

The calculated values for the phytosociological study in the three distinct layers of tree, shrubs & climbers and herbs shows significant species wide information against all the studied MPCAs. The data gives species wide community structures, associations and gives outline of population sizes of various species recorded in nested quadrates. The data can nicely help towards conservation and launching management program in MPCAs for their sustainability. The diversity indices show quite good result that clearly reflecting the healthy vegetation with less human imposed disturbances. The vegetation of all three (Sursuti MPCA, North Rajabhatkhawa (NRVK) MPCA and North Sevoke MPCA) are almost similar. They are sub-tropical forest and situated at the sub-Himalayan zone having similar types of floristic entities. The calculated value as per Sorensen's Index is quite satisfactory and showing value <1 but close to upper limit. The values are 90 or more showing the high affinity of similarity among the three vegetations.

CHAPTER-7
ETHNOBOTANY AND
ECONOMIC BOTANY

ETHNOBOTANY AND ECONOMIC BOTANY – 7

7.1. INTRODUCTION

Human beings were very much dependent on plants for their living since origin. Medicinal plants are such important group of plants used by tribal people mainly for their sustenance since the beginning of evolution. In addition to their food, fodder, hunting, building materials, fishing and war equipment, different parts of plant have been used in a big way. During the human civilization, several systems of therapy have been developed primarily based on herbal drugs. Ayurveda, Siddha, Unani, Homeopathy etc. are different traditional systems of medicines developed in India by different group of forest ethnic peoples. This plant based traditional medicine system continued to provide the primary health care to more than three quarters of the world's population. Several workers explored traditional knowledge on plant uses by local or tribal people like Mech, Rajbanshi, Rabha, Santhal, Bodo, Toto and Oraon in North Bengal plains and Terai and duars (Kirtikar & Basu, 1935; Biswas & Chopra, 1940; CSIR, 1948-1976; Chopra et al., 1956, 1969; Asolkar et al., 1992; Chowdhury, 2009; Mondal et al. 2018; Mondal 2020).

Man is a part of nature and evolved in their natural surroundings during the course of time and completely dependent on natural resources for their own survival. The worse Man's activities transformed the nature to such an extent that it is now attacking back to their civilization (Sarkar, 2011; Sarkar, 2014; Biswas, 2015; Mondal et al. 2017).

Considering biodiversity and species richness, three MPCAs i.e. NRVK, Sursuti and North Sevoke MPCA chosen as study area significantly representing unique biodiversity and very rich medicinal plant resources in Terai and Duars region of West Bengal. Study revealed that large number of ethnic, forest dwellers inhabit in and around the conservatories, and they are directly or indirectly dependent on the adjoining Forest resources. They stay there to maintain their sustainable livelihood and to fulfill their day to day need like food, fuel, fodder, hut construction, fibre use, medicinal plants/plant parts to cure for ailments, fencing around houses, agricultural implements etc.

7.2. Result and discussion

Extensive surveys were conducted during 2017-2021 over the three MPCAs and recorded 626 species of vascular plants and most of the species were traditionally used to cure various ailments the local ethnic communities like Rajbanshi, Rabha, Mech, Oraon and

Munda etc. An attempt has been made to record MPCA wise list of indigenous medicinal plants and their ethno-botanical uses of herbal medicines (Table 31, 32 and 33).

Attempt has been made to explore knowledge on ethno medicine practice over the MPCA areas and also to encourage traditional ethno medicine practice to maintain overall good health of the community population adjoining to MPCAs. Dissemination of knowledge on practice of herbal medicine within the indigenous community will help to aware about phytoresources as medicine to protect and conserve against illegal harvesting. Medicinal Plants Conservation areas (MPCA) of West Bengal were established during the period of 2009 – 2010. However, in last few years, it has been realised that those MPCAs need further assessment in terms of its medicinal plant species diversity, their population dynamics and status of community involvement in monitoring the MPCAs. The local communities staying around the MPCA are the major stakeholders. They visit forest almost every day for collection of fuelwood, fodder, fruits, vegetables, medicinal plants etc (Table 31, 32, 33). Therefore, understanding the bond of these people with the MPCA, their traditional knowledge, dependence and ethnobotanical information may help in better management. Five villages were identified for the survey based on the distance from the MPCAs and their community interactions to explore use of herbal medicines. Villages were selected keeping the criteria of *nearest* and *farthest* around 2km radius from the concerned MPCAs. Forest villages selected for the study in and around Rajabhatkhawa, Sursuti and Sevoke MPCAs in North Bengal were North Rajabhatkhawa MPCA;Buxa 28 Mile Forest village (Nearest), Buxa 29 Mile Forest Village (Farthest). Sursuti MPCA;Bamni Forest Village(Nearest), Borodighi Forest Village (Farthest) and North Sevoke MPCA;10 Mile Forest Village (Only Forest village within 7-8 km)

Table 31: Market value of most commonly available medicinal plant parts, ethnic uses and their local name in around North Rajabhatkhawa MPCA

Scientific name	Local name	Quantum collection	Price (Rs)	Parts Used	Utilization
<i>Rauvolfia serpentina</i>	Nagbai, Kulein	100-300g/day	40-50/kg (dry)	Roots used for fiver	Rare in the forest; roots has been used by the local people and also sold in the

					market
<i>Clerodendrum indicum</i>	Bhat	200-300g/day	80-100/kg	High blood Pressure	Root, Leaves and stem are used for rheumatism, fevers, abdominal pain, skin sores, and snake bites
<i>Eupatorium odoratum</i>	Assamialahara/ Bonmara	50-100g/day	30-50/10g	Cut and wound	Local use
<i>Azaratum conyzoides</i>	Gondejhar	50-100g/day	10-30/10g	Cut and wound	Local use
<i>Cissus quadrangularis</i>	Harjor	100-200g/day	20-30	Bone fracture	Local use
<i>Oroxylum indicum</i>	Kanaidinga/Totola	5-10/day	18-20/kg (dry)	Bark used for jaundice; seeds used to treat pneumonia	Traded and locally used; population has been decreased in the forest over the year
<i>Terminalia chebula</i>	Harrah	1-2 kg/day	15-20/kg (dry)	Fruits used locally for cough	Traded and locally used
<i>Terminalia bellirica</i>	Borrah/Bohera	2-3kg/day	15-20/kg (dry)	For decoration	Traded and locally used
<i>Phyllanthus emblica</i>	Amlaki/Aamla	0.5-1kg/day	20-25/kg (dry)	Fruits consumed with Harrah and Borrah for stomach problem	Local use
<i>Ziziphusrugosa</i>	Narkeli	5-6kg/day	15-20/kg		Fruit shells are traded; seeds are eaten locally
<i>Piper longum</i>	Pipla	1-2 kg/day	300-400/kg (dry)	Locally used for cough	Traded and locally used
<i>Dysoxylum</i>	Fatalali	3-4kg/day	20-	Used for bone	Traded

<i>excelsum</i>			25/kg (dry)	fracture	
<i>Litsea glutinosa</i>	Kaula bark	5-10kg/day	20- 22/kg		Traded ; Population has been decreased over the year
<i>Sterculia villosa</i>	Udal	2-3kg/day	15- 20/kg		Traded
<i>Diplazium esculentum</i>	Dheki sag	400- 800g/day	100/g	Edible; used as laxative	Local use
<i>Terminalia arjuna</i>	Arjun bark	0.5- 1kg/day	150- 180/kg	Chest pain	Local use
<i>Ailanthus grandis</i>	Gokul gum	50-60g/day	200/kg		Local use
<i>Shorea robusta</i>	Sal gum	50-60g/day	800/kg	Diarrhoea and stomach upset	Local use
<i>Wrightia arboria</i>	Koichepata	2-5kg/day	10- 15/kg	Fruits	Traded
<i>Abroma augusta</i>	Ulatkamal	100- 200g/day		Roots and barks used in dhatu and Stomach upset	Local use
<i>Solanum torvum</i>	Jangli berj	100- 200g/day	30-40/ kg	Used for high Blood pressure	Local use
<i>Gmelina arborea</i>	Gamari			Bark used in stomach upset	Local use
<i>Costus speciosus</i>	Betlauri	400- 500g/day		Rhizome and stem in stomach upset and jaundice	Local use

Table 32: Market value of most commonly available medicinal plant parts, ethnic uses and their local name in around Sursuti MPCA

Scientific name	Local Name	Quantum collection	Price (Rs)	Parts Used	Utilization
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<i>Oroxylum indicum</i>	Totola	8-10/day	15-20/kg (dry)	Bark used for jaundice; seeds used to treat pneumonia	Traded and locally used; population has been decreased in the forest over the year
<i>Asperagus racemosus</i>	Satamuli	3-4kg/day	25-28/kg		Traded and locally used
<i>Curcuma sp</i>	Shoti	8-10kg/day	5-6/kg		Traded
<i>Piper chaba</i>	Panpata	5-6kg/day	10-12/kg		Traded
<i>Sterculia villosa</i>	Udal	2-3kg/day	15-20/kg		Traded
<i>Phyllanthusemblica</i>	Amlaki	0.5-1kg/day	20-25/kg (dry)	Fruits consumed with Harrah and Borrah for stomach problem	Local use
<i>Terminalia chebula</i>	Hartaki	1-2 kg/day	15-20/kg (dry)	Fruits used locally for cough	Traded and locally used
<i>Terminalia arjuna</i>	Arjun	0.5-1kg/day		Chest pain	Local use
<i>Rauvolfia serpentina</i>	Nagbeil	100-300g/day	40-50/kg (dry)	Roots used for fever	Rare in the forest; roots has been used by the local people and also sold in the market
<i>Centrela asiatica</i>	Thunimankoni			Stomach upset	Local use
<i>Mimusa pudica</i>	Lajjbati			Dhaturog	Local use
<i>Terminalia bellirica</i>	Borrah	2-3kg/day	15-20/kg (dry)	Ulcer and stomach ailment	Traded and locally used
<i>Litsea glutinosa</i>	Kaula/Khagar	5-10kg/day	20-22/kg	Bark in diarrhoea and as head poultice during jaundice	Traded; Population has been decreased over the year
<i>Colocasia fallax</i>	Kalokochu			Sap for cut and wound	Local use
<i>Entada pursaetha</i>	Chakkor/Gila	1-2 fruits/day		Seeds used for treatment of	Local use

				carbuncles	
<i>Calotropis gigantea</i>	Akan	200-300g/day		Body and joint pain	Local use
<i>Solanum americanum</i>	Katalia	100-200g/day		Tooth ache	Local use
<i>Tinospora cordifolia</i>	Gurjolorong	8-10kg/day	10-12/kg	Liver tonic	Traded and Locally used
<i>Phlogacanthus thyriformis</i>	Rambasak	200-300g/day		Cough, cold and asthma	Local use
<i>Abroma augusta</i>	Ulatkamal	100-200g/day		Roots and barks used in dhatu and Stomach upset	Local use
<i>Adhatoda vasica</i>	Basak	100-200g/day		Cough	Local use
<i>Dioscorea sp</i>	Kanda	300-500g/day		Stomach problem	Local use
<i>Zizyphus mauritiana</i>	Borari	100-150g/day		Seeds used for treatment of scabies	Local use
<i>Cassia alata</i>	Chakonda	100-200g/day		Skin disease; ring worm or fungal disease	Local use
<i>Smilax lanceifolia</i>	Rampan	300-400g/day		Rhizome as energy tonic	Local use
<i>Leucas cephaloides</i>	Dandakalash	20-50g/day		Leaves used for appetite and headache	Local use
<i>Acorus calamus</i>	Boch	100-200g/day	15-20/kg	Nerve tonic and to treat people of ghost symptom	Traded and locally used
<i>Diplazium esculentum</i>	Dhekia	400-800g/day		Edible; used as laxative	Local use
<i>Bombax ceiba</i>	Shimul	500-800g/day		Roots in dhatu problem	Local use
<i>Terminalia bellirica</i>	Bohera	2-3kg/day	15-20/kg (dry)	For decoration	Traded and locally used

Table 33: Market value of most commonly available medicinal plant parts, ethnic uses and their local name in around North Sevoke MPCA

Scientific name	Local name	Quantum collection	Price (Rs)	Parts Used	Utilization
<i>Costus speciosa</i>	Betlauri	200-300g/day		Stem and rhizome in Jaundice and intestinal problem	Local use
<i>Oroxylum indicum</i>	Totola	8-10/day	15-20/kg (dry)	Bark used for jaundice; seeds used to treat pneumonia	Traded and locally used; population has been decreased in the forest over the year
<i>Azaratum conyzoides</i>	Elamay	50-100g/day		Cut and wound	Local use
<i>Calotropis gigantea</i>	Akh/Akan	100-200g/day		Body and joint pain	Local use
<i>Rauwolfia serpentina</i>	Kulein	100-300g/day	40-50/kg (dry)	Roots used for fiver	Rare in the forest; roots has been used by the local people and also sold in the market
<i>Cissus quadrangularis</i>	Harchur	100-200g/day		Bone fracture	Local use
<i>Phyllanthus emblica</i>	Aonla	0.5-1kg/day	20-25/kg (dry)	Fruits as food suppliment	Local use and traded
<i>Piper chaba</i>	Janglipan			Cough and body pain	Local use
<i>Baccaurea ramiflora</i>	Kusum	2-5kg/day		bark used in skin disease: fruit cover in body pain	Local use

<i>Ziziphus oenopolia</i>	Jangli Boyer	100-150g/day		Seeds used for treatment of scabies	Local use
<i>Ficus religiosa</i>	Pipal/Bot	200-300g/day		Leaves juice for fiver	Local use
<i>Solanum torvum</i>	Jangli Tomato	100-200g/day		Leaves are applied externally for arthritis	Local use
<i>Cassia alata</i>	Dadpata/Namaste patta	50-100g/day		Skin disease specially ringworm	Local use
<i>Terminalia chebula</i>	Harrah/Hartaki	1-2 kg/day	15-20/kg (dry)	Fruits used locally for cough	Traded and locally used
<i>Terminalia bellirica</i>	Borrah/Bohera	2-3kg/day	15-20/kg (dry)	Ulcer and stomach ailment	Traded and locally used
<i>Cuscuta reflexa</i>	Sarnalata	50-100g/day		Used for jaundice	Local use

During study it was found that many village people maintain small patch of herbal garden in their house surrounding. Some common enlisted plant species were presented in table.

Table 34: Plant species conserved through *ex-situ* by the traditional forest dwellers residing adjoining to the MPCAs

Sl no.	Botanical Name	Local name	Family
1.	<i>Azadirachta indica</i> L.	neem	Meliaceae
2.	<i>Asperagus racemosus</i> willd.	satamuli	Asperagaceae
3.	<i>Andrographis paniculata</i> Wall. ex Nees	Kalmegh	Acanthaceae
4.	<i>Adhatoda vasica</i> Nees.	Vasak	Acanthaceae
5.	<i>Centella asiatica</i> L.	Thankuni	Umbelliferae
6.	<i>Curcuma longa</i> L.	Halud	Zingiberaceae
7.	<i>Datura metel</i> L.	Dhutra	Solanaceae
8.	<i>Jatropha curcas</i> L	Varenda	Euphorbiaceae
9.	<i>Rauwolfia serpentina</i> (L.) Kurz.	sarpagandha	Apocynaceae

10.	<i>Ricinus communis</i> L.	Rerhi/Areda	Euphorbiaceae
11.	<i>Zingiber officinale</i> Rocs.	Adrak	Zingiberaceae
12.	<i>Ocimum sanctum</i> L.	Tulshi	Lamiaceae

The present study reveals that three MPCAs *i.e* North Rajabhatkhawa MPCA, Sursuti MPCA, North Sevoke MPCAs are very rich in medicinal plants population, those having tremendous pharmaceutical potential. Introducing techniques of *ex-situ* conservation (34) *i.e* creation of Home/ community herbal Garden of some commercially viable indigenous medicinal plant species available in MPCAs, which would help to boost socio-economic upliftment through additional income generation of the community population through capacity building and entry point activity. Also to encourage individual people of the concerned community to propagate and cultivate the commercially viable indigenous medicinal plant species within their homestead fallow land as a part of *ex-situ* conservation strategy.

7.2.1. Non timber forest produces

Socio-cultural environment took birth within the human society for their own survival and development (Vandbroek et al., 2011). Forests of North Bengal plains are storehouse of wide range of non timber forest produces. Forest dwellers regularly harvests different plant parts like leaves, twigs, fruits, flowers, rhizomes and tubers in both freshj and dry form. Sometimes they collect all those NTFPs for their own use or may sell in local markets for earnings (Table 31–35). During present survey, informations on traditional uses of local plant parts were gathered by direct interviewing of local inhabitants from different forested villages and local markets (Lataguri market, Chalsa Bazaar, Teesta Bazaar etc. Around 164 species of NTFPs have been recorded that includes parts of 132 medicinal plants, fruits and tender shoot of 29 species as edible, parts of 19 sp have religious value, 47 sp used as ornamental, leaves of 3 sp as fodder, 21 sp for fuel and bark and leaves of 8 sp as spices (Fig. 17).

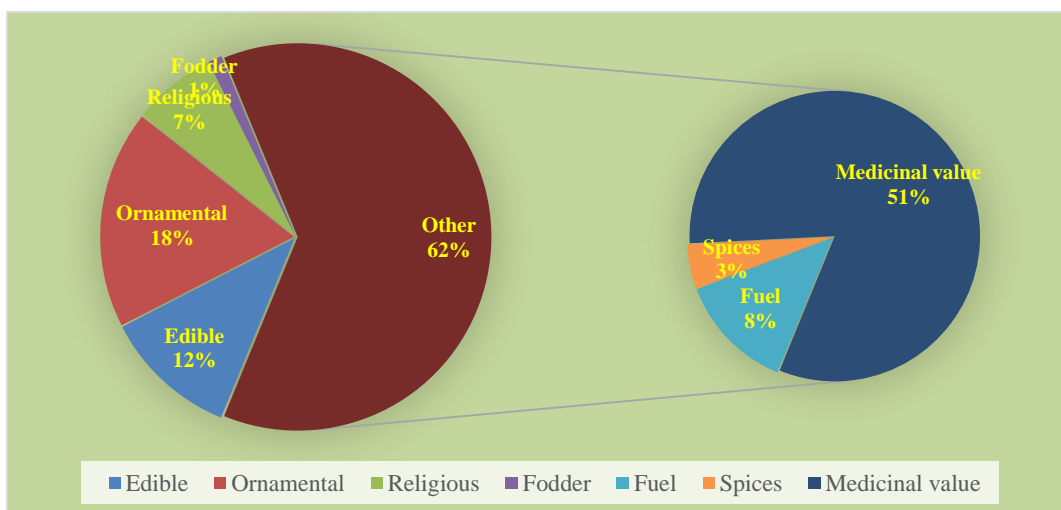


Fig 17: Different use category of trees against total NTFPs recorded plants from forest villagers

7.2.1.1. Ethnomedicinal Plants

Forests villagers are dependent on traditional medicines that are transferred from generation after generation. But, during this era of modernization they people gradually adapted the modern treatment along with their traditional medicines. They frequently consult with doctors in various centers. Few local medicine men still provide such treatment various forested villeges and attended 15 to 20 patients every day. But, most of them have no proficiency to bear the cost of modern medicine and for that they were prefer herbal treatment for them and also for their pet animals. Around 250 species were traditionally used as medicine that has been recorded from the different MPCAs. Some of high value medicinal plants of three MPCAs of North Bengal are *Cryptocarya amygdalina*, *Cinnamomum bejolghota*, *Chloranthus erectus*, *Litsea monopetala*, *Litsea hookeri*, *Litsea glutinosa*, *Machilus duthiei*, *Phoebe attenuate*, *Bischofia javanica*, *Bidens pilosa*, *Ardisia solanacea*, *Andrographis paniculata*, *Ampelocissus barbata*, *Alstonia scholaris*, *Ageratum conyzoides*, *Buddleja asiatica*, *Bombax ceiba*, *Calotropis gigantea*, *Cannabis sativa* etc. (Table 35).

7.2.1.2. Religious Plants

Forests villagers of study areas are mainly belongs to tribal communities. Their place of worship are mainly, each house has own *Than* and also Kali, Shiva, Monosa, Ganga hariboloram mandir and out side the house like under the *Ficus benghalensis* or stone as

like as Shiva Lingo (sacrad grove). Every traditional social activities and worship always includes some selected plant parts of various species. The plants which they use in their different religious purposes are *Aegle marmelos*, *Bambusa balcooa*, *Bambusa tulda*, *Imperata cylindrical*, *Cannabis sativa*, *Cynodon dactylon*, *Datura stramonium*, *Ficus benghalensis*, *Ficus neriifolia*, *Ficus religiosa* and *Butea monosperma* etc.

7.2.1.3. Edible Species of three MPCAs of North Bengal

People of the three MPCAs villagers collect their daily usable vegetables like fruits and flowers, roots and rhizomes from the wild or some of them also planted in their own house. Few such common edible plants of three MPCAs of North Bengal are like *Aegle marmelos*, *Alternanthera sessilis*, *Amaranthus blitum*, *A. viridis*, *Artocarpus heterophyllus*, *A. lacucha*, *Asparagus racemosus*, *Castanopsis indica*, *Chenopodium album*, *Citrus limon*, *C. maxima*, *Coccinia grandiflora*, *Deeringia amaranthoides*, *Dillenia indica*, *D. pentagyna*, *Dioscorea alata*, *D. bulbifera*, *D. pentaphylla*, *D. prazeri*, *Duchesnea indica*, *Elaeocarpus floribundus*, *Enydra fluctuans* etc.

7.2.1.4. Fodder Plants

Forests villagers, Forests guards, Mahuts of Kunki elephants are collected fodder plants from the forests of North Bengal for their domestic animals and also elephants i.e. Kunki hati. Several popular fodder species have been used for their domestic animals. Some of those plant species of three MPCAs of North Bengal are *Acacia pennata*, *Achyrospermum wallichianum*, *Acmella calva*, *Aesculus assamica*, *Actinodaphne longipes*, *Actinodaphne sikkimensis*, *Ageratum houstonianum*, *Ageratum houstonianum*, *Amaranthus spinosus*, *Amaranthus blitum*, *Alternanthera sessilis*, *Bambusa tulda*, *Bauhinia purpurea*, *Bidens pilosa*, *Casearia vareca*, *Holmskioldia sanguinea*, *Chukrasia tabularis*, *Ficus religiosa*, *Ficus hispida*, *Eurya acuminata*, *Eragrostis tenella*, *Eleocharis retroflexa*, *Bridelia sikkimensis* etc

7.2.1.5. Veterinary Medicinal Plants

The domestic animals that suffer from various diseases are treated in local traditional means. The Animal Hospitals is not frequent or known to the forested villagers of Terai-duars. So, they have treated their domestic animals using various wild plant materials. Present study records around 45–54 such species that are used to treat various ailments

of their domestic animals regularly and some of the important species are *Aegle marmelos*, *Alternanthera sessilis*, *Amorphophallus bulbifer*, *Ardisia solanacea*, *Argemone mexicana*, *Aristolochia indica*, *Azadirachta indica*, *Bischofia javanica*, *Bombax ceiba*, *Bryophyllum pinnatum*, *Cannabis sativa*, *Careya arborea*, *Centella asiatica*, *Cheilocostus speciosus*, *Cissus quadrangularis*, *Colocasia antiquorum*, *Clerodendrum infortunatum*, *Curcuma longa*, *Curcuma zedoaria*, *Cynodon dactylon*, *Deeringia amaranthoides* etc.

7.2.1.6. Poisonous Plants of MPCAs

Local people of MPCAs use some plants as fish poison to catch fishes. They also used make hunting tools from various species to catch birds from the waterbodies. Some of recorded major poisonous plants are *Abrus precatorius*, *Acmella uliginosa*, *Adenanthera pavonina*, *Alstonia scholaris*, *Cannabis sativa*, *Urtica dioca*, *Catunaregam spinosa*, *Cheilocostus speciosus*, *Clerodendrum infortunatum*, *Datura stramonium*, *Meyna spinosa*, *Persicaria hydropiper*, *Semecarpus anacardium*, *Tabernamontana divaricata*, *Careya arborea* etc.

Table 35: Non timber forest product (NTFP) from three MPCAs in North Bengal used by tribals/local peoples

Family	Taxa	Medicinal Uses
Chloranthaceae	<i>Chloranthus erectus</i> Sweet	The bark used to treat bone fractures.
Lauraceae	<i>Actinodaphne obovata</i> (Nees) Bl.	Bark used to treat bone fracture.
	<i>Cinnamomum bejolghota</i> (Buch.-Ham.) Sweet	Bark is used as essential oil and wood.
	<i>Cryptocarya amygdalina</i> Nees	Timber is used for construction of village houses.
	<i>Litsea cubeba</i> (Lour.) Pers.	Active compounds of <i>Litsea cubeba</i> is highly affective to cure various ailments as of inherent anticancer, antimicrobial, antiinflammatory, antioxidant, antidiabetic and anti-HIV properties.
	<i>Litsea elongata</i> (Nees) Hook. f.	Used as good fodder for cattle; wood is good for construction works and making furniture.

	<i>Litsea glutinosa</i> (Lour.) C.B. Rob.	Wood is used for making agricultural tools; root fiber for making ropes and paper pulp; seed oil for making candles, soaps and seed powder for treating skin boils.
	<i>Litsea hookeri</i> (Meisner) Long	Timber is used for making furniture.
	<i>Litsea laeta</i> (Nees) Hooker <i>f.</i>	It is used for diarrhea, indigestion, stomachache and gastroenteritis
	<i>Litsea monopetala</i> (Roxb.) Pers	Leaves are used as a topical medicine for the treatment of arthritis and seed oil also used as medicine.
	<i>Litsea panamanja</i> (Buch.– Ham. <i>ex</i> Nees) Hook. <i>f.</i>	Wood used for house construction, making furniture and as fire wood.
	<i>Litsea salicifolia</i> (Roxb. <i>ex</i> Nees) Hook. <i>f.</i>	Used to treat stomachache, indigestion, and gastroenteritis along with diabetes, edema, cold, arthritis, asthma, and traumatic injury.
	<i>Machilus duthiei</i> King in Hook. <i>f.</i>	Root is used for the treatment of inflammation, asthma, pain, bronchitis and vomiting.
	<i>Machilus gamblei</i> King <i>ex</i> Hook. <i>f.</i>	Leaves and root used as asthma, pain and bronchitis.
	<i>Persea odoratissima</i> (Nees) Kostermans	Leaves are used for silkworm cultivation due to presence of pleasant orange like smell.
	<i>Phoebe attenuata</i> (Nees) Nees	Plants part use by local tribal's as medicine to cure skin disease.
Annonaceae	<i>Artabotrys hexapetalus</i> (L. <i>f.</i>) Bhandari	This plant is used as antimicrobial, hepatoprotective, antioxidant, antileishmanial, mosquito repellent and anthelmintic.
	<i>Miliusa sclerocarpa</i> Kurz	Wood is good timber.
	<i>Miliusa dioeca</i> (Roxb.) Chaowasku & Kessler	Wood is good timber.
	<i>Polyalthia simiarum</i> (Buch.-Ham. <i>ex</i> Hook. <i>f.</i> & Thomson) Hook. <i>f.</i> & Thomson	The bark fibers are used to make ropes; wood is used to make tea boxes.

Magnoliaceae	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	This plant is used to quick wound healing, cardiac disorders, gout, dysuria.
Myristicaceae	<i>Knema linifolia</i> (Roxb.) Warb.	Fruits are used as intoxicating and purgative.
	<i>Knema erratica</i> (Hook. f. & Thomson) J. Sinclair	Latex is used to treat mouth sore and gum isused to treat.
	<i>Maesa indica</i> (Roxb.) A. D. C.	It is used to treat various diseases.
	<i>Maesa montana</i> A. DC.	Used as folk medicine.
Aristolochiaceae	<i>Aristolochia indica</i> L.	Roots and rhizome used as gastric stimulant and bitter tonic. Leaves decoction used in cough and seeds used in inflammation.
	<i>Aristolochia saccata</i> Wallich	It has been shown to stimulate WBC activity and healing of wounds.
Piperaceae	<i>Piper chaba</i> Blume	It is commonly used to treat constipation, chronic bronchitis, gonorrhoea and asthma etc.
	<i>Piper longum</i> L.	Fruits used to treat asthma, chronic bronchitis, constipation, gonorrhea, diarrhea, cholera, chronic viral hepatitis, respiratory infections and stomachache.
	<i>Piper mullesua</i> D. Don	it is used worldwide to treat several diseases like urological problems, liver, skin, and stomach ailments.
	<i>Piper peepuloides</i> Roxburgh.	It is also used to treat severe cough and root is used for skin disease
	<i>Piper sylvaticum</i> Roxb.	This plant is used to treat asthma, chronic bronchitis, constipation, gonorrhea, diarrhea, cholera, chronic viral hepatitis, respiratory infections and stomachache.
	<i>Peperomia pellucida</i> (L.) Kunth	The plant is used as food and flavoring agent.
Acoraceae	<i>Acorus calamus</i> L.	The rhizome is used for gastrointestinal problems including ulcer.
Araceae	<i>Alocasia fallax</i> Schott	Uses in modern medicine like pharmacological aspects and tribal medicine.

	<i>Alocasia macrorrhizos</i> (L.) G. Don	It is used as a laxative, leaves as a rubefacient and chopped-up roots
	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	Used in folk medicine for treatment of acute rheumatism, tumors, lung swelling, asthma, vomiting, and abdominal pain.
	<i>Colocasia esculenta</i> (L.) Schott	Utilized for treatment of various ailments such as asthma, arthritis, diarrhea, internal hemorrhage, neurological disorders, and skin disorders.
	<i>Colocasia fallax</i> Schott	Used as a tribals medicine.
	<i>Lasia spinosa</i> (L.) Thwaites	It is used to treat stomach aches, snake and insect bites, injuries, rheumatism.
	<i>Pothos scandens</i> L.	Used to treat lymphotuberculosis, lymphonoditis, stomach aches, snake and insect bites, injuries, rheumatism, throat ailments and piles.
	<i>Scindapsus officinalis</i> (Roxb.) Schott	It has been ethanobotanically used to treat diarrhea and worm infestation.
	<i>Typhonium roxburghii</i> Thwait.	It is used to treat diarrhea.
	<i>Typhonium trilobatum</i> (L.) Schott	It is used to heal stomach ailments and also used as anti dandruff and tonic.
Arecaceae	<i>Calamus tenuis</i> Roxb.	Stem is used for making rough baskets and useful raw material for furniture and handicrafts industry.
Amaryllidaceae	<i>Crinum amoenum</i> Ker Gawl. ex Roxb.	Used as Emetic, expectorant, laxative, tonic.
Asparagaceae	<i>Asparagus racemosus</i> Willdenow	It is used for constipation, stomach ulcer and dementia.
Hypoxidaceae	<i>Curculigo orchioides</i> Gaertn.	It is used for the treatment of Limb limpness, impotence and kneejoints.
	<i>Curculigo capitulata</i> (Lour.) Kuntze	It is udes for the treatment of asthma, Jaundice and diarrhea.
Commelinaceae	<i>Amischotolype hookeri</i> (Hassk.) Hara	Uses in Ethnic/Tribal Medicine
	<i>Commelina benghalensis</i> L.	Enrire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.

	<i>Commelina diffusa</i> Burman f.	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.
	<i>Commelina erecta</i> L.	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.
	<i>Commelina paludosa</i> Blume	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.
	<i>Commelina suffruticosa</i> Blume	Whole plant applied for abscesses and fever, used for colds, a sore throat and nose bleed.
	<i>Cyanotis axillaris</i> (L.) Sweet	The plant is used to treat boils and ascites
	<i>Cyanotis cristata</i> (L) Don	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder
	<i>Cyanotis vaga</i> (Loureiro) J. A. & J. H. Schultesin Roemer & Schultes	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder.
	<i>Floscopa scandens</i> Loureiro	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder
	<i>Murdannia keisak</i> (Hasskarl) Handel- Mazzetti	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache. Very good fodder
	<i>Murdannia nudiflora</i> (L.) Brenan	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache.
	<i>Murdannia spirata</i> (L.) Brueckner	Plants used as refrigerant, laxative and for the treatment of leprosy and headache.
	<i>Murdannia vaginata</i> (L.) Bruckner	Entire plants used as refrigerant, laxative and for the treatment of leprosy and headache.
Pontederiaceae	<i>Monochoria hastata</i> (L.) Solms	Plant is used as a tonic and cooling, rhizomes powdered with charcoal used for scurf.

	<i>Monochoria vaginalis</i> (Burm. f.) C. Presl	It is used as traditional medicine and roots are eaten as vegetables.
Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	the bulbils are used as contraceptives diabetes, leprosy and asthma
	<i>Dioscorea hispida</i> Dennst.	Tubers used to kill worms in wounds.
	<i>Dioscorea pentaphylla</i> L.	Plant is used for the treatment of piles, ulcer and cough.
	<i>Dioscorea prazeri</i> Prain et Burkill	Plant is used to make arrow-poison and Jaundice.
	<i>Dioscorea pubera</i> Bl.	Plant is used to make arrow-poison and also given against Jaundice.
Smilacaceae	<i>Smilax lanceifolia</i> Roxb.	It is used as local food and medicine.
	<i>Smilax ovalifolia</i> Roxb.	It is used in the treatment of ulcers.
	<i>Smilax perfoliata</i> Lour.	It is used in antipyretic agent, seed extract used as lotion in leprosy skin diseases.
	<i>Smilax zeylanica</i> L.	Roots are used as substitute for sarsaparilla & for the treatment of syphilis, gonorrhoea, skin disease.
Cyperaceae	<i>Cyperus compressus</i> L.	It is used widely for several siseses like analgesic, antispasmodic, sedative, antimalarial, relieve diarrhoea and stomach disorders
	<i>Cyperus difformis</i> L.	It is traditionally used for clinical conditions at home like diabetes, diarrhea, pyresis and inflammation, malaria, stomach and bowel disorders.
	<i>Cyperus digitatus</i> Roxb.	Rhizomes are used for astringent, diuretic, diaphoretic, analgesic, antispasmodic, aromatic, antitussive, carminative and emmenagogue.
	<i>Cyperus haspan</i> L.	It is used for astringent, diuretic, diaphoretic, antispasmodic, aromatic, antitussive
	<i>Cyperus rotundus</i> L.	Used to treat fevers, digestive system disorders, dysmenorrhoea, and other maladies.
	<i>Cyperus iria</i> L.	Used to treat fevers, digestive system disorders and dysmenorrhoea.

	<i>Cyperus pilosus</i> Vahl	Used to treat fevers, digestive system disorders and dysmenorrhea.
	<i>Pycreus flavidus</i> (Retzius) T. Koyama	Used to treat fevers, digestive system disorders, dysmenorrhea, and other maladies.
	<i>Eleocharis congesta</i> D. Don	Used to treat fevers, digestive system disorders, dysmenorrhea, and other maladies.
	<i>Fimbristylis aestivalis</i> (Retzius) Vahl	Plant is used as a poultice on inflammations.
	<i>Fimbristylis dichotoma</i> (L.) Vahl	Plant is used as a poultice on inflammations.
	<i>Fimbristylis dipsacea</i> (Rottboell) Clarke	Plant is used as a poultice on inflammations
	<i>Fimbristylis littoralis</i> Gaudichaud	Plant is used as a tribals medicine
	<i>Fimbristylis ovata</i> (N.L. Burman) J. Kern	Plant is used as a tribal's medicine.
	<i>Fuirena ciliaris</i> (L.) Roxburgh	Plant is used as a tribal's medicine.
	<i>Kyllinga brevifolia</i> Rottboell,	Plant is used as a tribal's medicine.
	<i>Kyllinga nemoralis</i> (Forst. &Forst.) Dandy ex Hutchinson & Dalziel	Leaves are used for antiseptics.
	<i>Schoenoplectiella juncooides</i> (Roxb.) Lye	Leaves are used for antiseptics
	<i>Schoenoplectiella mucronata</i> (L.) J. Jung & H. K. Choi	It is used medicinally to clear the eyes and to relieve coughing
Poaceae	<i>Axonopus compressus</i> (Sw.) P. Beauv.	It is known nearly worldwide as a common weed. It is used as animal fodder, and the seeds are edible.
	<i>Bambusa balcooa</i> Roxb.	Young shoot used as vegetable.
	<i>Cymbopogon jwarancusa</i> (Jones) Schult.	The roots are usefull in feaver and skin diseases.
	<i>Desmostachya bipinnata</i> (L.) Stapf	It is an Ayurvedic herb used to treat for skin diseases, diarrhea and dysmenorrhea.

<i>Dactyloctenium aegyptium</i> (L.) Willd.	Seeds used to relieve pains of the kidney
<i>Digitaria bicornis</i> (Lam.) Roem. et Schult.	The seeds are edible.
<i>Digitaria ciliaris</i> (Retz.) Koeler	It is used in the treatment of gonorrhoea.
<i>Digitaria fuscescens</i> (J. Presl & C. Presl) J. W. Moore	It is known nearly worldwide as a common weed. It is used as animal fodder, and the seeds are edible
<i>Echinochloa colona</i> (L.) Link	Local tribe leaf juice used for blood purification
<i>Eleusine indica</i> (L.) Gaertn.	Local tribe leaf juice used for blood purification
<i>Eragrostis pilosa</i> (L.) Beauv.	The plant is used as food and medicine.
<i>Eragrostis tenella</i> (L.) Beauv. ex Roem. et Schult.	It is used as fodder.
<i>Eragrostis unioloides</i> (Retz.) Nees ex Steud.	It is used mainly as animal fodder.
<i>Imperata cylindrica</i> (L.) Raeusch.	The plant is used as a fibre in ornamental purposes and mainly used in constructions
<i>Isachne globosa</i> (Thunb.) Kuntze	Mainly as fodder.
<i>Leersia hexandra</i> Sw.	Used for the treatment of hemoptysis.
<i>Leptochloa panicea</i> (Retz.) Ohwi	Used for fodder, and as a famine food in Eastern African Countries.
<i>Oplismenus burmannii</i> (Retz.) Beauv.	Used in guinea-worm sores and snake-bite. It is also used in treatment for earache.
<i>Oplismenus compositus</i> (L.) Beauv.	It is mainly used for modern medicine.
<i>Panicum repens</i> L.	Used as a forage for grazing or cutting.
<i>Paspalum conjugatum</i> Berg.	Occasionally used as a lawn grass and is also an important weed in rice and plantation crops.
<i>Paspalidium punctatum</i> (Burm. f.) Camus	The plant is used as mainly fodder purposes.

	<i>Pennisetum glaucum</i> (L.) R. Br.	The plant is milled, decorticated, germinated, cooked and extruded to obtain products such as flours, biscuits and snacks.
	<i>Pennisetum pauperum</i> Steud.	Used for grazing livestock in African countries.
	<i>Pennisetum polystachion</i> (L.) Schult.	Used as grazing stock.
	<i>Saccharum arundinaceum</i> Retz.	It is used for treatment for vitiated blood, erysipelas, leucorrhoea and piles
	<i>Saccharum spontaneum</i> L.	The plant is used as astringent, emollient, refrigerant, diuretic and lithotriptic
	<i>Setaria palmifolia</i> (Koen.) Stapf	The plant is mainly used as fodder, forage and medicinal, pharmaceutical . Ornamental.
	<i>Setaria glauca</i> (L.) Beauv.	Plant seeds are used to treat emollient, febrifuge, diuretic, refrigerant and tonic
	<i>Sporobolus diander</i> (Retz.) Beauv.	It is mainly used as weed.
Costaceae	<i>Cheilocostus speciosus</i> (J.Konig) C. Specht	Its rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms.
Marantaceae	<i>Phrynium pubinerve</i> Bl.	its rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms.
Zingiberaceae	<i>Alpinia calcarata</i> (Haw.) Roscoe	The rhizomes are used in treatment for antibacterial and antifungal activities
	<i>Alpinia nigra</i> (Gaertner) Burt	Its rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms.
	<i>Curcuma aromatica</i> Salisb.	Improves digestion and stimulates the gall bladder and circulatory system.
	<i>Curcuma caesia</i> Roxb.	Rhizomes medicinally important, used in sprains and bruises.
	<i>Globba racemosa</i> Sm.	It is traditionally used in treatment of mouth ulcer and post partum and food poisoning
	<i>Globba clarkei</i> Baker	It is traditionally used in treatment of mouth ulcer and food poisoning

	<i>Hedychium coccineum</i> Buch.-Ham.ex Smith	It is traditionally used in treatment of stomach ulcer and food poisoning.
	<i>Hedychium thyrsoideum</i> Smith	It is traditionally used in treatment food poisoning.
	<i>Zingiber montanum</i> (Konig) Link ex Dietr	It is traditionally used as tribal's medicine.
	<i>Zingiber zerumbet</i> (L.) Roscoe ex Smith	Grown as ornamental species; rhizomes used to treat various bacterial diseases and also as stimulant, carminative.
Orchidaceae	<i>Acampe praemorsa</i> (Roxb.) Blatt. et Mc Cann	The plant is traditionally used to treatment of wounds, neuralgia, rheumatism, eye diseases, sciatica, cough and fracture.
	<i>Aerides multiflora</i> Roxb.	The plant is used to treat vahic disorders
	<i>Arundina graminifolia</i> (Don) Hochr	Rhizomes are used as antidote, diuretic and demulcent
	<i>Bulbophyllum spathulatum</i> (Rolfe ex Cooper) Seiden f.	Not Evaluated (IUCN).
	<i>Coelogyne cristata</i> Lindl.	The plant used for the treatment of fractured bones in folk-tradition of Kumaon
	<i>Cymbidium aloifolium</i> (L.) Sw.	The plant is used for the treatment of Anti-inflammatory, Paralysis, joining fractured bones, fever, weakness of eyes, chronic illness, burns, sores
	<i>Cymbidium bicolor</i> Lindl.	The plant is used for the treatment of Anti-inflammatory, Paralysis.
	<i>Dendrobium aduncum</i> Wall. ex. Lindl	It is used in fever, thirst, lassitude and malaise.
	<i>Dendrobium amoenum</i> Wall. ex Lindl.	The plant is traditional used for treating dermatological disorders
	<i>Dendrobium anceps</i> Sw.	It is used to treat rheumatism.
	<i>Dendrobium aphyllum</i> (Roxb.) C.E.C. Fischer	It is used in stomach treatment, improve eyesight and relieve throat inflammation.
	<i>Dendrobium chrysanthum</i> Wall. ex Lindl.	It is used in diabetes, obesity, rheumatoid arthritis.
	<i>Dendrobium densiflorum</i> Lindl.	It is used to increases the production of body fluids.
	<i>Dendrobium fimbriatum</i> Hook.	It is used to treat night sweats, stomach, to strengthen the kidneys and to cure

		impotence and as tonic.
	<i>Dendrobium jenkinsii</i> Wall. ex Lindl.	It is used to treat eye, digestive, urinary ailments, diabetes.
	<i>Dendrobium nobile</i> Lindl.	It is used nourishes the stomach, lungs, and kidneys
	<i>Papilionanthe teres</i> (Roxb.) Schltr.	The plant is used for treatment of fever and heavy menstruation).
	<i>Phaius tankervilleae</i> (Banks) Bl.	The pseudobulbs contain drugs that promote blood circulation and help to stop bleedings.
	<i>Pholidota articulata</i> Lindl.	The plant is used for antitumor, antiinflammatory, anticancer and anticonvulsive.
	<i>Rhynchostylis retusa</i> Bl.	The plant is used in Assam to treat wounds, cuts and bruises.
	<i>Vanda cristata</i> Lindl.	The plants roots and leaves Used to cure hepatitis, dyspepsia, bronchitis, piles, rheumatism and diseases of nervous system.
	<i>Zeuxine nervosa</i> (Wall. ex Lindl.) Benth. ex Clarke	The plant is used to treat stomachache.
Menispermaceae	<i>Cissampelos pareira</i> L.	Traditionally used for numerous diseases like ulcer, wound, rheumatism, asthma, cholera, fever and diarrhoea
	<i>Cocculus laurifolius</i> DC.	Used as medicine for hair loss.
	<i>Pericampylus glaucus</i> (Lam.) Merr.	Used as eye-drops for treating conjunctivitis and as an antidote for snakebites.
	<i>Stephania rotunda</i> Lour.	The leaves, stems and tubers used to treat fever, asthma, headache, and diarrhoea.
	<i>Stephania japonica</i> (Thunb. ex Murray) Miers	Traditionally, this plant used to treat pain, rheumatism, bone fracture, cancer and fever
	<i>Tinospora cordifolia</i> (Willd.) Mier	<i>Tinospora cordifolia</i> is used for diabetes,, high cholesterol, fever and upset stomach.
	<i>Tinospora sinensis</i> (Lour.) Merr.	Plant parts are used for the treatment of rheumatism and other ailments.

Papaveraceae	<i>Argemone mexicana</i> L.	Plants are used for the treatment of rheumatism and other deases.
	<i>Fumaria indica</i> (Hassk.) Pugsley	It is used as a blood purifier.
Ranunculaceae	<i>Naravelia zeylanica</i> (L.) DC.	Plants are used for the treatment of rheumatism and other ailments.
	<i>Ranunculus sceleratus</i> L.	The whole plant is acrid, anodyne, diaphoretic, emmenagogue and antispasmodic.
Dilleniaceae	<i>Dillenia indica</i> L.	Mucilage found in the fruit. It is used to wash hair as shampoo and considered good for hair growth.
	<i>Dillenia pentagyna</i> Roxb.	Mucilage found in the fruit. It is used to wash hair as shampoo and considered good for hair growth.
	<i>Tetracera sarmentosa</i> (L.) Vahl	The root extract is used for treatment of rheumatism by the tribal people. The leaf extracts that have potential medical effects.
Vitaceae	<i>Ampelocissus sikkimensis</i> (Lawson) Planch.	It is used as cooking materials.
	<i>Cayratia japonica</i> (Thunb.) Gagnep.	The leaf extracts that have potential medical effects.
	<i>Cissus quadrangularis</i> L.	It is mainly used for bone health and weight loss.
	<i>Cissus repens</i> Lam.	It is used for snake bites, rheumatic pain, and carbuncles in folk medicine
	<i>Leea asiatica</i> (L.) Ridsdale	The leaf extracts that have potential medical effects.
	<i>Leea aequata</i> L.	The plants are used to treat dandraf hair shampoo
	<i>Leea guineensis</i> G. Don	It is used to wash hair as shampoo and considered good for hair growth.
	<i>Tetrastigma campylocarpum</i> (Kurz) Planchon	Uses in Ethnic / Tribal Medicine.
	<i>Tetrastigma planicaule</i> (Hook. f.) Gagnep.	Uses in Ethnic / Tribal Medicine.

	<i>Tetrastigma serrulatum</i> (Roxb.) Planch.	Uses in Ethnic / Tribal Medicine.
Cucurbitaceae	<i>Hodgsonia heteroclita</i> (Roxb.) Hook. f. et Thoms.	The fruit pulp of this plant traditionally used as antidiabetic.
	<i>Coccinia grandis</i> (L.) Voigt	This plant used to treat leprosy, asthma, jaundice, bronchitis, burns, tongue sores, earache, indigestion, nausea, insect bites, and fever.
	<i>Diplocyclos palmatus</i> (L.) Jeffrey	Used against heart, blood and liver disorders.
	<i>Luffa cylindrica</i> (L.) Roem.	Used for treating sores and swelling.
	<i>Luffa acutangula</i> (L.) Roxb.	Luffa is taken for treating and preventing colds
	<i>Momordica charantia</i> L.	Treating gastro-intestinal disorders.
	<i>Mukia maderaspatana</i> (L.) Roem.	Treating anaemia and joint problems.
	<i>Trichosanthes cordata</i> Roxb.	Immunity booster and weight loss.
	<i>Trichosanthes lepiniana</i> (Naudin) Cogn.	Treating Boils and Piles.
	<i>Trichosanthes tricuspidata</i> L.	Treating Boils and Piles
	<i>Zanonia indica</i> L.	Ayurvedic plant helpful to treat cuts and wounds.
Fabaceae	<i>Abrus pulchellus</i> Wall. ex Thwaites	Juice extracted from the stem is applied to treat coughs.
	<i>Abrus precatorius</i> L.	Plant is used for traditional medicine to treat wounds caused by dogs, cats and mice.
	<i>Acacia catechu</i> (L. f.) Willd.	This plant used to treat throats infection and diarrhoea.
	<i>Acacia pennata</i> (L.) Willd.	This plant used to treat as throats and diarrhoea
	<i>Albizia odoratissima</i> (L.f.) Benth.	It is used as folk medicine to treat various inflammatory pathologies.
	<i>Albizia procera</i> (Roxb.) Benth.	It is used as folk medicine to treat various inflammatory pathologies.
	<i>Bauhinia scandens</i> L.	Juice extracted from the stem is applied to treat coughs.

<i>Bauhinia vahlii</i> Wight & Arn.	Tonic and aphrodisiac seeds and demulcent and mucilaginous leaves.
<i>Bauhinia racemosa</i> Lam.	used in the treatment of headache, fever, skin diseases, blood diseases, dysentery and diarrhea.
<i>Bauhinia purpurea</i> L.	This plant stem is used internally and externally for fractured bones.
<i>Bauhinia malabaricum</i> Roxb.	Fruits are edible and commonly used for cough, glandular swellings and goitre.
<i>Bauhinia variegata</i> L.	The bark and roots are reported to be an astringent and tonic, and it used for the treatment of diarrhoea.
<i>Butea monosperma</i> Kuntze	The bark and roots are reported to be an astringent and tonic, and it used for the treatment of diarrhoea.
<i>Caesalpinia cucullata</i> Roxb.	The bark and roots are reported to be an astringent and tonic, and also used for the treatment of diarrhoea.
<i>Cassia fistula</i> L.	Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.
<i>Cassia javanica</i> ssp. <i>nodosa</i> (Buch.-Ham. ex Roxb.) Larsen and Larsen	Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.
<i>Crotalaria alata</i> Buch.-Ham. ex Don	Used against skin diseases, liver troubles, haematemesis, pruritus, leucoderma and diabetes.
<i>Dalbergia pinnata</i> (Lour.) Prain.	In folk medicine and homeopathy.
<i>Dalbergia sissoo</i> Roxb. ex Candolle	It is a folk rmedicine for gonorrhoea and skin ailments.
<i>Careya arborea</i> Roxb.	Used to treat gonorrhoea, syphilis, mouth ulcer, etc.
<i>Delonix regia</i> (Bojer) Raf.	Plant is used as inflammation, constipation, diabetes, rheumatoid arthritis, pneumonia, and malaria.
<i>Desmodium laxiflorum</i> Candolle	Plant is used as inflammation, constipation, diabetes, rheumatoid arthritis, pneumonia, and malaria.

<i>Desmodium gangeticum</i> (L.) Candolle	Plant is used as a febrifuge, tonic, digestive, anticatarrhal, antiemetic.
<i>Desmodium triflorum</i> (L.) Candolle	Roots are used for stomachach infection.
<i>Erythrina stricta</i> Roxb.	In anti-inflammatory activity, cardio protective activity, anti cataract activity, anti microbial activity, anti urolithic activity.
<i>Erythrina variegata</i> L.	Different parts of the plant is used for traditional medicine as nervine sedative, antiasthmatic, collyrium in ophthalmia, antiseptic, antiepileptic, and astringent.
<i>Flemingia strobilifera</i> (L.) W.T.Aiton	Plant root is used for various diseases like insomnia, ulcer, epilepsy, inflammation and microbial infection
<i>Leucaena leucocephala</i> (Lam.) Wit	This plant has huge medicinal properties that control stomach diseases, facilitate abortion and provide contraception. Some times it is used as alternative medicine as Sugar patient.
<i>Melilotus indica</i> (L.) Allioni	Leaves are used for antiseptics
<i>Mimosa invisa</i> Colla	Plant is used as treatment of urogenital disorders, piles, sinus, and applied on wounds.
<i>Mimosa pudica</i> L.	Plant is used as treatment of urogenital disorders, and applied on wounds.
<i>Mucuna pruriens</i> (L.) Candolle	Plant is used as treatment of nervous disorders and male sterility.
<i>Pterocarpus marsupium</i> Roxb.	Leaves used to treat fractures, constipation, depurative, hemorrhages skin diseases, ophthalmology.
<i>Senna alata</i> (L.) Roxb.	The plant is traditionally used for typhoid, diabetes, asthma, malaria, ringworms, tinea infections, blotch, herpes and eczem
<i>Senna occidentalis</i> (L.) Link	It is an Ayurvedic medicinal plant used for traditional medicine and treatment of various diseases.
<i>Senna siamea</i> (Lam.) Irwin et Barneby	It is traditionally used for the treatment of jaundice, typhoid fever, menstrual

		pain abdominal pain.
	<i>Senna sophera</i> (L.) Roxb.	It is traditionally used for treat fever, malaria and abdominal pain.
	<i>Senna tora</i> (L.) Roxb.	It is traditionally used for treat fever, malaria and abdominal pain.
	<i>Tamarindus indica</i> L.	Traditionally it has huge uses for daily life and several treatments.
	<i>Tephrosia candida</i> DC.	Traditionally it uses for daily life and several treatments like typhoid fever, menstrual pain abdominal pain.
	<i>Tephrosia candida</i> DC.	It is used as green manure and in extended fallows, contour hedgerows.
	<i>Uraria picta</i> (Jacq.) Desv. ex Candolle	Traditionally it has huge uses for daily life and several treatments.
Cannabaceae	<i>Cannabis sativa</i> L.	This species used to treat for pain, spasms, insomnia, depression, asthma and loss of appetite
Moraceae	<i>Artocarpus chama</i> Buch.-Ham. Mem.	It has anti-diabetic, anti-inflammatory and antioxidant properties and useful in the treatment of stomach ulcers and constipation.
	<i>Artocarpus lacucha</i> Buch.-Ham. ex D. Don	Reported to have anti-diabetic, and antioxidant properties and useful in the treatment of stomach ulcers and constipation.
	<i>Ficus benghalensis</i> L.	It is used for erysipelas, vomiting, fever, vaginal complains, inflammations and leprosy.
	<i>Ficus hispida</i> L.	Used to treat fever and provides nourishment to the body.
	<i>Ficus racemosa</i> L.	The plant is used for ulcers, psoriasis, anemia, piles jaundice.
	<i>Ficus religiosa</i> L.	It is used traditionally as antiulcer, antibacterial, antidiabetic, in the treatment of gonorrhoea and skin diseases.
	<i>Ficus semicordata</i> Buch.-Ham. ex Sm.	Leaves used as fodder. Wood used as firewood. Fruits are edible.

	<i>Ficus sarmentosa</i> Buch.-Ham. ex Wall.	Used as medicine to treat peptic ulcer.
	<i>Morus indica</i> L.	The primary medicinal use of this plant is a method of glucose levels in diabetic patients.
	<i>Streblus asper</i> Lour.	Treatment of different diseases such as toothache, filariasis, diarrhea, leprosy, dysentery and cancer.
Rhamnaceae	<i>Ziziphus rugosa</i> Lam.	It is used as Cough, Ulcer, Diarrhoea, Menorrhagia and Skin disease.
	<i>Zizyphus mauritiana</i> Lam.	It is used as Cough, Ulcer, Diarrhoea, Menorrhagia and Skin disease.
	<i>Ziziphus oenopolia</i> (L.) Miller	It is used as Cough, Ulcer, Menorrhagia and Skin disease
Rosaceae	<i>Duchesnea indica</i> (Jackson) Focke	Used for acute tonsillitis, weeping eczema, ringworm, laryngitis, stomatitis, snake, insect bites and traumatic injuries
Ulmaceae	<i>Trema orientalis</i> (L.) Bl.	The leaves and the bark are used for the treatment of coughs, sore throats, asthma and bronchitis.
Urticaceae	<i>Boehmeria glomerulifera</i> Miq.	The leaves and the bark are used for the treatment of coughs, sore throats, asthma and bronchitis.
	<i>Boehmeria hamiltoniana</i> Wedd.	The leaves, root and the bark are used for the treatment of cut deases
	<i>Dendrocnide sinuata</i> (Bl.) Chew	The leaves, root and the bark are used for the treatment of cut deases
	<i>Gonostegia hirta</i> (Blume ex Hassk.) Miq.	This plant used to treat abdominal cramps and leucorrhoea
	<i>Laportea interrupta</i> (L.) Chew	This plant used to traect as herbal medicines to aid in pregnancy.
	<i>Pilea microphylla</i> (L.) Liebmann	It is used for folk medicine to treat allergies and wounds
	<i>Pilea cordifolia</i> Hook. f.	It is used for folk medicine to treat allergies and wounds
	<i>Pouzolzia hirta</i> Blume ex Hasskal	In Traditional Medicine this plant is called Nuo Mi Tuan, and is described as cooling, depurative, diuretic, febrifuge, invigorating spleen.

	<i>Pouzolzia zeylanica</i> (L.) Benn.	It is used to treat cough, pulmonary tuberculosis, sore throat, enteritis, dysentery
Celastraceae	<i>Celastrus paniculatus</i> Wild.	The root is used as an antimalarial and antipyretic. The wood is used in the treatment of tuberculosis.
Achariaceae	<i>Gynocardia odorata</i> Roxb.	It is used in antipyretic agent, seed extract used as lotion in leprosy skin diseases.
Clusiaceae	<i>Mesua ferrea</i> L.	It is antiseptic, blood purifier, anti-inflammatory, anthelmintic, antipyretic, cardiogenic, diuretic, expectorant, purgative, antiasthmatic and antiallergic
Euphorbiaceae	<i>Acalypha hispida</i> Burm. f.	Its leaves are laxative, diuretic, used in the treatment of gonorrhoea and leprosy
	<i>Acalypha indica</i> L.	It serve as anti-inflammation, anthelmintic, anti-cancer, anti-bacterial, anti-diabetes, anti-venom and anti-obesity.
	<i>Antidesma acidum</i> Retz.	Leaves are laxative, diuretic, used in the treatment of gonorrhoea and leprosy
	<i>Balakata baccata</i> (Roxb.) Esser	Its leaves are used to treat like laxative, diuretic, used in the treatment of gonorrhoea and leprosy
	<i>Baliospermum solanifolium</i> (Burm.) Suresh	Leaves and seed are used to treat constipation, anemia, jaundice, piles.
	<i>Croton bonplandianus</i> Baill.	Leaves and seed are used to treat constipation, anemia, jaundice, piles.
	<i>Euphorbia heyneana</i> Spreng.	It is used to treat of migraine, skin diseases and intestinal parasites
	<i>Euphorbia hirta</i> L.	It is used in bronchitis, gonorrhoea, cough, asthma, pimples, jaundice, and tumors.
	<i>Euphorbia hypericifolia</i> L.	It is used to treatment of gonorrhoea, menorrhagia, leucorrhoea, pneumonia and bronchitis
	<i>Macaranga denticulata</i> Mull. Arg.	Leaves are commonly used for flavoring in Sri Lanka.
	<i>Macaranga peltata</i> (Roxb.) Mull. Arg	It is used to treat stomach-ache, cough and fever, and externally to treat wounds and the ulcers

	<i>Mallotus philippensis</i> (Lam.) Müll.-Arg.	It is used to kill intestinal worms
	<i>Trewia nudiflora</i> L.	It is used to treat flatulence, gout and rheumatism
Hypericaceae	<i>Hypericum japonicum</i> Thunb.	It is used against bacterial diseases, infectious hepatitis, internal hemorrhages and tumors
Passifloraceae	<i>Passiflora foetida</i> L.	Roots are used against bacterial diseases, infectious hepatitis, internal hemorrhages and tumors
Phyllanthaceae	<i>Antidesma acidum</i> Retz. Observ.	In the Cooch Behar district of West Bengal, the ripe fruits are eaten by children
	<i>Antidesma montanum</i> Blume	Roots are used internally to treat measles, chickenpox and malaria.
	<i>Antidesma buniis</i> (L.) Spreng.	Fruits juice is used to treat high blood pressure and heart diseases. The leaves are used to treat coughs and indigestion.
	<i>Baccaurea ramiflora</i> Lour.	Pulp edible and delicious. Bark is used as medicine for constipation.
	<i>Bischofia javanica</i> Blume.	Used as a medicine against rheumatic pain and malaria, tuberculosis, stomach ulcers, mouth ulcers and inflammatory conditions
	<i>Bridelia retusa</i> (L.) Spreng.	The plant is pungent, bitter, heating, useful in lumbago; bark is good for the removal of urinary concretions.
	<i>Bridelia sikkimensis</i> Gehrm.	<i>Bridelia</i> species are used as food plants by the larvae of some Lepidoptera species.
	<i>Flueggea virosa</i> (Roxb. ex Willd.) Voigt	Roots and fruits are used as snakebite remedy.
	<i>Phyllanthus amarus</i> Schum. et Thonn.	It is bitter, astringent, diuretic, stomachic, antiseptic and febrifuge
	<i>Phyllanthus emblica</i> L.	It is used for traditional medicine for the treatment of jaundice, diarrhea, and inflammation.
	<i>Phyllanthus fraternus</i> Webster	It is used for strongly diuretic and taken to allay spasms,
	<i>Phyllanthus reticulatus</i> Poir	The twigs are used as chew-sticks. A soup made of the leaves, boiled with palm

		fruits, is given to woman after child–birth.
	<i>Sauropus androgynus</i> Merr.	The leaves are used as a medicine for coughs and to soothe the lungs, as a tonic.
Salicaceae	<i>Salix tetrasperma</i> Roxb.	Used traditionally to treat diarrhoea, fever, diabetes, skin diseases, rheumatic arthritis, bleeding disorders, epilepsy, piles, swellings, cough, cold,
Violaceae	<i>Viola tricolor</i> L.	This species used for skin diseases, eczema and epilepsy
Elaeocarpaceae	<i>Elaeocarpus floribundus</i> Bl.	Used to treat diabetes, dysentery and inflamed gums.
Oxalidaceae	<i>Biophytum reinwardtii</i> (Zuccarini) Klotzsch	It is taken for cough. Crushed leaves used for cuts and wounds to stop bleeding.
	<i>Biophytum sensitivum</i> DC.	It is taken for cough. Crushed leaves used for cuts and wounds to stop bleeding.
	<i>Oxalis corniculata</i> L.	It is used as an anti-inflammatory medicine.
	<i>Oxalis latifolia</i> H B K.	This herb is anthelmintic, anti-inflammatory, diuretic, relaxant, febrifuge and stomachic.
	<i>Rorippa benghalensis</i> (DC.) Hara	Root and leaves have antibacterial properties
Bixaceae	<i>Bixa orellana</i> L.	It is used in antidiabetic and insect repellent.
Capparaceae	<i>Capparis multiflora</i> Hook. f. et Thom	It is used to treat liver and kidney diseases.
	<i>Capparis zeylanica</i> L.	It is used to Treating Boils and Piles.
	<i>Crateva religiosa</i> Forster	Immunity booster and weight loss.
Dipterocarpaceae	<i>Shorea robusta</i> Roxb. ex Gaertn. f.	Used in Constructing boats and ships.
Malvaceae	<i>Firmiana colorata</i> (Roxb.) R. Br.	It is used totreating sores and swelling.
	<i>Grewia serrulata</i> DC.	Heart Blood and liver disorders
	<i>Ceiba pentandra</i> (L.) Gaertner	It is the Source of fiber and timber.
	<i>Helicteres isora</i> L.	It is used to treating urine problem.
	<i>Pterygota alata</i> (Roxb.) R.	Bark is used as leprosy, swelling and pain.

	Br.	
	<i>Abelmoschus moschatus</i> Medik.	Treating snake bites, abdominal and intestinal problems
	<i>Urena lobata</i> L.	Treating facture wounds and snake bites.
	<i>Sida acuta</i> Burm. f.	It is used totreating facture wounds and snake bites.
	<i>Sida cordifolia</i> L.	Treating facture wounds and snake bites
	<i>Sida rhomboidea</i> Roxb. ex Fleming	Treating facture wounds and snake bites
	<i>Sida cordata</i> (Burm. f.) Borss.Waalk.	Treating facture wounds and snake bites
	<i>Malva verticillata</i> L.	Used as Chinese mallow as a laxative to relieve constipation and as a diuretic to relieve water retention by increasing urine production.
	<i>Corchorus aestuens</i> L.	Used for the treatment of stomach-ache and pneumonia
	<i>Triumfetta rhomboidea</i> Jacq.	Used in urinary trouble & dysentery, bark and leaves are used in Jaundice-Hepatitis, diarrhoea, asthma and inflammation
	<i>Bombax ceiba</i> L.	Decoction of the bark is given to reduce stomach-ache.
	<i>Abroma augusta</i> L. f.	It is used to treat rheumatism, sleeping disorders, abnormal vaginal discharge and fever
	<i>Melochia corchorifolia</i> L.	Used as fodder for cattle.
	<i>Pterospermum acerifolium</i> Willd.	Used in inflammation, abdominal pain, ascites, cures ulcers, leprosy, constipation, urinary discharges and tumours.
	<i>Sterculia villosa</i> Roxb.	Used by Indians as a traditional remedy for inflammation
Anacardiaceae	<i>Lannea coromandelica</i> (Houtt.) Merr.	It is used as folk medicine to treat fever, dyspepsia, general debility, gout, dysentery, sore eyes, wounds and much more disorders.
	<i>Mangifera indica</i> L.	Plant parts are used as a dentrifrice, antiseptic, astringent and diaphoretic
	<i>Melia azadirachta</i> L.	Used as an ayurvedic medicine like anti-

		Inflammatory, insecticidal and rodenticidal,
	<i>Chukrasia tabularis</i> Jussieu	Used as a febrifuge and to treat diarrhoea.
	<i>Swietenia mahagoni</i> (L.) Jacq.	Used as for malaria, hypertension, diabetes and diarrhea, as antipyretic and bitter tonic
	<i>Toona ciliata</i> Roemer	Used to treat chronic dysentery, leprosy, headache, blood complaints and cardiogenic,
	<i>Aphanamixis polystachya</i> (Wall.) Parker	Used to treat tumors, ulcer, dyspepsia, skin diseases, leprosy, diabetes and eye diseases
	<i>Aegle marmelos</i> (L.) Correa	Used to treat antidiarrhoeal, antimicrobial, antiviral, radioprotective, anticancer, chemopreventive, antipyretic
	<i>Citrus limon</i> (L.) Osbeck	Used to treat scurvy, sore throats, fevers, rheumatism, high blood pressure.
	<i>Citrus maxima</i> (Burm.) Merrill	Used to treat scurvy, sore throats, fevers, rheumatism, high blood pressure.
	<i>Clausena excavate</i> Burm. f.	Used to treat tumors, ulcer, dyspepsia, intestinal worms, skin diseases and leprosy
	<i>Glycosmis pentaphylla</i> (Retz.) Candolle	Used to treat tumors, ulcer, dyspepsia, intestinal worms and skin diseases.
	<i>Murraya koenigii</i> (L.) Spreng.	Used in many cultures for the treatment of cough, stomach ulcers, diabetes obesity.
	<i>Murraya paniculata</i> (L.) Jack	Used in many cultures for the treatment of cough, flatulence.
	<i>Toddalia asiatica</i> (L.) Lam.	Used in many cultures for the treatment of stomach ulcers, diabetes and obesity
Amaranthaceae	<i>Achyranthus aspera</i> L.	This plant is used as oils, asthma, in facilitating delivery, bronchitis, debility, dropsy, cold, colic, dog bite, snake bite, scorpion bite, earache, headache and leukoderma.
	<i>Achyranthus bidentata</i> Blume.	This plant is taken internally to treat back pains, hypertension, urine in the blood, menstrual pain.

	<i>Aerva sanguinolenta</i> (L.) Bl.	It has significant therapeutic effects, hepatoprotective, including antihyperglycaemic, antioxidant, anti-inflammatory, antimicrobial.
	<i>Alternanthera paronychioides</i> St. Hill	It has significant therapeutic effects, hepatoprotective, including antihyperglycaemic, antioxidant, anti-inflammatory, antimicrobial.
	<i>Alternanthea philoxeroides</i> (Mart.) Griseb.	It is used to treat tight chest, hepatitis, asthma, bronchitis and other lung troubles
	<i>Alternanthera pungens</i> HBK	It has used to treat stomachache, swelling and nasopharyngeal infections
	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	This is used to treat hepatitis, bronchitis, asthma, tight chest and other lung troubles.
	<i>Amaranthus blitum</i> ssp. <i>oleraceus</i> (L.) Costea	This plant is used as vegetable and medicinal purposes.
	<i>Amaranthus spinosus</i> L.	It is used treat breathing and bronchitis problem
	<i>Amaranthus viridis</i> L.	Traditionally root and bark and leaves are used to treat for fever, asthma, diabetes, dysentery, liver disorders, urinary disorders and venereal diseases
	<i>Celosia argentea</i> L.	Young plants edible as vegetable.
	<i>Chenopodium album</i> L.	Several parts of this plant used for anthelmintic, antiphlogistic, antirheumatic, contraceptive, laxative and odontalgic diseases.
	<i>Deeringia amaranthoides</i> Merr.	Tender leaves are eaten for head pain.
	<i>Dysphania ambrosioides</i> (L.) Mosy. et Clemants	This herb is used for folk medicine, poultices, and infusions for inflammatory problems and lung infections.
	<i>Pupalia lappacea</i> (L.) A. Juss.	It has been used to treat bone fractures, cough, toothache, fever and diarrhea.
Caryophyllaceae	<i>Drymaria cordata</i> (L.) Willd. ex Roem. et Schult.	It is used as cold, coryza, headache, bronchitis.

	<i>Polycarpon prostratum</i> (Forssk.) Asch. et Schw.	<i>Polycarpon prostratum</i> (Forssk.) Asch. et Schw.
	<i>Stellaria media</i> (L.) Vill.	It has been used for itchy skin disorders and pulmonary diseases
	<i>Stellaria uliginosa</i> Murra	It has been used as to treat pulmonary diseases and itchy skin condition
	<i>Stellaria wallichiana</i> Benth. ex Haines	It is used as medicine like Skin disease and othe purposes.
Droseraceae	<i>Drosera burmanni</i> Vahl	Species is used in medications for asthma, cough and ulcers.
Molluginaceae	<i>Glinus lotoides</i> L.	It is used as an anthelmintic, an antiseptic, treatment for diarrhea.
	<i>Glinus oppositifolius</i> (L.) DC.	Stem and Leaves are used to treat joint pains, diarrhea, inflammation, intestinal parasites, furuncles, fever and skin disorders
Nyctaginaceae	<i>Boerhavia diffusa</i> L.	Plants have medicinal values for several diseases like skin, tunge and hair fall.
	<i>Mirabilis jalapa</i> L.	It is used as a purgative, diuretic, and vulnerary (wound healing) purposes.
	<i>Nyctanthes arbor-tristis</i> L.	This plant is sued as anti-helminthic, anti-pyretic besides and laxative.
Plumbaginaceae	<i>Plumbago zeylanica</i> L.	This plant reatments for skin diseases, chronic rheumatoid arthritis and tumerous growths
Polygonaceae	<i>Persicaria barbata</i> (L.) Hara	Root and leaves used for skin diseases, chronic rheumatoid arthritis and tumerous growths
	<i>Persicaria chinensis</i> (L.) Gross	It is used to relieve inflammation to kill intestinal worms.
	<i>Persicaria hydropiper</i> (L.) Delarbre	Used to treat bleeding, skin problems, diarrhoea etc.
	<i>Persicaria lapathifolia</i> (L.) Delarbre	The whole plant is antiseptic and astringent
	<i>Persicaria orientalis</i> (L.) Spach	It is used as an anthelmintic, an antiseptic, treatment for diarrhea.
	<i>Persicaria strigosa</i> (R.Br.) Nakai	This plant reatments for skin diseases, chronic rheumatoid arthritis and tumerous growths

	<i>Polygonum plebeium</i> R. Br.	Used for Chinese and folk medicine
	<i>Polygonum pubescens</i> Bl.	It is used for the treatment of liver enlargement, pain, dysentery, loss of appetite, gastric ulcer, itching skin, dysmenorrhea, painful carbuncles and cancer
	<i>Rumex dentatus</i> L.	Leaves are used for skin disease.
	<i>Rumex maritimus</i> L.	Leaves is used for skin disease and bone fracture.
Portulacaceae	<i>Portulaca oleracea</i> L.	Its use as a purgative, emollient, cardiac tonic, muscle relaxant and anti-inflammatory.
Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Leaves are eaten for diuresis, diabetes and dissolving kidney stones.
Cornaceae	<i>Alangium chinense</i> (Lour.) Harms	Plants are used in the treatment of numbness, rheumatism and traumatic injuries
Balsaminaceae	<i>Impatiens balsamina</i> L.	Plants are used in the treatment of numbness, rheumatism and traumatic injuries
	<i>Impatiens trilobata</i> Colebr.	Leaves and stems are used for treatment of poison ivy rash
Boraginaceae	<i>Cynoglossum lanceolatum</i> Forsskal	It is used as diaphoretic, colic medicine for children and old person and diuretic expectorant
	<i>Heliotropium indicum</i> L.	This plant is used on skin ulcers, wounds and furuncles
Ebenaceae	<i>Diospyros malabarica</i> (Desrouss.) Kosteletsky	It is used externally to wounds and heal sores
Lecythidaceae	<i>Careya arborea</i> Roxb.	Bark and fruit are used to treat for cough, ulcer, wound and promotes digestion
Primulaceae	<i>Ardisia solanacea</i> Roxb.	Medicinal plant used for treatment of fever, alleviating chest pains, diarrhea and liver poisoning.
	<i>Maesa indica</i> (Roxb.) Candolle	Medicinal plant used for treatment of fever, alleviating chest pains, diarrhea and liver poisoning
Sapotaceae	<i>Manilkara zapota</i> (L.) P. Royen	Plant used for treatment of fever, alleviating chest pains, diarrhea and liver

		poisoning
Theaceae	<i>Schima wallichii</i> Choisy	The bark and leaves are used as an important antiseptic for cuts and wounds
Icacinaceae	<i>Natsiatum herpeticum</i> Buch.-Ham. ex Arn.	Leaves and tender shoots are used to treat skin diseases
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.	It is used for tribal medicine like fever and leg pain.
	<i>Calotropis gigantea</i> (L.) Dryander	Plant is used for digestive disorders, diarrhea and stomach ulcers.
	<i>Chonemorpha grandiflora</i> (Roth) M. R. & Almeida	It is used to treat fever and stomach disorders.
	<i>Cryptolepis buchananii</i> Roem. & Schult.	It is used in, blood purifier, leprosy, fever and skin diseases.
	<i>Dregea volubilis</i> (L. f.) Benth. ex Hook. f.	It is used to treat rheumatic pain, fever, cold and cough.
	<i>Holarrhena pubescens</i> Wall. ex G. Don	It is used for treating anemia, jaundice, dysentery, diarrhea, epilepsy and cholera.
	<i>Hoya parasitica</i> Wall. ex Wight	It is used in antirheumatic and acute renal failure.
	<i>Ichnocarpus frutescens</i> (L.) Aiton	It is used for treating anemia, diarrhea, epilepsy and cholera
	<i>Marsdenia tinctoria</i> R. Br.	Traditionally leaves and roots are applied for intestinal disorders and externally to stimulate hair growth.
	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	It is used for treating anemia, diarrhea, epilepsy and cholera.
	<i>Tabernamontana divaricata</i> (L.) R. Br.	Leaves and tender shoots are used as an anti-epileptic, anti-mania, brain tonic and anti-oxidant
	<i>Vallaris solanacea</i> (Roth) Kuntze	It is used for epilepsy and cholera.
	<i>Wrightia arborea</i> (Dennstaedt) Mabblerl.	It is used for the treatment of epilepsy and cholera.
Rubiaceae	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	It is used to treat fever and stomach disorders.
	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	It is used to treat fever and stomach disorders.

<i>Coffea bengalensis</i> Roxb. ex Schultes	Root and leaves are used to manage AIDS / HIV in Kamuli.
<i>Dentella repens</i> (L.) Froster et G. Froster	Leaf juice is used for blood pressure.
<i>Dentella repens</i> var. <i>serpyllifolia</i> (Wall. ex Craib) Verdcourt	Leaf juice is used for blood pressure and sugar.
<i>Haldina cordifolia</i> (Roxb.) Ridsd.	Plant is used as tribals medicine like bone fracture.
<i>Ixora coccinea</i> L.	It is traditionally used for astringent, dysentery and tuberculosis
<i>Ixora nigricans</i> R. Br. ex Wight et Arn.	This species are used to treat astringent, treat dysentery and tuberculosis.
<i>Mitracarpus hirtus</i> (L.) DC.	It is to used to treat ringworm, rashes, eczema, toothache, itch and venereal diseases
<i>Morinda angustifolia</i> Roxb.	It is used as folk medicine like leaves are boiled with other herbs and bathing with the boiled water at evening helps in curing jaundice.
<i>Meyna spinosa</i> Roxb. ex Link, Jahrb.	Plant is used for the treatment of skin infection, diabetes, headache, disorder, hepatic dysentery, indigestion and painful urination
<i>Mussaenda roxburghii</i> Hook. f.	Root and Leaves are used for Cytotoxicity, anti-inflammatory, antiviral, antioxidant and antibacterial properties
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	It is used for fever, blood diseases, uterine complaints, tumour, anaemia, skin diseases, eye inflammation and diarrhoea.
<i>Oldenlandia corymbosa</i> L.	The plant is heat and toxins, activate blood pressure, diuresis and relieve stranguria. It is also active against hepatitis, appendicitis, pneumonia.
<i>Oldenlandia diffusa</i> (Willd.) Roxb.	Plant parts are used as pain killer.
<i>Oldenlandia verticillata</i> L.	Medicinal activities includes anti-inflammatory, antiviral, cytotoxicity, antioxidant and antibacterial properties

	<i>Hedyotis wallichii</i> Walpers	It is used in treatment of angina pectoris and ischemic stroke
	<i>Paederia foetida</i> L.	This plant treatment for intestinal complaints like abdominal pain, cramps, colic dysentery and flatulence.
	<i>Pavetta indica</i> L.	Used to treat haemorrhoids, dropsy, pain of piles.
	<i>Pavetta polyantha</i> (Hook. f.) Wall. ex Bremek.	Used to treat haemorrhoids, dropsy, the pain of piles.
	<i>Spermacoce ocymoides</i> Burm. f.	Leaves are applied for the treatment of headache and wounds.
	<i>Spermacoce alata</i> Aub.	It is used to heal stomach ailments and also used as anti dandruff and tonic.
	<i>Spermacoce hispida</i> L.	It is used to treat heal stomach ailments and anti dandruff
Convolvulaceae	<i>Argyreia roxburghii</i> (Wall.) Arn. ex Choisy.	Uses in Ethnic/Tribal Medicine and pharmacological aspects.
	<i>Cuscuta reflexa</i> Roxb.	It is used for fevers and externally in the treatment of pains and itchy skin.
	<i>Cuscuta chinensis</i> Lam.	Used to treat impairment for sexual function.
	<i>Evolvulus alsinoides</i> L.	Used to treat impairment for sexual function.
	<i>Ipomoea aquatica</i> Forsskal	Used to treat impairment for sexual function.
	<i>Ipomoea fistulosa</i> Mart ex Choisy	Used to treat impairment for sexual function.
	<i>Ipomoea hederifolia</i> L.	Used to treat impairment for sexual function.
	<i>Merremia hirta</i> (L.) Merril	Used to treat impairment for sexual function
	<i>Merremia hederacea</i> (Burm f.) Hallier f.	Used to treat febrile disease, colds, sunstroke, tonsil inflammation, laryngitis.
	<i>Poranopsis paniculata</i> (Roxb.) Roberty	Used to treat febrile disease, colds, sunstroke, tonsil inflammation, laryngitis.
Solanaceae	<i>Datura metel</i> L.	Leaves, stem and roots used to treat febrile disease, colds, sunstroke, tonsil inflammation and laryngitis.
	<i>Datura stramonium</i> L.	Used to treat bone fracture

	<i>Nicotiana plumbaginifolia</i> Viviani	Used to treat bone fracture
	<i>Physalis divaricata</i> D. Don	It is used as an anti-inflammatory medicine
	<i>Solanum aculeatissimum</i> Jacq.	The whole plant parts are used to treat bronchitis and rheumatism
	<i>Solanum americanum</i> Miller	The whole plant parts are used to treat bronchitis and rheumatism
	<i>Solanum nigrum</i> L.	It is used in the treatment of sugar, blood pressure
	<i>Solanum pimpinellifolium</i> L.	It is used as first aid treatment for scalds, burns and sunburn
	<i>Solanum sisymbriifolium</i> Lam.	Used to treat for hypertension, diarrhea, and various central nervous system (CNS) disorders and respiratory tract infections
	<i>Solanum stramonifolium</i> Jacq.	The plant is used as sedative, diuretic and stomachic
	<i>Solanum viarum</i> Dunal	Fruit is used to treat asthma, coughs and colds
	<i>Solanum villosum</i> Miller,	Leaves and fruit are used to treat asthma, coughs and colds
Oleaceae	<i>Jasminum multiflorum</i> Roth	It is used in the treatment of wound, headache and poisoning
	<i>Jasminum laurifolium</i> Roxb. ex Hornem	It is used to treat headache, wound and poisoning
Plantaginaceae	<i>Mecardonia procumbens</i> (Mill.) Small	Leaves extract used to treat wound, cuts and ringworm
Scrophulariaceae	<i>Lindenbergia indica</i> (L.) O. Kuntze Oesterr.	Leaves are used for antiseptics
	<i>Scoparia dulcis</i> L.	It is used in the treatment of sugar, blood pressure
Bignoniaceae	<i>Stereospermum colais</i> (Buch.-Ham. ex Dillwyn) Mabberley	This is used for diuretic, Lithotropic, cardio tonic and aphrodisiac
	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	Useful in diarrhoea and dysentery
	<i>Spathodea nilotica</i> Seemon	Useful in diarrhoea and dysentery

Verbenaceae	<i>Clerodendrum indicum</i> (L.) Kuntze	Plant extract is mixed with ghee and used against various skin diseases. Root used in asthma. Smokes of dried leaves are used to treat cough. Leaves used as vermifuge.
	<i>Clerodendrum infortunatum</i> Dennst.,	Extract of the leaves is given orally in fever and bowel troubles among Kuki and Rongmei tribes in the North–East India
	<i>Lantana camara</i> L.	Widely used ornamental
	<i>Phyla nudiflora</i> (L.) Greene	It is used for pain in knee joints and kidney
	<i>Ajuga macrosperma</i> Wall. ex Benth.	It is used for pain in knee joints and kidney
	<i>Anisomeles indica</i> (L.) Kuntze	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Clerodendrum indicum</i> (L.) Kuntze	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Clerodendrum infortunatum</i> L.	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Clerodendrum japonicum</i> (Thunb.) Sweet	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Callicarpa arborea</i> Roxb.	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Gmelina arborea</i> Roxb.	Used medicinally for rheumatism, fevers, abdominal pain, skin sores, and snake bites.
	<i>Mesosphaerum suaveolens</i> (L.) Kuntze	Leaves are used for antiseptics.
	<i>Vitex quinata</i> (Lour.) F.N. Williams	Used as a stomachic and as a tonic.
	<i>Isodon rugosus</i> (Wall. ex Benth) Codd	Stem and leaves are used for antiseptics and oil preparation.
<i>Leonurus sibiricus</i> L.	Stem and leaves are used for antiseptics and oil preparation.	

	<i>Leucas indica</i> (L.) R. Br. ex Vatke	It is used for Anti-inflammatory, anti-diarrheal, antimicrobial, analgesic, antioxidant, and insecticidal activities
	<i>Leucas aspera</i> (Willd.) Link	It is used for Anti-inflammatory, anti-diarrheal, antimicrobial, analgesic, antioxidant, and insecticidal activities
	<i>Ocimum basilicum</i> L.	It is used for Anti-inflammatory, antimicrobial, analgesic, antioxidant, and insecticidal activities
	<i>Ocimum tenuiflorum</i> L.	It is used for aiding cough, asthma, diarrhea, dysentery, fever, eye diseases, indigestion, arthritis, gastric ailments
	<i>Pogostemon amaranthoides</i> Benth	Leaves has antioxidant and antimicrobial activities.
	<i>Premna barbata</i> Wall. ex Voigt	A paste of the wood is applied to cuts and wounds. The bark juice is used in the treatment of fevers and chilblains.
	<i>Premna bengalensis</i> C. B. Clarke	Its Stem bark In throat pain, Leaves Improve immune system. Leaves, roots Kidney diseases, venereal infections, fevers, dysentery
	<i>Premna herbacea</i> Roxb.	Its Stem bark In throat pain, Leaves Improve immune system. Leaves, roots Kidney diseases, venereal infections, fevers, dysentery
	<i>Vitex peduncularis</i> Wall. ex Schauer	Used for traditional medicine to treat for the malarial and black fevers.
Acanthaceae	<i>Peristrophe paniculata</i> (Forsskal) Brummitt	It is used to treat malarial and black fevers.
	<i>Eranthemum griffithii</i> (Anders.) Bremek et Nonnenga Bremek	It is used in malarial and black fevers.
	<i>Asystasia macrocarpa</i> Nees	It is used as Antioxidant and Antidiabetic.
	<i>Barleria cristata</i> L.	It is used in anti-inflammatory, burns, diuretic, blood purifier, stomatitis, , dental caries, wounds, cracking heel.
	<i>Barleria strigosa</i> Willd.	It is used to treat Snake bites, Boils, Sores.
	<i>Dicliptera bupleuroides</i> Nees	It is used in cut wound to stop bleeding.

	<i>Hygrophila auriculata</i> (Schumach.) Heine	It is used in kidney infections, rheumatic arthritis, oedema, jaundice, gout and aphrodisiac.
	<i>Hygrophila polysperma</i> (Roxb.) Anderson	It is used in rheumatism, inflammation, jaundice, hepatic obstruction, pain, gout and aphrodisiac.
	<i>Hygrophila phlomoides</i> Nees	It is used to cure sore eyes, flatulence, fungal infections of skin.
	<i>Justicia adhatoda</i> L.	It is used in asthma, cough, colds, bronchial catarrh, bronchodilator, bronchitis, and tuberculosis.
	<i>Justicia gendarussa</i> Burm. f.	It is used in antispasmodic, carminative, antiperiodic, diaphoretic, chronic rheumatism
	<i>Justicia diffusa</i> Willd.	It is used in coughs, asthma, and rheumatism.
	<i>Justicia japonica</i> Thunb.	Tuberculosis, diuretic, antispasmodic, antiseptic.
	<i>Lepidagathis incurva</i> Buch.-Ham. ex Don	It is used in diuretic, antispasmodic, antiseptic.
	<i>Nelsonia canescens</i> (Lam.) Sprengel	It is used in managing pain and inflammation.
	<i>Phaulopsis imbricata</i> (Forsskal) Sweet	Rheumatism, skin diseases, dysentery, stomachache.
	<i>Phlogacanthus thyriformis</i> (Roxb. ex Hardw.) Mabberley	Menorrhagia, fevers, asthma, pox, sore, scabies etc.
	<i>Rungia pectinata</i> (L.) Nees	Treat smallpox, relieve pain and reduce swelling.
	<i>Thunbergia fragrans</i> Roxb.	Anti-inflammatory, antioxidant, anti-drug, antidote.
	<i>Thunbergia grandiflora</i> (Roxb. ex Rottler) Roxb.	It is used in hedges and for fuelwood.
Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Lupus, varicose ulcers, psoriasis, diarrhoea, fever etc.
	<i>Eryngium foetidum</i> L.	Stomachache, worms, snake bites, diarrhea, and malaria.
	<i>Oenanthe javanica</i> (Bl.) Candolle	It is used for treating jaundice, alcohol hangovers, abdominal pain, acute

		hepatitis, and inflammatory conditions.
	<i>Seseli diffusum</i> (Roxb. ex Sm.) Santapou et Wagh	It is used for treating jaundice, alcohol hangovers, acute hepatitis.
Araliaceae	<i>Hydrocotyle sibthorpioides</i> Lam.	It is used treatment coughs, influenza, boils, bruises, cirrhosis, colds, hepatitis, hepatoma, itch, jaundice, sore throat.
Apiaceae	<i>Centella asiatica</i> (L.) Urban C.F.P.von Martius & auct. suc. (eds.)	It is used wound healing, varicose ulcers, fever, eczema, skin leprosy, lupus, psoriasis, diarrhoea,
	<i>Hydrocotyle sibthorpioides</i> Lamarck	It is used externally to wounds, hepatoma, bruises, cirrhosis, coughs, abscesses, boils, colds, hepatitis, influenza, jaundice.
Campanulaceae	<i>Lobelia alsinoides</i> Lamarck	It is used for breathing problems
	<i>Lobelia zeylanica</i> L.	It is used for breathing problems
	<i>Wahlenbergia marginata</i> (Thunberg) A. DC.	It is used for breathing problems
Asteraceae	<i>Acmella paniculata</i> (Wall. ex Candolle) Jansen	Its uses for spices, as antiseptic, antifungal, antibacterial and antimalarial.
	<i>Acmella calva</i> (Candolle) Jansen	Its uses for toothache pain. inflammation of the mouth, Diuretic, Gastric ulcers.
	<i>Acmella uliginosa</i> (Swartz) Cassini	Its uses for toothache pain. and Gastric ulcers.
	<i>Ageratina adenophora</i> (Spreng.) King & Robins.	It is used in wound, skin diseases, itching, measles, uterine bleeding.
	<i>Ageratum conyzoides</i> L.	It is used to treat fever, headache, rheumatism, dyspepsia, wounds caused by burns, uterine disorders and pneumonia.
	<i>Ageratum houstonianum</i> Miller	It is used to cure burns and wounds.
	<i>Artemisia indica</i> Willd.	It is used inanthelmintic, antispasmodic, antiseptic, expectorant and stomachic.
	<i>Bidens pilosa</i> L.	It is used inAnti-inflammation, Antimalarial Diuretic, Antibacterial treatment.
	<i>Blumea lacera</i> (Burm. f.) Candolle	It is used inantipyretic, bronchitis, fevers, burning and thirst sensations.
<i>Chromolaena odorata</i> (L.) King et Harold Robinson	It is used in wound healing, burns, and skin infections.	

<i>Crassocephalum crepidioides</i> (Benth.) Moore	It is used to treat indigestion, stomach, headaches, epilepsy.
<i>Cyanthillium cinereum</i> (L.) Robinson	It is used in asthma, cancer, cholera, colic pain, cough, dysentery, impotency and night-blindness.
<i>Eclipta prostrata</i> (L.) L.	It is used in hemoptysis, hematuria, epistaxis, hematemesis, and uterine bleeding.
<i>Elephantopus scaber</i> L.	Used to treat diuresis, fever, bladder stones, nephritis, scabies, edema, dampness, and leukemia.
<i>Eleutheranthera ruderalis</i> (Sw.) Sch.-Bip.	It is used high blood pressure, cuts wounds, rheumatic pain.
<i>Emilia sonchifolia</i> (L.) Candolle ex Candolle	It is used in diarrhea, nyctolpia, gastropathy, ophthalmic, fevers and asthma.
<i>Enydra fluctuans</i> Lour.	It is used in ascites, anasarca, dropsy and snakebite.
<i>Galinsoga parviflora</i> Cavanilles	It is used in wound healing, toothache, cold, flu, dermatological and eye diseases
<i>Gnaphalium luteo-album</i> L. ssp. affine (Don) Koster	It is used to Breast cancer, diuretic, as astringent, cholagogue.
<i>Gnaphalium purpureum</i> L.	It is used to relief of stomach diseases, wounds, swelling, prostatism, neuritis, and angina ache,
<i>Grangea maderaspatana</i> (L.) Poir.	It is used in antipyretic, antiseptic, anthelmintic, diuretic, stomachic, deobstruent.
<i>Mikania micrantha</i> Kunth	It is used in antioxidant, anti-inflammatory, anti-stress, antimicrobial, and anti-diabetic
<i>Parthenium hysterophorus</i> L.	It is used in skin inflammation, dysentery, diarrhoea, malaria, rheumatic pain, urinary tract infections.
<i>Pseudognaphalium affine</i> (D. Don) Anderberg	It is used in the treatment of sore throat, influenza, productive coughing,
<i>Sonchus asper</i> (L.) Hill	Used as vegetable for internal disease
<i>Synedrella nodiflora</i> (L.) Gaertn.	It is used to treat anticonvulsant, epilepsy, neuropharmacological effects.

<i>Tridax procumbens</i> (L.) L.	It is used in wound healing, anticoagulant, antifungal and insect repellent
<i>Wedelia trilobata</i> (L.) Hitchc.	It is used in arthritis rheumatic symptoms, swellings muscle cramps.
<i>Xanthium strumarium</i> L.	
<i>Youngia japonica</i> (L.) Candol	It has many medicinal properties like cooling, anthelmintic, fattening, tonic, digestive, improves appetite.

CHAPTER-8

THREATS AND CONSERVATION

THREATS AND CONSERVATION OF MPCAs – 8

8.1. INTRODUCTION

With the gradual increasing of demand for herbal medicine is now shooting up at a geometrical progression throughout the world. In consequence the natural medicinal plants are under tremendous threat of extinction due to indiscriminate harvesting from natural habitat. Therefore, considering the fact, for conservation purpose, UNDP funded project has started in West Bengal Forest Department through MoEF, GoI with FRLHT (Foundation for revitalization of local health Traditions) as coordinating agency envisages two components of works viz. Establishment of a system for Rapid threat assessment (RTA) for prioritized conservation action and establishment of a network of MPCAs (Nayar and Sastry 1987, 1988, 1990).

Under the RTA component, a workshop was held at Kolkata during the month of December, 2007 wherein multiple stakeholders discussed at length involving Botanists, Taxonomists, Researchers, medicinal plant traders, Forest officers and members of FRLHT, Bengaluru. Thereafter proceedings were published titled, CAMP “Conservation Assessment and management prioritization for the medicinal plants of West Bengal”. During the CAMP workshop, after thread bare discussion, 46 (Forty Six) medicinal plant species were indentified to be in different priority categories within the state of west Bengal and Taxon sheets were prepared for each of the 46 species. Based on the recommendation of CAMP workshop, considering Forest types and Bio-geographic zones 7 (Seven) MPCAs have been established, representing at least one flagship species in the MPCA. literatures (Hooker 1872 - 1897; Prain 1903; Hara 1966, 1971, Ohashi 1975; Hara et al 1978, 1979, 1982; Grierson & Long 1983, 1984, 1987, 1991, 1999, 1001; Noltie 1994, 2000)

8.2. Physical threats of MPCAs on North Bengal

It is now clear that the medicinal plant diversity is significant, and the ecosystem of West Bengal is somewhat dependent on the wide range of several families. Along with other floristic elements, the medicinal plants of the region at present are under severe threat of losing their habitat mostly due to anthropogenic reasons. Such threats can be perceived only after detailed scientific investigations at different corners of diversified areas of three MPCAs of West Bengal. The major recorded physical threats are as follows:

8.2.1. Habitat loss: Medicinal plants are large trees or spinus dense shrubby bushes, shrubs and herbs in various wild habitats. Like other important floristic elements drastic habitat alteration cause serious loss of population of various plants (Fig. 17).

8.2.1.1. Road network or fragmentation: Continuous extension of metallic roads and rail-links crisscrossing the forests of Terai and Duars, hills of Darjeeling and Alipurduar district are gradually destroying the natural habitats of wild indigenous species. The continuous habitat fragmentations causes' serious damage in various existing ecological diversity and finally treats reach to species and genetic diversity. Repeated fragmentation in habitat directly affects the population size of essential members of MPCAs including medicinal plants. Fragmentations of wild habitats and conservatories are major threats for existing vegetation and it mostly created through frequent human activities by establishing road networks and colonies. Natural vegetation are greatly fragmented due to forest clearing by human activities such as rural development, urbanization, agricultural activities and the creation of hydroelectric reservoirs. Roads are the major causes of natural habitat fragmentation because roads divide large landscapes into minor patches and change interior natural forest pattern.

8.2.1.2. Developmental works: The rapid extension of human settlement in forest village & its adjoining forest fringe areas, eco-tourism centers, hotels, extension of tea gardens and many other anthropogenic activities resulting in extensive alteration of natural habitat and has posed threat to existing medicinal plants resources by reducing their population sizes. In this case the threats result from activities such as land clearing for human settlements, dams, huge developmental works, exploitation of palms for making household items, furniture and other purposes to meet their pleasure, in addition to which they are also used for daily chores for fuel, food, fodder etc. Medicinal plants are also form one of the good raw materials for local people or tribal people and have increasing day to day demand over the globe.

8.2.2. Unscientific collections from wild: Unscientific extraction of various wild plants and plant parts from natural habitats by many local communities, to run their livelihood and meet the industrial demand of 'Joributi Clinic' causing serious damages of their

population. Excessive cattle grazing are destroying seedling and sapling of different plants species.

8.2.2.1. Fast depletion of important medicinal plant resources from our study areas (MPCAs)-

With the gradual hike of demands for medicinal plants in drug industries & Indiscriminate collections from forests mostly on a destructive mode, absence of genuine data base, prevalent practice of unregulated collection by the forest fringe dwellers, lack of modern agricultural practices among forest fringe dwellers, inadequate trade information network & training regime to the plant collectors etc. have contributed to the fast depletion of our natural medicinal plant resources.

8.2.2.2. Predominance of grey market in the medicinal plant trade-

Marketing of medicinal plants have always been a grey area & has been grossly undervalued in financial & physical terms since raw material often bypass the tax net Governmental interventions are nearly absent. From primary collectors to aggregators to the final destination i.e. the drug manufacturing units, about 4-5 middlemen are involved who sucks the bulk profit leaving little for the primary collectors. It is estimated that more than 70% of the raw material required for the drug & cosmetic industry is being obtained from Forests legally or illegally. In North Bengal, it is found that much of the valued medicinal plants find their way out to Hongkong, China or SE Asian countries through the porous border of Nepal.

8.2.2.3. Exploitation of Forest fringe dwellers & forest villagers-

Forest fringe dwellers & forest villagers, being the actual collectors of medicinal plants & its parts play a crucial role in maintaining the resource base of the forest medicinal plants. Forest fringe dwellers & forest villagers are being exploited by the middlemen as the fringe dwellers are economically backward & less aware about their own forest resources & thus weaknesses of the fringe dwellers & forest villagers are being utilized. In turn, paying them very less for collection of medicinal plants & its parts & forcing them to harvest destructively over the years in the forest in order to get more collection, subsequently earn maximum financial benefit by the middlemen.

8.2.3. Absence of a true data base on our medicinal plant resources-

Unfortunately, the Forest Dept does not have a comprehensive data base on the medicinal plant resources available within thrust areas of the Forest. This lacuna is one of the major threats for indiscriminate harvesting of medicinal plant resources by the illegal traders. Therefore, Forest Dept. need to have a comprehensive data base on the medicinal plant resources of Forest by assessing quantification of important medicinal plant species.

8.2.4. Climate change: The climate is changing globally at a faster rate than normal as compared to past many decades. The main reason for the climate change consists in increasing human population followed by their activities such as grazing, logging, destructive lumbering, pollution due to industries, transport road extensions etc. because of drastic climatic change, the soil is polluted and its quality is degraded on account of which the growth of plant species is affected adversely.

8.2.5. Introduction of unwanted and selective species:

Invasion of exotic species within the natural population and introduction of huge number of very selective tree species under planed plantation program in natural forest since the establishment creates great threats on indigenous species.

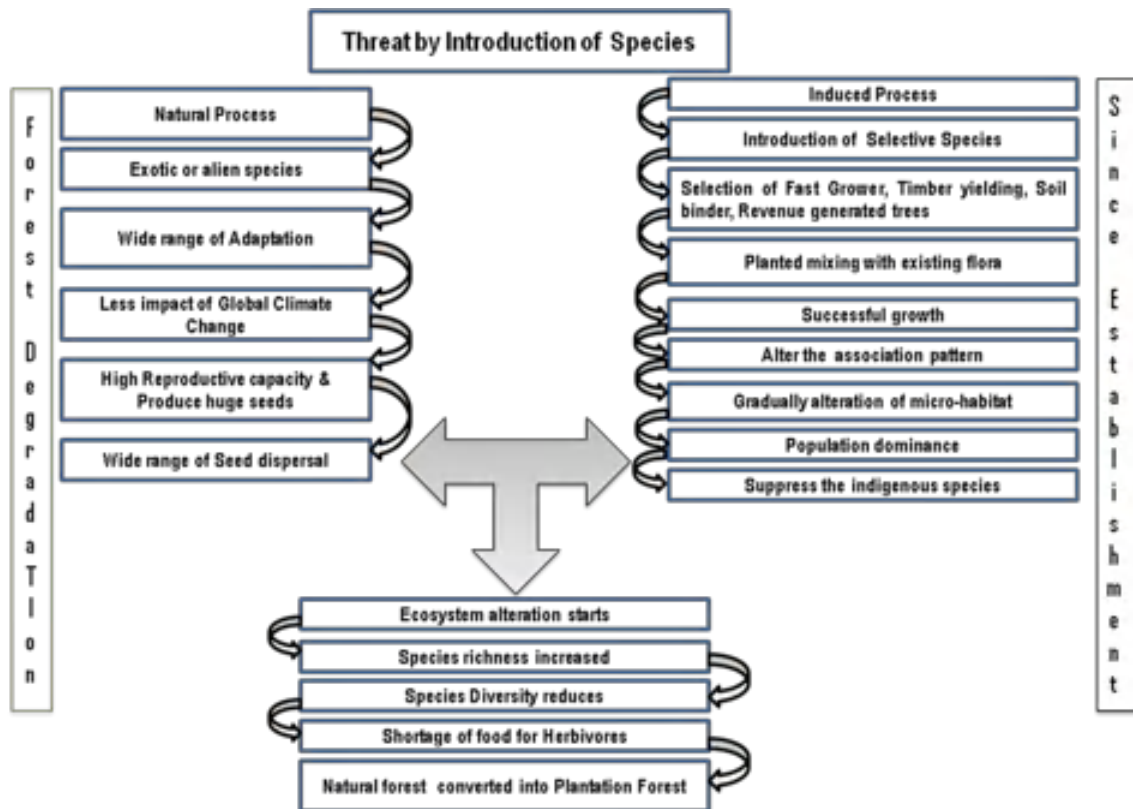


Fig. 17: Chart showing status of the threats by the introduction of species

8.2.5.1. Invasive species: The indigenous flora of North Bengal Forests is under extreme threats from exotic species. The faster invasiveness, huge seed production and high adoptive features of exotic species greatly affect the local vegetations. Some of the noxious exotic species in this region may classify as aggressive invader: *Ageratum conyzoides*, *A. houstonianum*, *Alternanthera paronychioides*, *Chromolaena odorata*, *Digitaria ciliaris*, *Lantana camara*, *Mikania micrantha*, *Mimosa pudica*, *Senna alata*, *Synedrella nodiflora*, etc. Moderate invaders: *Cissampelos pareira*, *Senna tora*, *Bidens pilosa*, *Crassocephalum crepidioides*, *Cleome rutidosperma*, *Emilia sonchifolia*, *Evolvulus nummularius*, *Mesosphaerum suaveolens*, *Ricinus communis*, *Tridax procumbens*, etc. Slow invaders: *Persicaria hydropiper*, *Senna occidentalis*, *Solanum sisymbriifolium*, *Physalis angulata*, *Stachytarpheta indica*, *Galinsoga parviflora*, *Parthenium hysterophorus*, etc.

8.2.5.2. Introduction of selective species: During afforestation program, easy growing and economically important species were chosen and to looks greener, only few species

were introduced within the natural forest. After the successful introduction of selective species and they can propagate successfully and gradually suppress the other indigenous species. Continuous introduction of similar type of species may shift the natural vegetation. Some the planted species in this study areas are *Tectona grandis*, *Schima wallichii*, *Shorea robusta*, *Aglaia spectabilis*, *Aphanamixis polystachya*, *Terminalia elliptica*, *T. arjuna*, *T. myriocarpa*, *Delonix regia*, *Jatropha curcas*, *Lagerstroemia indica*, *Annona squamosa*, *Senna siamea*, etc.

8.2.6. Quality of Ayurvedic drugs-

Due to increasing demand of Ayurvedic medicines, cheap substitutes and spurious look alike medicinal plant materials are often adulterated deliberately with raw materials, resulting in quality deterioration which in the long run affects the credibility of the Ayurvedic drug industry.

8.3. Conservation

Medicinal plants conservation does not advocate a total stoppage of plants collection and utilization because this will deprive rural artisans and craftsmen from earning their livelihood and the furniture industries will suffer causing unemployment and resentment. For conserving the medicinal plants resource bases some serious action is needed so that productive clumps are maintained within their capacity to revive. Silviculture Division of research wing of Forest directorate under Govt. of West Bengal have already enforced various acts & rules against destruction of medicinal plants and have focused on the planting of seeds and rootstocks of important plant species back to wild.

8.3.1. In – situ conservations

In-situ conservations or the onsite conservation are being carried out to protect tree diversity in their natural populations. The protected area network in this includes National Parks, Wildlife Sanctuaries, Biosphere Reserve (terrestrial or marine) etc. This type of conservations helps to protect endangered plants and animal species in their own natural habitat.

In West Bengal 15 wild life sanctuary where medicinal plants are naturally growing, they are Ballavpur WLS, Bethuadahari WLS, BibhutiBhusan WLS, Holiday Island

WLS, Jorepokhri Salamander WLS, Chapramari WLS, ChintamaniKar Bird Sanctuary, Buxa WLS, Lothian Island WLS, Mahananda WLS, Raiganj WLS, Ramnabagan WLS, Sajnakhali WLS, Senchal WLS, Neora Valley WLS, West Sunderban WLS and 6 National parks like Buxa National Park, Gorumara National Park, Singalila National Park, Sundarban National Park and Jaldapara National Park. Even though National Parks and Bio-reserves are helpful in promoting *in – situ* conservation, illicit harvesting cannot be controlled efficiently. For conserving the natural populations, some of the state forest departments have introduced some extraction rules suggest that the extraction should be carried out on a 4–year rotation.

It is a matter of fact that all MPCAs are under tremendous stress due to biotic interference and in order to minimize the extent of such interference several conservation management strategies are being evolved time to time, which are as follows:

8.3.2. *Ex-situ* conservatories and promote Medicinal plant cultivation:

Establishment of *ex-situ* conservatories in various institutions, forest ranges etc. are highly encourage for promote awareness about the importance of Medicinal plants. Centre for Utilization and Conservation of aromatic and medicinal plants, University of North Bengal Conserving more than 600 species collected from various nearby natural forests. The garden is also act as display center as well as arranging various awareness program and encouraging local farmers for alternative cultivation of Medicinal plants to strengthen their economy and reduce direct impact on natural population of popular medicinal plants. It is also encouraged various college, school, army areas for establishing such garden.

8.3.3. Restrict the entry of Exotic species:

Regular monitoring required on the spreads of exotic species and threat level should be measured. The phenology, reproductive biology and allelopathy of each aggressive exotic element should study to assess their destructiveness and also formulate the scientific eradication process. Apart from that, normal periodical eradication of noxious alien species is in their sterile stage is essential to reduce their faster expansion. Updated population and their growth should monitor and all possible measures (mostly in sterile phase) must be taken to stop their extensive growth.

8.3.4. Avoid Monoculture: Before plantation program, authority should prepare entire floristic information of each conservatory. The complete floristic data helps in selection of plantation species. Along with the timber yielding, high growth species, economical species authority should also select atleast 50% other less populated species in this respective conservatory. The hybrid mode of less populated indigenous species along with targeted species may restore the healthy and balanced ecosystem in the conservatories.

8.4. Management Strategies

8.4.1. Joint Forest Management:

It is need less to explain that West Bengal Forest Department is the pioneer state in India initiating Joint Forest Management strategy which involves participation of Forest fringe population (Registered Forest protection committee members) towards protection of Forest and wildlife through a set of activities of employment generation followed by adoption of Government's decision to share usufructs benefits on net sale profits of the intermediate and final Forest produce.

The process of formation and subsequent consolidation of JFM led to reckonable success in rejuvenating the degraded forests bringing about economic upliftment of Forest fringe population constituting FPC (Forest protection Committee) and EDC (Eco development Committee) through series of administrative and orientation development program.

The strategy is now well tested towards conservation of entire Forest resources. The people around Forests are integral part of Forest ecosystem and their livelihood needs to be reckoned as very important for ensuring long term conservation of resources. While direct benefit flow to the members of FPC/EDCs from forest resources by way of sharing of usufructs and employment generation is limited, there is scope of improvisation of traditional skill development, land based improved technical inputs support for better agro farm yield, self employment promotion, promotion towards Community oriented development, development of marketing facilities, value addition of NTFP (Non timber forest produce) and medicinal plant resources etc.

As a part of Conservation strategy PEEST analysis had been carried out to address impact on overall MPCA study area.

8.4.2. Policy Ecological Economical Social and Technological (PEEST)

It is a strategic planning tool used to evaluate the impact of the MPCA study area on policy, ecology, economics, social conditions and technological factors. This PEEST analysis had been done by a consultant, NAEB, Regional center, Govt of India, Jadavpur University and North Bengal University.

8.4.3. Policy impact

- Demarcation of MPCAs having separate management plan with emphasis on listed endangered species conservation.
- The study helped to recognize the role of local health traditions in contributing to the health security of rural poor living in and around the forest.
- The study encompasses role of Forest Department in the conservation of medicinal plants.
- The study focuses on the rural employment potential of medicinal plants resources.

8.4.4. Economic impact

The local communities (FPC/EDCs) are getting some direct economic benefits through Joint Forest management support activities within the MPCA area.

Non availability of modern treatment in most of the remote areas, low capability of spending for health care, dependency on herbs and shrubs available locally has matched with traditional social values and resulted in economic benefit to household.

Sustainable harvesting technique and value added to medicinal plants at village level will help in quality improvement and in getting high prices.

The local herbal medicine practitioners are getting popularity and hence their income is rising.

Joint Forest Management (JFM) allows women participation and empowers them to tackle issues of health care and livelihood. So, socially backward economically weaker classes are involved in the project directly or indirectly.

8.4.5. Ecological impact

Initial CAMP (Conservation Assessment and Management prioritization for the medicinal plants of west Bengal) workshop was shortlisted 46 (forty-six) medicinal plants for conservation priority.

Established and selected Medicinal plant conservation area to conserve the endangered medicinal plants as long term conservation measure is established. These are in-situ Forest gene banks ensuring survival and propagation of the selected species. Target species oriented MPCA is perhaps the first such initiative in the country.

For mass awareness generation, effective posters on state wise prioritized medicinal plants of west Bengal and complete checklist of medicinal plants are developed and are generating interest in stake holders like Forest officials, students, farmers and traders etc.

Forest users' awareness and value of sustainable harvesting methods increased. Awareness of the benefits of sustainable harvesting, such as improved continuity and stability of the resource, promotes adoption of methods.

Attitude towards harvesting changed: less destructive, more traditional methods tested and readopted.

MPCA establishment has led to the change of social, institutional and ecological context of resource management in the state thus affecting rural livelihoods. It enables community members to explore the factors affecting such change, and to propose and test adaptations to such change. It explicitly draws on and combines local and scientific knowledge processes, ensuring the benefits of both small- and large-scale awareness of change.

Disturbances in the site for local community needs, demand and utilization are reduced.

8.4.6. Social impacts

Poor and marginalized community (FPC/EDC) members gained the confidence to draw up a management plan for the forest (MPCAs), thereby enhancing legitimacy of collaborating forestry.

Through discussions, exchange of knowledge with scientists and scientific testing of different management regimes, perceived value of local ecological knowledge raised.

In partnership with external agencies, information pathways developed on which to base forest management decisions.

Through such information and capacity building rural forest users improves control of access to resources (particularly in relation to illicit harvesters, and neighboring communities). Health improvement where access to medicinal plants is assured.

Community to community training for conservation and sustainable harvesting methods spreads to other areas.

Community cohesion is increased.

Eco-tourism spots and community owned infrastructure are built for environmental recreation, social interactions and income generation.

Establishment of MPCA envisages women participation and empowers them to tackle issues of health care and livelihood.

8.4.7. Technological and management impact

Skills in scientific sampling and enumeration techniques combined with rigorous observation of different experimental regimes raise capacity of individuals/forest officers, who in turn contribute to more informed management decisions.

- Increased knowledge of resource through monitoring and assessment.
- Tools gained to reduce variability and risk in production.
- Forest users' awareness and value of sustainable harvesting methods increased.
- New lessons on long term and continued medicinal plants management are learnt.
- Conservation of medicinal plants in their natural habitats being a relatively new initiative, there is a need to sensitize the various stakeholders about conservation imperatives and to build their capacity to undertake conservation action.

Therefore, conservation Education and capacity building is the important tool to sensitize different target groups/stakeholders' group in order to conserve natural habitats of medicinal plants, it may in-situ or ex-situ conservation sites.

8.4.8. Conservation Education:

The objective of the Conservation Education Programme (CEP) is to sensitize different target group to the need and approaches of conservation in general and of medicinal plants. CEP may include a range of activities to cater to the need of different stakeholder groups. Specific CEP packages/ modules need to be developed for need based stake holder group, which are as follows:

1. Local village communities
2. Student of local school and colleges
3. Pharmacy students, Botany students of colleges/universities.
4. General visitors such as pilgrims, nature tourists.

The facility to support CEP at MPCA site may include i) set of signage with English and local vernacular ii) appropriate educational material. iii) Nature trails. iv) Demonstration garden with befitting labeling. v) Interpretation center with audio visual matters. These facilities may be developed according to specific user needs in respect of a particular MPCA and there may not be the necessity to have all these facilities and activities at all the MPCAs. The CEP facilities will thus be site specific and user specific and taken into consideration for present study area.

The conservation education program would need to be designed in such a way as to meet the requirements of semi –literate also. The use of folk media like street plays, songs, documentaries etc. is generally a very forceful tool to address this type of audience. For the literate population, use of communication media like slide and video shows, education material in the form of brochures, posters, leaflets etc is very useful.

8.4.9. Capacity building:

Once the stake holders are sensitized about the conservation imperatives and their role in such initiatives through conservation education program, they would need to be enabled to take up the responsibility of conservation action. It is for this reason that any program related to conservation of medicinal plants must have a strong component of capacity building of various players involved in the conservation action.

The first and foremost stakeholders in conservation and sustainable management of medicinal plants are the resource manager, viz. State Forest Department, their capacity for this specific work would need to be built at various levels in view of this new dimensions to their on-going responsibilities. The capacity building program will be to supplement the knowledge and skills acquired by this group during their induction training to the service. It is therefore, imperative that detailed training need assessment for various levels of SFD staff is carried out before embarking upon the capacity-building program.

Monitoring mechanism: The local FPC/EDC communities have a large role in the medicinal plant conservation program and they are envisaged to actively participate in

the preparation of work plans for the MPCAs. In all fairness, it would be desirable to involve the communities in the monitoring and evaluation mechanism by involving concerned FPC/EDC members through its MPCA management plan committee. In this present study all concerned FPC/EDC members have been included in the each respective MPCA. This monitoring has been done with an aim to assess the adequacy and quality of the various activities related to conservation of medicinal plants, conservation education and income generation amongst the fringe forest community for all three MPCA study area.

8.4.10. Overhauling of the procurement & marketing strategy-

There should be an institutional mechanism to tackle the issue of procurement of medicinal plants to prevent destructive collection, financial exploitation of fringe dwellers & forest villagers, activity of middlemen & also to ensure proper marketing to maintain medicinal plants resource base at native habitat.

Construction of warehouses& semi processing facilities (controlled drying, winnowing etc for long term storage of medicinal plant/parts) so that auction could be done as per convenience.

To develop minimum support price for medicinal plants/ parts to protect the farmers/ collectors to prevent financial exploitation & also to minimise middlemen activity.

It is necessary to identify and develop a network of legal business partners in the long run.

The Forest protection Committee (FPC) /Eco-development committee (EDC) need to be trained in the cultivation of important medicinal plants, its sustainable harvesting & post harvesting techniques, capacity building etc.

8.4.11. Medicinal plant Quantity assessment study –

A comprehensive effort has been taken by the Forest department for Medicinal plant Quantity assessment study to have a comprehensive data base on the medicinal plant resources available within thrust areas of the Forest with approximate quantity which subsequently will help to prevent the major threat for indiscriminate harvesting of medicinal plant resources by the illegal traders.

8.4.12. Augmenting medicinal plantations in the existing forest plantations-

It is necessary to augment medicinal plants in the existing forest plantation area by raising it as intercrops. Farmers are now being encouraged by the forest Department for cultivation of medicinal plants with assured buy back policy.

Similarly, in existing plantation inside forest FPC/EDC members are being encouraged to get short term benefit by raising medicinal plant as intercrop by utilising space in between of plant rows without affecting the growth of the existing plantation by suppressing weed growth as well.

CHAPTER-9

CONCLUSION

CONCLUSION – 9

The present floristic survey in the three MPCAs of terai and duars has recorded the occurrence of a rich spermatophytic flora that includes representations of primitive taxa like Cyatheaceae, Marattiaceae, Aristolochiaceae, Piperaceae, Lauraceae, Trochodendraceae, Annonaceae, Chloranthaceae, Magnoliaceae etc. in one hand and on other hand progressed taxa like Apiaceae, Araliaceae, Campanulaceae, Asteraceae. The three MPCAs are the storehouse for a good number of NTFP resources and most of which have high market potential and medicinal uses.

Over 35 percent of the resources of Himalayan hotspot are threatened due to various anthropogenic activities. Despite being the storehouse of medicinal and aromatic plants and the related traditional knowledge, their documentations especially of Terai and Duars region is still limited. Present study records 626 species of vascular plant species encompasses trees, shrubs, climbers, herbs, epiphytes and ferns. The most dominating family of three MCPAs were Fabaceae with 47 species followed by Asteraceae (31 species), Rubiaceae (25 species), Lamiaceae (23 species), Lauraceae, Acanthaceae, Malvaceae with same numbers of species (20 species).

Among the 626 recorded taxa, 537 indigenous species were found with an important medicinal role with different daily life activities. A good number of IUCN threatened taxa of trees, herbs and shrub were enlisted from all the three MPCAs and some important such species are *Piper peepuloides*, *Staria palmifolia* and *Curcuma caesia*, *Gloriosa superba*, *Asparagus racemosus*, *Codariocalyx motorius*, *Rauwolfia serpentina*, *Mucuna pruriens*, *Piper attenuatum*, *Drymaria cordata* and *Polycarpon prostratum* etc. Around 38 (34 %) of endemic species of monocot and dicot species were also listed and were that exclusively endemic to the Darjeeling foothills and adjoining area of Terai and Dooars region of West Bengal, like *Globba racemosa*, and other endemic elements such as *Carex filicina*, *C. decora*, *Amorphophallus napalensis*, *A. paeoniifolius*, *Calamus latifolius*, *C. erectus*, *C. mahanandensis*, *Zingiber rubens*, *Hedychium densiflorum*, *H. coccineum*, *Curcuma aromatica* etc.

The vegetation of Himalayas and its foothill region is highly affected with exotic taxa and some of them are quite aggressive in nature. The community structure for the vegetation of three MPCAs of terai and duars, were understood through the phytosociological investigation by nested quadrature samplings. Phytosociological analysis data for Frequency, Density, Abundance, IVI for tree layer, shrubs layer and herb layers (monsoon and Post monsoon) were determined and results showing quite significant and satisfactory. The

diversity, richness and concentration of dominance for the species of each MPCAs were also found satisfactory.

It is important for the conservation of biodiversity and prioritizing areas for conservation planning for achieving sustainability for arboreal spermatophyte diversity with rich and diverse plant communities. Although these MPCAs are confined to conserve the threatened medicinal plants but the non-medicinal plants were also required conservational attention. Not only the MPCAs but the entire belt of terai duars region is rich and diverse in medicinal flora including different category of threatened species. Among the 77 IUCN threatened species, 45 were Least Concern (*Cryptocarya amygdalina*, *Litsea laeta*, *Machilus duthiei*, *Knema erratica*, *Acorus calamus*, *Calamus tenuis*, *Smilax ovalifolia*, *Murdania japonica*, *Curculigo capitulatae*, *Gloriosa superba*, *Asparagus racemosus*, *Codariocalyx motorius*, *Rauwolfia serpentina*, *Mucuna pruriens* etc.), 12 species were Near Threatened (*Actinodaphne sikkimensis*, *Cinnamomum impressinervium*, *Areca triandra*, *Daemonorops jenkinsiana*, *Monochoria hastata*, *Bambusa balcooa*, *Phrynium pubinerve*, *Alpinia calcarata* etc.), 10 were Vulnerable species (*Microsorium punctatum*, *Fimbristylis aestivalis*, *Schoenoplectiella juccoides*, *Sccharum arundinaceum*, *Saccharum spontaneum*, *Sporobolus diander*, *Cissus repens*, *Duchesnea indica*, *Hoya parasitica* etc.), 7 were Endangered Species (*Beilschmiedia assamica*, *Leucaena leucocephala*, *Morus indica*, *Drymaria cordata*, *Polycarpon prostratum*, *Justicia diffusa* and *Centella asiatica*) and most importantly *Piper peepuloides*, *Staria palmifolia* and *Curcuma caesia* were recorded as Critically Endangered and these all threatened species along with other important medicinal plants need to be conserved.

MPCAs play a very important role in livelihood of various ethnic as well as local communities since long back and plant parts have been broadly used as medicine, food, fodder, house building material, fishing and religious purposes etc. Present survey records a great diversity of uses of trees, herbs and shrubs species and it were recorded that they collect plant parts for medicinal use and practice from studied area sustainably. The MPCAs of terai and duars are small patches with quite rich and diversified flora. Among the 626 recorded species, 537 indigenous species have an important direct medicinal role in treating various ailments. The forest department should select more such dense and diversified vegetation patches within the various conservatories as Medicinal Plant Conservation Area and that initiatives gives double layer protection to the wild indigenous species.

CHAPTER-10

REFERENCES

REFERENCE

- Angiosperm Phylogeny Group (2016), "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV", Botanical Journal of the Linnean Society, 181 (1): 1–20, doi:10.1111/boj.12385
- Anonymous. (1993). Annual report of M.S. Swaminathan Research Foundation, Centre for Research on Sustainable Agriculture and Rural development, Madras. 133–600.
- Anonymous. (2012). State Forest Report, West Bengal (2010 – 2011). Government of West Bengal, Directorate of Forests, Office of the Principal Chief Conservator of Forests and Head of Forests Force, Aranya Bhaban, Salt Lake, Kolkata, <http://westbengalforest.gov.in/ /SFR – 2010 – 2011.pdf>
- Anonymous. (2021). India state of Forest Report : West Bengal. Forest Survey of India. MoEF, Govt. of India. 501 – 509.
- Barik, S.K., Pandey, H.N., Tripathi, R.S. and Rao, P. (1992). Microenvironmental variability and species diversity in treefall gaps in a sub-tropical broadleaved forest. *Vegetatio.*, 103: 31–40.
- Basu S.K. (1991). *India: Palm utilization and conservation. In Palms for human needs in Asia.* D. Johnson ed. A.A. Balkema, Rotterdam.
- Basu S.K. (2012). Medicinal values of some semi wild and cultivated Palms. *Horticultural Bulletin*, 1: 3–6.
- Basu S.K. and Chakraverty R.K. (1994). *A Manual of Cultivated Palms in India.* Botanical Survey of India, Calcutta, Pp. 166.
- Basu S.K. and Mondal S. (2013). Observation on Genus *Licuala* Thunberg (Palmae, Arecaceae) in India. *Phytotaxonomy*, 13: 109–116.
- Basu, S. K., & Mondal, S. (2015). Local, medicinal and ethnic uses of some indigenous Palms. *Phytotaxonomy*, 15: 44 – 54.
- Biswas, B., Walker, S. and Varun, M. (2017). Web GIS based recognition and Mapping of Medicinal Plants: A Case Study of Agra (UP), India. *Plant Archives* 171(1): 8–20.
- Blanquet-Blanquet, J. (1932). *Plant Sociology: the Study of Plant Communities.* McGraw-Hill Book Company, New York, 439 pp.
- Brandis. D. (1906). *Indian trees.* Archibald Constable & Co. Ltd., 767 pp.
- BSI. (1997). *Flora of West Bengal.* Botanical Survey of India, Calcutta. Vol. 1, 485 pp.

- Champion, G.H. & Seth, S.K. (1968). *A revised survey of the forest types of India*. Govt. of India, New Delhi.
- Chase, M.W. and Reveal, J.L. (2009). A phylogenetic classification of the land plants to accompany APG III. *Bot. Jour. Linn., Soc.*, 161(2): 122–127.
- Chase, M.W., Christenhusz, M.J.M., Fay, M.F., Byng, J.W., Judd, W.S., Soltis, D.E., Mabberley, D.J., Sennikov, A.N., Soltis, P.S. and Stevens, P.F. (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Bot. Jour. Linn., Soc.*, 181(1): 1–20.
- Chatterjee, D. (1940). Studies on the endemic flora of India and Burma. *Jour. Royal Asiat. Soc. Beng. (Sci.)*, 5(3): 19 – 67.
- Chaurasia, O. P., Singh, B., & Sareen, S. K. (1999). Ethno-medicinal plants of Arctic Desert-Ladakh used in veterinary practices. *Journal of Economic and Taxonomic Botany*, 23(1), 161 – 166.
- Chopra, R.N., and Nayar, S. L. (1956). *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. 329 pp.
- Chowdhury, D. (2015). *Distribution and chemotaxonomy of some members of Lauraceae in Terai and Duars region of West Bengal*. Ph.D Thesis. University of North Bengal, India.
- Chowdhury, M. (2009). *Plant Diversity and Vegetation Structure in the Wetlands of Malda District of West Bengal, India*. Ph.D. Thesis. North Bengal University. India.
- Clacke, C.B. (1885). Botanic Notes from Darjeeling to Tonglo and Sundukphoo. *Jour. Linn. Soc. Bot.*, 21: 384 – 386.
- Cowan, A.M. and Cowan, J.M. (1929). *The Trees of Northern Bengal*. Bengal Secretariat Press, Calcutta. 178 pp.
- Das, A. P., Ghosh, Sarker, C. A., Biswas, R., Choudhury, D., Lama, A., Moktan, S., and Choudhury, A. (2010). Preliminary report on the Medicinal Plants from three MPCAs in Terai and Duars of West Bengal, India. *Pleione*. 4(1): 90 – 101.
- Don, D. (1823). An illustration of the natural family of plants called Melastomaceae. *Memoirs of the Wernerian. Nat. Hist. Soc.*, 4: 276–329.
- FRLHT. (2006). *Conservation and Adaptive Management of Medicinal Plants - A Participatory Model: Medicinal Plants Conservation Areas and Medicinal Plants Development Areas*. FRLHT, Bangalore, India. Pp.58.
- Ganesh, T., Ganesan, R., Devy, M.S., Davidar, P. and Bawa, K.S. (1996). Assessment of

- plant diversity at a mid-elevation evergreen forest of Kalakad-Mudanthurai Tiger Reserve, India. *Curr. Sci.*, 71: 379 – 392.
- Grierson, A.J.C. and Long, D.G. (1983, 84, 87). *Flora of Bhutan*. Vol. 1, parts 1, 2 & 3. Royal Botanic Garden, Edinburgh.
- Grierson, A.J.C. and Long, D.G. (1979). Notes relating to the flora of Bhutan. II. Notes Roy. Bot. Gard., 36: 139 – 150.
- Grierson, A.J.C. and Long, D.G. (1991, 1999, 2001). *Flora of Bhutan*, Vol. 2, Parts 1, 2 & 3. Royal Botanical Garden, Edinburgh.
- Griffith, W. (1847). *Journey of Travels in Assam, Burma, Bhotan, Afganistan and the Neighbouring Countries*. (ed. J. Mc Clelland). Calcutta.
- Hara, H. (1966). *Flora of Eastern Himalaya*. Tokyo University. Tokyo, 744 pp.
- Hara, H. (1966). *Flora of Eastern Himalaya*. Tokyo University. Tokyo, 744 pp. 2nd Report
- Hara, H. and Williams, L.H.J. (1979). *An Enumeration of the Flowering Plants of Nepal*. Vol. II. British Museum of Natural History, London, 154 pp.
- Hara, H., Chater, A.Q. and Williams, L.H.J. (1982). *An Enumeration of the Flowering Plants of Nepal*. Vol. III. British Museum of Natural History, London, 226 pp.
- Hara, H., Stearn, W.T. and Williams, L.H.J. (1978). *An Enumeration of the Flowering Plants of Nepal*. Vol. 1. British Museum of Natural History, London.
- Hooker, J.D. (1849). Notes, chiefly botanical, made during an excursion from Darjiling to Tonglo, a lofty mountain on the confines of Sikkim and Nepal. *Jour. Asia. Soc. Bengal.*, 18: 419 – 446.
- Hooker, J.D. (1854). *Himalayan journals or notes of a naturalist in Bengal, the Sikkim and Nepal Himalayas, the Khasia Mountains etc*. Vols. I & II, London.
- Hooker, J.D. (1872 – 97). *The Flora of British India*. Vols. 1 – 7. L. Reeve & Co Ltd, Ashford, Kent, London.
- Hooker, J.D. (1904). *A sketch of Flora of British India*. London.
- Hooker, J.D. (1907). The Indian Empire. *The Imperial Gazetteer of India* 1: 157 – 212.
- Jain, S.K. & Rao, R.R. (1977). *A Handbook of Field and Herbarium Methods*. Today & Tomorrow's Printers and Publishers, New Delhi. 150 pp.
- Jain, S.K. and Sastry, A.R.K. (1980). *Threatened plants of India: A state-of-the-art report*. Botanical Survey of India, Calcutta.
- Khan, M.L., Rai, J.P.N. and Tripathi, R.S. (1987). Population structure of some tree species in disturbed and protected subtropical forest of north east India. *Acta Oecologica*,

8: 247 – 255.

- Khare, C.P. (2004). *Encyclopedia of Indian Medicinal Plants*. Springer, Berlin.
- Kirtikar, K.R. and Basu, B.D. (1935). *Indian Medicinal Plants*, Vol. I. Lalit Mohan Publication, Allahabad.
- Konatowska, M., & Rutkowski, P. (2019). Phytosociology—A Useful Tool for the Assessment of Past and Future Human Impacts on Plants and Forest Ecosystems. *Journal of Biosciences and Medicines*, 7(11): 154 – 163.
- Malhotra, S.K. (1973). Studies on the limestone vegetation of Sahasradhara near Dehra Dun – Phytosociological studies: Importance Value Index. *Indian For.*, 99(2): 102 – 115.
- Mallick, D., Paul, P., Mondal, S., Pal, A., Dasgupta, S., and Chowdhury, M. (2020). Survey and Documentation of the Weed Flora in NBU Garden of Medicinal Plants. *NBU Journal of Plant sciences*. 12: 15 – 27.
- Mallick, D., Dasgupta, S., Paul, P., Mondal, S., Pal, A. and Chowdhury, M. (2021). Diversity of Arboreal Spermatophytes in three MPCAs of India: With Special Reference to West Bengal. *Indian Forester*, 147(12): 1039 – 1043.
- Manzur Kadir, A.K.M. (2001). *Ecology of subhimalayan herblands in Darjeeling with special emphasis on Streptocaulon sylvestre Wight - an endangered and endemic plant*. Ph.D. thesis, University of North Bengal, Siliguri.
- Margalef, R. (1968). Information theory of ecology. *Gen. Syst.*, 3: 36 – 71.
- Matuszkiewicz, W. (2002). *Przewodnik do oznaczania zbiorowisk roslinnych Polski*. PWN, Warszawa.
- Menhinick, E.F. (1964). A comparison of some species diversity indices applied to samples of fieldinsects. *Ecology*, 45: 858 – 868.
- Mishra, R. (1968). *Ecology workbook*. Oxford and I.B.H. Calcutta.
- Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & da Fonseca, G.A.B. (2005). *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. [accessed January, 2021]. <http://multimedia.conservation.org/cabs/online_pubs/hotspots2/cover.html>
- Monda, H., Cozzolino, V., Vinci, G., Drosos, M., Savy, D. Piccolo, A. (2018). Molecular composition of the Humeome extracted from different Green Composts and their Biostimulation on early growth of maize. *Plant Soil* 429: 407–424.

- Mondal, S., Basu, S.K. and Chowdhury, M. (2016). In vivo seed germination and seedling morphology of *Phoenix dactylifera* L. and *Phoenix sylvestris* (L.) Roxb. *NBU Journal of Plant Sciences*, 10(1): 45–48.
- Mondal, S., Chowdhury, A., Basu, S.K. and Chowdhury, M. (2017). Indigenous Method of ‘Sugar Cake’ (Patali) Production from *Borassus flabellifer* L. In West Bengal, India. *Plant Archives*, 17(1): 445–448.
- Mondal, S. and Chowdhury, M. (2018). Rattans diversity in West Bengal, India. *Advances in Plant Sciences*, 31(2): 159–165.
- Mondal S., Basu S.K. and Chowdhury, M. (2019). *Calamus pseudoerectus* (Arecaceae). a new species from the eastern Himalaya, India. *Journal of Threatened Taxa*, 11: 13605–13610.
- Mondal, S. (2020). *Taxonomy, phenology and ethnobotany of palms in West Bengal* (unpublished). Ph.D. Thesis. University of North Bengal.
- Mondal S., Basu S.K. and Chowdhury, M. (2020). A new species of *Calamus* (Arecaceae) from Eastern Himalaya, India. *Turczaninowia*. 23, 3: 92–98.
- Nayar, M.P. & Sastry, A.R.K. (1987, 1988 & 1990). *Red Data Book of Indian Plants*. Vols. 1 – 3. Botanical Survey of India. Calcutta.
- Noltie, H.J. (1994, 2000). *Flora of Bhutan*. Vol. 3, Parts 1 & 2. Royal Botanic Garden, Edinburgh.
- Ohashi, H. (1975). *The Flora of Eastern Himalaya*. 3rd Report, Tokyo University, Tokyo.
- Pandit, P.K., Ghosh, C. and Das, A.P. (2004). Non-Timber Forest Products of Jaldapara Wildlife Sanctuary. An assessment. *Indian For.*, 130 (10): 1169 – 1185.
- Paul, P., Dhar, S., Chowdhury, M., & Das, D. (2020). *Herbarium Technique: Evolution from Conventional to Digitization*. OrangeBooks Publication.
- Pearce, N.R. & Cribb, P.J. (2002). *Flora of Bhutan*. Vol. 3, Part 3. *The Orchids of Bhutan*. Royal Botanic Garden, Edinburgh.
- Phillips, E. A. (1959). *Methods of vegetation study*. Henry Hill and Co. Inc. New York.
- Prain, D. (1903). *Bengal plants*. Vol. 1 & 2. West, Newman and Co., London, 1088 – 1100.
- Rai, P.C. (2001). *Survey of the Flora of Neora Valley National Park in Darjeeling, West Bengal, India*. Ph.D. thesis. University of North Bengal, Siliguri.

- Rai, P.C., Sarkar, A., Bhujel, R.B. and Das, A.P. (1998). Ethnobotanical studies in some fringe areas of Sikkim and Darjeeling Himalayas. *Jour. Hill Res.* 11(1): 12 – 21.
- Rai, S. K., & Bhujel, R. B. (2012). Medicinal Plants of Darjeeling Himalayan Region. *Himalayan Research Journal*, 1(1).
- Rai, U. (2006). *Characterisation of plant biodiversity in Darjeeling Hills using Remote Sensing Technique*. Ph.D. thesis, University of North Bengal.
- Rao, P. (1992). *Ecology of gap phase regeneration in a subtropical broad-leaved climax forest of Meghalaya*. Ph.D Thesis (unpublished), North Eastern Hill University, Shillong.
- Rao, P., Barik, S.K., Pandey, H.N. and Tripathi, R.S. (1990). Community composition and tree population structure in a subtropical broad – leaved forest along disturbance gradient. *Vegitatio*, 88: 151 – 162.
- Rao, R.R. and Hajra, P.K. (1986). Floristic diversity of the eastern Himalaya in a conservation perspective. *Proc. Ind. Acad. Sci. Suppl.* Nov, 103 – 125.
- Rawat M.S., Shankar, R., Singh, V. K. (1998). Conservation and cultivation of some rare and threatened medicinal plants in Arunachal Pradesh. *Bull. Medico-Ethno Bot. Res.*, 19(3-4): 151 – 159.
- Saha, G., Biswas, R. and Das, A.P. (2013). Survey of medicinal plants in the Gorumara National Park, Jalpaiguri, West Bengal, India. *Pleione*, 7(1): 127 – 133.
- Sarkar, A. (2011). *Ethnobotanical Studies of Sub-Himalayan Duars in West Bengal and Assam with particular reference to the Tribe Mech*. Ph.D. Thesis, University of North Bengal, India.
- Sarkar, A. (2014). *Non-timber forest produces and their conservation in Buxa Tiger Reserve, West Bengal, India*. Ph.D. Thesis, University of North Bengal, India.
- Shannon, C.E. and Weaver, W. (1963). *Mathematical Theory of Communication*. University of Illinois Press, Illinois. USA. 111 pp.
- Shimwell, D. W. (1971). *The description and classification of vegetation*.
- Simpson, E.H. (1949). Measurement of Diversity. *Nature*, 163: 688.
- Singh, J. (1980). *Studies on structural and functional aspect of two subtropical humid forest types of Meghalaya*. Ph.D. Thesis (unpublished). North Eastern Hill University, Shillong.
- Singh, P. and Chauhan, A.S. (1998). An overview of plant diversity of Sikkim. In: S.C. Rai, R.C. Sundriyal and E. Sharma (eds.), *Sikkim perspectives for planning and*

development. Bishen Singh and Mahendra Pal Singh, Dehradun, India. Pp. 219–231.

- Somashekhar B. S. (2011). Biodiversity for Human Health. Theme paper presented at the National Conference on Biodiversity and Sustainable Development, 20–21st August 2011.
- Ved and Goraya, B. S. (2013). *Conservation of Medicinal Plants in Karnataka: Initiatives so far, Gaps and Challenges ahead*. 12 pp.
- Takhtajan, A. (1969). *Flowering Plants: Origin and dispersal*. Oliver and Boyd Ltd. Edinburg (English translation by C. Jeffery).
- Tiwari, B. K., and Rani, S., (2004). Edible Products from the Forest. *In Encyclopedia of Forest Sciences*, London: Elsevier Science, 541–550.
- Tripathi, N., Singh, R.S. (2013). Cultivation impacts soil microbial dynamics in dry tropical forest ecosystem in India. *Acta Ecologica Sinica*, 33: 344–353.
- Vandebroek, I, Reyes-Garcia, V., Albuquerque, U.P.d., Bussmann, R. & Pieroni, A. (2011). Local knowledge: who cares?. *Jour. Ethnobia. Ethnomed.*, 7: 1 – 7.
- Ved, D. K. and Goraya, G. S. (2008a). Demand and Supply of Medicinal Plants in India. Bishen Singh Mahendra Pal Singh, Dehradun & FRLHT, Bangalore.
- Ved, D.K. and Goraya, G.S. (2008b). Foundation for Revitalisation of Local Health Traditions. National Medicinal Plants Board, 143 – 144.
- Vatsavaya, S. R., Reddy, C. S., and Suthari, S., (2010). Flowering plant diversity and endemism in India: An overview. *Anu. J. Nat. Sci.*, 1(1): 27–39.
- Yonzon, R., Bhujel, R. B., & Rai, S. (2012). Genetic resources, current ecological status and altitude wise distribution of medicinal plants diversity of Darjeeling Himalaya of West Bengal, India. *Asian Pacific Journal of Tropical Biomedicine*, 2(1): 439 – 445.
- [http://bsi.gov.in/content/259_1_Inventorisation of Endangered Plant Species. Aspx](http://bsi.gov.in/content/259_1_Inventorisation_of_Endangered_Plant_Species.aspx)
- [http://bsi.gov.in/content/259_1_Inventorisation of Endangered Plant Species. Aspx](http://bsi.gov.in/content/259_1_Inventorisation_of_Endangered_Plant_Species.aspx)
- <http://www.census2011.co.in/district.php>
- http://www.efloras.org/flora_page.aspx?flora_id=2
- <http://www.hindustantimes.com/india/india-ranks-10th-in-world-in-plant-diversity/story-SKwpVETr40aJWr64lh81sO.html>
- <http://www.iucnredlist.org>

<http://www.iucnredlist.org/>

<https://www.powo.science.kew.org/>

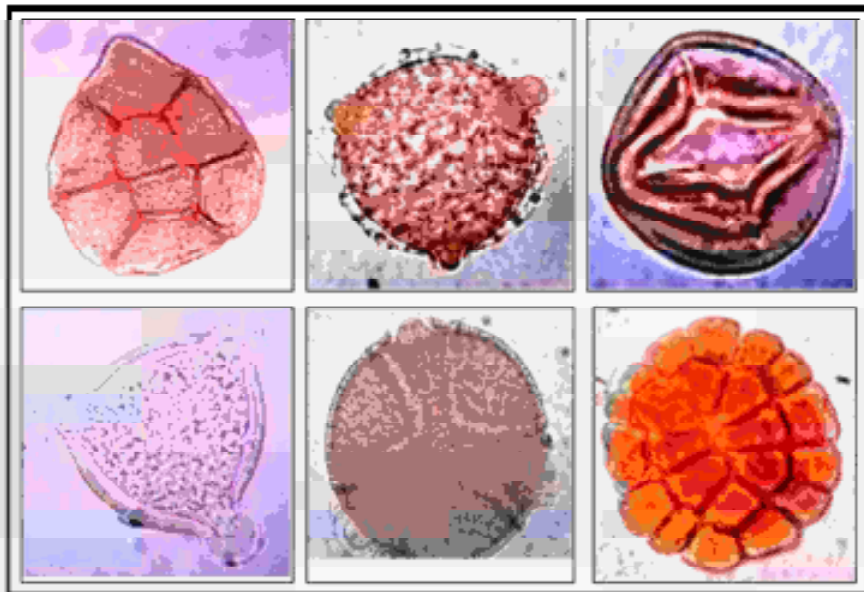
<http://www.theplantlist.org/>

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Survey and documentation of the Weed Flora in NBU Garden of Medicinal Plants

Debanshu Mallick^{1,2}, Payel Paul¹, Sujit Mondal¹, Aaratrik Pal¹, Subhajit Dasgupta¹,
Monoranjan Chowdhury^{1*}

¹Taxonomy of Angiosperms and Biosystematics Laboratory, Department of Botany,
University of North Bengal, Siliguri-734 013, Darjeeling, West Bengal, India.

²Chief Conservator of Forests, Research and Development, West Bengal, P-16, India
Exchange place Extension, New KIT Building, Third Floor, Kolkata – 700073

Abstract

Weeds are the plants with generally undesirable properties. They spread rapidly and competitively. When it grows in garden it reduces air flow in garden, keeping plants wetter and more prone to pathogens. They are unattractive and can cause health problems such as Hay fever, skin rashes, etc. It also affects quality of product and income of grower. Traditionally, weed control in India has been largely dependent on manual weeding. Understand weed ecology, biology and using information technology should be part of developing and disseminating effective, economical and ecologically advantageous in India. Some weeds release nitrogen from root nodules into soil which automatically add fertilizer into the soil. A survey was conducted in NBU Garden of Medicinal Plants in West Bengal to identify most common and prevalent weeds associated with medicinal plants. A total of 86 different weed species belong to 25 families were identified of which 53 annual and 32 perennial. Among the most abundant weed species are *Axonopus compressus*, *Eleusine indica*, *Cyperus rotundus*, *Cyperus haspan*, *Kylinga brevifolia*, *Melastoma malabathricum*, *Osbeckia nepalensis*, *Nicotiana plumbaginifolia*, *Persicaria orientalis*.

Keywords: Weeds, Soil erosion, Medicinal Plants, MPCA.

Introduction

A weed is a plant considered as undesirable in a particular situation, “a plant in the wrong places”. Taxonomically, the term weed has no botanical significance, because a plant that is a weed in one context is not a weed when growing in a situation where it is in fact wanted and where one species of plant is a valuable crop plant, another species in the same genus might be a serious weed such as a wild bramble growing among cultivated loganberries. Weeds not only reduce yield

by competing for available nutrients but harbor the pathogen which is harmful to the crops. They harbor rodents, insects, pests’ disease and provide ideal conditions for their shelter and proliferation.

There is general agreement about the necessity to remove weeds from cultivated stands of Medicinal plants, and almost all technical papers providing indications for cultivation clearly state that Medicinal plant fields must be kept weed free as much, and as long, as possible. DE la Fuente et al. (2003) demonstrated

*Corresponding author

Email Id- mono_malda@yahoo.co.in

that on biomass and seeds yield of coriander, especially under poor soil conditions, weeding had a greater effect than did fertilization. Furthermore, the absence of weeds from herbal products is mandatory in order to declare their high quality, irrespective whether they come from cultivation or wild collecting (FAH 2003). Yet, a surprisingly reduced number of works have been expressly addressed to the evaluation of the effects that weeds may exert on Medicinal Plants. Studies about this topic are scattered in the world literature, and very rarely the argument is treated in detail. Medicinal plants have the distinguishing property to be graded by the market according to their content in active components, i.e., the special metabolites that confer to them their medicinal properties. In many cases, these metabolites are synthesized by plants under environmental stress conditions; as competition with weeds is a special and often severe cause of stress, it should be argued that the best conditions for producing medicinal metabolites would be under weedy conditions.

The campus of NBU is quite rich itself with the record of over 700 plants. One *ex-situ* conservatory was established in the North Bengal University (NBU) campus in the year 1998. The garden was earlier named as “Garden of Medicinal Plants, NBU” and presently it is renamed as “*Centre for Aromatic and Medicinal Plant Garden*”. The Garden has been developed with this basic floristic background and that is why a good number of medicinal and aromatic plants are growing here naturally. The garden of medicinal and aromatic plants housing several species of plants that are brought from various parts like MPCAs of West Bengal, Western Ghats, Eastern Ghats, central and Gangetic

plains, North East India and various altitudinal ranges of entire Himalaya and successfully introduced time to time. It is spread over an area of 5 acre and is with well boundary. Different species of weeds which are growing in the garden along with the medicinal plant cause harmful effect to not only the garden plants but also to human health as well as cattle. Therefore, the present study was undertaken to investigate the distribution, severity and to understand the importance of the weed flora prevailing in the medicinal plant garden of University of North Bengal.

Materials and Methodology

Study area

The University of North Bengal was established by Act of the Legislature of West Bengal in 1962 and University Act was revised under West Bengal Act of XXV of 1981 and it came into force with effect from September 16, 1981. The campus occupies an area of about 330 acres 9 km outside Siliguri and Bagdogra Airport in the Terai region of Darjeeling district. The garden lies in 26°42'39" N latitude and 88°21'18" S longitude within Darjeeling District. A small river, Magurmari, is flowing through the campus and it divides campus in two halves. 10 small artificial ponds are also present in the Magurmari river valley. Another small river, Lachka on the Western border of the campus makes the main drainage system for the NBU campus. These two rivers are rain-fed and remain almost dry during the dry seasons. The NBU Campus has mixed deciduous type of forest, dominated by Sal, Litsea, Jarul, Sisso, Teak, Palash, Sirish etc. Sal Kunja is a largest and

natural left over forest patch inside the campus, apart from this several small patches of Rubber plantation, tea plantation and several more patches of plantation areas and/or social forestry makes the campus quiet green and clean. The central part of the campus area is covered with savanna type of grassland vegetation, dominated with two species of tall grasses, namely *Cymbopogon pendulus* and *Saccurum spontaneum*. The river valleys are covered with many species of grasses, ferns and other herbaceous flora.

Methodology

Regular surveys were carried out to determine the present status of the weed flora of the garden. Photographs of the plants in their vegetative and reproductive conditions were taken. The specimens were identified with the help of various literatures (Hooker 1872 - 1897; Prain, 1903; Hara, 1966; Ohashi, 1975; Hara et al., 1978, 1979, 1982; Grierson & Long, 1983, 1984, 1987, 1991, 1999, 2001; Noltie, 1994, 2000). For correct nomenclature and family delimitation reliable websites (www.theplantlist.org and www.ipni.org) were principally

consulted. For RET (Rare, Endangered and Threatened) status elements Red Data Book for Indian Flora (Nayar and Sastry, 1987, 1990) and the IUCN red list (version 14; 2019) was followed.

Result and Discussion

A total of 86 different weed species representing 53 annuals and 32 perennials, comprising 8 grasses, 4 sedges and 4 broadleaved weeds were identified (Table 1). The annual species was greater in number than perennial species and overall annual grasses were more prevalent than perennial grasses due to lack of satisfactory control measure either cultural or herbicide application. The weed species represented 25 families from surveyed area. Among which Asteraceae family had the highest number of weed species (11), followed by Poaceae (8) Commelinaceae (6), Scrophulariaceae (6), Amaranthaceae (5), Euphorbiaceae (5), Polygonaceae (5), Acanthaceae (4), Cyperaceae (4), Solanaceae (4), Fabaceae (4), Lamiaceae (3), Lythraceae (2), Urticaceae (2), Onagraceae (2). Rests of the families were represented by one species each (Table 1).

Table 1. List of weeds of the NBU Garden of Medicinal Plants. [C= Common, R= Rare, VC= Very Common]

Species	Family	Flowering & fruiting	Distribution	Abundance	Uses
<i>Hygrophila phlomidodes</i> Nees	Acanthaceae	October	SW Asia	-	-
<i>Hygrophila polysperma</i> (Roxb.) T.	Acanthaceae	May - December	India	-	-

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<i>Hygrophila ringens</i> (L.) R. Br. ex Spreng.	Acanthaceae	May - December	SW Asia	-	-
<i>Phaulopsis imbricata</i> (Forssk.) Sweet	Acanthaceae	November - March	Tropics	-	-
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	September - February	Asia	-	as vegetables
<i>Alternanthera paronychioides</i> A.St.-Hil.	Amaranthaceae	January - December	Native to tropical America	R	-
<i>Amaranthus blitum</i> subsp. <i>oleraceus</i> (L.) Costea	Amaranthaceae	June - December	Pantropical	VC	as vegetables
<i>Amaranthus spinosus</i> L.	Amaranthaceae	May - December	Pantropical	C	as vegetables
<i>Amaranthus viridis</i> L.	Amaranthaceae	April - June	Pantropical	VC	as vegetables
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	April - August	-	C	taken locally to cure Dysentery
<i>Acmella calva</i> (DC.) R.K.Jansen	Asteraceae	May - December	SW Asia	C	-
<i>Ageratum houstonianum</i> Mill.	Asteraceae	Throughout the year	Naturalized in India	C	-
<i>Ageratum conyzoides</i> (L.)L.	Asteraceae	Throughout the year	Naturalized in India	C	-
<i>Bidens pilosa</i> L.	Asteraceae	Throughout the year	SW Asia	C	-

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<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	Asteraceae	July - December	SW Asia	C	-
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Asteraceae	April - December	Naturalized in India	C	-
<i>Emilia sonchifolia</i> (L.) DC. ex DC.	Asteraceae	Throughout the year	SW Asia	C	-
<i>Mikania micrantha</i> Kunth	Asteraceae	Throughout the year	Naturalized in India	VC	-
<i>Cyanthillium cinereum</i> (L.) H.Rob.	Asteraceae	Throughout the year	SW Asia	C	-
<i>Tridax procumbens</i> L.	Asteraceae	November - March	Pantropical	C	-
<i>Youngia japonica</i> (L.) DC.	Asteraceae	April - October	SW Asia	C	-
<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	July – February	Subtropics	C	as vegetables
<i>Cleome rutidosperma</i> D C.	Caparridaceae	July - February	Asia, Africa, America, Australia	-	-
<i>Cleome viscosa</i> L.	Caparridaceae	July - February	Asia, Africa, America, Australia	-	-
<i>Chenopodium album</i> L.	Chenopodiaceae	October - February	Cosmopolitan	-	as vegetables
<i>Amischotholype hookeri</i> (Hassk.) H.Hara	Commelinaceae	June - July	SW Asia	-	-
<i>Commelina diffusa</i> N. L. Burman	Commelinaceae	May - November	Tropics	C	-
<i>Commelina suffruticosa</i>	Commelinaceae	May - December	SW Asia	-	-

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Blume						
<i>Commelina benghalensis</i> L.	Commelinaceae	May - December	Tropics	C	-	
<i>Cyanotis vaga</i> (Lour.) Schult. & Schult.f.	Commelinaceae	July - October	SW Asia	-	-	
<i>Murdannia nudiflora</i> (L.) Brenan	Commelinaceae	January - October	SW Asia	-	-	
<i>Bulbostylis densa</i> (Wall.) Hand.-Mazz.	Cyperaceae	April - December	Tropics & sub-tropics	C	-	
<i>Cyperus rotundus</i> L.	Cyperaceae	Throughout the year	Cosmopolitan	C	-	
<i>Cyperus haspan</i> L.	Cyperaceae	June - September	Cosmopolitan	C	-	
<i>Kylinga brevifolia</i> Rottb.	Cyperaceae	Throughout the year	Tropics	C	-	
<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Throughout the year	Pantropical	VC	-	
<i>Euphorbia hirta</i> L.	Euphorbiaceae	July - September	Pantropical	Sparce	-	
<i>Phyllanthus urinaria</i> L.	Euphorbiaceae	April - November	Pantropical	C	-	
<i>Phyllanthus fraterons</i> G.L.W ebster	Euphorbiaceae	June - September	Pantropical	C	-	
<i>Ricinus communis</i> L.	Euphorbiaceae	June - September	Pantropical	C	-	
<i>Sauropus quadrangularis</i> (Willd.) Müll.Arg.	Euphorbiaceae	Throughout the year	Pantropical	R	-	
<i>Desmodium gangeticum</i> (L.) DC.	Fabaceae	April - November	Asia	-	-	
<i>Desmodium trifolium</i> (L.)	Fabaceae	January - February	Asia	-	-	

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DC.						
<i>Mimosa pudica</i> L.	Fabaceae	March - November	Naturalized in India	-	-	
<i>Mimosa diplotricha</i> Wright ex Sauvalle	Fabaceae	May - December	Native to tropical America	-	-	
<i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	August - November	Asia	-	-	
<i>Hyptis brevipes</i> Poit.	Lamiaceae	May - December	Tropics	-	-	
<i>Leucas zeylanica</i> (L.) W.T.Aiton	Lamiaceae	August - February	SW Asia	-	-	
<i>Ammannia baccifera</i> L.	Lythraceae	August - December	Asia, Africa	-	-	
<i>Rotala rotundifolia</i> (Bu ch.-Ham. ex Roxb.) Koehne	Lythraceae	November - January	Asia	-	-	
<i>Sida acuta</i> Burm.f.	Malvaceae	July - April	Asia	-	-	
<i>Sida rhombifolia</i> L.	Malvaceae	July - April	Asia	-	-	
<i>Marsilea minuta</i> L.	Marsileaceae	January - April	Asia, Africa	C		as vegetab les
<i>Osbeckia nepalensis</i> Hook .f.	Melastomataceae	August - December	Asia	-	-	
<i>Melastoma malabathricum</i> L.	Melastomataceae	Throughout the year	Tropics	-	-	
<i>Glinus oppositifolius</i> (L) Aug. DC.	Molluginaceae	March - July	Africa, Asia, Australia	C		-
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	Onagraceae	May - December	India	-	-	

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<i>Ludwigia perennis</i> L.	Onagraceae	July - November	Asia	-	-
<i>Axonopus compressus</i> (Sw.) P.Beauv.	Poaceae	August - December	Native to tropical America	VC	-
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Poaceae	June - October	Asia to Pacific	C	-
<i>Cynodon dactylon</i> (L.) Persoon	Poaceae	July - November	Tropics	VC	-
<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae	May - October	Tropics & sub-tropics	C	-
<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	June - October	Tropics & sub-tropics	C	-
<i>Imperata cylindrica</i> (L.) P.Beauv.	Poaceae	April - August	Tropics	C	-
<i>Panicum humile</i> Steud.	Poaceae	August - December	Tropics & sub-tropics	C	-
<i>Panicum repens</i> L.	Poaceae	January - December	Tropics & sub-tropics	C	-
<i>Persicaria hydropiper</i> (L.) Spach	Polygonaceae	May - August	-	Sparce	-
<i>Persicaria orientalis</i> (L.) Assenov	Polygonaceae	July - September	Pantropical	C	-
<i>Parsicaria tenella</i> (Blume) Hara	Polygonaceae	May - September	Pantropical	C	-
<i>Rumex dentatus</i> L.	Polygonaceae	April - October	India	-	-
<i>Rumex maritimus</i> L.	Polygonaceae	April - October	India	-	-
<i>Portulaca oleracea</i> L.	Portulacaceae	January - December	Pantropical	C	-
<i>Mitracarpus verticillatus</i> (Sc hum. & Thorn.)	Rubiaceae	January - December	Tropics	C	-

Vatke						
<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	August - November	SW Asia	-	-	
<i>Limnophila heterophylla</i> (Roxb.) Buchanan & Hamilton	Scrophulariaceae	August - November	SW Asia	-	-	
<i>Torenia crustacea</i> (L.) Cham. & Schltdl.	Scrophulariaceae	August - May	SW Asia	-	-	
<i>Bonnaya antipoda</i> (L.) Druce	Scrophulariaceae	August - May	Tropics	-	-	
<i>Mazus pumilis</i> (Burm.f.) Steenis	Scrophulariaceae	April - October	Asia	-	-	
<i>Scoparia dulcis</i> L.	Scrophulariaceae	June - May	Asia	-	-	
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	March - November	India	C	-	
<i>Physalis angulata</i> L.	Solanaceae	April - January	SW Asia	-	-	
<i>Solanum nigrum</i> L.	Solanaceae	November - March	SW Asia	-	-	
<i>Solanum sisymbriifolium</i> Lam.	Solanaceae	January - December	Asia, Africa, America, Australia	-	-	
<i>Gonostegia triandra</i> (Blume) Miq.	Urticaceae	January - September	Asia, Australia	C	-	
<i>Pouzolzia zeylanica</i> (L.) Benn.	Urticaceae	September - April	Asia	C	-	
<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	January - December	Pantropical	-	-	



A. *Ageratum conyzoides* **B.** *Bacopa monnieri* **C.** *Chenopodium album* **D.** *Crassocephalum crepidioides* **E.** *Leucas indica* **F.** *Osbeckia nepalensis* **G.** *Sida acuta* **H.** *Physalis minima*
I. *Solanum nigrum* **J.** *Solanum sisymbriifolium*

Conclusion

Weeds are unwanted to human controlled setting. While the weed is generally has a negative connection to the other plants. But most of the weeds are not dangerous, they gives economic and medicinal use also. Weeds are socially benefitted plants. They give beneficial properties and most of the collected species gives more medicinal used for curing diseases. Some beneficial aspects of weeds and are used as edible purpose such as their parts like leaves, roots, fruits, may be used for making medicine. Some weeds attract insects, which may protect other plants from harmful pests. Weeds may also act as 'living mulch' i.e. providing ground cover that reduces moisture loss and prevents erosion. Weeds may also improve soil fertility.

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Reference

- de la Fuente EB, Gil A, Lenardis AE, López Pereira M, Suárez SA, Ghersa CM, Yaber Grass M., 2003. Response of winter crops differing in grain yield and essential oil production to some agronomic practices and environmental gradient in the Rolling Pampa, Argentina. *Agric Ecosyst Environ* 99:159–169.
- FAH—Forschungsvereinigung der Arzneimittel-Hersteller e.V., 2003. Standard operating procedures for inspecting cultivated and wild crafted medicinal plants. *J Herbs Spices Med Plants* 10 (3):109–125.
- Grierson, A.J.C., Long, D.G., 1983, 1994, 1987. *Flora of Bhutan*. Vol. 1, Parts 1, 2 & 3. Royal Botanical Garden, Edinburgh.
- Grierson, A.J.C., Long, D.G., 1991, 1999, 2001. *Flora of Bhutan*, Vol. 2, Parts 1, 2 & 3. Royal Botanical Garden, Edinburgh.
- Hara, H., 1966. *Flora of Eastern Himalaya*. Tokyo University, Tokyo.
- Hara, H., Chater, A.Q., Williams, L.H.J., 1982. *An Enumeration of the Flowering Plants of Nepal*. Vol. III. British Museum of Natural History, London.
- Hara, H., Stearn, W.T., Williams, L.H.J., 1978. *An Enumeration of the Flowering Plants of Nepal*. Vol. 1. British Museum of Natural History, London.
- Hara, H., Williams, L.H.J., 1979. *An Enumeration of the Flowering Plants of Nepal*. Vol. II. British Museum of Natural History, London.
- Hooker, J.D., 1872 - 1897. *The Flora of British India*, Vols 1-7. L. Reeve & Co. Ltd., Ashford, Kent, London.
- Nayar, M.P., Sastry, A.R.K., 1987. 1990. *Red Data Book of Indian Plants*, Vol. 1 & 3. Botanical Survey of India, Calcutta, India.
- Noltie, H.J., 1994. 2000. *Flora of Bhutan* Vol. 3 Parts 1 & 2. Royal Botanical Garden, Edinburgh.
- Ohashi, H., 1975. *The Flora of Eastern Himalaya*, 3rd Report, Tokyo University, Tokyo.
- Prain, D., 1903. *Bengal Plants*. Vol. I & II. West, Newman & Co., London.

Diversity of Arboreal Spermatophytes in three MPCAs of India: With Special Reference to West Bengal

Medicinal Plant Conservation Areas (MPCAs) are the patches in protected forests with rich indigenous medicinal plant species. Arboreal spermatophyte heterogeneity and floristic arrangement of three Medicinal Plant Conservation Area (MPCAs) of West Bengal were assessed with an aim to acquire a baseline data assumption for medicinally important trees and their proper in situ conservation strategies for the floristically affluent ecosystem. The study was made during the period of 2014-2020 by following standard sampling method and by random quadrates. It was observed that study areas are quite enriched with about 164 trees species representing 52 families and maximum species are found to be used to treat various ailments in Indian system of medicines. Various diversity indices were calculated to understand the community structure for the tree layer and it was found quite significant. These quantitative measures pointed the diversity of the arboreal spermatophytes of the study area in its structure, composition, function and vegetation dynamics. The present study also highlights various types of anthropogenic intervention, including NTFPs (Non Timber Forest Products) collection and artificial forest-fire causing dangerous threats for the maintenance of its original vegetation and survival of numerous threatened and endangered species in all the strata of the vegetation.

Key words: Arboreal Spermatophyte, Indices, IUCN, MPCAs, NTFPs.

Introduction

Forests are captious habitats for arboreal spermatophytes and they are necessary for the provision of a wide range of ecological services that are important to mankind. The diversity of plants existing in a specific region during a particular period of time is referred to as floral diversity. The floral diversity of India is mainly concentrated in four areas viz. - Western Ghats, Himalayas, Andaman and Nicobar Islands and North-East India. Of the total recorded species in the world, India's flora is estimated to be 11.4% out of which 28% are considered to be endemic. In India, Angiosperms are the largest plant group comprising 38.15% that followed by fungi constitute 31.38% of floral diversity of the entire country. As per reports, 12% of global floral diversity is represented in India (Olson *et al.*, 2001; Olson and Dinerstein, 2002). Their significance is measured by the total number of wild crop related species in various climatic regions of India.

The medicinal plants form an integral part of the biodiversity. Their contribution and therapeutic values to the forestry sector has been realized lately. Forests and wild habitats are home to around 85% of wild medicinal plant diversity of India. According to Ved and Goraya (2008) 82% of high consumption botanicals (>100 MT per annum) in trade originates from wild sources. This fact arouses concern about the medicinal plant resources in the forests. The tropical forests, which has been the homeland for plant and animal diversity already been by about 50%. The annual rate of the disappearance of forest cover in India is estimated to be 1.5 m ha/yr.

Evaluating the sustainable uses of medicinally valuable wild arboreal spermatophytes, their threat status and conservation strategies of the Sub-Himalayan MPCAs of West Bengal, India.

**DEBANSHU MALLICK^{1,2},
SUBHAJIT DASGUPTA², PAYEL PAUL²,
SUJIT MONDAL², AARATRIK PAL²,
AND MONORANJAN CHOWDHURY^{2*}**
*E-mail: mchowdhury@nbu.ac.in

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¹Chief Conservator of Forests, Hill Circle, Shankar Villa, Landela Road, Darjeeling -734101, West Bengal, India.

²Taxonomy of Angiosperms and Biosystematics Laboratory, Department of Botany, University of North Bengal, Siliguri-734 013, Darjeeling, West Bengal, India.

Foundation for Revitalization of Local Health Traditions (FRLHT) initiated exercises for fast threat assessment based on IUCN Red List Categories and Criteria. Based on this methodology, the threatened species were recognized and their threat status was assessed in 17 different states of the country. As a consequence, India's "First list of threatened species of medicinal plants" came into being holding a record of 326 threatened species of medicinal plants along with their assigned threat status. At present, this conservation model has been made possible and formulated in the form of MPCAs (Medicinal Plants Conservation Areas). The term MPCAs refers to a patch of natural conservatories with rich diversity of medicinal plants for their conservation and sustainable uses for future need research and uses. These are an *in-situ* practices where the conventional forest practices are minimized, thereby allowing the medicinal plant populations to be flourished. This sound initiative was first established in South India in 1993. Along with the joint collaboration of the state forest departments of Karnataka, Kerala and Tamil Nadu, FRLHT facilitated the recognition of MPCA's in 34 forest sites across South India from 1993 to 2004. After that 112 MPCA's were developed with conservatories across the country based on criteria like area with varied diversity of vegetation with proven medicinal value, relatively undisturbed, reasonable accessibility, traditionally known for its medicinal plant richness and area is under legal protection.

There are very few studies were made on the different MPCAs (Das *et al.*, 2010; Pramanik and Das, 2015), while its forests with arboreal spermatophyte diversity have still been unexplored. The selected three MPCAs in Terai and Duars *viz.* North Sevoke, North Rajabhatkhawa (NRVK) and Sursuti are very much enriched with large population of economically important arboreal spermatophytes. Systematic and detailed structural and functional study of these vegetations are required for their sustainable management. The present study was thus an attempt to document the baseline information on the floristic diversity of the trees in various vegetation patches in the MPCAs for their overall sustainable management and conservation.

Material and Methods

Study area

The Northern alluvial plains of West Bengal at the foothills of Eastern Himalayas are coined as Terai and Duars. The forest regions of this area are highly rich with various biological entities. Owing to the vast variation in habitat structure, this region has been a home of several rare and threatened species. Regarded as a part of the Himalayan Hotspot region of the world, the forests are of mixed-deciduous type with mono or mixed plantations including shrubby scrubs, savannah, herblands etc. Among the three MPCAs (Fig. 1), the North Sevoke lies within the "Mahananda Wildlife Sanctuary" in between the latitudes of 26°37'27"N and longitudes of 88°12'88.34"E and which was located at the southern

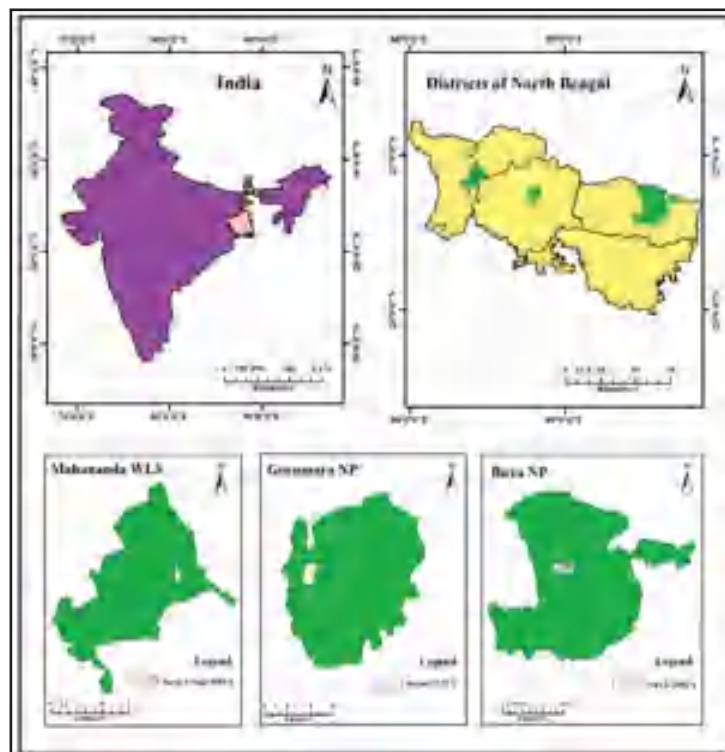


Fig. 1: Map showing the territory of tree MPCAs in India

part of Darjeeling district on the right bank of river Tista. On left bank of River Tista, the NRVK lies (Buxa NP) between latitudes 26°41'21"N and longitude 89°33'19"E and Sursuti (Gorumara NP) lies in between latitude 26°48'09"N and longitudes 88°49'17"E (Table 1).

The soil of study site was mainly alluvial and older alluvial consisting of boulders pebbles, sand beds with huge humus deposition. The main rocks are mainly represented by slates, phyllite, quartzite, banded haematite, dolomite, quartz, mica, graphite and schists. The average day temperature varies from 12° C to 32° C and highest recorded temperature was 39°C and the lowest was 2° C (Chowdhury, 2015).

Methodology

A vast methodology was carried out to perform the entire work. All the tree species were collected by random survey and understanding the community structure quadrates were plotted in different years on random basis for all MPCAs. With the help of wooden pegs, all the quadrates were properly demarcated in all the four corners of the quadrate. Total 64 quadrates of 20m x 20m were marked for trees (Misra, 1966; Rai, 2006). The voucher specimens were processed through entire conventional herbarium techniques (Jain and Rao, 1977; Paul *et al.*, 2020) and then deposited in the NBU herbarium [NBU]. The specimens were identified with the help of various literatures (Hooker, 1872-1897; Prain, 1903; Hara, 1966, 1971, Ohashi, 1975; Hara *et al.*, 1978, 1979, 1982; Grierson and Long, 1983, 1984, 1987, 1991, 1999, 2001; Noltie, 1994, 2000). For correct nomenclature and family delimitation www.theplantlist.org and www.ipni.org were principally consulted. For RET (Rare, Endangered and Threatened) status elements Red Data Book for Indian Flora (Nayar and Sastry, 1987, 1988, 1990) and the IUCN red list, version 14; 2019) was followed.

Tree diversity indices are arithmetical measures to estimate the community structure and number of species in a community. They are instrumental in the observation of diversity in a region. Five selected diversity indices such as Simpson index, Shannon-Wiener index Menhinick Index, Margalef Index, and species evenness index were used to understand the

arboreal spermatophytes diversity in various vegetation patches. The formulae for each index are as follows:-

Simpson Index (λ) as suggested by Simpson (1949) to measure concentration of dominance.

$$\lambda = 1 - \frac{\sum NI (NI - 1)}{\sum NI (\sum NI - 1)}$$

Where, ' NI ' is the number of individuals of species

Shannon-Wiener Index (H') as suggested by Shannon-Weiner (1963) to measure species diversity.

$$H' = NI (NI - 1) \times \log^{NI}/\sum NI$$

Where, ' NI ' is the number of individual of species.

Menhinick Indices (D) as suggested by Menhinick, 1964 to measure species diversity.

$$D = \frac{s}{\sqrt{\sum NI}}$$

Where, ' NI ' is the number of individuals of species; ' S ' is the total number of species observed.

Margalef Index (RI) as suggested by Margalef, 1968 to measure species diversity.

$$RI = \frac{s-1}{\sum \log NI}$$

Where, ' NI ' is the number of individuals of species; ' S ' is the total number of species observed.

Pielou's evenness Index (J') as suggested by Pielou, 1966 to measure the closeness of species in a habitat.

$$J' = \frac{NI (NI-1) \times \log^{NI}/_N}{\log S}$$

Where, ' NI ' is the number of individuals of species; ' S ' is the total number of species observed; ' N ' is the total number of individuals of species.

Result

Sub-Himalayan terai and duars of West Bengal houses seven conservatories with very rich biodiversity and good number of medicinal plant species. Three such conservatories like Mahananda WLS, Buxa NP and Gorumara NP are qualify for selecting and conserving some of their part as MPCAs. The selected patches of all

Table 1: Detailed profiling of studied three different MPCAs

	North Sevoke	Sursurti	NRVK
Beat	Sevoke beat	Barodighi beat	Buxa road beat
Ranges	10th mile Range	Lataguri Forest Range	Buxaduar Range
Protected Area	Mahananda WLS	Gorumara NP	Buxa NP
Sub-division	Kurseong	Rangpur	Alipurduar
District	Darjeeling	Jalpaiguri	Alipurduar
Area (Ha)	379.59	343.18	400
Forest	Dry mixed forest	Moist Sub Tropical Evergreen Forest	Mixed Deciduous Forest
Forest Villages nearby	10 th Mile Forest, Sevoke Bazar, Chamakdangi, Toribari Singhijhora	Bichabhanga, Sursuti, Baradighi, Bamni	28th Mile, 29th Mile
Drainage system	Tista, Mahanadi, Gulma khola, Nandi khola	Chel, Neora, Mal Bamoni Jhora, Sursuti Jhora, Monpala Jhora	Dima, Jainty, Bala, Buxa Jhora, Guenala, Hatinala

these MPCAs are quite rich and significant in view of medicinally valuable species.

Arboreal spermatophytic flora

The tree layer is the most permanent strata with significant species diversity and valuable medicinal uses. A total of 164 taxa were recorded from different vegetation patches of the studied MPCAs (North Sevoke, NRVK and Sursuti). All the recorded taxa were tabulated (Table 2) accompanied by family, habit, life span, fertile time, availability status, bio-geography and their ethnic uses. In the present study it was found that most dominating family of three MCPAs is Leguminosae represented by 14 species and 8 genera, followed by Lauraceae (12 spp.), Meliaceae (11 spp.), Moraceae (10 spp.), Euphorbiaceae, Lamiaceae, Phyllanthaceae and Rutaceae with 8 spp. each etc. 25 families were delineated by single genera with solitary species etc. Among monocotyledons only two taxa were reported from Pandanaceae and Arecaceae. Different categories of threats include Near Threatened, Vulnerable, Least Concern, Data Deficient and Not Evaluated (Fig. 2) were enlisted.

Sustainable ethnic uses

A large number of tribal and/or ethnic communities such as Rava, Mech, Garo, Toto, Santhal, Oraon, Munda are inhabiting in various remote forest villages surrounding the studied conservatories. About 132 species of trees were found to be used as folk medicines (Table 2). Various anthropogenic actions are responsible for the devastation and fragmentation of tree flora and facilitating the invasion of exotic species. Excessive growth of some species of shrubs was recognized as intimidation to not only the flora and vegetation of concerned MPCAs but also the entire Terai-Duars region.

Non timber forest products

Socio-cultural environment took birth within the human society for its own survival and development (Vandbroek *et al.*, 2011). Apart from timber, forests and different other types of vegetation are the storehouses for wide array of non timber forest produces. People of forest villages and of nearby areas regularly harvest twigs/leaves/fruits/flowers/rhizomes/tubers etc from wild vegetation and put on self for the urban people. During present survey for traditional uses of local plant was conducted in different forest villages and markets like Lataguri market, Chalsa Bazaar, Teesta Bazaar etc taking help of many local people including collectors and traditional medical practitioners. A total of 164 species of useful plants has been recorded of which various parts were use as NTFPs that includes parts of 132 medicinal plants, fruits and tender shoot of 29 species as edible, parts of 19 sp have religious value, 47 sp used as ornamental, leaves of 3 sp as fodder, 21 sp for fuel and bark and leaves of 8 sp as spices (Fig. 3).

Arboreal diversity

The present study also conducted quadrat to understand the community study and various diversity indices were calculated and presented in Fig. 4. In North Sevoke, for measuring concentration of dominance of species, Simpson index was 0.98 whereas for measuring species diversity Shannon-Wiener Index was recorded to be 1.78. Arboreal spermatophyte diversity was calculated through Menhenick (3.76) and Margalef (1.63) indices. Pielou's evenness index was found to be 0.95 (Fig. 4). In Sursuti, for measuring concentration of dominance Simpson index was 0.99 whereas for measuring species diversity, Shannon-Wiener Index was recorded to be 1.76. Arboreal spermatophyte richness was calculated through Menhenick (3.49) and Margalef (1.49) indices. The evenness of distribution of different species is higher in Sursuti MPCA as the evenness index is highest (0.96). On the other hand NRVK shows lowest species diversity as Shannon-Wiener Index was recorded to be 0.04 whereas concentration of dominance (0.95) was almost similar to those of the other MPCAs. Species richness was calculated by Menhenick (3.27) and Margalef (1.5) indices. The evenness of distribution of different species is lowest in NRVK as the evenness index is highest (0.02).

Discussion

Over 35 per cent of the resources of Himalayan hotspot are threatened due to various anthropogenic activities. Despite being the store house of medicinal and aromatic plants and the related traditional knowledge, their documentations especially of Terai and Duars region is still very less explored. Hence, present work was initiated to attempt for the documentation of medicinally important tree species and their uses in the traditional system of medicine. Being a part of Himalaya Biodiversity Hotspot, MPCAs may be considered as pool of a vast number of threatened taxa. After the comprehensive floristic survey, it was noted that the studied MPCAs are housing enormously rich arboreal spermatophytic flora. The reason for sustainment of enormous richness in floral diversity within the forest is being the natural habitation areas and suitable climate of Terai and Duars foothills. The investigation of the flora discovered that there are numerous tropical, subtropical and even temperate elements those are common with the East Himalayan region. The beels, jhoras, other low-laying areas, scrubs, forests etc. provided tremendous variety of habitats and that is echolike in the profuseness of the flora. The detailed analysis of the total spermatophytic flora of the forest shows that dicotyledons have much dominance over the monocotyledons. During present survey the conservation status of trees was determined under different threatened categories of IUCN (2020) *i.e* Not Evaluated (NE), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Data Deficient (DD) etc. The

Table 2: Recorded arboreal taxa from three Indian MPCAs [Abbreviation used LC = Least Concern; NE = Not Evaluated; VU = Vulnerable; NT= Near Threatened; DD = Data Deficient; NR = Not recorded; Uk = Unknown]

Family	Name of Plants [Vernacular name]	Field No	Status	Used against
Actinidiaceae	<i>Saurauia roxburghii</i> Wall. [Gagun]	MPCA2490	LC	Piles & hepatitis B
Adoxaceae	<i>Viburnum colebrookeanum</i> Wall. ex DC. [Uk]	MPCA2706	LC	NR
Anacardiaceae	<i>Drimycarpus racemosus</i> (Roxb.) Hook. f. ex Marchand [Uk]	MPCA407	NE	Skin diseases
	<i>Lannea coromandelica</i> (Hout.) Mer. [Jiol]	MPCA4461	NE	Dysentery & dyspepsia
	<i>Mangifera sylvatica</i> Roxb. [Jangli Aam]	MPCA440	LC	Syphilis, stomatitis & diphtheria
	<i>Sorindeia madagascariensis</i> Thouars ex DC [Uk]	MPCA2413	NE	Tuberculosis & malaria
Annonaceae	<i>Artabotrys caudatus</i> Wall. ex Hook. f. & Thomson [Uk]	MPCA111	NE	NR
	<i>Desmos dumosus</i> (Roxb.) Saff. [Uk]	MPCA3858	NE	NR
	<i>Milusa roxburghiana</i> Hook. f. & Thomson [Kali lahara]	MPCA560	NE	Headache
	<i>Polyalthia simiarum</i> (Buch.-Ham. ex Hook. f. & Thomson) Benth. ex Hook. f. & Thomson [Lapche Kath]	MPCA4327	NE	Hypertension & scorpion strings
	<i>Uvaria dioeca</i> Roxb. [Kali lahara]	MPCA2475	LC	Fever & stomach-ache
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br. [Chhatim]	MPCA3538	LC	Leucoderma, asthma & ulcers
	<i>Holarhena pubescens</i> (Buchanon-Hamilton) G. Don [Kurchi, Khirra]	MPCA3833	LC	Toothache & snakebite
	<i>Wrightia arborea</i> (Dennstaedt) Mabb. [Chhoto khira]	MPCA3849	NE	Dysentery
Araliaceae	<i>Trevesia palmata</i> (Roxb. ex Lindl.) Vis. [Uk]	MPCA3731	LC	Diabetes
Arecaceae	<i>Caryota urens</i> L. [Rambhang]	MPCA3571	LC	Snake-bite poisoning, migraine headaches & rheumatic swellings
Bignoniaceae	<i>Oroxylum indicum</i> (L.) Vent. [Totola]	MPCA2144	NE	Diabetes & jaundice
	<i>Stereospermum colais</i> (Dillwyn) Mabb. [Parari]	MPCA3641	NE	Asthma & rheumatism
	<i>Stereospermum tetragonum</i> DC. [Parari]	MPCA2717	NE	Diabetes & stomach problems
Boraginaceae	<i>Cordia dichotoma</i> G. Forst. [Bohori]	MPCA344	LC	Fever, coryza & cough
	<i>Cordia grandis</i> Roxb. [Bohori]	MPCA349	NE	Bronchitis & asthma
	<i>Ehretia acuminata</i> R. Br. [Kukurchita, kula aja]	MPCA2388	LC	Fevers
Burseraceae	<i>Garuga floribunda</i> var. <i>gamblei</i> (King ex W. W. Sm.) Kalkman [Dobdobe]	MPCA185	NE	Post childbirth problems
Calophyllaceae	<i>Mesua ferrea</i> L. [Nagkesar]	MPCA4236	NE	Amoebic dysentery & scabies
Cannabaceae	<i>Trema orientalis</i> (L.) Blume [Kuail, Zigni]	MPCA4161	LC	Oliguria & diabetes
Capparaceae	<i>Capparis acutifolia</i> Sweet [Uk]	MPCA3843	NE	Gout, rheumatoid & arthritis
	<i>Crateva religiosa</i> Forst. f. [Chiple, Barun]	MPCA419	LC	Benign prostate hyperplasia & several urinary disorders
Celastraceae	<i>Celastrus paniculatus</i> Willd. [Malkaguni]	MPCA3525	NE	Malaria, lactagogue, mental illness & depression
Clusiaceae	<i>Garcinia sopsopia</i> (Buch.-Ham.) Mabb. [Uk]	MPCA58	NE	NR
Combretaceae	<i>Combretum decandrum</i> Roxb. [Kali Lahara]	MPCA63	NE	Diarrhoea, eczema & gastric troubles
	<i>Combretum wallichii</i> var. <i>flagrocarpum</i> (C.B. Clarke) M.G. Gangop. & Chakrab. [Uk]	MPCA2485	NE	Abdominal pain, cough & leprosy
	<i>Terminalia bellirica</i> (Gaertn.) Roxb. [Bahera, Barra]	MPCA3789	NE	Sore throat & respiratory problems
	<i>Terminalia chebula</i> Retz. [Haritaki, Harra]	MPCA4511	NE	Constipation & dementia
	<i>Terminalia myriocarpa</i> Heurck & Meul. [Paani Saaj]	MPCA4100	NE	Heart problems
Dilleniaceae	<i>Dillenia indica</i> L. [Chalta, Panchphol]	MPCA2316	LC	Prometho, influenza & asthma
Dipterocarpaceae	<i>Shorea robusta</i> Gaertn. f. [Saal]	MPCA4145	LC	Dysentery & diarrhoea
Elaeocarpaceae	<i>Sloanea sterculiacea</i> (Benth.) Rehder & E. H. Wilson [Kadam kattush]	MPCA2375	NE	NR
Euphorbiaceae	<i>Acalypha spiciflora</i> Burm. f. [Uk]	MPCA2408	NE	Abortion
	<i>Croton caudatus</i> Geiseler [Uk]	MPCA2321	NE	Numbness, malaria & convulsions
	<i>Macaranga denticulata</i> (Blume) Müll. & Arg. [Malata]	MPCA2257	LC	Wounds
	<i>Macaranga indica</i> Wight [Malata]	MPCA2372	LC	Venereal sores
	<i>Macaranga peltata</i> (Roxb.) Müll. Arg. [Uk]	MPCA427	NE	Bone settling & kidney stones
	<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen [Ramritha, Pithali, Dhope]	MPCA4214	LC	Gout & flatulence
	<i>Mallotus philippensis</i> (Lam.) Muel. [Sindure]	MPCA210	LC	Diarrhoea & nausea
	<i>Sapium sebiferum</i> (L.) Roxburgh [Uk]	MPCA2065	NE	Constipation & oedema
Fagaceae	<i>Castanopsis eyrei</i> (Champ. ex Benth.) Hutch. [Uk]	MPCA2343	NE	NR
	<i>Castanopsis lanceifolia</i> (Oerst.) Hickel & A. Camus. [Katus]	MPCA90	NE	NR
	<i>Castanopsis indica</i> (Roxb. ex Lindl.) A. DC. [Oalnekatus]	MPCA2716	LC	Cancer
	<i>Castanopsis tribuloides</i> (Sm.) A. DC. [Uk]	MPCA552	NE	NR
Lamiaceae	<i>Callicarpa arborea</i> Roxb. [Gwelo]	MPCA2178	LC	Diabetes, polydipsia, tumour & fever
	<i>Premna barbata</i> Wall. ex Schauer [Gineri]	MPCA2427	NE	Herpes complex, throat infection & dropsy
	<i>Premna bengalensis</i> C.B. Clarke. [Gineri/ Seti guenlo]	MPCA4567	NE	Paralysis
	<i>Premna mollissima</i> Roth [Gineri]	MPCA4192	NE	Boils & eczema

Family	Name of Plants [Vernacular name]	Field No	Status	Used against
Lauraceae	<i>Vitex negundo</i> L. [Nisinda]	MPCA4155	LC	Bronchitis
	<i>Vitex peduncularis</i> Schauer [Charaigarua]	MPCA4359	LC	Black fever
	<i>itex quinata</i> (Lour.) F. N. Williams [Uk]	MPCA339	LC	Headache & cough and cold
	<i>Vitex pinnata</i> L. [Uk]	MPCA310	LC	Stomach-ache
	<i>Actinodaphne obovata</i> (Nees) Blume [Runchepat]	MPCA2708	NE	Fractures
	<i>Cinnamomum bejolghota</i> (Buch.-Ham.) Sweet [Janglee tejmeta]	MPCA373	LC	Gall stones, urinary stones, liver complaints & toothaches
	<i>Cinnamomum glaucescens</i> (Nees) Hand.-Mazz[Malagiri]	MPCA4433	NE	NR
	<i>Litsea cubeba</i> (Lour.) Persoon[Timur]	MPCA2509	NE	Asthma, gastroenteritis & diabetes
	<i>Litsea glutinosa</i> (Lour.) Rob.[Kawala]	MPCA99	LC	Furunculosis and diarrhoea
	<i>Litsea hookeri</i> (Meisn.) D. G. Long [Uk]	MPCA2374	LC	NR
Lecythidaceae	<i>Litsea monopetala</i> (Roxb.) Persoon [Bonsum]	MPCA4301	LC	Rheumatism
	<i>Litsea salicifolia</i> (Roxb. ex Nees) Hook. f. [Sanu Pahenle]	MPCA474	LC	Loose motion
	<i>Litsea panamanja</i> (Buch.-Ham ex Nees) Hook. f. [U.k]	MPCA25	NE	NR
	<i>Machilus glaucescens</i> (Nees) Wight [Bhale Kawlo, Kawala]	MPCA4110	NE	Tuberculosis & asthma
	<i>Persea odoratissima</i> (Nees) Kosterm [Uk]	MPCA474	NE	Heart attack
	<i>Ocotea lancifolia</i> (Schott) Mez. [Angare]	MPCA4517	LC	Sores & wounds
	<i>Careya arborea</i> Roxb. [Kumbhi]	PCA4195	NE	Ulcers and loose motions
	<i>Acacia catechu</i> (L. f.) Willd. [Khayer]	MPCA3783	NE	Asthma, dysentery
	<i>Acacia pennata</i> (L.) Willd. [Arare kanta]	MPCA3514	NE	Cholera & aches
	<i>Albizia lucidior</i> (Steud.) I.C.Nielsen [Silkoro]	MPCA2385	NE	Stomach ache, ulcers & rheumatism
Leguminosae	<i>Bauhinia malabarica</i> Roxb. [Kanchan]	MPCA4455	LC	Gout, goiter & urinary disorders
	<i>Bauhinia purpurea</i> L. [Rakta Kanchan]	MPCA3797	LC	Animal bite & diarrhoea
	<i>Bauhinia variegata</i> L. [Swet Kanchan]	MPCA4150	LC	Infertility & diarrhoea
	<i>Caesalpinia cucullata</i> Roxb. [Ultey kate]	MPCA2069	NE	Cramps & convulsions.
	<i>Cassia fistula</i> L. [Bandarlathi]	MPCA330	LC	Ulcers, skin disease, diabetes & dyspepsia
	<i>Dalbergia pinnata</i> (Lour.) Prain [Uk]	MPCA469	LC	Fever & scabies
	<i>Dalbergia stipulacea</i> Roxb. [Lahara Sirish]	MPCA3670	LC	Decreased menstrual flow
	<i>Dalbergia latifolia</i> Roxb. [Setisal, Pahari sissoo]	MPCA513	VU	Epistaxis, dyspepsia, bleeding piles, epigastria & aphthae
	<i>Dalbergia sissoo</i> DC [Sissoo]	MPCA111	LC	Nausea & boils
	<i>Erythrina stricta</i> Roxb. [Madar]	MPCA4462	NE	Lice attacks
Lythraceae	<i>Pterocarpus marsupium</i> Roxb. [Uk]	MPCA4172	NT	Leucoderma & leprosy
	<i>Lagerstroemia hirta</i> (Lam.)Willd. [Jarul]	MPCA205	NE	NR
	<i>Lagerstroemia parviflora</i> Roxb. [Sidha]	MPCA263	NE	Hypertension & diabetes
				Magnoliaceae
Malpighiaceae	<i>Magnolia hodgsonii</i> (Hook.f. & Thomson) H. Keng. [Chiuri]	MPCA3852	LC	Ulcers
	<i>Magnolia lanuginosa</i> (Wall.) Figlar & Noot [Uk]	MPCA426	DD	NR
	<i>Magnolia champaca</i> (L.) Baill. ex Pierre [Champ]	MPCA4552	LC	Ophthalmia, dyspepsia & oral ulcer
Malvaceae	<i>Magnolia lanuginosa</i> (Wall.) Figlar & Noot [Champ]	MPCA426	DD	NR
	<i>Aspidopterys glabriuscula</i> A. Juss. [Uk]	MPCA381	NE	NR
	<i>Bombax ceiba</i> L. [Simul]	MPCA3611	LC	Cough, tubercular fistula, dysentery & coughs
Marattiaceae	<i>Grewia asiatica</i> L. [Falsa]	MPCA3790	LC	Cancer & diabetes
	<i>Kydia calycina</i> Roxb. [Kubinde, Pichala]	MPCA3679	LC	Skin diseases & body aches
	<i>Pterospermum acerifolium</i> (L.) Willd. [Hantipahale]	MPCA2044	LC	Ulcers
	<i>Pterygota alata</i> (Roxb.) R.Br. [Labshi, Narkeli]	MPCA3675	NE	Dropsy & hemorrhoids
	<i>Sterculia villosa</i> Roxb. [Odal]	MPCA4466	NE	Bone fracture
	<i>Angiopteris evecta</i> (G. Forst.) Hoffm. [Uk]	MPCA5017	NE	Berberi & abdominal pain.
	<i>Aglaia perviridis</i> Hiern [Uk]	MPCA447	VU	Human cancers
	<i>Aglaia spectabilis</i> (Miq.) S. S. Jain & S.Bennet. [Lali]	MPCA201	LC	NR
	<i>Aphanamixis polystachya</i> (Wall.) Parker [Rasune Lali]	MPCA505/218	NE	Leprosy, skin diseases
	<i>Chisocheton cumingianus</i> (C. DC.) Harms	MPCA446	LC	Bowel problems
Meliaceae	<i>Chisocheton paniculatus</i> Hiern. [Uk]	MPCA2409	NE	NR
	<i>Chukrasia tabularis</i> A. Jussieu [Chikrasi]	MPCA2074	LC	Diarrhoea & fever
	<i>Dysoxylum mellisimum</i> Blume [Chhalegach]	MPCA4143	NE	NR
	<i>Dysoxylum gotadhora</i> (Buch.-Ham.) Mabb. [Uk]	MPCA444	NE	Urinal problems & increased inflammation
	<i>Sphaerosacme decandra</i> (Wall.) T. D. Penn [Uk]	MPCA2320	NE	NR
	<i>Toona ciliata</i> Roemer [Toon]	MPCA145	LC	Dysentery

Family	Name of Plants [Vernacular name]	Field No	Status	Used against
Menispermaceae	<i>Cocculus laurifolius</i> DC [Dai gachh]	MPCA4164	NE	Muscular problems
Moraceae	<i>Artocarpus chama</i> Buch.-Ham. [BanKatha, Lator]	MPCA4296	NE	Constipation & stomach ulcers
	<i>Ficus benghalensis</i> L. [Bot, Bor]	MPCA4115	NE	Vaginal complains, erysipelas & biliousness
	<i>Ficus curtipes</i> Corner [Uk]	MPCA2715	NE	NR
	<i>Ficus hispida</i> L. f. [Kak Dumur, Koksia]	MPCA3533	LC	Vitiligo & hepatitis
	<i>Ficus racemosa</i> L. [Dumri]	MPCA4237	LC	Hemorrhoids & diarrhoea
	<i>Ficus religiosa</i> L. [Ashathwa]	MPCA4559	NE	Gonorrhoea & skin diseases
	<i>Ficus semicordata</i> J. E. Smith [Khanium]	MPCA4146	LC	Dysentery, leprosy & ulcer
	<i>Ficus hederacea</i> Roxb. [Uk]	MPCA3561	NE	Nose-diseases, vomiting & malaria
	<i>Morus macroura</i> Miq. [Uk]	MPCA31	NE	Wounds & cuts
	<i>Streblus asper</i> Lour. [Seora]	MPCA234	LC	Dysentery & filariasis
Myristicaceae	<i>Knema erratica</i> (Hook. f. & Thomson) J. Sinclair [Ramguwa]	MPCA33	NE	Dysentery
	<i>Knema linifolia</i> (Roxb.) Warb. [Uk]	MPCA371	NE	An'dime (a female disease after delivery)
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels [Jaam]	MPCA364	LC	Diabetes & vomiting
	<i>Syzygium praecox</i> (Roxb.) Rathakr. & N. C. Nair [Uk]	MPCA3719	NE	NR
Oleaceae	<i>Nyctanthes arbor-tristis</i> L. [Sephali]	MPCA4471	NE	Gastritis & malaria
Pandanaceae	<i>Pandanus unguifer</i> Hook. f. [Keya]	MPCA2461	NE	Periods
Pentaphylacaceae	<i>Eurya acuminata</i> DC [Uk]	MPCA14	NE	Diarrhoea & cholera
	<i>Eurya cerasifolia</i> (D. Don) Kobuski [Uk]	MPCA40	NE	High blood pressure & diabetes
Phyllanthaceae	<i>Bridelia sikkimensis</i> Gehrman [Kasai Datan]	MPCA2250	NE	NR
	<i>Bridelia tomentosa</i> Blume [Kasai Datan]	MPCA269	LC	High fever, stomach aches & influenza
	<i>Phyllanthus emblica</i> L. [Amlaki/Amla]	MPCA281	LC	Jaundice & diarrhoea
Rhamnaceae	<i>Ziziphus jujuba</i> Mill. [Kul, Boer]	MPCA3763	LC	Amnesia
	<i>Ziziphus rugosa</i> Lam. [Uk]	MPCA2049	NE	Liver problems & cancer
Rubiaceae	<i>Morinda angustifolia</i> Roxb. [Haldi kath]	MPCA4572	NE	Neuralgia, tuberculosis blood pressure
	<i>Psychotria monticola</i> Kurz. [Uk]	MPCA2423	NE	NR
Rutaceae	<i>Citrus medica</i> L. [Lebu]	MPCA3785	NE	Dysentery, indigestion & typhoid
	<i>Clausena excavata</i> Burm. f. [Jungle Karipata]	MPCA3700	NE	Fever, rhinitis & sores
	<i>Glycosmis cyanocarpa</i> var. <i>cymosa</i> Kurz. [Ban jamir]	MPCA181	NE	NR
	<i>Micromelum integerrimum</i> (Roxb.) Roemer. [Ban-kunch]	MPCA2003	LC	Jaundice
	<i>Paramignya monophylla</i> Wight [Uk]	MPCA2502	NE	Nose infections & urinary disorders
	<i>Toddalia asiatica</i> (L.) Lam. [Belkanta]	MPCA3735	NE	Chest aches & food poisoning
	<i>Zanthoxylum rhetsa</i> (Roxb.) DC. [Timbur]	MPCA3738	LC	Rheumatism, dyspepsia & cholera
Sabiaceae	<i>Meliosma pinnata</i> (Roxb.) Maxim. [Uk]	MPCA2401	LC	Uterus contraction
	<i>Meliosma simplicifolia</i> (Roxb.) Walp. [Chiwari/Patpate]	MPCA703	NE	Fever & toothache
Salicaceae	<i>Casearia glomerata</i> Roxb. [Bandar Khaja]	MPCA2437	LC	NR
	<i>Flacourtia jangomas</i> (Lour.) Raeusch. [Panial]	MPCA4347	NE	Dysentery & diarrhoea
Sapindaceae	<i>Sapindus rarak</i> DC [Ritha]	MPCA442	NE	Hairfall
Staphyleaceae	<i>Turpinia pomifera</i> (Roxb.) DC [Uk]	MPCA2384	LC	Chronic tonsillitis & chronic pharyngitis
Theaceae	<i>Schima wallichii</i> (DC) Korth. [Chilauney]	MPCA2232	LC	Gonorrhoea
Tetramelaceae	<i>Tetrameles nudiflora</i> R. Br. [Maina, Moyna]	MPCA133	LC	Itching
Vitaceae	<i>Leea guineensis</i> G. Don [Uk]	MPCA382	NE	Vertigo & arthritis

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, tourism 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 ethnic communities of these areas are quite rich in traditional knowledge and they were very much dependent on nearby botanical resources especially for their health care. Present survey records a great diversity of uses of tree species and it was recorded that they collect plant parts for medicinal use and practice from studied area sustainably. They preserve unused collected parts in dry form for future use.

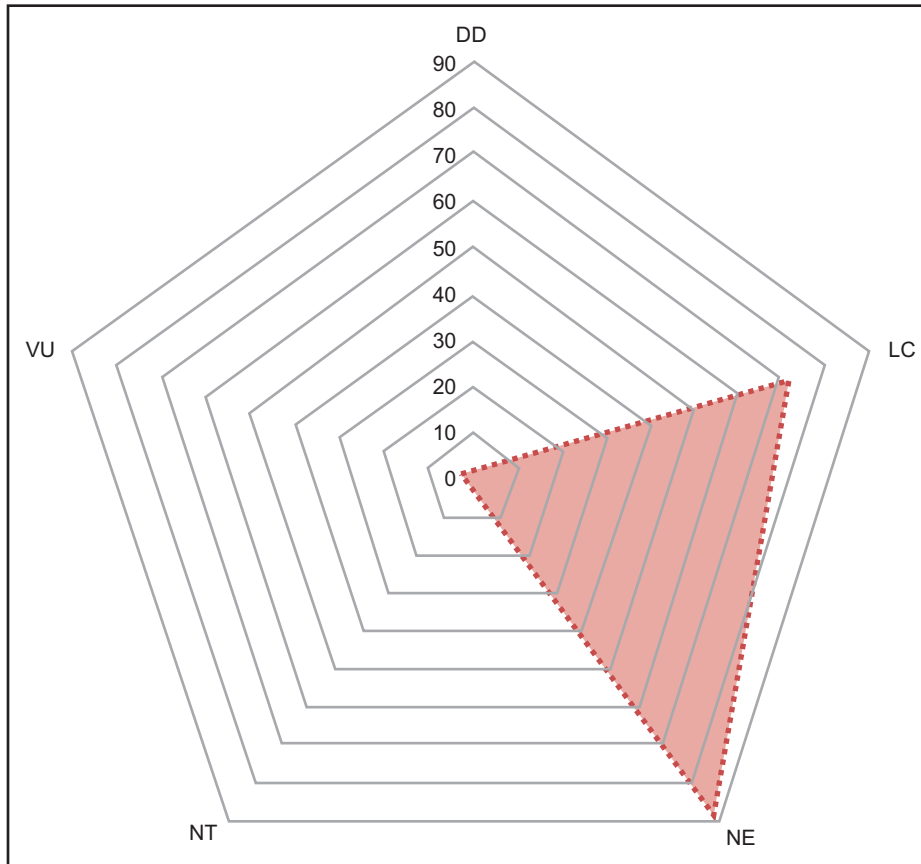


Fig. 2: Statistical analysis of IUCN categorized arboreal spermatophyte

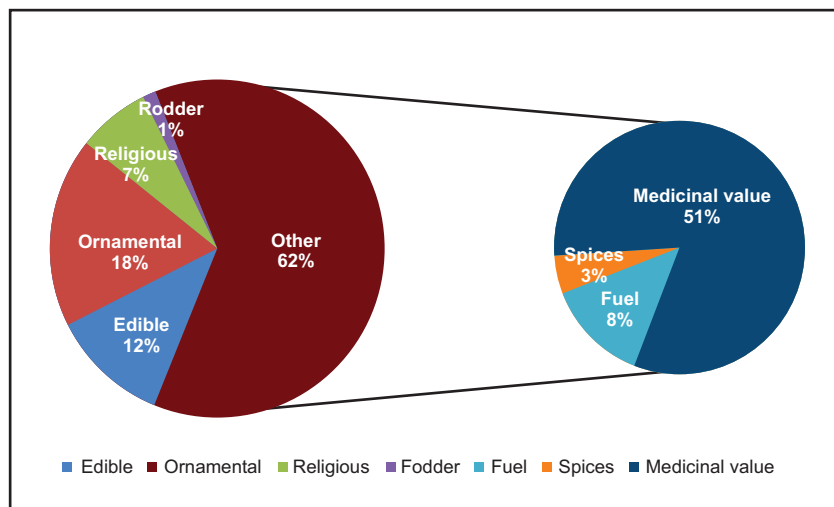


Fig. 3: Different use category of trees against total NTFPs recorded plants from forest villagers

Climate change and excessive collection of NTFPs including fire-wood and medicinal plants were recognized as some of the other worst forms of threats. Thus, the threatened medicinally or economically important species were needed to be conserved either in

situ and/or ex situ conservation system and therefore MCPAs were established for the maintenance and propagation of especially medicinal plants thereby ensuring the safety and survival of the valuable species.

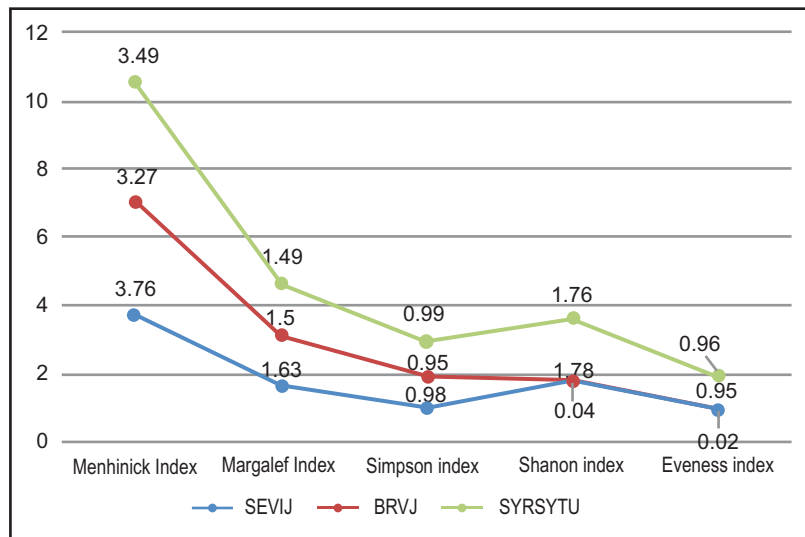


Fig. 4: Species diversity and species richness of arboreal spermatophyte of studied MPCAs

The concentration of dominance expresses if there is dominance of one or a few species in the sampled area. Concentration of dominance for tree strata was calculated using Simpson index and the result (ranging from 0.95 - 0.99) showing significant values for all the MPCAs. The diversity of the tree community of different MPCAs was reflected by Shannon-Weiner index. Its values were found to be high for two MPCAs *i.e.*, North Sevoke and Sursuti whereas it showed extremely low value for NRVK. Species richness for same vegetation were measured using Menhinick and Margalef Index and calculated values were appeared to be very high for all the studied MPCAs *i.e.*, ranging from 3.27 to 3.76 and 1.49 - 1.63 respectively denoting the high arboreal spermatophytic diversity. The closeness for the same vegetation was also calculated using Pielou's Evenness Index and their values were found to be ranging from 0.02 to 0.96 which is significant. The present data is indicating a heterogeneous assemblage of trees in a diverse and stable habitat for Sevoke and Sursuti. The density dependent study and assessment of a species is of prime concern for conservation and protection of forests (Odum, 1971). The present study is showing difference in values of different biodiversity indices due to the variations in the environmental conditions, extent of biotic stresses, forest type, species composition and other conditions (Dash *et al.*, 2009; Ansari *et al.*, 2016; Bhat *et al.*, 2020). Appropriate habitat conditions for a specific vegetation type support a high growth rate and species richness that was reflected by higher values of basal area in the present study.

Conclusion

It is important for the conservation of biodiversity and prioritizing areas for conservation planning for achieving sustainability for arboreal spermatophyte diversity with rich and diverse plant communities.

Although these MPCAs are confined to conserve the threatened medicinal plants but the non-medicinal plants were also required conservational attention. Not only the MPCAs but the entire Terai Duars region is highly rich and diverse in medicinal flora including various threatened taxa. If forests were categorized by species richness, diversity, density, the current area of study may also be classified as one of the most diverse and dense portions of the Eastern Himalayas, indicated by higher diversity indices and population density. The near threatened species such as *Aglaia perviridis* etc. need to be properly mapping of their concentration areas which will be helpful to identify the key places that need to be conserved. This baseline data will be useful for the MCPA's authority to formulate conservation strategies and to reconstruct the vegetation as connective corridor among their fragmented habitats.

पश्चिमी बंगाल के विशेष संदर्भ में भारत के तीन औषधीय पादप संरक्षण क्षेत्रों में वृक्षीय स्पेरमेटोफाइटों की विविधता

देवांशु मलिक, सुभाजित दास गुप्ता, पायल पौल, सुजित मंडल,
आरात्रिक पाल तथा मोनोरंजन चौधुरी

सारांश

औषधीय पादप संरक्षण क्षेत्र समृद्ध देशज औषधीय पादप प्रजातियों के साथ संरक्षित वनों में छोटे खंड हैं। औषधीय रूप से महत्वपूर्ण वृक्षों के लिए एक आधाररेखा आँकड़ा पूर्वानुमान हासिल करने और पादपी रूप से विपुल पारितंत्र के लिए इनके उपयुक्त स्व-स्थाने संरक्षण रणनीतियों के उद्देश्य के साथ पश्चिम बंगाल के तीन औषधीय पादप संरक्षण क्षेत्र की वृक्षीय स्पेरमेटोफाइट विजातीयता और पादपी व्यवस्था का मूल्यांकन किया गया। मानक प्रतिचयन विधि और बेतरतीब क्वार्टेट अपनाकर यह अध्ययन 2014-2020 के दौरान किया गया। यह प्रेक्षित किया गया कि अध्ययन क्षेत्र करीब 164 वृक्ष प्रजातियों के साथ काफी समृद्ध हैं। जो 52 कुलों का प्रतिनिधित्व करते हैं और अधिकतम प्रजातियों का उपयोग भारतीय औषध

प्रणाली में विभिन्न बीमारियों के उपचार में किया जाता है। वृक्ष लेयर के लिए समुदाय संरचना को समझने के लिए विभिन्न विविधता सूचकांकों को परिकल्पित किया गया और इसे काफी महत्वपूर्ण पाया गया। ये मात्रात्मक उपाय इसकी संरचना, संयोजन, क्रिया और वनस्पति गतिकी में अध्ययन क्षेत्र की वृक्षीय स्पर्मेटोफाइटों की विविधता का इशारा करते हैं। इस अध्ययन में वनस्पति के सभी संस्तरों में असंख्य संकटस्थ और संकटापन्न प्रजातियों की उत्तरजीविता तथा इसकी मूल वनस्पति के अनुरक्षण के लिए गंभीर संकट उत्पन्न करने वाली कृत्रिम वनाग्नि एवं गैर प्रकाष्ठ वन उपज संग्रहण सहित मानवोद्भव हस्तक्षेप की विभिन्न किस्मों की मुख्य-मुख्य बातों को भी बताया गया है।

Reference

- Ansari A.A., Gill S.S., Abbas Z.K. and Naeem M. (2016). *Biodiversity: Monitoring, Assessment and Conservation*. CAB International Publications, UK 628 pp.
- Bhat J.A., Kumar M., Negi A.K., Todaria N.P., Malik Z.A., Pala N.A., Kumar A. and Shukla G. (2020). Species diversity of woody vegetation along altitudinal gradient of the Western Himalayas, *Global Ecology and Conservation*, **24**: e01302.
- Chowdhury D. (2015). Distribution and chemotaxonomy of some members of Lauraceae in Terai and Duars region of West Bengal. Ph.D Thesis. Department of Botany. University of North Bengal, West Bengal, India: 261pp.
- Das A.P., Ghosh C., Sarkar A., Biswas R., Biswas K., Chowdhury D., Lama A., Moktan S. and Chowdhury A. (2010). Preliminary report on the Medicinal Plants from three MPCAs in Terai and Duars of West Bengal, India, *Pleione*, **4**(1): 90–101.
- Dash P.K., Mohapatra P.P. and Rao Y.G. (2009). Diversity and distribution of tree species in Niyamgiri hill ranges, Orissa, India, *Indian Forestry*, **135**: 927–942.
- Grierson A.J.C. and Long D.G. (1983, 1994, 1987). *Flora of Bhutan*. Vol. 1, Parts 1, 2 & 3. Royal Botanical Garden, Edinburgh.
- Grierson A.J.C. and Long D.G. (1991, 1999, 2001). *Flora of Bhutan*, Vol. 2, Parts 1, 2 & 3. Royal Botanical Garden, Edinburgh.
- Hara H. (1966). *Flora of Eastern Himalaya*. Tokyo University, Tokyo 744pp.
- Hara H., Chater A.Q. and Williams L.H.J. (1982). *An Enumeration of the Flowering Plants of Nepal*. Vol. III. British Museum of Natural History, London, 226pp.
- Hara H., Stearn W.T. and Williams L.H.J. (1978). *An Enumeration of the Flowering Plants of Nepal*. Vol. 1. British Museum of Natural History, London.
- Hara H. and Williams L.H.J. (1979). *An Enumeration of the Flowering Plants of Nepal*. Vol. II. British Museum of Natural History, London, 154pp.
- Hooker J.D. (1872 - 1897). *The Flora of British India*, Vols 1-7. L. Reeve & Co. Ltd., Ashford, Kent, London.
- Jain S.K. and Rao R.R. (1977). *A Handbook of Field and Herbarium Methods*. Today & Tomorrow's Printers and Publishers, New Delhi, India, 157pp.
- Margalef R. (1968). Information theory of ecology, *Journal of General Systems*, **3**: 36–71.
- Menhinick E.F. (1964). A comparison of some species diversity indices applied to samples of field insects, *Ecology*, **45**: 858–861.
- Misra R. (1966). *Ecology Workbook*. Oxford & I. B. H. Calcutta, India, 244pp.
- Nayar M.P. and Sastry A.R.K. (1987). *Red Data Book of Indian Plants*, Vol. 1. Botanical Survey of India, Calcutta, India.
- Nayar M.P. and Sastry A.R.K. (1990). *Red Data Book of Indian Plants*, Vol. 3. Botanical Survey of India, Calcutta, India.
- Noltie H.J. (1994; 2000). *Flora of Bhutan* Vol. 3 Parts 1 & 2. Royal Botanical Garden, Edinburgh.
- Odum E.P. (1971). *Fundamentals of Ecology*. WB Saunders Co., Philadelphia, pp. 574.
- Ohashi H. (1975). The Flora of Eastern Himalaya, 3rd Report, Tokyo University, Tokyo.
- Olson D.M. and Dinerstein E. (2002). The Global 200: Priority Eco regions for Global Conservation, *Annals of the Missouri Botanical Garden*, **89**: 199–224.
- Olson D.M., Dinerstein E., Wikramanayake E.D., Burgess N.D., Powell G.V.N., Underwood E. C., D'Amico J. A., Illanga I., Strand H.E., Morrison J.C., Loucks C.J., Allnutt T.F., Ricketts T.H., Kura Y., Lamoreux J.F., Wettengel W.W., Hedao P. and Kassem K.R. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth, *Bio Science*, **51**: 933–938.
- Paul P., Dhar S., Das D. and Chowdhury M. (2020). *Herbarium Technique*. Orange Book Publication, Chhattisgarh, India.
- Pielou E.C. (1966). The Measurement of Diversity in Different Types of Biological Collections. *Journal of Theoretical Biology*, **13**: 131-144. [http://dx.doi.org/10.1016/0022-5193\(66\)90013-0](http://dx.doi.org/10.1016/0022-5193(66)90013-0)
- Prair D. (1903). *Bengal Plants*. Vol. I & II. West, Newman & Co., London.
- Pramanik B.K. and Das D. (2015). Preliminary Phytosociological Study of Medicinal Plants Conservation Area (MPCA) At Forests of Buxa Tiger Reserve (BTR) and Gorumara National Park, *Journal of Environmental Science, Toxicology and Food Technology*, **9**: 64–77.
- Rai U. (2006). Plant Biodiversity Characterization in Darjiling Hills using Remote Sensing technique. Ph.D. Thesis, University of North Bengal, West Bengal, India: pp. 341.
- Shannon C.E. and Weiner W. (1963). *The Mathematical Theory of Communication*. University of Illinois press, Urban, Illinois, USA, pp. 111.
- Simpson E.M. (1949). Measurement of diversity, *Nature*, **163**: 688.
- Vandebroek I., Reyes-Garcia V., Albuquerque U.P.d., Bussmann R. and Pieroni A. (2011). Local knowledge: who cares? *Journal of Ethnobiology and Ethnomedicine*, **7**: 1–7.
- Ved D.K. and Goraya G.S. (2008). *Demand and Supply of Medicinal Plants in India*. Vedams eBooks (P) Ltd, New Delhi, India.

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