



Group Project Report

**A PRELIMINARY STUDY ON
THE FLORA, FAUNA AND PHYSICAL RESOURCES OF
MAHATMA GANDHI UNIVERSITY CAMPUS**

M Sc Third Semester
January 2008

**School of Environmental Sciences
Mahatma Gandhi University
Kottayam, Kerala - 686560.**



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*Group Project Report submitted to
the School of Environmental Sciences,
Mahatma Gandhi University, Kottayam.*

By

*Students of IIIrd Semester
M.Sc Environment Science and Management
(2006 - 2008 Batch)*



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Kottayam**

January - 2008

Declaration

We, the third semester M. Sc. students, hereby declare that the group project report entitled, "***A Preliminary Study on the Flora, Fauna and Physical Resources of Mahatma Gandhi University Campus***" is an authentic record of the project work carried out by us under the supervision of **Dr. A. P. Thomas**, Director, School of Environmental Sciences, Mahatma Gandhi University, Kottayam.

Kottayam

III Semester M. Sc. Students

18 - 01 - 2008



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CERTIFICATE

*This is to certify that the project report entitled '**A Preliminary Study on the Flora, Fauna and Physical Resources of Mahatma Gandhi University Campus**' being submitted by **III semester M. Sc. Environment Science and Management students (2006 - 2008 Batch)** to the Mahatma Gandhi University, is a record of the bona fide work carried out by them under my supervision and guidance at the School of Environmental Sciences, Mahatma Gandhi University, Kottayam.*

Dr. A. P. Thomas
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Chapter - 1

INTRODUCTION

The conservation and sustainable use of earth's natural resources is of critical importance in meeting food, fodder, fiber, health, water and other needs of growing world population. The general lack of information and knowledge regarding biological diversity and other resources is a constraint in our way towards sustainable development. So there is an urgent need to develop scientific, technical and Institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures.

1.1. Biodiversity

The term biodiversity was introduced in the late 1980s by the American biologist, Edward O. Wilson. The 1992 United Nations Earth Summit in Rio de Janeiro defined "biodiversity" as the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. Biological diversity is now increasingly recognized as a vital parameter to assess global and local environmental changes and sustainability of developmental activities (Lovejoy, 1995). In recent years, the focus of nature conservation efforts has become more inclusive, broadening from an approach emphasizing flagship species like cranes, sea turtles or tiger to embrace the entire diversity of life. As one of the world's top twelve mega diversity countries, and a signatory to the International Convention on Biological Diversity (CBD) it is important for India to try and conserve the entire spectrum of biological diversity (UNEP-CBD, 1991)

The efforts needed for inventorying and monitoring are enormous in magnitude. India harbours over 1,25,000 scientifically described and perhaps another 400,000 undescribed species, over its 320 million hectares of landmass and 200 million hectares of exclusive economic zone (Gadgil, 1994). Conservation strategies must therefore be developed to maintain diversity levels in the entire range of natural as well as managed ecosystems. This calls for extensive information, ideally on all groups of plants, animals and microorganisms across India's landscape and waterscape. Conservation priorities should be decided on the basis of such information, and conservation measures decided upon to translate these priorities into action.

The present study is an attempt to provide a comprehensive picture of the current status, and diversity of plants, birds, butterflies, dragonflies and damselflies of the Mahatma Gandhi University Campus. Along with this, the water and soil quality of the campus were also analysed.

Chapter - 2

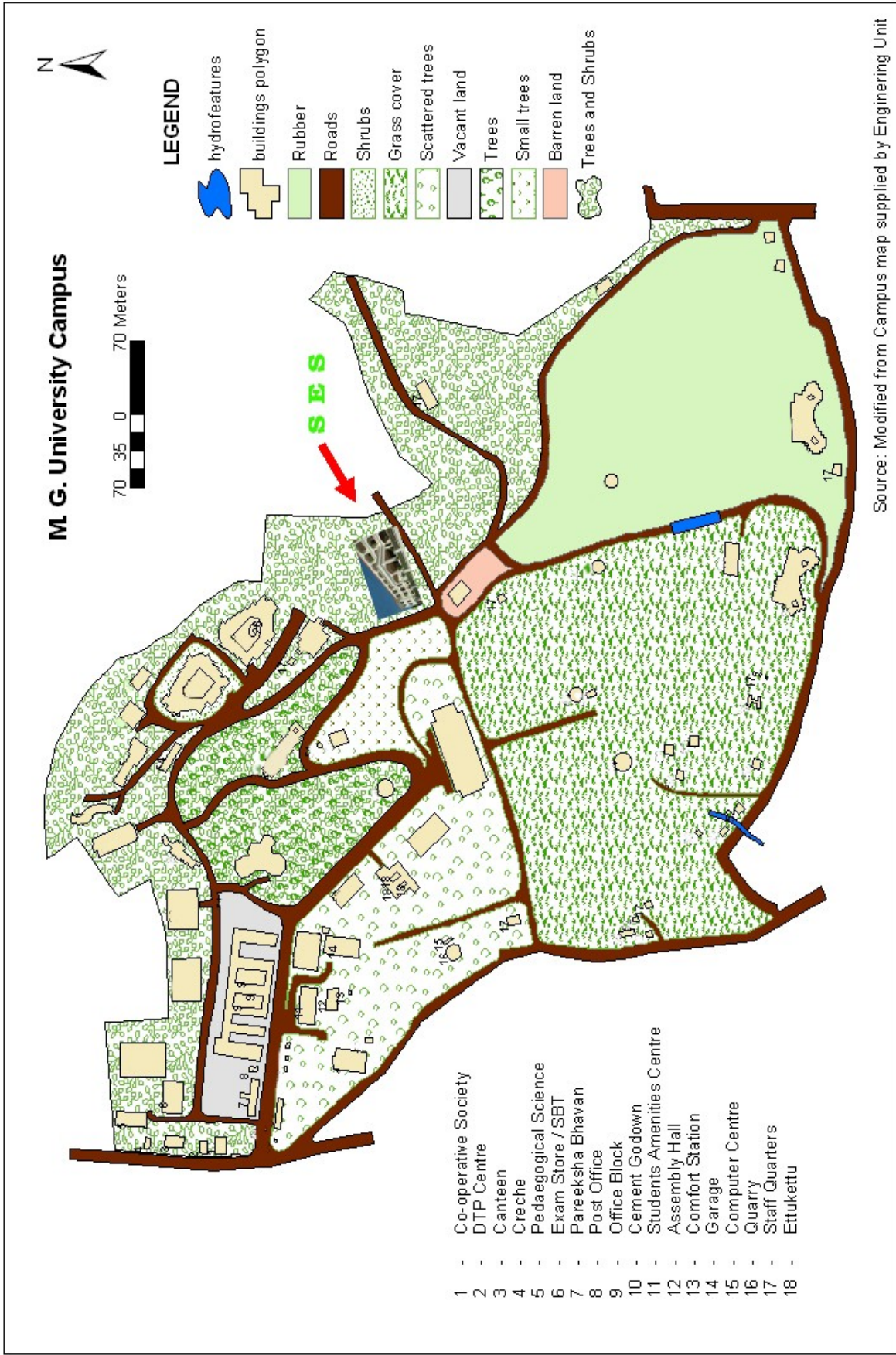
OBJECTIVES

1. To provide systematic account of the flora of the campus.
2. To prepare a systematic herbarium of the flora in the campus.
3. To provide a comprehensive checklist of endemic and RET plant species in the campus.
4. To provide a systematic account of the birds, butterflies, dragonflies and damselflies in the campus.
5. To find out the migratory and breeding bird species during the study time.
6. To provide systematic checklist of birds, butterflies, dragonflies and damselflies.
7. To assess the water quality of the campus.
8. To assess the soil status of the campus.

Chapter - 3

STUDY AREA

The Mahatma Gandhi University Campus is situated at about 15 km from Kottayam. The geographical position of the area can be co-ordinated as 9°39'28" N latitude and 76°32'10" E longitude. The campus is having an undulating topography with residual hillocks and laterite outcrops. The elevation ranges from 95-151m above Mean Sea Level. The campus has a total area of 41.75 hectares and is having garden lands, scrub jungles and rubber plantation. The campus has also a number of small water bodies (natural as well as man-made) such as quarry, check dams, ponds and wells. The main rock type of the campus is charnockite, which is well exposed at the abandoned quarry present in the campus. The tropical weathering has produced lateritic soil in the region. The area is enjoying a warm tropical climate with predominance of South-west monsoon. Different grass species and rubber dominate the vegetation.



CHAPTER: 4

FLORISTIC ANALYSIS

4.1 INTRODUCTION

Plants are dominant species of the earth. Botanists were exploring the floristic region of the earth for several centuries and their efforts have succeeded only in preparing a more realistic taxonomic account of the plants. The estimated 233,885 species in 12650 genera (Thorne, 1992) are extremely diverse in both habit and habitat. They include plants on which human depend on sustenance such as grains and legumes, as well as numerous important products including drugs, paper and building material.

Flowering plants had their beginning in the cretaceous period of the Mesozoic era around 135 million years ago. They flourished in the Cenozoic era around 70 million years ago, which also saw the evolution of mammals and the birds. In the course of evolution, flowering plants prove to be the most successful. They could grow in almost every kind of habitat in earth. Today flowering plants are the largest dominant groups in the plant kingdom. India, being a vast country with the wide contrast in the physical features and the climate possess one of the richest and most varied floras I the world. The determining factors like latitude, altitude, rain shadow, geology, slope of the land, direction, nature of ocean current, day length and the intensity of sunlight, resulting in the different habitat ranging from forest, grassland wetland etc.

The Indian subcontinent with its diverse habitat and the rich vegetation has always been a tempting proposition for the botanist. There are enough evidence for the fact that ancient Indian had domesticated plant since the Vedic ages (1500 - 800 BC). They studied plants mainly from there stand point via, botanical (udvita), dietic (annapanadi) and medicinal (virenchanadi) of these the most important was their study of medicinal plants and they have bequeathed to the posterity, a

time-tested, indigenous system of herbal medicine.

The Southern Western Ghats is a place of rich vegetation when comparing other parts of peninsular India. Once the place was a continuous stretch of tropical forest, now small patches of virgin forests are remaining. As a result, many species of plants are presumably in danger of extinction. (Henry *et al.*, 1978). This makes the floristic investigations urgent. The extensive construction works and other human activities are also reducing the diversity and density of plant species. The present study is to assess the species diversity of a small patch in the region which is prone to a high construction and other human activities. Besides, it is a supportive step to prepare a comprehensive floral account of the region.

4.2 REVIEW OF LITERATURE

Western ghat is considered as one of the the 18 centres in the world where mega diversity exist (Nair 1997). A lot of study has been conducted in this region. Major contribution of the floristic study were conducted by the British. In western ghats majority of the endemic species are confined to selected hill slopes or small hill areas and habitat, thus making those pockets very important from the point of conservation (Ragavan & Singh, 1983) indicating that 103 species are confined to the western ghat of Maharashtra and 46 species to Karnataka region, 93 species are confined to Nilgiri, 13 to Anamalai hills and 18 species to Palani hills (Blasco 1970). The rate of endemism and floristic richness are greatest in Tirunelveli and Travancore section, that is about 150 strict endemism occur in this region.

A lot of study has been conducted in this region. Hortus Indicus Malabaricus was brought out by Henrich van Rheede (1678-1703). This 12 volume monumental work formed a landmark in the history of plant resource studies in Asia and is intimately implicated with systematic Botany in general (Manilal, 1980). The important works on the flora of southern peninsular India are: Flowering plants of Travancore (Rama Rao 1914), Flora of Anamalai hills Coimbatore district, Flora of Madras presidency (Gamble & Fisher 1921) and Flora of South Indian hill stations (Fyson, 1932). Since then the work on regional as well as local floras were undertaken with the view of preparing a complete and comprehensive flora of India and major work was done by the Botanical survey of India.

The notable publications on the flora of Kerala are: Flora of Calicut (Manilal & Sivarajan, 1982), Flora of Cannanore (Ramachandran & Nair, 1988), Flora of Silent valley (Manilal, 1988), Flora of Palghat (Vajravelu, 1990), Flora of Thiruvananthapuram district (Mohanan & Hentry, 1994), Flora of

Thenmala division (Subramaniyan, 1995), Flowering plants of Thrissur forest (Sasidharan & Sivarajan, 1996) Flora of Kottayam district (Antony, 1989).

4.3 MATERIALS AND METHODS

The study was based on the specimens collected from the Mahatma Gandhi University campus at regular intervals for three months, since September 2007. Explorations were taken under the intervals of 15 days, to different parts of the campus to have a clear understanding of the influence of seasonal changes in vegetation pattern and biodiversity composition. During the field trip every species was collected in flowering and fruiting stages and detailed field notes were taken on the spot. The flowering and fruiting time of each species was particularly noted. Using wet method, sample specimen were collected in polyethylene bags for detailed lab study. Photographs of every specimen was taken. The specimen was subjected to detailed lab study using light microscope and stereo microscope and final identification of materials were done after consulting relevant literature and expert judgment. The nomenclature of each species has been brought up to date as per rules given in the International Code of Botanical Nomenclature (1988).

4.4. RESULT AND DISCUSSION -

4.4.1. QUALITATIVE FEATURES OF THE VEGETATION

4.4.1(a). Species composition

From the preliminary floristic investigation in the university campus, a total of 273 species of plants were identified, which were belongs to 91 families. A total of 258 angiosperm species belong 82 families were recorded from the region. A total of 15 species of pteridophytes were collected from the campus which were belongs to 9 families (Table - 1). A total of 7 Poaceae, 3 Euphorbiaceae, 2 Cyperaceae and one each of Acanthaceae, Meliaceae, Moraceae, Fabaceae and Rubiaceae memebres were collected and could not identified.

A total of 137 species preserved as herbarium specimens and photographic documentation was also done for each species within their habitats. Form the field data, the most dominant angiosperm family of the campus according to the species number is Euphorbiaceae which has 16 species and both Fabaceae and Rubiaceae in the second position with each of 13 species.

The study showed that the vegetation profile consisted of trees, shrubs, climbers, herbs and grasses (Fig - 2). The herbaceous flora dominates the vegetation followed by shrubs, trees and climbers.

4.4.1(b). Endemism

As a part of the Western Ghat, the midlands of Kerala also potential pockets of endemism. Even though the area of the University campus is less, endemic plant species were recorded as past relics of evergreen vegetation in this region. There are 11 species which are recorded as endemic to Western Ghats found in study area. A total of 5 species were found endemic to peninsular India (Table -2). A total of 3 Vulnerable species were observed during the floristic analysis.

4.4.1(c). Economic resources

There are 60 trees reported from the University campus which includes many wood yielding ones. They include *Artocarpus heterophyllus*, *A. hirsutus*, *Calophyllum inophyllum*, *Swietenia mahagoni* and *Tectona grandis*. Most of these species were cultivated in this region.

4.4.1(d). Medicinal plants

Medicinal plants like *Abrus precatorius*, *Biophytum sensitivum*, *Cinnamomum malabattrum*, *Desmodium gangeticum*, *Glycosmis pentaphylla*, *Helictres isora*, *Hydnocarps pentandra*, *Myxopyrum smilacifolium*, *Physalis angulata*, *Phyllanthus amarus*, *Scoparia dulcis*, *Spilathus calva*, *Sida cordifolia*, *Rauvolfia serpentina*, *Aegle marmelos*, *Leucas aspera*, *Cassia fistula*, *Elephantopus scaber*, *Cassia tora*, *Achyranthes aspera*, *Protasparagus racemosus*, *Emilia sonchifolia* etc. were also noticed from the University campus.

4.5 SYSTEMATIC TREATMENT

DICOTYLEDONS

ANNONACEAE

ANNONNA

***Annona squamosa* L.**

Local name: ആത്ത.

Habit: Shrub.

Habitat: Cultivated.

Tree, 3 - 5 meter tall. Leaves glabrous, linear - oblong, or oblong lanceolate, narrowed at base. Flowers greenish, fragrant. Cultivated in gardens. Sometimes found wild. Fruits edible.

ARTABOTRYS

***Artabotrys zeylanicus* Hook.**

Local name: മനോരഞ്ജിനി.

Habit: Climbing shrub.

Habitat: Semi evergreen and evergreen forests.

Woody, climbing shrubs. Leaves elliptic or elliptic - oblong, acuminate at apex, cuneate at base. Flowers fascicled. Flowering and fruiting: May - September. (Plate - I A)

CANANGA

***Cananga odorata* (Lam.) Hook. f. & Thoms.**

Local name: മഞ്ഞച്ചമ്പകം.

Habit: Tree.

Habitat: Cultivated.

Tree; bole straight, bark greyish-white. Leaves simple, alternate, distichous, estipulate; petiole slender, grooved above, minutely puberulous; lamina oblong, elliptic, ovate or elliptic-lanceolate; base obtuse or oblique; apex acuminate or acute; margin entire, undulate, glabrous, coriaceous; lateral nerves pinnate; intercostae scalariform, obscure. Flowers bisexual, yellowish-green, fragrant, several in peduncled, axillary cymes;

bracts subulate, puberulous on both sides, cauducous; pedicel slender; sepals 3, ovate, pubescent, reflexed, shortly connate at base; petals 6, green, turning yellow, linear or lanceolate, valvate, puberulous; inner ones smaller, subequal; torus some what convex; stamens many, closely arranged, connectives broadly appendaged, acute, concealing anthers; carpels many, glabrous at the very base, ovules many attached to the suture, stylules slender, terminated by a club-shaped stigma. Fruit aggregate of berry, in a cluster, globose, glabrous, pulpy, black; seeds transversely compressed, yellowish-brown.

POLYALTHIA

***Polyalthia longifolia* (Sonner.) Thw.**

Local name: അരണമരം.

Habit: Tree.

Habitat: Cultivated.

Tall tree, bole straight; crown conical; bark greyish-brown, smooth; Leaves simple, alternate, distichous, estipulate; petiole pubescent when young, slender; lamina ovate-lanceolate; base round; apex acuminate; margin strongly undulate, glabrous, coriaceous. Flowers bisexual, green, numerous, in umbels or fascicles at the axis; pedicels slightly pubescent; sepals 3, ovate-triangular, pubescent, connate at base; petals 6, linear, broad at base, puberulous; stamens numerous, cuneate; carpels many, puberulous, ovoid, style oblong; stigma sessile. Fruit aggregate of berries; berry ovoid to ellipsoid, glabrous, reddish to black; seed one, ovoid, pale brown, shiny.

Flowering and fruiting: March - August.

UVARIA

***Uvaria narum* (Dunal) Bl.**

Local name: കൂരി, നറുപൊന്നൽ.

Habit: Scandent Shrub.

Habitat: Deciduous forests of plains.

Scandent shrubs, branches zigzag, leaves oblong-lanceolate,

glabrous, acuminate. Flowers yellow, solitary. Petals 6, ovate, connate at base, inflexed. Stamens many. Fruitlets stalked, many, glabrous.

Flowering and fruiting: December.

MENISPERMACEAE

CYCLEA

***Cyclea peltata* (Lam). Hook.**

Local name: പാടത്താളി.

Habit: Shrub.

Habitat: Semi evergreen and evergreen forests.

Climbing shrub, stems twining, clothed with reflexed hairs. Leaves ciliate, pilose, peltate, slightly retuse or truncate at base. Flowers greenish in axillary drooping panicles. Fruits ovoid. (Plate - I C)

The leaves are locally used as *Thali* (താളി) for newborn children.

TINOSPORA

***Tinospora cordifolia* Miers.**

Local name: ചിറ്റുമ്പ്.

Habit: Shrub.

Habitat: Moist deciduous forests.

Climbing shrub with succulent stem, the bark papery at first, then corky; leaves glabrous; flowers yellow, on nodes on the old wood; drupes red, sessile; endocarp with few isolated tubercles or smooth.

Flowering and fruiting: January - March.

CAPPARACEAE

CLEOME

***Cleome rutidosperma* L.**

Local name: നായ്ക്കടക്.

Habit: Herbs.

Habitat: Deciduous forests and plains.

Erect, branched viscid, hairy herbs, 30 - 50 cms tall. Leaves 3 - 5 foliolate; leaflets oblong, acute or obtuse at apex, narrowed at base. Flowers yellow, Solitary in reduced leaf axils. Capsules upto 7.5 cms long.

Flowering and fruiting: June - July. (Plate - I D)

FLACOURTIACEAE

HYDNOCARPUS

***Hydnocarpus pentandra* (Buch. - Ham.) Oken.**

Local name: മരോട്ടി.

Habit: Tree.

Habitat: Semi evergreen and moist deciduous forests.

Tree, 7 - 9m tall. Leaves pubescent below, serrate, elliptic, acuminate at apex, acute at base. Flowers white in axillary racemes; peduncles and sepals brown, tomentose. Berries globose, tomentose.

Flowering and fruiting: November - May.

Endemic to Western ghats.

Oil extract from the seeds used in Ayurvedic preparations in rheumatism.

CLUSIACEAE

CALOPHYLLUM

***Calophyllum inophyllum* L.**

Local name: ചുവ.

Habit: Tree.

Habitat: Fairly common throughout the coast and midland.

Tree. Leaves coriaceous, oblong or broadly obovate elliptic, obtuse or emarginated at apex, acute at base. Flowers white in axillary racemes. Fruits brownish yellow.

Flowering and fruiting: September - March. (Plate - I E)

Cultivated for wood and fruits and as an ornamental in gardens. Woods used for making country boats and handles for agricultural tools. Seeds yield oil.

GARCINIA

***Garcinia gummi-gutta* Wt.**

Local name: കൊടംപുളി.

Habit: Tree.

Habitat: Evergreen forests, cultivated.

Evergreen tree, bark black, rough, thinly scaly; blaze creamy yellow; exudation pale yellow, sticky. Leaves simple, opposite, decussate, estipulate; lamina elliptic or elliptic-oblongate, base cuneate, or attenuate, apex acute, margin entire, coriaceous. Flowers polygamodioecious, yellowish-white; male flowers in axillary fascicles; sepals 4, coriaceous, ovate or obovate; petals 4, concave with narrow membranous margin; stamens inserted on a receptacle, monadelphous, forming globular head; pistil absent or minute; female flowers: in terminal and axillary fascicles; staminodes 10 - 20, ovary globular; stigmatic rays spreading. Berry, ovoid to subglobose, yellow or red, grooved; seeds ovoid, compressed, pale brown, veined.

Flowering and fruiting: December - September.

MALVACEAE

ABELMOSCHUS

***Abelmoschus moschatus* Medikus.**

Local name: കസ്തുരിവെണ്ട.

Habit: Herb.

Habitat: Moist deciduous forests also in plains.

Erect shrubs 1-1.5 meter tall. Leaves hastate, palmately 5 lobed, stellately pubescent; lobes lanceolate, serrate. Flowers yellow.



Plate - I : A. *Artabotrys zeylanicus*, B. *Nymphoides indica*, C. *Cyclea peltata*,
D. *Cleome rutidosperma*, E. *Calophyllum inophyllum*,
F. *Sida rhombifolia*, G. *Helictres isora*.

Flowering and fruiting: July - September.

HIBISCUS

***Hibiscus vitifolius* Linn.**

Local name: വെള്ളൂരം.

Habit: Herb.

Habitat: Dry deciduous and semi evergreen forests; also in the plains.

Annual or biennial herb; leaves stipulate usually palmately lobed or cut. Flowers yellow, axillary or rarely in a terminal raceme. Bracteoles usually free from each other and from the calyx. Calyx 5 lobed, valvate or spathaceous or circumscissile. Petals 5, connate at the base and adnate to the staminal tube. Staminal tube truncate or 5 toothed at the top, giving of the free ends of the stamens at various heights. Ovary 5 celled; ovules three or more in each cell; styles 5, connate below; stigmas usually capitate. Capsule loculicidally 5 valved, 5 celled or rarely 10 celled. Seeds reniform, globose or ovoid, glabrous, velvety cottony or scaly.

Flowering and fruiting: March - August.

SIDA

***Sida acuta* Burm.**

Local name: മഞ്ഞക്കുറുന്തോട്ടി.

Habit: Shrub.

Habitat: Frequent along road sides and railway tracks.

Low, branched shrubs; branches stellate, tomentose. Leaves lanceolate, acute at apex, slightly obtuse or sub acute at base. Flowers yellow.

Flowering and fruiting: October - December.

***Sida cordifolia* L.**

Local name: കുറുന്തോട്ടി.

Habit: Undershrub.

Habitat: Common in all habitats.

Erect, branched under shrubs, 50-60 cm tall. Leaves densely

stellate, tomentose, crenate, ovate, obtuse or acute at apex, rounded, cordate or truncate at base. Flowers yellow mostly solitary, axillary, rarely in clusters of 2-3. Mericarps awned, trigonous, flattened.

Flowering and fruiting: March -May.

***Sida rhombifolia* L.**

Local name: കുറുന്തൊട്ടി.

Habit: Under shrub.

Habitat: Wastelands and degraded forests.

Erect, stellate - tomentose undershrubs, leaves rhomboid, acute, lower half entire, upper serrate; petiole joint not distinct; calyx lobes shorter than tube; petals pale yellow, obliquely obovate - truncate; staminal tube hairy, styles 9 -12; mericarps 10 - 12, each with 2 awns, stellate pubescent.

Flowering and fruiting: November - October- March. (Plate - I F)

URENA

***Urena lobata* L.**

Local name: ഉറുരൂ.

Habit: Shrub.

Habitat: Common along road sides and waste lands.

Erect shrubs. Stems stellate hairy. Leaves tomentose, extremely variable in shape, mostly orbicular, entire or serrate, acute or obtuse at apex, cordate at base. Flowers rose - red, axillary mostly solitary, rarely clustered. Mericarps stellate, hairy.

Flowering and fruiting : October - November. (Plate - II A)

BOMBACACEAE

BOMBAX

***Bombax ceiba* L.**

Local name: ഇലവ്. ഉന്നപ്പൂള.

Habit: Tree

Habitat: Deciduous forests.

Deciduous trees; bole straight, armed with conical prickles; bark grey mottled with white, longitudinal fissures shallow. Leaves digitately-compound, alternate, stipulate, lateral; rachis stout, swollen at base, glabrous; leaflets whorled; petiolule stout, glabrous; lamina elliptic, elliptic-ovate or elliptic-obovate; base attenuate or cuneate; apex caudate-acuminate. Flowers dark crimson, solitary or 2 - 5 together; calyx campanulate, irregularly lobed, lobes coriaceous, silky inside, falling off with corolla and stamens; petals 5, obovate to elliptic-obovate, fleshy, imbricate; stamens in 5 bundles; filaments flat, angular; anthers reniform; ovary conical, tomentose, 5 celled; ovules many; stigma 5 fid. Capsule tomentose, cylindrical, blackish and glabrous; seeds numerous, pyriform, smooth, dark brown, embedded in white cotton.

Flowering and fruiting: December - May.

STERCULIACEAE

HELICTRES

***Helictres isora* L.**

Local name: എടംപിരി വലംപിരി.

Habit: Small tree.

Habitat: Deciduous forests, also in plantations and plains. Small tree. Scabrous or stellately pubescent, incised, obovate, abruptly acuminate, at apex, obliquely rounded at base. Flowers red in axillary fascicles. Follicles pubescent.

Common in the undergrowth of semi evergreen forests.

Flowering and fruiting: September - March.

WALTHERIA

***Waltheria indica* Linn.**

Habit: Shrub.

Habitat: Degraded moist deciduous forests, roadsides and waste places.

An under shrub with much soft pubescence, ovate, serrate

leaves and small yellow flowers in globose axillary clusters.

Flowering and fruiting: September - May.

TILIACEAE

GREWIA

***Grewia nervosa* (Lour.) Panigrahi.**

Local name: ചേരിക്കൊട്ട.

Habit: Shrub.

Habitat: Semi evergreen forests and sacred grooves.

Erect shrubs, 3 - 5m tall. Leaves glabrous above, stellate hairy beneath, oblong, acuminate at apex, truncate or rounded at base. Flowers pale yellow.

Flowering and fruiting: October - February.

TRIUMFETTA

***Triumfetta rhomboidea* Jaq.**

Local name: ഉൗർപ്പം.

Habit: Shrub.

Habitat: Degraded deciduous forests and plains.

Erect herbs or sub shrubs; stellate - tomentose all over; lower leaves trilobed, upper ones ovate - deltoid, acuminate, serrate, three - nerved from base; petiole 3 cms long; flowers in leaf - opposed cymes; sepals oblong aristate at apex; petals yellow obovate-obtuse, glabrous; stamens 10; capsule globose, glabrous, covered by globchidiate bristles.

Flowering and fruiting: September - January.

The plant is reported to have demulcent and astringent properties. Roots are diuretic.

LINACEAE

HUGONIA

***Hugonia mystax* L.**

Local name: മോതിരക്കണ്ണി.

Habit: Straggling shrub.

Habitat: Moist deciduous forests and plains.

Straggling shrubs. Leaves, subsessile, elliptic or obovate, acute or obtuse at apex, cuneate at base. Flowers yellow, lowest pair of peduncles transferred into spiral hooks. Drupes fleshy, globose.

Flowering and fruiting: November - May.

OXALIDACEAE

BIOPHYTUM

***Biophytum sensitivum* (L.) DC.**

Local name: മുക്കുറ്റി.

Habit: Herb.

Habitat: Moist shady places.

Stems 5 - 10cm tall. Leaves long; leaflets 10 - 13pairs, sessile, oblong or obovate at apex, truncate or obtuse at base. Flowers yellow.

Flowering and fruiting: January - September. (Plate - II B)

Roots with pepper are taken by ladies after birth as a tonic.

RUTACEAE

AEGLE

***Aegle marmelos* (L.) Corr.**

Local name: കുമ്പളം.

Habit: Tree.

Habitat: Cultivated near temples.

Small deciduous trees, 7 - 10m tall with sharp spines. Leaves 3 - foliolate; leaflets ovate-lanceolate, rounded at base. Flowers 5 - merous, petals greenish white. Stamens numerous.

Berries globose, pulp sweet.

Flowering and fruiting: October.

Fruit is valued for its aromatic pulp and its medicinal use. Leaves offered to God in worship.

GLYCOSMIS

***Glycosmis pentaphylla* (Retz.) DC.**

Local name: പാണൽ.

Habit: Shrub.

Habitat: Semi evergreen and moist deciduous forests.

Glabrous shrub or small tree; Leaves alternate, imparipinnate; leaflets 3 - 7, elliptic or oblong, acute or acuminate, crenulate, gland - dotted, glabrous; flowers in terminal or axillary, spiciform panicles; calyx lobes 5, ovate - acute; petals 5, ovate acute, gland dotted; stamens 10, sub equal, anthers gland - tipped. berries globose, white turning pink.

Flowering and fruiting: November - March.

MURRAYA

***Murraya exotica* Linn.**

Local name: മരമല്ല.

Habit: Shrub or small tree.

Habitat: Common in the hills, underwood especially in ravines.

A large shrub or small tree with scented flowers. Wood very hard, resembling boxwood.

Common in the hills, underwood especially in ravines; often planted in gardens.

***Murraya koenigii* (L.) Spreng.**

Local name: കറിവേപ്പ്.

Habit: Shrub or small tree.

Habitat: Cultivated.

A small tree with very aromatic leaves which are eaten in curries. Wood greyish white.

Flowering and fruiting: March - February.

SIMARUBACEAE

AILANTHUS

***Ailanthus excelsa* Roxb.**

Local name: മട്ടി, പൊങ്ങലൂം.

Habit: Tree.

Habitat: Cultivated.

Trees 10 - 30 meter tall; bark grey. Leaves upto 56 cms long; leaflets pubescent beneath, obliquely ovate - lanceolate, acuminate at apex. Flowers yellow, in long, dense flowered, axillary and terminal panicles 20 - 35 cms long. Common in evergreen forests. Wood used for match boxes and splints.

Flowering and fruiting: February - May.

MELIACEAE

AZADIRACHTA

***Azadirachta indica* A. Juss.**

Local name: ആര്യവെപ്പ്.

Habit: Tree.

Habitat: Cultivated.

Evergreen tree; bark greyish-brown, vertically striated; exudation red, sticky. Leaves imparipinnate, alternate, estipulate; rachis slender, swollen at base, glabrous, leaflets 7 - 15, opposite or subopposite; petiolule slender, glabrous; lamina lanceolate or falcate, base oblique, apex acuminate, margin serrate, glabrous, coriaceous. Flowers bisexual, white, in axillary panicles; bracteoles scaly; sepals 5, connate at base, ovate, margin ciliate; petals 5, free, white, oblong-obovate, pubescent, imbricate; staminal tube glabrous, apically 10 lobed; lobes truncate; anthers 10, slightly exerted, apiculate, opposite to lobes, sessile; ovary superior, globose, 3 celled; style elongate; stigma terete, 3 lobed. Drupe oblong - ovoid, greenish-yellow; seed one, surrounded by a sweet pulp.

NAREGAMIA

***Naregamia alata* Wight & Arn.**

Local name: നിലന്മാരകം.

Habit: Undershrub.

Habitat: Fairly common throughout the midlands along road.

Undershrub. Leaves long, trifoliate, glabrous, central leaflets, obovate, entire or 2 - 3 lobed, obtuse at apex, cuneate at base, laterals smaller, flowers white, axillary, solitary, capsules 3 - valved, globose.

Flowering and fruiting: September - October.

Endemic to Peninsular India.

SWIETENIA

***Swietenia mahagoni* (L.) Jacq.**

Local name: മഹാഗണി.

Habit: Tree.

Habitat: Cultivated.

Large evergreen trees; Bark fissured, dark; leaves paripinnate; leaflets 3 - 6 pairs, obliquely ovate - lanceolate, base cuniate, thinly coreaceous, glabrous; flowers in axillary panicles; calyx tube short, lobes minute, petals 5, white oblong; staminal tube lobbed at apex, anthers 10, included; capsule large, woody, brown - tomentose.

Flowering and fruiting: April - January.

Timber is beautifully grained, good for furniture and other decorative works.

RHAMNACEAE

ZIZYPHUS

***Ziziphus oenoplia* (L.) Mill.**

Local name: ചെറുതുടലി.

Habit: Shrub.

Habitat: Deciduous forests and plains.

Straggling shrubs; young branches strigose. Leaves canescent above, brown sericeous beneath, ovate - lanceolate. Flowers greenish - yellow in axillary, pubescent cymes. Fruits obovoid, black.

Flowering and fruiting: January - February. (Plate - II C)

***Zizyphus rugosa* Lam.**

Local name: തുടലിമുളള.

Habit: Shrub.

Habitat: Deciduous forests and plains.

Large, straggling, thorny shrubs or small tree. Leaves pubescent beneath, subcordate at base. Flowers in tomentose cymes. Calyx lobes ovate. Ovary villous. Drupes oblong.

Flowering and fruiting: February - April.

VITACEAE

CAYRATIA

***Cayratia trifolia* (L.) Domin.**

Local name: കാട്ടുപെരണ്ട.

Habit: Climber.

Habitat: Semi evergreen forests and plains.

Herbaceous climbers with wiry, branched tendrils. Leaves 3-foliolate on long petioles, pubescent; leaflets ovate, serrate, acute at apex, rounded at base. Flowers pale yellow in umbellate cymes. Fruits turbinate, fleshy, 2 - 4 seeded.

***Cissus repens* Lam.**

Local name: തൈരിഞ്ഞാമ്പുളി, എരുങ്ങാൻ.

Habit: Scandent shrub.

Habitat: All type of forests.

Scandent, glabrous shrubs with leaves opposed tendrils. Leaves serrate, ovate, acuminate at apex, cordate at base. Flowers greenish in compound cymes.

Flowering and fruiting: March - October. (Plate - 10 a)

TETRASTIGMA

***Tetrastigma leucostaphylum* (Dennst.) Alston ex Mabb.**

Local name: വലിയ ചൊരിവള്ളി.

Habit: Climbing shrub.

Habitat: Evergreen, semi evergreen forests and sacred groves.

Climbing shrub; stem and branches warted, obscurely 4 gonous; leaves paddately 3 - 5 foliolate; leaflets elliptic acuminate, distantly serrate, base cuniate, coriaceous, glabrous; flowers in corymbose cymes; calyx tube 4 lobed; petals 4 green, ovate; stamens 4 in male flowers; staminodal in females, berries ovoid.

Flowering and fruiting : December - March. (Plate - II E)

LEEACEAE

LEEA

***Leea indica* (Burm. f.) Merr.**

Local name: ഞെട്ട, ചൊരിയൻതാളി.

Habit: Shrub.

Habitat: Degraded semi evergreen and evergreen forests, also in the plains.

Shrubs; stem terete, glabrous; stipules obovate - obtuse, leaflets elliptic-lanceolate, serrate - dentate, glabrous; panicles large; corolla white; staminod lobes deeply sinuate; anthers coherent; berries purple when mature.

Flowering and fruiting: July - December.

The plant is used in Ayurveda as the source of the drug. Local people use the mucilage of the tender parts as shampoo.

SAPINDACEAE
CARDIOSPERMUM

***Cardiospermum helicacabum* L.**

Local name: ഉഴിഞ്ഞ.

Habit: Climber.

Habitat: Moist deciduous forests, also in scrub jungles.

Climber, stems wiry, leaves biternate; leaflets lanceolate. Flowers white in umbellate cymes; lower pedicels modified into circinate tendrils. Capsules depressed, pyriform. Seeds black with a large heart-shaped hilum.

Flowering and Fruiting: October - December. (Plate - II G)

ANACARDIACEAE
ANACARDIUM

***Anacardium occidentale* L.**

Local name: പാക്കിമാവ്.

Habit: Tree.

Habitat: Cultivated.

Trees, 10 - 12m tall. Leaves glabrous, chartaceous, oblong, obtuse at both ends. Flowers yellowish - white in terminal cymose panicles; sepals and petals pubescent.

A cash crop commonly cultivated for nuts.

Flowering and fruiting: December - June.

HOLIGARNA

***Holigarna arnottiana* Hook. f.**

Local name: ചേര്.

Habit: Tree.

Habitat: Semi evergreen and evergreen forests, also in the plains.

Trees, 10 - 15m tall. Leaves coriaceous, glabrous above, sparsely brownish tomentose along the nerves beneath, obovate or oblanceolate, acute or shortly acuminate at apex, narrowed from the middle to a cuneate base; petiolar spurs usually

deciduous. Flowers brown, tomentose in axillary and terminal racemes. Drupes oblong, glabrous.

Flowering and fruiting: March - May.

Endemic to Southern Western Ghats.

MANGIFERA

***Mangifera indica* Linn.**

Local name: മാവ്.

Habit: Tree.

Habitat: Evergreen and semi evergreen forests, and also widely cultivated.

Tree. Leaves alternate, petioled, coriaceous, simple, entire. Flowers small, polygamous in terminal panicles; pedicels jointed; bracts, deciduous. Petals 4 - 5, free of adnate to the disc, imbricate, furnished on the inside with a lobed glandular scale or crest. Disk fleshy. 4 - 5 lobed. Stamens 1 - 5, inserted inside or on the disk. Ovary sessile, one celled, oblique; style lateral; stigma simple; ovule pendulous. Fruit a large fleshy resinous drupe with a compressed fibrous stone. Seed large, ovoid - oblong, compressed; testa thin, papery; Cotyledons plano-convex; radicle slightly curved upwards.

Flowering and fruiting: January - June.

Cultivated for its edible fruit, which is eaten fresh, or made into preserves or pickles. Wood used for planking, packing cases, boats and other purposes.

FABACEAE

ABRUS

***Abrus precatorius* L.**

Local name: കമ്പി.

Habit: Climbing shrub.

Habitat: Occasional at low elevations of the moist deciduous forest.

Climbing shrubs. Leaflets pairs, Sparsely strigose beneath, oblong, rounded at base. Flowers pink, fascicled in thick axillary

peduncles upto 3 cms long. Seeds white or scarlet with a black spot.

Flowering and fruiting : March - October.

Paste of seeds used externally for skin infections. Seeds used as jeweller's weight.

ALYSICARPUS

***Alysicarpus vaginalis* (L.) DC.**

Local name: നിലക്കാരില.

Habit: Herb.

Habitat: Waste lands in the plains.

Prostrate or ascending herbs; basal leaves orbicular, upper oblong-obtuse, base cordate, lower surface appressed hairy, upper strongly reticulate; stipules lanceolate; flowers in terminal racemes; calyx hispid, lobes lanceolate, upper two connate; corolla purple; pods strongly reticulate, glabrous, 5 - 6 jointed; seeds subreniform.

Flowering and fruiting: September - December.

CENTROSEMA

***Centrosema pubescens* Benth.**

Local name: കാട്ടുപയർ.

Habit: Climber.

Habitat: Forest plantations and deciduous forests, also in the plains.

Leaves trifoliolate; leaflets pubescent beneath, ovate, acuminate at apex, rounded at base. Flowers white with a violet tinge in axillary peduncles; petals densely villous. Pods upto 7cm long, compressed, slightly pubescent.

Flowering and fruiting: August - January. (Plate - II F)

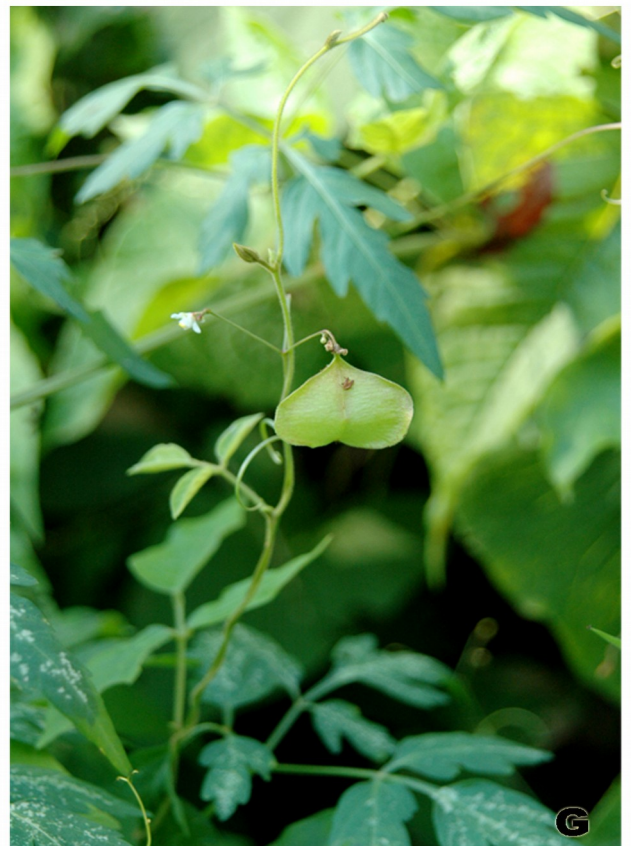


Plate - II : A. *Urena lobata*, B. *Biophytum sensitivum*, C. *Zizyphus oenoplea*,
D. *Cissus discolor*, E. *Tetrastigma leucostaphylum*, F. *Centrosema pubescens*,
G. *Cardiospermum halicacabum*.

CROTALARIA

***Crotalaria pallida* Dryand.**

Local name: ആനത്തകര.

Habit: Shrub.

Habitat: Waste lands.

Subshrub; leaves trifoliolate; leaflets obovate-obtuse, membranous; flowers in terminal or subterminal racemes; calyx lobes longer than tube, upper two connate at apex; corolla yellow with prominent red veins, standard broadly elliptic-acute, wings oblong-obtuse with transverse pouches, keels strongly curved, beaked, upper part connate; pod oblong, glabrous; seeds many, reniform.

Flowering and fruiting: September - March.

DALBERGIA

***Dalbergia latifolia* Roxb.**

Local name: റ്റീ.

Habit: Tree.

Habitat: Cultivated.

Deciduous trees; bark smooth; leaflets obovate-obtuse, emarginate, subcoriaceous, glabrous; flowers in corymbose panicles; calyx glabrous, lobes subequal; corolla white, standard obovate - obtuse, wings oblong - acute, keels connate at apex; stamens 9; pod 1 - 4 seeded, oblong, acute at both ends.

Flowering and Fruiting: May - February.

Status: *Vulnerable* (IUCN 2000).

DESMODIUM

***Desmodium gangeticum* (L.) DC.**

Local name: ഓരില.

Habit: Shrub.

Habitat: Frequent in deciduous forests at low elevations.

Erect shrubs, branches pubescent. Leaves sparsely pubescent above, densely villous beneath. Flowers white, tinged, lilac. Pods 4 - 7 seeded, slightly curved, sparsely clothed with

curved hairs.

Flowering and fruiting: August - December.

***Desmodium heterophyllum* (Willd.) DC.**

Habit: Herb.

Habitat: Frequent in wet situations throughout the plains.

Wiry, branched, trailing herb. Rooting at nodes; stems 30 - 60 cms long, pilose. Leaves trifoliolate; Central leaflets elliptic-ovate or obovate, obtuse at apex, rounded at base. Flowers pink, 1 - 3 together in axillary and 2 - 6 in terminal racemes.

Flowering and fruiting: August - September.

***Desmodium triflorum* (L.) DC.**

Local name: നിലംപരണ്ട.

Habit: Herb.

Habitat: Grasslands and moist deciduous forests.

Wiry, trailing herbs. Leaflets obovate, truncate or emarginate at apex, cuneate at base. Flowers pink in axillary racemes. Pods straight, 3 - 5 jointed.

Flowering and fruiting: July - December.

***Desmodium triquetrum* DC.**

Local name: പൈമ്പലടയ്ക്ക, അടയ്ക്കാപാണൽ.

Habit: Shrub.

Habitat: Semi evergreen and moist deciduous forests, also in the plains.

An erect shrub with leaflets up to 6-8in. long and triquetrous stems. Flowers purple, pod appressed pubescent.

Flowering and fruiting: September - October.

PONGAMIA

***Pongamia pinnata* (L.) Pierre.**

Local name: ഉണ്ട.

Habit: Tree.

Habitat: Frequent along roadsides in the midland zone.

Tree, 6-8 m tall. Leaves up to 22 cm long, leaflets 5 - 7,

elliptic or elliptic-oblong, shortly acuminate at apex, acute at base.
Flowers white.

Flowering and fruiting: July.

TEPHROSIA

***Tephrosia purpurea* (L.) Pers.**

Local name: കൊഴുവ.

Habit: Undershrub.

Habitat: Moist deciduous forests and grass lands, also in the plains.

Erect, perennial undershrub. Leaflets acute, lanceolate. Flowers dark pinkish, in racemes. Pods slightly curved, glabrous.

Flowering and Fruiting: October.

VIGNA

***Vigna dalzelliana* (O. Kzte.) Verdc.**

Local name: കാട്ടുഴുന്ന്.

Habit:

Habitat: Deciduous forests.

Twining shrubs; stems wiry, sparsely pubescent. Leaflets pubescent, ovate, acuminate at apex, obtuse at base. Flowers yellow in slender peduncled racemes.

Flowering and Fruiting: September - February.

ZORNIA

***Zornia gibbosa* Span.**

Local name: കൊഴുപ്പ, മുറികൂട്ടി.

Habit: Herb.

Habitat: Common in the plains as well as degraded forest areas.

Diffuse or prostrate herbs; leaves 2 foliolate; leaflets oblong or ovate, membranous, red-glandular; stipules peltate, lanceolate, auricled; flowers in terminal or axillary, bracteate racemes; bracts

imbricate, peltate, ovate-lanceolate, auricled, ciliated along margins, gland-dotted; calyx membranous, lobes sub equal, wings obovate-obtuse, keels curved, oblong-obtuse, connate at base; stamens monadelphous, anthers dimorphic; pods 3 - 4 jointed, strongly reticulate with retrorsely barbed bristles.

Flowering and Fruiting: September - January.

CAESALPINIACEAE

BAUHINIA

***Bauhinia purpurea* L.**

Local name: മന്ദാരം.

Habit: Tree.

Habitat: Common in plains, often cultivated.

Deciduous trees, bark brown, rough, shallow with vertical and horizontal furrows, fibrous. Leaves simple, bilobed, alternate; lamina suborbicular, base cordate, apex obtuse, margin entire, glabrous above, slightly glaucous beneath, coriaceous. Flowers bisexual, purple coloured, in axillary corymbs; pedicels slender, calyx tube thin, pubescent with 5 short lobes; petals 5, oblong; stamens 10, alternate ones short; anthers versatile; ovary half inferior, stipitate; ovules many; style filiform; stigma peltate. Pod flattened, beaked, longitudinally striate, glabrous; seeds oblong.

Flowering and fruiting: September - December.

CAESALPINIA

***Caesalpinia mimosoides* Lam.**

Local name: തിമുള.

Habit: Shrubs.

Habitat: Forest clearings and agricultural lands in plains.

Straggling shrubs; Spines recurved; leaves bipinnate; pinnae 15-20 pairs; leaflets 10-15 pairs, oblong- obtuse, mucronate; racemes terminal; calyx lobes oblong - obtuse; petals yellow, sub-equal stamens 10, filament vilous at base, anthers uniform; pods

turgidprickly; seeds 2.

Flowering and Fruiting: December - March.

***Caesalpinia pulcherrima* (L.) Swartz.**

Local name: രാജമല്ലി.

Habit: Tree.

Habitat: Cultivated as an ornamental plant.

Small to medium tree, Leaves compound, opposite, bipinnate. Bark yellowish - green. Flowers terminal on new growth, erect alternate, 30 - 40 in a long raceme. Bright scarlet stamens. Petals frilled edged, red with green tinge. Seed pods darkish brown.

Flowering and fruiting: Throughout the year.

***Caesalpinia sappan* L.**

Local name: ചപ്പുങ്ങം, പതിമുഖം.

Habit: Tree.

Habitat: Cultivated.

Trees, sparsely armed with short straight or recurved prickles. Leaves bipinnate, alternate; stipules spiniform, rachis slender, pubescent, pulvinate; pinnae 10 - 14 pairs, slender; leaflets opposite, sessile; lamina oblong, base oblique, obtuse, apex obtuse, emarginate, margin entire, glabrous, coriaceous. Flowers bisexual, yellow, in supra-axillary and terminal racemes; sepals 5, unequal; petals 5, orbicular, subequal, with red spot at the base; stamens 10, declinate, densely woolly at base; ovary grey-velvety. Pod obliquely oblong, black, glabrous; seeds black, oblong or ellipsoid.

CASSIA

***Cassia fistula* L.**

Local name: കണിക്കൊന്ന.

Habit: Tree.

Habitat: Moist deciduous forests widely planted as ornamental plants.

Medium sized deciduous tree, leaflets 4 - 5 pairs, ovate-

lanceolate, glabrous, racemes drooping to 1m long. Sepals 5, petals yellow, obovate - orbicular, stamens 10, unequal, only 3 - 4 perfect. Pods terete, woody, pendulous.

Flowering and fruiting: May - July.

Flowers are popularly used in Hindu religious ceremonies. Root is used for treating skin diseases, leprosy, tuberculosis.

CHAMAECRISTA

***Chamaecrista leschenaultiana* (DC.) Degner.**

Habit: Undershrub.

Habitat: Grass lands and open areas in moist deciduous forests.

Erect undershrub. Glands on petioles sessile. Leaflet 16 - 24 pairs, subfalcate. Stamens 10. Stipules conspicuous. Flowers yellow, supra-axillary. Pod 8 - 16 seeded.

Flowering and fruiting: November.

DELONIX

***Delonix regia* (Boj. ex Hook.) Rafin.**

Local name: അലന്ദിപ്പുമരം, ഗുൽമോഹർ.

Habit: Tree.

Habitat: Planted as ornamental avenue tree.

Trees, branchlets warty, puberulous. Leaves bi-pinnate, alternate; stipules lateral; rachis slender, pulvinate, puberulent; pinnae opposite or subopposite, slender, pulvinate, puberulent; leaflets sessile, opposite; lamina oblong or linear-oblong, base oblique, apex obtuse, margin entire, puberulent above and pubescent beneath, membranous. Flowers bisexual, crimson, in terminal or lateral corymbose panicles; calyx lobes 5, valvate, subequal; petals 5, orbicular, imbricate; margins fimbriate; claws yellow, upper petal dissimilar and white streaked with red and yellow; stamens 10, declinate, long exserted; filaments villous below; anthers uniform; ovary sessile; style filiform; stigma truncate, ciliolate. Pod flat, elongate, woody; seeds oblong, transverse.

PELTOPHORUM

***Peltophorum pterocarpum* (DC.) Backer ex Heyne.**

Habit: Tree.

Habitat: Planted as ornamental avenue tree.

Tree, young parts brown tomentulose. Leaves bipinnate, alternate, stipulate; stipules small, lateral, cauducous; rachis stout, pulvinate, brown tomentulose; pinnae opposite, pulvinate, brown pubescent; leaflets 14 - 38, opposite, estipulate; lamina sessile, oblong, base obliquely truncate, apex obtuse or retuse, margin entire, glabrous above, puberulent beneath. Flowers bisexual, golden yellow, in terminal or lateral racemose panicles; calyx lobes 5, ovate, petals 5, subequal, crinkled; stamens 10, filaments pilose at base; anthers uniform; stigma peltate. Pod samaroid, oblong-elliptic, minutely tomentulose, longitudinally striated; seed lenticular, light brown, compressed.

SARACA

***Saraca asoca* (Roxb.) de Wilde.**

Local name: അശോകം.

Habit: Shrub.

Habitat: Evergreen forests also grown as ornamental trees.

Erect shrubs 3 - 4m tall. Leaves pinnate; leaflets 4 - 5, chartaceous, oblong, obtuse at apex, narrowed at base. Flowers orange in axillary panicles. Mostly cultivated in gardens.

Flowering and fruiting: April - May. (Plate - III C)

Status: *Vulnerable* (IUCN 2000).

SENNA

***Senna tora* (L.) Roxb.**

Local name: തകര.

Habit: Shrub.

Habitat: Waste lands throughout the plains.

Small annual shrub. Leaves with subulate glands between trate leaflets; leaflets 3 pairs, obovate, obtuse, mucronate. Flowers 5 - 6, yellow, small in axillary pairs. Pods 10 - 20 cm long,

curved. Seeds many.

Flowering and fruiting: October - December.

Leaves locally used as remedy for skin diseases.

TAMARINDUS

***Tamarindus indica* L.**

Local name: പൂളി.

Habit: Tree.

Habitat: Cultivated.

Tree, 8 -15m tall. Leaves long, leaflets oblong, retuse at apex, narrowed at base. Flowers yellow in axillary racemes.

Flowering and fruiting: January - June.

Fruits edible; cultivated.

MIMOSACEAE

ACACIA

***Acacia auriculiformis* A. Cunn.**

Local name: അക്കേഷ്യ.

Habit: Tree.

Habitat: Cultivated.

***Acacia pennata* (Linn.) Willd.**

Local name: കാരീഞ്ചി.

Habit: Shrub.

Habitat: Moist deciduous forests.

Prickly, straggling shrubs; prickles recurved; leaves bipinnate, pinnae leaflets oblong-obtuse; petiole with a large sessile, concave gland near the middle; flowers in paniced globose heads; calyx tube 5 - lobed; petals 5, white, oblong, acute; stamens numerous, exerted; pod thin, flat, 10 - 14 seeded.

Flowering and fruiting: September - March.

ADENANTHERA

***Adenantha pavonina* L.**

Local name: മഞ്ചാടി.

Habit: Tree.

Habitat: Cultivated.

Deciduous tree; bark grey to reddish-brown, smooth. Leaves bipinnate, alternate, stipulate; stipules minute, lateral, cauducous; rachis pulvinate; pinnae 2 - 3 pairs, opposite or rarely subopposite, even pinnate, grooved above, pulvinate, puberulent; leaflets alternate, estipulate; lamina oblong, oblong-elliptic, apex round, emarginate or obtuse and mucronate, margin entire. Flowers bisexual, pale yellow, clustered in axillary spiciform racemes; bracts linear; calyx tube campanulate, 5 toothed, pubescent; petals 5, connate below, linear-lanceolate, glabrous; stamens 10, filaments filiform, alternately long and short; anthers oblong, ending in a stipitate gland; ovary subsessile; style filiform; stigma simple. Pod straight to falcate to slightly twisted, spirally coiled after dehiscence, thin, septate within, apex acute, glabrous; seeds elliptic-lenticular, glossy, red.

Flowering and Fruiting: June - August.

ALBIZIA

***Albizia lebbbeck* (L.) Benth.**

Local name: നെന്മേനിലാക.

Habit: Tree.

Habitat: Deciduous forests and plains.

Deciduous tree; bark surface yellowish-brown, rough, deeply fissured. Leaves bipinnate, alternate, stipulate; stipules lateral, cauducous; rachis slender, grooved above, with a gland at its base, glabrous, pulvinate, pinnae glabrous, opposite, even pinnate; leaflets opposite, estipulate, even pinnate, a gland in between each leaflets; lamina obliquely oblong, apex obtuse, margin entire, glabrous above and slightly pubescent beneath, coriaceous; midrib towards distal margin, lateral nerves 6 - 8 pairs, pinnate, slender, prominent. Flowers bisexual, greenish-white, in subglobose heads, solitary or 2 - 4 together in axillary corymbose racemes; bracts linear, cauducous; calyx tube funnel-shaped, pubescent, teeth triangular; corolla infundibuliform,

greenish, lobes 5, lanceolate, pubescent without; stamens many, filament tube shorter than corolla tube, filaments long exerted, green or pink; ovary sessile, glabrous, style filiform; stigma minute. Pod flat, oblong, compressed, straw coloured, base and apex obtuse; seed ovate, dull dark brown, flattened.

Flowering and Fruiting: March - October.

MIMOSA

***Mimosa diplotricha* C. Wt. & Sanvalle.**

Local name: ആനത്തൊട്ടാവടി.

Habit: Climbing Shrub.

Habitat: Common weed in degraded forests.

Diffuse shrub with 3 - 6 pairs of pinnae; leaflets 15 - 20, oblong, apiculate at apex, acute at base, flowers pink in pedunculate, globose heads arranged in terminal racemes.

Flowering and fruiting: November - April. (Plate - III A)

***Mimosa pudica* L.**

Local name: തൊട്ടാവടി.

Habit: Shrub.

Habitat: Abundant in plains and in lower ghats.

Diffuse shrub, pinnae 3 - 4, sessile, leaflets 24 - 40, glabrous. Flowers rose - red in peduncle and globose heads. 3 - 4 seeded, prickly along the structures.

Flowering and fruiting: Almost throughout the year. (Plate - III B)

ROSACEAE

RUBUS

***Rubus ellipticus* Sm.**

Habit: Straggling Shrub.

Habitat: Evergreen shola and semi evergreen forests.

A large straggling shrub with stiff red hairs and prickles. The orange raspberry - like fruit is edible and good. It can be made into preserves.

A number of varieties of **Garden Rose** are cultivated as

ornamental plants.

CRASSULACEAE

KALANCHOE

***Kalanchoe pinnata* (Lam.) Pers.**

Local name: ഇലമഷി, ഇലമുളച്ചി.

Habit: Under shrub.

Habitat: Rocky areas in moist deciduous forests, also in plains.

Fleshy undershrubs. Leaves crenate, elliptic - oblong, obtuse at both ends. Flowers white in lax pendulous panicles.

Flowering and fruiting: December - February.

RHIZOPHORACEAE

CARALLIA

***Carallia brachiata* (Lour.) Merr.**

Local name: വക്കണം.

Habit: Tree.

Habitat: Semi evergreen forests, also in the plains.

Pretty, evergreen tree, 5 - 7m. Leaves opposite, simple, entire, obovate, glabrous. Flowers small, yellowish-green, in small heads. Calyx 8 lobed, glabrous. Petals orbicular, clawed. Stamens 16. Berries globose.

Flowering and fruiting: November - April.



Plate - III : A. *Mimosa diplotricha* , B. *Mimosa pudica*, C. *Saraca asoca*,
D. *Melastoma malbathricum*, E. *Lagerstroemia speciosa*, F. *Solena amplexicaulis*,
G. *Chasalia curviflora*, H. *Ixora coccinea*.

COMBRETACEAE

CALYOPTERIS

***Calycopteris floribunda* Lam.**

Local name: പുല്ലാഞ്ഞി.

Habit: Shrub.

Habitat: Moist deciduous forests also in the plains.

Straggling shrub. Leaves sparsely pubescent above, densely pubescent beneath, lanceolate, acuminate at apex, obtuse at base.

Flowers white in axillary and terminal tomentose racemes.

Flowering and fruiting : January - May.

TERMINALIA

***Terminalia catappa* L.**

Local name: ബദാം, അടമരം.

Habit: Tree.

Habitat: Grown as ornamental trees.

Trees, 10 - 15 meters tall. Leaves crowded at the ends of branches, obovate, obtuse at apex, cordate at base. Flowers white in axillary spikes.

Flowering and fruiting: October - November.

Planted in gardens. kernels of nuts edible.

***Terminalia paniculata* Roth.**

Local name: മരത്.

Habit: Tree.

Habitat: Moist and dry deciduous forests, also in the plains.

Tree, 12 - 16m tall. Leaves lanceolate, acuminate at apex, obtuse at base. Flowers greenish in axillary and terminal racemes. Fruits brownish-red.

Flowering and fruiting: July- February.

Endemic to Peninsular India.

Wood used for house construction.

MYRTACEAE

PSIDIUM

***Psidium guajava* L.**

Local name: പേര.

Habit: Tree.

Habitat: Cultivated.

Trees 4 - 6m tall; bark smooth. Leaves pubescent beneath, elliptic or elliptic-oblong, acute at both ends. Flowers white. Berries yellow.

Flowering and fruiting: December - June.

Commonly cultivated in plains for fruits.

SYZYGIIUM

***Syzygium cumini* (L.) Skeels.**

Local name: തൊവൽ.

Habit: Tree.

Habitat: Fairly common in semi evergreen forests.

Trees 15 - 20 m tall. Leaves chartaceous, ovate-lanceolate, obtusely acuminate at apex, cuneate at base. Flowers pinkish yellow in paniced cymes. Fruits oblong purple.

Flowering and fruiting: December - August.

Endemic to Southern Western Ghats

Fruits edible, used against diabetes and bladder stones.

***Syzygium zeylanicum* (L.) DC.**

Local name: പൂച്ചപ്പഴം.

Habit: Tree.

Habitat: Banks of streams in evergreen forests.

Trees, 7-12m tall. Leaves ovate-lanceolate, rounded at base. Flowers white in paniced cymes. Fruits white, globose. Fruits edible.

Flowering and fruiting: September - June. (Plate - 9 f)

MELASTOMATACEAE

MELASTOMA

***Melastoma malabathricum* L.**

Local name: അതിരാണി, കലമ്പട്ട, കാട്ടുചക്കര.

Habit: Shrub.

Habitat: Abundant in moist deciduous forest.

Erect, branched shrubs; stems scarfy. Leaves ribbed, scabrous on both the surfaces, ovate or elliptic, acute at both ends. Flowers pink in terminal panicles. Capsules irregularly dehiscent.

Flowering and fruiting: April - June. (Plate - III D)

Fruits edible.

MEMECYLON

***Memecylon randerianum* SM & MR Almeida.**

Local name: കായാവ്, കാശാവ്.

Habit: Tree.

Habitat: Stream banks and marshy areas.

Tree, 4 - 6m tall. Leaves coriaceous, elliptic-oblong, acuminate at apex, rounded at base. Flowers pale blue in umbels on short peduncles.

Flowering and fruiting: June - August.

Endemic to Southern Western Ghats.

OSBECKIA

***Osbeckia aspera* (L.) Blume.**

Habit: Shrub.

Habitat: Deciduous forests.

Erect shrub. Leaves appressed bristly, ovate, cuneate or rounded at base. Flowers pink, solitary or in racemes.

Flowering and Fruiting: April - August.

LYTHRACEAE
LAGERSTROEMIA

***Lagerstroemia speciosa* (L.) Pers.**

Local name: പൂമരത്.

Habit: Tree.

Habitat: Semi ever green and evergreen forests, planted as avenue tree.

Tree, 9 - 12m tall. Leaves chartaceous, elliptic-oblong, acuminate at apex, acute at base. Flowers pink in terminal branched racemes.

Flowering and fruiting: March - April. (Plate - III E)

Timber used for furniture.

ONAGRACEAE

LUDWIGIA

***Ludwigia perennis* L.**

Local name: തിർക്കരയാമ്പു.

Habit: Herb.

Habitat: Water logged areas in grass lands.

Herb. Leaves linear, lanceolate, acute at apex, narrowed at base.

Flowering and fruiting: October - February.

PASSIFLORACEAE

PASSIFLORA

***Passiflora foetida* L.**

Local name: പൂച്ചപ്പഴം.

Habit: Climbing shrub.

Habitat: Wastelands and dry deciduous forests.

Climbing shrub with tendrils; stem hirsute. Leaves trilobate, cordate, sericeous, lobes acuminate at apex. Flowers white,

axillary, solitary.

Fruits edible.

CARICACEAE

CARICA

***Carica papaya* L.**

Local name: പപ്പായ, കപ്പളം, കറമുസ.

Habit: Tree.

Habitat: Cultivated for edible fruits.

A soft - wooded, almost branchless tree, introduced from South America, is cultivated in gardens in the plains for its valuable edible fruits, which is of the size of a small melon with a soft yellow pulp.

Flowering and fruiting: Throughout the year.

CUCURBITACEAE

MUKIA

***Mukia maderaspatana* (L.) M. Roem.**

Local name: മുക്കാപിര.

Habit: Prostrate shrub.

Habitat: Common in cultivated lands and waste places.

Scandent or prostrate shrub with tendrils. Leaves finely scabrid on both the surfaces, membranous, acute at apex, deeply cordate-sinuate at base. Flowers yellow. Ripe berries red.

Flowering and fruiting: September - May.

SOLENA

***Solena amplexicaulis* (Lam.) Gandhi.**

Local name: കാരക്ക, അരീക്കച്ചക്ക.

Habit: Climbing Herb.

Habitat: Deciduous forest areas also in the plains.

Succulent herb. Leaves glandular, ovate, sub orbicular, oblong or narrowly lanceolate, denticulate, acute or acuminate at apex, cordate at base. Flowers pale yellow, male sub umbellate,

female solitary, fruits oblong.

Flowering and fruiting: April - June. (Plate - III F)

AIZOACEAE

GLINUS

***Glinus oppositifolius* (L.) DC.**

Habit: Herb.

Habitat: Open areas, lake shores, stream banks.

Prostrate or diffused herbs; leaves in apparent whorls of 3-5, obovate - spatulate; flowers in axillary fascicles; tepals 5, green, with white margin oblong-obtuse; stamens 5; ovary 3-celled; styles 3, recurved; capsule oblong, loculicidal; seeds numerous, reniform, tubercled with a pair of unequal, white hilar appendages.

Flowering and fruiting: February - May.

MOLLUGO

***Mollugo pentaphylla* L.**

Local name: പർപ്പടകപ്പല്ല്.

Habit: Herb.

Habitat: Along banks of streams and in moist and dry deciduous forests.

Ascending herbs; leaves whorled, subsessile, obovate-obtuse, base attenuate, upper leaves often elliptic-lanceolate; flowers white in terminal, lax panicles; tepals 5, ovate-acute; stamens 3; style 3, short; capsule loculicidal, 3-valved; seeds reniform, areolate.

Flowering and fruiting: July.

APIACEAE

CENTELLA

***Centella asiatica* (L.) Urban.**

Local name: കടങ്ങൽ, മുത്തീശ.

Habit: Trailing herb.

Habitat: Common in marshy places.

Trailing herb, rooting at nodes, leaves orbicular - reniform, crenate, cordate at base. Flowers dull, reddish in umbels. Fruits compressed.

Flowering and fruiting: July - August.

RUBIACEAE

CANTHIUM

***Canthium angustifolium* Roxb.**

Local name: കട്ടാരമുള്ളി.

Habit: Armed shrub.

Habitat: Moist deciduous , semi evergreen and ever green forests.

Erect armed shrub. Leaves elliptic - lanceolate, obtusely lanceolate - acuminate at apex rounded at base. Flowers white.

Flowering and fruiting: March - April. (Plate - IV B)

***Canthium coromandelicum* (N. Burm.) Alston.**

Local name: കാരമുള്ളി.

Habit: Shrub.

Habitat: Moist and dry deciduous forests, also in sacred groves.

Armed shrub or small tree; flowering branches usually with out spines; leaves ovate - acuminate, base rounded; stipules triangular, acuminate flowers in few-flowers axillary cymes; calyx minutely four lobed; corolla greenish white, tube short, lobes as long as the tube, ovate - acute, reflexed; stamens four, drupe obcordate, didymous.

Flowering and fruiting: June - September.

CHASALIA

***Chasalia curviflora* (Wall.) Thw.**

Local name: വെള്ളക്കുറിഞ്ഞി.

Habit: Shrub.

Habitat: Fairly common in evergreen forest.

Shrub. Leaves membranous, elliptic, obovate or linear - oblong, acute, acuminate or cuspidate at apex, cuneate at base. flowers sessile, reddish white in terminal cymes. fruits didynamous, smooth.

Flowering and fruiting: March - September. (Plate - III G)

HEDYOTIS

***Hedyotis corymbosa* (L.) Lam.**

Local name: പരപ്പുകപ്പല്ല്.

Habit: Herb

Habitat: Cultivated fields and wastelands.

Erect or diffused branched herbs, sometimes rooting at nodes. Leaves scabrous, elliptic-lanceolate acute at both ends. Flowers white, long pedicelled. Capsule globose, glabrous.

Flowering and fruiting: July - November.

***Hedyotis pruinosa* L.**

Local name: കന്തമണിയൻ.

Habit: Shrub.

Habitat: Grass lands and open areas in forests.

Erect shrubs 1 - 2m tall, leaves glabrous above, sparsely hairy below, acute or acuminate at apex, acute at base, stipules pectinate, flowers pale violet in terminal, paniculate cymes.

Flowering and fruiting: October - February.

Endemic to Southern Western ghats.

Status: *Rare* (Nayar 1997)

IXORA

***Ixora coccinia* L.**

Local name: ചെറുതേങ്ങ.

Habit: Shrub.

Habitat: In the plains.

Large shrub, 3 - 4 m length. Leaves elliptic - ovate, olivegreen when dry, acute at apex, rounded or cordate at base. Flowers in dense sessile corymbiform cymes. Calyx 4 - toothed, corolla tube 2 - 4cm long, stamens 4.

Flowering and fruiting: October. (Plate - III H)

***Ixora cuncifolia* Roxb.**

Habit: Shrub.

Habitat: Evergreen forests.

Shrub, leaves lanceolate or oblanceolate, acuminate, flowers pink with yellowish tinge in spreading corymbs. Calyx pubescent. Corolla lobes glabrous.

Flowering and fruiting: January - May.

Endemic to Peninsular India.

MITRACARPUS

***Mitracarpus villosus* (Swartz) DC.**

Habit: Herb.

Habitat: Degraded moist deciduous forests and waste lands.

Erect, pubescent herb, leaves sessile, ovate or elliptic, basally veined, veins impressed; stipules forming a pectinate sheath; flowers in dense, axillary, sessile, capitate clusters; bracteoles filiform; calyx lobes four, sub equal, corolla white, lobes four, shorter, ovate-acute, stamens four sessile, at the mouth of the corolla; capsules circumscissile, seeds 2, furrowed on one side.

Flowering and fruiting: August - November.

MUSSAENDA

***Mussaenda bellila* Buch. - Ham.**

Local name: ഐളിപ്പ.

Habit: Shrub.

Habitat: Moist deciduous and semi ever green forests and also in the plains.

Shrub. Leaves broadly ovate, abruptly acuminate at apex. Stipules hairy outside; bifid; teeth curved. Flowers reddish yellow, in densely hirsute cymes. One calyx lobe transformed into a showy petaloid bract. Berries obovoid.

Flowering and fruiting: July.

Endemic to Western Ghats.

Mussaendas include medium to tall shrubs, very showy and strikingly handsome, with ovate or lanceolate corrugated soft leaves, mostly covered with soft hair. The true flower is tubular, star-like, yellow, orange, cream or white. The striking feature is the expanded ovate or obovate sepals of the flowers.

PAVETTA

***Pavetta tomentosa* Roxb.**

Local name: പാവട്ട.

Habit: Shrub.

Habitat: Semi ever green forests, also in the plains.

Shrub, 3 - 5 m tall; young branches tomentose. Leaves sparsely puberulous above, tomentose beneath, elliptic-lanceolate, ovate or oblanceolate, acute or acuminate at apex. Flowers pinkish-white in terminal corymbiform sessile cymes. Fruits globose, green.

Flowering and fruiting: January - April.

PSYCHOTRIA

***Psychotria flavida* Talbot.**

Habit: Shrub.

Habitat: Undergrowth of evergreen forests.

Shrub. Leaves acuminate at apex, acute or cuneate at base.

Flowers white. Fruits ellipsoid, smooth.

Flowering and fruiting: March - May. (Plate - IV A)

Endemic to Southern Western Ghats.

SPERMACOCE

***Spermacoce articularis* L.**

Local name: താർതാവൽ.

Habit: Herb.

Habitat: Grass lands and dry deciduous forests, also in the plains.

Procumbent, branched hispid herb. Leaves sessile, scabrous, elliptic, acute at apex, cuneate at base, flowers white in axillary fascicles, bracteoles few, filiform.

Flowering and fruiting: June - December.

***Spermacoce latifolia* (Aubl.) Schum.**

Local name: അപ്പപ്പല്ല.

Habit: herb.

Habitat: Abundant in cultivated fields, especially in coconut plantations.

Trailing herb; stem villous. Leaves sessile, strigose, ovate, acute at apex, cuneate at base. Flowers white, fascicled in axils of leaves. Fruits densely strigose.

Flowering and fruiting: June - November. (Plate - 9 g)

Hamelia patens, an ornamental plant of this family, is a tall, elegant ,bushy evergreen shrub with older dark green leaves and younger ones with marked brownish - maroon edging and dashes and the youngest ones are copper - brown coloured.

ASTERACEAE

AGERATUM

***Ageratum conyzoides* Linn.**

Local name: കാട്ടപ്പ.

Habit: Herb.

Habitat: Abundant and often troublesome in tea, coffee and other plantations.

Erect herb, strong-scented. Leaves ovate, crenate, petioled; opposite or the upper alternate. Pale blue flowers. Heads in dense corymbs or panicles. Involucre campanulate; bracts linear, subequal. Receptacle nearly flat, naked or with caducous scales. Corolla tubular, equal, regular, 5-cleft. Anthers appendaged, base obtuse. Style arms elongate, obtuse. Achenes black, 5-angled, glabrous or the angles slightly hispid; pappus of 5 free or connate palaeaceous scales, broad and lacerate towards the base, aristate at apex or of 10 -20 narrow, unequal scales.

Flowering and fruiting: Throughout the year.

BIDENS

***Bidens pilosa* L.**

Habit: Herb.

Habitat: Weed in fallow fields and waste lands.

Herbs. Leaves 3 - foliolate, leaflets ovate to elliptic - lanceolate, middle one larger, serrate; heads solitary or paired, heterogamous, rayed; peduncle upto 4 cm long, phyllaries multiseriate, margin hairy; ray florets female, yellow or white; disc florets bisexual, yellow; achenes 8mm long, 4 - angled; pappus of 2 - 4, retrorsely barbellate awns.

Flowering and fruiting: June - December. (Plate - IV E)

CHROMOLAENA

***Chromolaena odorata* (L.) King & Robinson.**

Local name: കമ്മ്യൂണിസ്റ്റ് പച്ച.

Habit: Shrub.

Habitat: Along road sides and waste lands and also in plains.

Straggling shrubs. leaves puberulous above, pubescent beneath, ovate, deeply dentate, acuminate at apex, cuneate at base. Florets bluish white in terminal corymbose capitula. Achenes blackish, 4 - 5 ribbed, scabrid; pappus white.

Flowering and fruiting: December - February.

ECLIPTA

***Eclipta prostrata* (L.) L. Mant.**

Local name: കഞ്ഞുണ്ണി, കയോന്നി.

Habit: Herb.

Habitat: At elevations, in waste places and on roadsides.

Herbs, stems red rooting at nodes, pilose. Leaves entire or obscurely serrate, elliptic - ovate, acute at apex, cuneate at base. Flowers white, axillary. Achenes sparsely pubescent at tip.

Flowering and fruiting: All seasons.

ELEPHANTOPUS

***Elephantopus scaber* L.**

Local name: ആനച്ചവടി.

Habit: Herb.

Habitat: Moist deciduous forests, also in the plains.

Scapigerous herb; leaves in a basal rosette, oblanceolate - obtuse, coarsely serrate, strigose on both surfaces; heads 2 - 5 flowered, aggregated to 1 - 7 dense, non-rayed pseudoheads on the scape subtended by 3 leafy bracts; florets homogamous, blue, rarely white; phyllaries biseriate, green, lanceolate; achenes oblong, 10 ribbed; pappus uniseriate, stiff, setose hairy.

Flowering and fruiting: October - January.

Rootstock is very stout, and is used in Indian herbal medicine.

ELUTHERANTHERA

***Elutheranthera rudralis* (Sw.) Sch.-Bip.**

Habit: Herb.

Habitat: Degraded moist deciduous forests, also in the plains.

EMILIA

***Emilia sonchifolia* (L.) DC.**

Local name: മുയൽച്ചെറിയൻ.

Habit: Herb.

Habitat: Dry and moist deciduous forests, also in the plains.

Herbs. Leaves pubescent beneath, irregularly dissected, terminal part triangular. Flowers pink in terminal capitula.

Flowering and fruiting: December - February. (Plate - IV C)

SPILANTHES

***Spilanthes calva* DC.**

Local name: അക്രോസ്, എരിപച്ച.

Habit: Herb.

Habitat: Marshy areas.

Ascending herbs; leaves ovate, obtuse or acute, base truncate or obtuse, serrate; heads homogamous, solitary, axillary; phyllaries biseriate, pubescent; palea concave; florets yellow, all tubular; achenes compressed, glabrous.

Flowering and fruiting: November - April. (Plate - IV F)

SYNEDRELLA

***Synedrella nodiflora* (L.) Gaertn.**

Local name: മുടിയൻപച്ച.

Habit: Herb.

Habitat: Deciduous forests, also in the plains.

Erect scabridulous herbs, upto 60cm tall; leaves opposite, ovate or elliptic, acuminate, basally 3 - nerved, heads in axillary or terminal clusters; phyllaries biseriate; florets heterogamous, paleaceous, yellow; outer female, ligulate; inner bisexual, disciform; ray achenes compressed, laterally winged, with 2 apical horn - like pappus, that of disc florets ribbed, hairy, without wing; pappus of 2 - 4 horns.

Flowering and fruiting: July - October.



Plate - IV : A. *Psychotria flavioda*, B. *Canthium aungustifolium*,
C. *Emilia sonchifolia*, D. *Tridax procumbens*,
E. *Bidens pilosa*, F. *Spilanthes calva*.

TRIDAX

***Tridax procumbens* L.**

Local name: കമ്മിണിപ്പച്ച, ഒടിയഞ്ചീര.

Habit: Procumbent herb.

Habitat: Deciduous forests, also in the plains.

Procumbent herb, creeping and ascending. Leaves ovate, acute, deeply incisodentate or pinnatisect, hairy. Flowers yellow in solitary, pendangulate heads. Bracts 2-3 seriate, outer herbaceous, inner scarious, pinkish. Achenes turbinate, silky-villous, pappus bristles, plumose.

Flowering and fruiting: All seasons. (Plate - IV D)

VERNONIA

***Vernonia cinerea* (L.) Less.**

Local name: പൂവാങ്കുന്തൽ.

Habit: Herb.

Habitat: Common in cultivated lands and secondary forests.

Erect or decumbent herb. Leaves pubescent, obscurely dentate, ovate, obtuse at apex, cuneate at base. Flowers white in terminal corymbose capitula. Achenes blackish with an inner long and outer short ring of pappus.

Flowering and fruiting: Throughout the year.

WEDDELIA

***Weddellia chinensis* (Osbeck.) Merr.**

Local name: മഞ്ഞക്കഞ്ഞുണ്ണി.

Habit: Procumbent herbs.

Habitat: Common in moist areas near streams in coastal zone.

Procumbent herbs, leaves entire or serrate, sparsely hispid, oblanceolate, acute and apiculate at apex, attenuate at base. Florets yellow in terminal capitula.

Flowering and fruiting: August - March.

Leaves used in the preparation of hairoil; powdered plants mixed with sugar given for promoting digestion and appetite.

Gynura aurantiaca, an ornamental plant, of this family, is a strikingly pretty small foliage shrub with shallowly lobed leaves green above and purple below with same coloured hair, softer than velvet. The leaves turned in different directions give a lovely effect of green, purple and red.

SAPOTACEAE

CHRYSOPHYLLUM

***Chrysophyllum cainito* L.**

Local name: പുള്ളിച്ചക്ക.

Habit: Tree.

Habitat: Often cultivated in gardens and avenues.

Tree, 20 - 25m tall. Leaves oblong-lanceolate, acuminate at apex, narrowed at base. Flowers greenish-white in axillary clusters. Fruits yellowish, globose.

Flowering and fruiting: November - February.

MIMUSOPS

***Mimusops elengi* L.**

Local name: ഇലഞ്ഞി.

Habit: Tree.

Habitat: Semi evergreen and ever green forests, also grown in homesteads.

Tree, 10 -15m tall. Leaves coriaceous, elliptic, acuminate at apex, acute or rounded at base. Flowers white, axillary, solitary. Berries ellipsoid.

Flowering and fruiting: April - September.

OLEACEAE

MYXOPYRUM

***Myxopyrum smilacifolium* (Wall.) Blume**

Local name: ചതുരമുല്ല.

Habit: Shrub

Habitat: Semi evergreen and evergreen forests and sacred groves.

Jasminum sps. are cultivated as ornamental plants which includes climbing, semi-climbing and erect shrubs with pearl-white or pure white flowers.

APOCYANACEAE

ALSTONIA

***Alstonia scholaris* (L.) R. Br.**

Local name: ഏഴിലംപാല.

Habit: Trees.

Habitat: Moist deciduous forests and sacred groves and also in the plains.

Trees, 12 - 15 meter tall. Leaves coriaceous, cuneate at base. Flowers white in umbellate cymes. Follicles narrow, pendulous; seeds papillose.

Flowering and fruiting: December - February.

ALLAMANDA

***Allamanda cathartica* Linn.**

Local name: കോളാനിപ്പുവ്.

Habit: Shrub.

Habitat: Frequently grown in gardens in the plains.

Laticiferous, scandent shrubs; leaves whorled, elliptic-oblong, acuminate, base attenuate, coriaceous; flowers in short, terminal cymes; pedicel short; calyx lobes 5, unequal, oblong - acute; corolla large, yellow, funnel-shaped, tube dilated above the base, lobes 5, suborbicular, twisted to left in bud, throat densely villous; stamens included, stigma ovoid with a basal ring like

appendage.

Flowering and fruiting: Throughout the year. (Plate - V A)

Very common ornamental plant in gardens, seen in seldom fruits. Native of South America.

CATHARANTHUS

***Catharanthus roseus* (L.) G. Don**

Local name: ശവക്കോട്ടപ്പച്ച, ശവനാരി.

Habit: Herb.

Habitat: Cultivated in gardens.

Herbs or subshrubs, less than 1m tall, profusely branched from base; leaves opposite, obovate, rounded or obtuse at tip, glabrous; calyx 5 - lobed, lobes lanceolate; corolla pink or white, lobes obovate, obtuse, follicles linear; seeds many.

Flowering and fruiting: Throughout the year. (Plate - V B)

A medicinal herb of great demand in international market. This is the source of bis - Indolic alkaloids, Vincristine and Vinblastine.

CERBERA

***Cerbera odallam* Gaertn.**

Local name: ഒതളം.

Habit: Tree.

Habitat: Along the sides of water courses, ponds, in coastal areas as well as mangroves.

Tree, 4 - 6 meters tall. Leaves sparsely pubescent, oblanceolate, abruptly acuminate at apex, cuneate at base.

Flowers white in terminal panicles.

Flowering and fruiting: Throughout the year.

Leaves used in skin diseases.

ICHNOCARPUS

***Ichnocarpus frutescens* (L.) Ait. & Ait. f.**

Local name: പാൽവള്ളി.

Habit: Climbing shrub.

Habitat: Frequent in cultivated and waste lands in the plains.

Climbing shrub; stems rusty villous. Leaves villous, upper ovate - elliptic, acute at both ends. Flowers white in terminal panicles.

Flowering and fruiting: January - April.

***Rauvolfia serpentina* (L.) Benth.**

Local name: അമല്ലാരി, സർപ്പഗന്ധി.

Habit: Shrub.

Habitat: Moist deciduous forests, also in the plains.

Erect shrubs. Leaves sparsely pubescent above when young, glabrous beneath, elliptic - lanceolate or oblanceolate, acuminate at apex, cuneate at base. Flowers in axillary cymes; peduncles pubescent.

Very rare in natural habitats. Cultivated for medicinal use.

Flowering and fruiting: May - August. (Plate - V C)

TABERNAEMONTANA

***Tabernaemontana heyneana* Wall.**

Local name: കൂനമ്പല.

Habit: Shrub.

A small tree with stout woody resinous branches, oblong or obovate coriaceous leaves with about 20 main nerves at right angles to the mid rib and meeting in loops, impressed above. Flowers large, white with a yellow tube; follicles 4 - 5 in long, 1 - 2 inches broad, orange yellow.

Endemic to Southern Western ghats.

Status: *Lower risk, Near threatened* (IUCN 2000).

***Tabernaemontana divaricata* (L.) R. Br.**

Local name: നന്യാർവട്ടം.

Habit: Shrub.

Habitat: Mostly cultivated as garden plants.

Shrub, 4 - 6m tall. Leaves obovate or oblanceolate, acuminate at apex, narrowed at base. Flowers white in axillary cymes. Fruits spindle shaped, divaricate.

Flowering and fruiting: December - March.

NERIUM

***Nerium odorum* Sol.**

Local name: അരളി.

Habit: Shrub.

Habitat: Ornamental.

A glabrous erect shrub. Young shoots greenish, thin, brown, emitting quantities of milky juice when cut. Leaves opposite, linear-lanceolate, tapering at both ends, thick, coriaceous with a thick midrib, decurrent at the base; petiole thick. Flowers arranged in terminal panicles, pink or white single or double, fragrant; peduncles and pedicels minutely pubescent; bracts small. Seeds small each topped by a tuft of hairs.

Flowering and Fruiting: Throughout the year.

This shrub is considered as 'The Glory of the Gardens' in Northern India where during the hot season it thrives vigorously and being always in bloom, scents the whole air around with its perfume.

The plant is poisonous and contains a glucoside allied to Digitalin which acts as a heart poison. There is 2.5 times as much poison in *Nerium* leaves as in those of *Digitalis*. The root if taken internally are highly poisonous but a paste is useful in skin diseases. The leaves boiled in oil yield a medicated ointment which is used in skin diseases.

ASCLEPIADACEAE

CALOTROPIS

***Calotropis gigantea* (L.) R. Br.**

Local name: എരിക്ക.

Habit: Shrub.

Habitat: Waste lands.

White tawny, semi - succulent shrubs; latex milky; leaves broadly elliptic to obovate, cordate, subsessile; flowers in terminal or subterminal panicles; calyx lobes ovate, glandular scaly within;

corolla pink, lobes ovate, spreading; corona laterally compressed, basally incurved; follicles ellipsoid; seeds with silky coma.

Flowering and fruiting: December - June.

It is widely used in Ayurvedic medicines. The latex is believed to be acrid.

WATTAKAKA

***Wattakaka volubilis* (L. f.) Stapf.**

Local name: വട്ടക്കാക്കക്കാടി.

Habit: Shrub.

Habitat: Common in coastal zones.

Glabrous twining shrubs. Leaves ovate, acuminate at apex, cordate at base. Flowers pale yellow in axillary, pendulous umbels. Follicles woody.

Flowering and fruiting: March - August.

PERIPLOCACEAE

HEMIDESMUS

***Hemidesmus indicus* (L.) R.Br.**

Local name: തുമ്പിണ്ടി, നന്മാരി.

Habit: Shrub.

Habitat: Deciduous forests and plantations, also in the plains.

Perennial, prostrate or twining undershrub; root stocks aromatic. Leaves linear-lanceolate to elliptic, very variable, apiculate mottled with white above. Flowers yellowish with pinkish tinge. Calyx glabrous. Corolla lobes ovate-acute, thick. Follicles two, divaricate, slender.

Flowering and fruiting: September - December.

Roots are tonic and are said to be an excellent substitute for Sarsaparilla. (Plate - V E)

***Asclepias currassavica* L.** is grown as an ornamental plant. (Plate - V D)



Plate - V : A. *Allamanda cathartica*, B. *Catharanthus roseus*, C. *Rauvolfia serpentina*, D. *Asclepias currasavica*, E. *Hemidesmus indicus*, F. *Ipomoea nil*, G. *Merremia tridentata*, H. *Physalis minima*.

LOGANIACEAE

STRYCHNOS

***Strychnos nux-vomica* L.**

Local name: കാഞ്ഞിരം.

Habit: Tree.

Habitat: Moist and dry deciduous forests, also in sacred groves.

Deciduous trees; bark rough, dark; leaves opposite, broadly elliptic-acute, basally 3 - 5 nerved, glabrous, coriaceous; flowers in axillary cymes; calyx minutely 5 lobed; corolla greenishwhite, tube cylindric, lobes 5, rounded; stamens 5; berries large, globose, thick-walled, orange-red when ripe; seeds many, discoid, shining grey.

Flowering and fruiting: November - June.

The bark and seeds are the source of the alkaloid 'Strychnine' which is highly poisonous, but also used in medicine.

MENYANTHACEAE

NYMPHOIDES

***Nymphoides indica* (L.) Kuntze.**

Local name: ചിന്താമ്പൽ, നെയ്യാമ്പൽ.

Habit: Herb.

Habitat: Ponds and ditches.

Rhizomatous, aquatic herbs; branches slender, petiole-like; uniphyllous leaves peltate, base deeply cordate; coriaceous, glabrous; flowers in clusters from the axils; calyx lobes lanceolate; corolla white, lobes 5, obovate-oblong, densely fimbriate within; stamens 5; stigma 2 fid; capsule ellipsoid.

Flowering and fruiting: All seasons. (Plate - I B)

BORAGINACEAE

***Heliotropium indicum* Linn.**

Local name: തേക്കട.

Habit: Herb.

Habitat: On roadsides and in waste places.

A coarse annual herb reaching 2ft. in height, with pale violet small flowers in long spikes, the leaves large.

CONVOLVULACEAE

ARGYEREIA

***Argyereia nervosa* (Burm. f.) Bojer.**

Local name: സമുദ്രപ്പച്ച, അടമ്പ്.

Habit: Climbing Shrub

Habitat: Common in plains, often grown as live fence.

A very large climbing shrub with stout white - tomentose stems, long peduncled cymes, large purple corollas, silky - pubescent without and a nearly dry fruit.

EVOLVULUS

***Evolvulus nummularis* (L.) L.**

Local name: ശിവകൃഷ്ണി.

Habit: Creeping herb.

Habitat: Forest plantations, degraded moist deciduous forests also in plains.

Prostrate herbs rooting at nodes; leaves orbicular, rounded or retuse, base truncate or cordate; flowers solitary, axillary; pedicels slender; sepals oblong, acute, ciliate; corolla white, rotate; capsule glabrous; seeds dark brown.

Flowering and fruiting: October.

IPOMOEIA

***Ipomoea carnea* Jacq.**

Habit: Climbing shrub.

Habitat: Ornamental.

Glabrous shrub; branches often scandent; leaves alternate; lamina ovate-lanceolate, cordate, entire, glabrous, lateral nerves 5-8 pairs; flowers in axillary cymes; pedicel glabrous; calyx glabrous, lobes orbicular subequal; corolla funnel-shaped, pink

with a dark purple eye; capsule ovoid; seeds densely pubescent.

Flowering and fruiting: September - January.

***Ipomoea mauritiana* Jacq.**

Local name: പാൽമുളക്.

Habit: Climber.

Habitat: Semi-evergreen forests.

Climber with large tuberous tap roots; leaves alternate, orbicular digitately 5-7 lobed, more than half way down, glabrous; petiole to 9 cm long; flowers in axillary cymes; peduncle to 12cm; pedicel 2cm sepals ovate-obtuse, concave, glabrous; corolla pink, funnel-shaped 5-lobed; filaments unequal; ovary and style glabrous; capsule ovoid, 4-celled; seeds woolly.

Flowering and Fruiting: September - November.

The large tuber is the accepted source of '*Kshira vidary*' in Ayurvedic medicine.

***Ipomoea nil* (L.) Roth.**

Local name: നക്ഷത്രമുല്ല.

Habit: Climber.

Habitat: Ornamental

Stems covered with trichomes. Leaves strigose above, silky pubescent beneath, palmately three lobed; lobes lanceolate, acuminate at apex, cordate at base. Flowers blue with violet centre.

Flowering and fruiting: March - June. (Plate - V F)

***Ipomoea obscura* Ker-Gawl.**

Local name: താളി.

Habit: Climber.

Habitat: All plains, hedges.

Twining or trailing annual. Leaves thin, cordate, sometimes pubescent, but more often glabrous. Flowers yellow or white with purple corolla tube.

MERREMIA

***Merremia tridentata* (L.) Hall. f.**

Local name: റയറ.

Habit: Herb.

Habitat: A common weed in cultivated fields.

Twining herb. Leaves narrow - linear to oblong, mucronate at apex, auriculate at base, auricles toothed. Flowers white. Capsules globose.

Flowering and fruiting: December - March. (Plate - V G)

***Merremia vitifolia* (Burm. f) Hall. f.**

Local name: മഞ്ഞക്കൊളാനി.

Habit: Herb.

Habitat: Degraded forest areas and also in the plains.

Twining herb. Stems briastly hairy, leaves ovate, cordate digitately 5 - 7 lobed. Flowers yellow; sepals ovate-lanceolate, hairy; corolla companulate. Capsules globose, yellow.

Flowering and fruiting: October - February.

SOLANACEAE

DATURA

***Datura metel* Linn.**

Local name: കറുത്തുമ്മം.

Habit: Undershrubs.

Habitat: On roadsides and in plains.

Large undershrubs. Leaves ovate - triangular to elliptic, toothed, oblique at base. Flowers white. Calyx long - tubular. Corolla funnel - shaped, glandular - hairy. Capsules with deltoid spines, recurved pedicels and enlarged calyx base.

Flowering and Fruiting: All seasons.

A very poisonous plant but used in medicines.

PHYSALIS

***Physalis angulata* L.**

Local name: ഞൊട്ടാഞൊടിയൻ.

Habit: Herb.

Habitat: Degraded forests and waste places.

Erect, Glabrous herbs. Leaves ovate, acute, sinuate or toothed, rounded at base. Flowers yellow, solitary. Calyx hairy, lobes triangular, acute. Filaments hairy at base. Berries enclosed in the bladder-like calyx.

Flowering and Fruiting: July. (Plate - V H)

SOLANUM

***Solanum torvum* Sw.**

Local name: ചുണ്ട.

Habit: Prickly shrub.

Habitat: Degraded forest areas and also in the plains.

Prickly shrub, stellate tomentose. Leaves ovate - oblong, sinuate or lobed, acute or acuminate at apex, unequally cordate at base. Flowers white, pubescent in lateral cymes. Berries red, subglobose or obovoid.

Flowering and fruiting: November - March.

SCROPHULARIACEAE

LIMNOPHILA

***Limnophila heterophylla* (Roxb.) Benth.**

Local name: മാങ്ങനാടി.

Habit: Submerged herb.

Habitat: Occasional along backwaters.

Submerged herb. Upper leaves glabrous, serrate, oblong, acute at apex, narrowed at base. Flowers violet in the axils of upper leaves.

Flowering and fruiting: December - February. (Plate - VI B)

LINDERNIA

Lindernia antipoda (L.) Alston.

Habit: Herb.

Habitat: Sides of streams, reservoirs and marshy areas.

Glabrous, diffuse herbs, rooting at lower nodes; leaves elliptic, acute or obtuse, sessile; flowers solitary, axillary or in terminal racemes; calyx lobes 5, lanceolate; corolla bluish-purple, yellow at the throat; stamens 2, staminodes 2; capsule linear, much longer than the calyx.

Flowering and fruiting: July - December.

SCOPARIA

Scoparia dulcis L.

Local name: കല്ലുരക്കി.

Habit: Herb.

Habitat: Waste lands.

Erect branched herb. Leaves opposite or whorled, elliptic-lanceolate, serrate. Flowers small, white, axillary. Calyx deeply 4 partate, corolla rotate, 4 lobed, throat bearded. Stamens 4. Capsules globose, enclosed in the calyx. Seeds scrobiculate.

Flowering and Fruiting: May - November.

TORENIA

Torenia bicolor Dalz.

Local name: കാക്കപ്പ.

Habit: Herb.

Habitat: Marshy areas.

Trailing herb. Leaves ovate elliptic, Corolla with dark blue or violet upper and white lower lip. Fruit linear or oblong septicidal capsule, valves separating from the placentiferous dissepiment, winged. Seeds many, rugose or cancellate.

Flowering and Fruiting: September.

Endemic to Western Ghats. (Plate - VI A)

BIGNONIACEAE

TECOMA

***Tecoma stans* (Linn.) H.B.K.**

Habit: Herbs or undershrubs.

Habitat: Ornamental.

A large shrub sometimes reaching the size of a small tree. The leaves are opposite, compound and odd pinnate. Leaflets opposite, ovate-oblong to lanceolate in shape. The new leaves are a beautiful glossy green. The flowers are borne in large terminal panicles and are fragrant. The capsules are produced during the cold weather and remain hanging for a long time on the plant.

PEDALIACEAE

PEDALIUM

***Pedaliium murex* L.**

Local name: ആനത്തെരിഞ്ഞിൽ.

Habit: Herb.

Habitat: Wastelands.

Succulent herb. Leaves glabrous, ovate, margin irregularly lobed, obtuse at apex, truncate at base. Flowers blue, solitary, axillary. Fruits spinescent, trigonal, green.

Flowering and fruiting: June - December.

SESAMUM

***Sesamum orientale* L.**

Local name: എള്ള.

Habit: Herb.

Habitat: Cultivated.

Erect annual herb; stem 4-angled, pubescent; lower leaves large, digitately lobed, upper entire; flowers axillary, solitary, white or pink; calyx 5-lobed, lobes lanceolate; corolla bilabiate, stamens 4; capsule oblong, beaked, densely pubescent; seeds black, smooth.

Flowering and fruiting: September - March. (Plate - 9 e)

Widely cultivated as an oil crop.

ACANTHACEAE

ANDROGRAPHIS

***Andrographis paniculata* (Burm. f.) Wall.**

Local name: കിരിയാത്ത.

Habit: Shrub.

Habitat: Abundant in cultivated lands in plains.

Erect shrub, 30 - 60 cm tall; stems tetragonous, puberulous. Leaves puberulous on both the surfaces, lanceolate, acuminate at apex, cuneate at base. Flowers white with pink spots in axillary and terminal panicles.

Flowering and fruiting: August - January. (Plate - 9 B)

ASYSTASIA

***Asystasia dalzelliana* Sant.**

Habit: Herb.

Habitat: Evergreen and semi - evergreen forests and also in the plains.

Procumbent herb; stems quadrangular. Leaves sericeous above, glabrous beneath, ovate-lanceolate, acuminate at apex, cuneate at base. Flowers blue with pink tinge.

Flowering and fruiting: August - December. (Plate - VI C)

***Asystasia gangetica* (L.) T.**

Local name: ഉപ്പിയം.

Habit: Straggling herb.

Habitat: Common in plains.

Straggling perennial herbs. Leaves ovate, acute, rounded or sub-cordate or narrow at base. Flowers white-yellow, in lax secund racemes. Calyx lobe linear, hirsute. Corolla tube cylindric, capsules elliptic.

Flowering and Fruiting: October.



Plate - VI: A. *Torenia bicolor*. B. *Limnophila heterophylla*,
C. *Asystasia dalzelliana*, D. *Justicia japonica* ,
F. *Strobilanthus ciliatus*, E. *Stachytarpheta jamaicensis*, G. *Lantana camera*.

BARLERIA

***Barleria prionitis* L.**

Local name: കനകാംബരം.

Habit: Shrub.

Habitat: Dry deciduous forests and scrub jungles.

A much - branched, usually prickly shrub up to 3 m tall, with whitish stems and rounded branches. Leaves opposite, elliptic, acuminate, lineolate, bristle-tipped, entire, glabrous above, young leaves often pubescent beneath. Flowers orange-yellow or cream-coloured, sessile, borne in axillary foliaceous bristle-tipped bracts. Fruits ovoid with a tapering beak, 2 seeded.

Induces perspiration (bark juice); antiseptic (plant); expectorant (bark juice).

BLEPHARIS

***Blepharis maderaspatensis* (L.) Heyne ex Roth.**

Local name: ഹേമകാന്തി.

Habit: Herb.

Habitat: Dry deciduous forests and plains.

Prostrate herb; stems sericeous. Leaves puberulous above, glaucous beneath, entire or serrate, ovate or obovate, acute and mucronate at apex, cuneate at base. Flowers white with yellow spots and pink striations at the throat of the lower lip.

Flowering and fruiting: November - March.

JUSTICIA

***Justicia japonica* Thumb.**

Habit: Herb.

Habitat: Fairly common in undergrowth of evergreen forest.

Decumbent herb. Leaves appressed hairy, oblong, acute at apex, cuneate at base. Flowers pink in terminal spikes upto 2 cm long. Capsules papery, villous at apex.

Flowering and fruiting: August - March. (Plate - IV D)

STROBILANTHUS

***Strobilanthus ciliatus* Nees.**

Local name: കരിങ്കുറിഞ്ഞി.

Habit: Shrub.

Habitat: Evergreen and semi evergreen forests.

Shrub, reaching 4 feet in height, Leaves elliptic, acuminate, crenulate, chartaceous, deep green; spikes axillary, linear; peduncle deflexed in fruits; bracts elliptic to obovate, obtusely acuminate, densely lineolate on both surfaces; bracteoles as long as the calyx; calyx lobes 5, linear; corolla white, with purple blotches inside, funnel-shaped, 5 lobed; stamens 4, filaments white villous; fruits ovoid, beaked, glabrous; seeds 4. Flowers white or lilac. (Plate - VI E)

Endemic to Peninsular India.

THUNBERGIACEAE

THUNBERGIA

***Thunbergia fragrans* Roxb.**

Local name: മുരിളി.

Habit: Climbing shrub.

Habitat: Common in deciduous forests.

Climbing herbs, leaves ovate-lanceolate, truncate or cordate at base, often angled or lobed, petiole not winged. Flowers axillary, bracteoles oblong, obtuse, mucronate, puberulous. Calyx lobes minute, subulate, pubescent. Corolla blue, stamens 4, included, anther celles not spurred. Sapsule long beaked. Seeds reticulate.

Flowering and fruiting: December - March.

VERBENACEAE

CLERODENDRUM

***Clerodendrum inerme* (L.) Gaertn.**

Local name: പെരിയില.

Habit: Shrub.

Habitat: Common in all habitats.

Erect or straggling shrub. Leaves glabrous, ovate, subobtuse or acute at apex, cuneate at base. Flowers white in axillary cymes.

Flowering and fruiting: November - March.

Leaves used against external parasites.

***Clerodendrum paniculatum* L.**

Local name: കൃഷ്ണകിരീടം.

Habit: Shrub.

Habitat: Grown as ornamental plants.

Glabrous herbs or subshrubs, scarcely branched, leaves opposite, orbicular - cordate, 5 - 7 lobbed, distantly denticulate, basally 7 nerved, flowers in terminal panicles of dichotomous cymes; calyx red, tube short, lobes 5, oblong - obtuse, corolla red, tube narrow, cylindrical, lobes 5, spreading, oblong - obtuse; stamens 5, long exserted, curved.

Flowering and fruiting: September - March.

LANTANA

***Lantana camara* L.**

Local name: അരിപ്പച്ചടി.

Habit: Shrub.

Habitat: A common weed in the disturbed areas deciduous forest.

Erect shrubs, Leaves hirsute, dentate, ovate, acute or shortly acuminate at apex, rounded, truncate or slightly cordate at base. Flowers yellow in axillary pedunculate umbels. Mature drupes black, globose.

Flowering and fruiting: December - July. (Plate - VI G)

***Stachytarpheta jamaicensis* (L.) Vahl.**

Local name: വേലിയേരി.

Habit: Herb.

Habitat: Occasional in plains.

Dichotomously branched herb. Leaves serrate, ovate - oblong, acute at apex, tapering to base. Flowers bluish - purple in terminal spikes.

Flowering and fruiting: Through out the year. (Plate - VI F)

TECTONA

***Tectona grandis* Linn.**

Local name: തേക്ക.

Habit: Tree.

Habitat: Moist deciduous forests, also raised in plantations.

Deciduous trees; branchlets quadrangular, brown tomentose; leaves opposite, elliptic - acuminate, subentire, base cuneate, upper surface scabrous, lower tomentose; flowers in terminal, tomentose panicles; calyx 5 toothed; corolla white, lobes 5, ovate- obtuse; stamens 4; fruits depressed or sub globose, densely tomentose with accrescent calyx and spongy pericarp.

Flowering and fruiting: September - December.

The oil extracted from the seeds and a tar-like concentrated liquid is extracted from the teak wood are used for medicinal purposes.

Duranta plumieri, an ornamental, evergreen, medium to tall shrub with neat, dark green, smooth, shining foliage and golden-yellow mass of berries.

LAMIACEAE

ANISOMELES

***Anisomeles ovata* R.Br.**

Local name: കരിത്തമ്പ, ചെടയൻ.

Habit: Perennial herb.

Habitat: Fairly common in wastelands in plains.

Perennial herbs; stems angular, pubescent. Leaves pubescent crenate, ovate, obtuse at apex, truncate at base. Flowers white with pink spots on the lower lips, in sessile cymes.

Flowering and fruiting: November - January.

Used in local medicines.

COLEUS

***Coleus blumei* Benth.**

Habit: Herbs or undershrubs.

Habitat: Ornamental.

A beautiful species with the leaves mottled with deep purple or sanguineous stains.

HYPTIS

***Hyptis suaveolens* (L.) Poit.**

Habit: Herb.

Habitat: Degraded moist and dry deciduous forests and wastelands

Erect aromatic herbs, 30 - 50 cm tall. Stems tetragonal. Leaves densely pubescent, denticulate, ovate, acute at apex, truncate at base. Flowers purple in axillary cymes or fascicles.

Flowering and fruiting: November - March. (Plate - VII G)

The juice of leaves used to heal wounds.

***Hyptis capitata* Jacq.**

Habit: Herb.

Habitat: Degraded forests and wastelands.

Perennial herbs, leaves oblong to lanceolate, crenate-serrate; flowers in axillary, peduncled heads; bracts oblong, acute, ciliate; calyx tube 5 toothed, teeth equal, linear-subulate, pubescent; corolla white, villous without, bilipped; stamens 4, exerted, style bifid.

Flowering and fruiting: September - January. (Plate - VII A)



Plate - VII : A. *Hyptis capitata*, B. *Ficus hispida*, C. *Leucas aspera*,
D. *Zeuxine longilabris*, E. *Aerva lanata*, F. *Sebastania chamaelia*,
G. *Hyptis suaveolens*, H. *Dioscorea bulbifera*, I. *Smilax zeylanica*.

LEUCAS

***Leucas aspera* (Willd.) Link.**

Local name: ഇമ്പ.

Habit: Herb.

Habitat: Fairly common in the plains.

Erect herb, 20 - 35 cm tall. Leaves pubescent, distantly serrate, linear - lanceolate, acute at apex, cuneate at base. Flowers white in axillary whorls.

Flowering and fruiting: January - November. (Plate - VII C)

OCIMUM

***Ocimum tenuiflorum* Linn.**

Local name: ഇളസി, തൃത്ത.

Habit: Shrub.

Habitat: Grown as a sacred plant.

Strongly aromatic subshrubs, often purple suffused, densely hispid; leaves elliptic or ovate oblong, obtuse or acute, serrate; flowers in thyrsoid panicles; calyx bilipped, upper lip orbicular, lower 4 lobed, lobes linear, ciliate; corolla whit, bilipped; stamens 4; nutlet dark brown, not mucilaginous when wet.

Flowering and fruiting: Throughout the year.

NYCTAGINACEAE

BOERHAVIA

***Boerhavia diffusa* L.**

Local name: തട്ടുതാമ.

Habit: Herb.

Habitat: Common weed in open bright places.

Diffuse, ascending herbs. Leaves thick, in unequal pairs, undulate, ovate-oblong, rounded-subcordate at base, white beneath. Flowers bright pink, in panicles of subcapitate umbels. Perianth urceolate, 5 ribbed. Stamens 1-3. Fruits clavate, glandular-viscid along the 5 ribs.

Flowering and fruiting: October.

AMARANTHACEAE

ACHYRANTHES

***Achyranthes aspera* L.**

Local name: കടലാടി.

Habit: Herb.

Erect herbs. Leaves pubescent, obovate, mucronate at apex, cuneate at base. Flowers greenish white in terminal spikes.

Flowering and fruiting: November - May.

Leaves and roots medicinal.

AERVA

***Aerva lanata* Juss.**

Local name: ചെറുള.

Habit: Herb.

Habitat: Deciduous forests and waste lands.

Herb. Leaves alternate or opposite or fascicled. Flowers hermaphrodite or polygamous, small or minute in simple or paniced spikes; bracts and 2 bracteoles small. Perianth calicine, membranous, five, rarely four lobed. Stamens 5, rarely 4; filaments subulate, connate with interspersed linear staminoids in a hypogynous cup; anthers 2 celled. Ovary ovoid or subglobose, 1celled; ovule pendulous; style simple; stigma capitellate or 2 fid. Fruit a membraneous utricle or a circumcissile capsule with coriaceous apex. Seed inverse, testa coriaceous, embryo annular, cotyledons linear, radicles superiar.

Flowering and fruiting: October - April. (Plate - VII E)

ALTERNANTHERA

***Alternanthera sessilis* (L.) R. Br. ex DC.**

Local name: പൊന്നാങ്കണ്ണി, കൊഴുപ്പ.

Habit: Herb.

Habitat: Along sides of water courses and marshy areas.

Branched, prostrate herb, Leaves lanceolate, or linear-oblong, cuneate at base. Flowers white in globose or elongate

heads. Perianth lobes 5, glabrous, 1 nerved. Stamens 3-5, alternate with staminodes.

Flowering and fruiting: All seasons.

ARISTOLOCHIACEAE

ARISTOLOCHIA

***Aristolochia indica* L.**

Local name: ഗരുഡക്കൊടി, ഇരുശ്ശരമുലി.

Habit: Climbing shrub.

Habitat: Degraded moist deciduous forests and plains.

Twining shrubs, leaves lanceolate, acuminate at apex, cordate at base. Flowers brownish grey solitary in racemes. Capsules 6 valved, oblong.

Flowering and Fruiting: June - September.

THOTTEA

***Thottea siliquosa* (Lam.) Ding Hou.**

Local name: കുറ്റിവയണ, അല്പം, കോടാശാരി.

Habit: Herb.

Habitat: Evergreen and semi evergreen forests.

Erect shrubs, Leaves oblong lanceolate, acute or acuminate at apex, rounded at base, flowers grey, axillary.

Flowering and Fruiting: December - March.

PIPERACEAE

PEPEROMIA

***Peperomia pellucida*. (L.) H.B.K.**

Local name: മഷിത്തണ്ട്.

Habit: Herb.

Habitat: Degraded forest areas and wastelands.

Erect, flaccid herb with translucent stems. Leaves deltoid, cordate at base. Flowers greenish in splendour, erect spikes.

Flowering and fruiting : July - December.

PIPER

Piper nigrum L.

Local name: കുരുമുളക്.

Habit: Climber.

Habitat: Often cultivated.

Leaves elliptic or ovate, acute or acuminate at apex, 5 - 9 ribbed. Flowers greenish in pendulous spikes. Berries red, globose.

Flowering and fruiting: November - January.

LAURACEAE

CINNAMOMUM

Cinnamomum malabathrum (Burm. f.) Blume.

Local name: വഴന, ഇലവങ്ങം.

Habit: Tree.

Habitat: Evergreen and semi evergreen forests.

Tree, 15 - 20m. Leaves opposite or subopposite, elliptic-oblong, acuminate-caudate at apex, acute at base. Flowers yellow in lax panicles. Perianth lobes fleshy, ovate. Staminodes hastate, cordate. Fruits ellipsoid, on fleshy cup.

Flowering and fruiting: December - May.

Endemic to Southern Western Ghats.

LORANTHACEAE

DENDROPHTHOE

Dendrophthoe falcata (L. f.) Etting.

Local name: ഇത്തിക്കണ്ണി, പുളളന്നി.

Habit: Parasitic shrub.

Habitat: Evergreen and moist deciduous forests.

Parasitic shrubs with greyish brown branches. Leaves ovate-oblong, obtuse at both ends. Flowers bright red in axillary racemes.

Flowering and fruiting: October - March.

Endemic to Peninsular India.

SANTALACEAE

SANTALUM

***Santalum album* L.**

Local name: ചന്ദനം.

Habit: Tree.

Habitat: Evergreen and moist deciduous forests.

Evergreen tree, bark surface dark grey to nearly black, rough with short vertical cracks. Leaves opposite, estipulate; petiole glabrous, grooved above; lamina elliptic, elliptic-ovate or ovate-lanceolate, base acute or round, apex acute, margin entire, glabrous. Flowers reddish-purple, in axillary and terminal paniculate cymes; tepals 5, basally connate into a campanulate tube, shortly connate to the basal part of the ovary; lobes ovate, thin, fleshy, glaucescent without, minutely ciliate; disc concave, adhering to the bottom of perianth, its lobes alternates with tepals; stamens 5, alternates with disc; anthers ovoid, 2 - celled; ovary superior later half inferior at the time of flowering, globose, 1 - celled, ovules pendulous; stigma 3 lobed. Fruit a drupe, globose, blackish-purple.

Vulnerable (IUCN, 2000)

EUPHORBIACEAE

ACALYPHA

***Acalypha ciliata* Forsk.**

Habit: Herb.

Habitat: Dry deciduous forest and plains.

Erect herb; stem angular, pubescent. Leaves pubescent, serrate, ovate-lanceolate. Flowers greenish in axillary spikes.

Flowering and fruiting: June - July.

***Acalypha indica* L.**

Local name: കപ്പമേനി.

Habit: Herb.

Habitat: Dry deciduous forest and plains.

Annual hispid herb; leaves ovate - deltoid, serrate, spikes monoecious with a triradiate hood at the tip; male flowers above and female below; bracts large, orbicular - dentate; capsules hispid, shorter than bracts.

Flowering and fruiting: July - December.

Endemic to Central and Peninsular India.

Used in indigenous medicine in treating bronchial disorders. Leaves are also used against scabies.

BRIDELIA

***Bridelia retusa* Spreng.**

Local name: കൈനി.

Habit: Tree.

Habitat: Semi evergreen and deciduous forests.

Deciduous tree, bark greyish-brown, young trees armed with sharp thorns; branchlets thinly hairy. Leaves simple, alternate; stipules lateral, lanceolate, deciduous; petiole pubescent when young; lamina broadly elliptic, oblong, elliptic-oblong, obovate or obovate-oblong, base round, obtuse, truncate, apex obtuse, margin entire or slightly crenulate. Flowers unisexual; greenish-yellow, sessile or shortly pedicellate; male flowers: tepals 10, biseriate, valvate; outer tepals ovate-lanceolate, thick, truncate, shortly connate, acute, inner obovate, cuneate, obtuse, fimbriate; stamens 5, monadelphous, born on a gonophore, exserted; anthers oblong; pistillode bifurcate; disc annular; female flowers: tepals 10, biseriate, lanceolate, valvate; ovary globose, 2 locular, ovules 2 in each cell; styles 2, forked; disc with membranous fimbriate corona enclosing basal part of ovary. Fruit a drupe, purplish-black,

pyrenes 2, epicarp crustaceous.

Flowering and fruiting: August - October.

***Croton triglium* L.**

Local name: നീരാളം.

Habit: Trees.

Habitat: Cultivated.

Trees or shrubs, rarely herbs. Leaves alternate, rarely opposite or whorled, usually 2- glandular at the base; stipules linear. Flowers usually monoecious, solitary or clustered on the rachis of a terminal raceme; bracts small. Calyx 5, partite, the lobes imbricate or valvate. Petals 5; disk annular or of glands opposite the calyx lobes. Stamens many, inserted on the villous receptacle; filaments free, inflexed in bud then erect; anther cells parallel. Ovary 3- celled, ovule solitary in each cell; styles long, slender . Fruit a capsule . Seeds 3, smooth, carunculate; testa crustaceous; albumen copious; cotyledons flat.

The source of powerful medicine Croton oil.

EUPHORBIA

***Euphorbia hirta* L.**

Local name: നിലപ്പാല.

Habit: Herb.

Habitat: Degraded forest areas and forest plantations.

Diffuse milky herbs with yellowish hairy stems, leaves obliquely elliptic lanceolate, serrulate, acute, hairy. Flowers pale greenish in capitate cymes of pairs. Limb of glands minute. Female pendulous. Cocci appressed-pubescent.

Flowering and Fruiting: All seasons.

FLUEGGEA

***Flueggea leucopyrus* Wild.**

Local name: അന്യൂരിപ്പച്ചില.

Habit: Shrub.

Habitat: Dry deciduous forests.

A large stiff straggling shrub, Ends of the branchlets sharply

spinous, Fruits white. Wood hard and close-grained.

HEVEA

***Hevea brasiliensis* (Willd. ex A. Juss.) Muell.-Arg.**

Local name: റബ്ബർ.

Habit: Tree.

Habitat: Cultivated.

Tree, bark grey; latex milky. Leaves digitately trifoliate, alternate, estipulate; rachis slender, glabrous, swollen at base, a gland at the top; petiolule whorled, slender, glabrous; lamina elliptic, elliptic-ovate or obovate, base acute, apex acuminate, margin entire, glabrous, glaucous beneath, coriaceous; lateral nerves 13 - 20 pairs, pinnate, prominent, intercostae scalariform. Flowers unisexual, yellowish-white, in terminal paniced racemes in which the central flowers are female and the males; tepals yellowish-white; disc of 5 free or united glands; stamens 5 - 10 in 2 whorls; filaments united into a column extending beyond the anthers; ovary superior, 3 celled, ovules 3; stigma sessile. Fruit a capsule, 3 lobed, woody, dehiscent; seeds 3, yellowish-brown, mottled.

JATROPHA

***Jatropha curcas* L.**

Local name: കല്ലാവണക്ക.

Habit: Shrub.

Habitat: Often grown as live fence posts.

Erect shrub, 2 - 3m. Leaves orbicular-ovate, or 3 - 5 lobed, cordate at base, acute, entire. Flowers yellowish green. Calyx 5 lobed. Petals hairy inside. Stamens 10. Capsules subglobose, rugose.

Flowering and fruiting: August.

MACARANGA

***Macaranga peltata* Muell. Arg.**

Local name: വട്ട, ഉപ്പുത്തി.

Habit: Tree.

Habitat: Moist deciduous and secondary forests.

A small resinous quick-growing tree with glaucous branchless large stipules and leaves glandular and more or less villous beneath, Bark pale with lenticels; wood pale brown, soft, of no value.

Flowering and fruiting: December- January.

The red gum is used for taking impression.

MALLOTUS

***Mallotus philippensis* (Lam.) Muell. - Arg.**

Local name: കരങ്ങുമഞ്ഞൾ, ചെങ്കൊള്ളി.

Habit: Tree.

Habitat: Evergreen forests.

Tree, 7 - 15m. Leaves ovate, lanceolate, serrate, red-glandular beneath, acuminate. Flowers pale-yellow, in racemes. Perianth lobes 4 in male, 3 in female. Stamens many, capsules globose, 3 valved, red-glandular.

Flowering and fruiting: July - December. (Plate - 9 h)

Endemic to peninsular India.

MANIHOT

***Manihot esculenta* Crantz.**

Local name: കപ്പ, മരച്ചീനി.

Habit: Herbs.

Habitat: Cultivated.

The Cassava plant, occasionally cultivated for its tubers, which are edible. Also starch(Tapioca starch) is prepared.

PHYLLANTHUS

***Phyllanthus amarus* Schum. & Thonn.**

Local name: കിഴാർനെല്ലി.

Habit: Herb.

Habitat: Degraded moist deciduous, forest plantations and plains.

Herbs with slender branches. Leaves oblong, glaucous, obtuse. Stipules lanceolate, scarious. Male flowers few, terminal. Perianth lobes 5, ovate. Stamens three; filaments connate. Female flowers many, perianth lobes 5 oblong, capsules glabrous with brownish tuberculate seeds.

Flowering and fruiting: All seasons.

***Phyllanthus emblica* L.**

Local name: നെല്ലി.

Habit: Tree.

Habitat: Dry and moist deciduous forests, also cultivated in the plains.

Trees, 15 - 20m tall. Leaves linear-oblong, subacute at apex, rounded at base. Flowers greenish yellow. Fruits globose, yellowish green.

Flowering and fruiting: February - March.

***Phyllanthus urinaria* L.**

Local name: കിഴാർനെല്ലി.

Habit: Herb.

Habitat: In the plains, also in degraded deciduous forests.

Herb. Leaves oblong, mucronate at apex, obtuse at base. Flowers pale yellow; male pedicellate in fascicles; females solitary, sessile.

Flowering and fruiting: May - October.

SEBASTIANA

***Sebastiania chamaelea* (L.) Muell. - Arg.**

Local name: കൊടിയാവണക്ക്, ഞെട്ടാവണക്ക്.

Habit: Herb.

Habitat: Common weed in cultivated lands.

Erect herb, stems woody at base. Leaves glabrous, linear-oblong, obtuse at apex, narrowed at base. Flowers greenish, axillary. Capsules warted, red.

Flowering and fruiting: August - December. (Plate - VII F)

TRAGIA

***Tragia involucrata* L.**

Local name: കൊടിത്തൂവ.

Habit: Twining Herb.

Habitat: Open areas and also in Evergreen forests.

Twining herb with stinging hairs all over; leaves ovate or elliptic, acuminate, base round, serrate, basally 5 - nerved; flowers in axillary, monoecious spikes; female flowers 1 - 2 at the base, male flowers above; male bracts spatulate; tepals 3, spreading; stamens 3; female flowers ebracteate; tepals 3, ovate-lanceolate, styles 3 spreading; capsule densely hairy.

Flowering and fruiting: June - December.

Acalypha wilkesiana has leaves in shades of brown, chestnut and bronze, light and dark, playing with peach dots and streaks. A dazzling sight in sunshine.

Codiaeum variegatum is the common garden shrubs with curiously shaped and variegated leaves, known as 'Crotons'.

ULMACEAE

TREMA

***Trema orientalis* (L.) Blume.**

Local name: അരണി.

Habit: Tree.

Habitat: Dry and moist deciduous forests and also in plains.

Trees 7 - 14 meters tall. Leaves hirsute, serrate, ovate - lanceolate, acuminate at apex, obliquely rounded at base. Flowers pale green in axillary cymes.

Flowering and fruiting: March - November.

MORACEAE
ARTOCARPUS

***Artocarpus hirsutus* Lam.**

Local name: ആഞ്ഞിലി.

Habit: Tree.

Habitat: Semi ever green and moist deciduous forests.

Tree, 12m tall. Leaves sparsely puberulous above, densely pubescent beneath, elliptic, shortly acuminate at apex, acute at base. Flowers brownish in oblong receptacles; peduncles pubescent. Fruits and seeds edible.

Flowering and fruiting: December - April.

Wood used for furniture and house construction.

Endemic to southern western ghats.

***Artocarpus heterophyllus* Lam.**

Local name: പിലാവ് (പ്ലാവ്).

Habit: Tree.

Habitat: Evergreen forests.

Tree, leaves elliptic-oblong, subobtuse at apex, acute at base. Flowers greyish black, crowded in globose or oblong, receptacles.

Flowering and fruiting: December - April.

Extensively cultivated in plains for the edible fruits and valuable wood.

FICUS

***Ficus benghalensis* Linn.**

Local name: പേരാൽ.

Habit: Tree.

Habitat: Dry deciduous forests and plains.

Tree with pillar like prop roots from the branches; leaves alternate, ovate or elliptic obtuse or acute, base truncate, coriaceous, green above, pale yellow, basal nerve 5 - 7. Stipules ovate, acuminate, caducous; figs in sessile axillary pairs, depressed globose, orange red when ripe; basal bracts 3,

rounded; male flowers with single stamens; female dispersed among male and gall flowers, sessile; gall flower pedicellate.

Flowering and fruiting: May - July.

Bark is used in the treatment of ulcers and the milky juice is used against piles; the areal root is used in the treatment of dysentery, venereal diseases, and liver ailments.

***Ficus exasperata* Vahl.**

Local name: തേരകം.

Habit: Tree.

Habitat: Dry deciduous forests and plains.

Deciduous tree; bark greenish-white, smooth, punctiform lenticellate, fibrous; all parts coarsely and harshly scabrid with stout white hairs. Leaves simple, laxly alternate spiral to opposite or subdistichous; petiole slender, lamina elliptic, ovate, oblong-lanceolate, or obovate, basal acute, round or cuneate, apex acute to shortly acuminate, margin denticulate or sinuate-crenate to serrate, scabrid on both surfaces, coriaceous, 3 - ribbed from base; lateral nerves 3 - 6 pairs, pinnate, prominent. Flowers unisexual; inflorescence a syconia, axillary, solitary, harshly scabrid; peduncle with 2 - 3 small scattered, lateral bracts, sometimes more or less aggregated into a collar, body subglobose or ellipsoid with scattered small lateral bracts. Flowers of 4 kinds; male flowers sessile, ostiolar, in 1 - 2 rings; tepals 3 - 6, oblong-spathulate, white hairy; stamen 1; anther oblong; female flowers sessile; tepals 4 - 7, linear-spathulate, white hairy; ovary superior, obovoid; style filiform, lateral, puberulous, stigma clavate; gall flowers sessile to pedicellate tepals 4 - 6, lanceolate, white hairy, ovary white, sessile, style terminal, puberulous, stigma dilated. Syconium yellow or purple; achene oblong, reticulate.

***Ficus hispida* L.**

Local name: പാറകം.

Habit: Tree.

Habitat: Frequent near rivers and streams in plains and

semi evergreen forests.

Shrubs or small trees; branches hollow; leaves opposite, elliptic - acuminate, base truncate or cordate, margin denticulate or entire, scabrid, 3- nerved from base; stipules ovate- lanceolate; figs clustered on the trunk or on trailing or pendulous, leafless branches, short-peduncled, depressed globose, warty, ripening yellow, orifice raised, closed by 5-6 bracts; male flowers biseriate; stamens 1; tepals 0; gall and female flowers sessile or pedicelled. The plant is used in the treatment of anaemia, piles and jaundice. Flowering and Fruting: March - July. (Plate - VII B)

Ficus racemosa L.

Local name: അത്തി.

Habit: Tree.

Habitat: Semi evergreen and deciduous forests.

Deciduous tree without aerial roots, often buttressed at base; leaves elliptic- acute, basally 3- nerved, entire, glabrous; stipules lanceolate, deciduous; figs clustered on short tubercles on trunk and on branches, pyriform, red on ripening, orifice closed by 5 bracts; basal bracts 3, ovate- obtuse, persistent; tepals 3, red; male flowers near orifice, in 3 rows; stamens 2; female flowers sessile, mixed with gall flowers.

Flowering and fruting: March - April.

This tree is considered to be an indicator of underground water. The latex is watery.

URTICACEAE

PILEA

Pilea microphylla (L.) Liebm.

Local name: ശീവേലി.

Habit: Herb.

Habitat: Grown as garden plants.

A small prostrate species with very small rotund or spatulate, entire leaves which is grown in borders in gardens and

has run wild in many places. The ripe pollen is ejected in clouds when the plant is jolted.

POUZOLZIA

***Pouzolzia zeylanica* (L.) Bennett.**

Local name: നെയ്യൻപ.

Habit: Herb.

Habitat: Waste lands.

Slender, erect or procumbent, hirsute herbs. Leaves linear lanceolate to ovate-lanceolate, hoary pubescent, hirsute or glabrous, acute, base rounded. Flowers pale pinkish green, strigose. Tepals 4, ovate-lanceolate, concave. Bracts 2, concave. Stamens 4. Fruits ovoid, 2-4 winged.

Flowering and fruiting: July- December.

CASURINACEAE

CASUARINA

***Casuarina equisetifolia* L.**

Local name: ചുളമരം, കാറ്റാടി.

Habit: Tree.

Habitat: Cultivated.

A fast growing , erect, tall tree. Bark brown, rough, fibrous, peeling in vertical strips; wood yellowish- pink to reddish- brown, very hard; useful for scaffolding poles and an excellent fuel. Scales in whorls of 6-8, usually 7; teeth acute or setaceous. Valves of the cone pubescent outside.

Flowering and Fruting: October.

Used as poles and fuel wood.

MONOCOTYLEDONS

ORCHIDACEAE

ZEUXINE

***Zeuxine longilabris* Benth.**

Habit: Herb.

Habitat: Ever green shola and semi evergreen forests.

Terrestrial herb; stems creeping below. Leaves membranous. Flowers white or olive with lip white and column orange; small in terminal racemes or spikes. Sepals subequal, lateral, free, enfolding the base of the lip, dorsal concave, cohering with the petals in a hood. Lip adnate to the base of the column, saccate or cymbiform, with a sessile or clawed entire or 2 lobed limb. Column short, with or without 2 processes in front. Anther membranous, cells two, contiguous; pollinia two, pyriform with a common caudicle; gland oblong.

Flowering and fruiting: February - December. (Plate - VII D)

Spathoglottis plicata is grown as an ornamental orchid.

ZINGIBERACEAE

ZINGIBER

***Zingiber zerumbet* Sm.**

Local name: കാട്ടിഞ്ചി.

Habit: Herb.

Habitat: Evergreen forests.

Perennial herb, fleshy rhizomes and thick roots. Leaves vaginate, sheath usually ligulate. Flowers pale sulphur-yellow in colour; lip darker; zygomorphic, bracteate, trimerous. Calyx tubular or spathaceous, 3 lobed or toothed. Corolla funnel-shaped below, 3 lobed above, the dorsal segment cucullate. Stamens 1 fertile, the other two combined in a petaliferous lip embracing the fertile one; the outer whorl absent or represented by 1, 2 or 3 staminoides more or less petaloid or reduced to teeth. Anther of fertile stamen 2 celled introrse. Ovary usually 3, rarely 1, 2 or

more-celled; style long, lying in a groove in the stamen; stigma funnel-shaped. Ovules numerous. Fruit capsular or indehiscent or breaking up irregularly. Seeds ellipsoid or variously angled.

Flowering and fruiting: July - September. (Plate - VIII A)

MARANTACEAE

MARANTA

***Maranta arundinaceae* Linn.**

Local name: കൂവ, ബിലാത്തിക്കൂവ.

Habit: Herb

Habitat: The arrowroot is occasionally cultivated and runs wild.

COSTACEAE

COSTUS

***Costus speciosus* (Koen.) J.E. Smith.**

Local name: മലവയമ്പ്, ചണ്ണക്കൂവ, ചണ്ണക്കിഴങ്ങ്.

Habit: Herb.

Habitat: Semi evergreen forests.

Plants 2m tall; stem twisted; leaves apparently spiral, elliptic acuminate, pubescent; sheath tubular, ligule indistinct; flowers in terminal globose heads, bracts oblong-obtuse, mucronate, reddish; calyx 3 lobed; corolla white, lobes 4, elliptic-oblong; labellum yellow at the centre; stamen petaloid; capsule globose.

Flowering and fruiting: September - December.

The rhizome is a valuable source of '*Diosgenin*'. The root has astringent, purgative and anthelmintic properties. (Plate - VIII B)

HYPOXIDACEAE

CURCULAGO

***Curculago orchoides* Gaertn. Fruit.**

Local name: നിലപ്പന.

Habit: Herb.

Habitat: Fairly common through out planes.

Herb with tuberous roots, Leaves linear, lanceolate, acute at apex, narrowed at base. Flowers yellow in axillary racemes, hidden in the bases of leaves.

Flowering and fruiting: May - September.

DIOSCOREACEAE

DIOSCOREA

***Dioscorea bulbifera* L.**

Local name: കാട്ടുകാച്ചിരി.

Habit: Twining shrub.

Habitat: Moist deciduous forests and plains.

Slendour, tuberous twiners; Stems 4 angular, ribbed, unarmed. Leaves alternate, ovate to sub-orbicular, cordate at base, caudate or acuminate at apex. Bulbils common in leaf axils. Flowers white in pendulous spikes. Tepals linear, female spikes 1 - 3 together. Stamens 6, staminodes 6. Capsules quadrately oblong. Flowering and fruiting: September. (Plate - VII H)

***Dioscorea tomentosa* Koen. ex. Spreng.**

Local name: നെൽച്ചേമ്പ്.

Habit: Prickly climber.

Habitat: Semi ever green moist and deciduous forests.

Prickly, tuberous climbers; Stems twining to left. Leaflets 3 terminal ones elliptic, obovate; lateral ones glabrous, acuminate, upper leaves simple, white-tomentose, ovate, or orbicular. Flowers pale greenish, in short spikes. Female flowers in long racemes. Tepals ovate, capsules oblong, 3 winged.

Flowering and Fruiting: October - December.



A



B



C



D



E



F



G

Plate - VIII: A. *Zingiber zerumbet*, B. *Costus speciosus*,
C. *Dactyloctenium aegypticum*, D. *Murdannia pauciflora*,
E. *Commelina benghalensis*, F. *Colocasia esculenta*, G. *Gloriosa superba*.

LILIACEAE

ASPARAGUS

***Protasparagus racemosus* (Willd.) Oberm.**

Local name: ശതാവരി.

Habit: Climber.

Habitat: All forest types.

Cladodes 9 - 12cm long, triquetrous, 2 - 6 nate. Flowers white in fascicles of racemes.

Flowering and fruiting: August - December.

***Aloe vera* (L.) Burm.f.**

Local name: കറ്റാരച്ച.

Habit: Herbs.

Habitat: Is grown as an ornamental and medicinal plant.

Leaves dense, aggregated ensiform with horny prickles on the margins; perianth reddish- yellow and green , cylindrical .

GLORIOSA

***Gloriosa superba* L.**

Local name: മേന്തോന്നി.

Habit: Herb.

Habitat: Occasional in cultivated fields.

Climbing herb. Leaves lanceolate, apex modified into tendrils. Flowers red.

Flowering and fruiting: August - September. (Plate - VIII G)

Dracaena, an ornamental foliage shrub, with bands in the centre of leaves in combinations of white, cream or yellow colour.

SMILCACEAE

SMILAX

***Smilax zeylanica* L.**

Local name: കരിലാഞ്ചി, വലിയകണ്ണി.

Habit: Climbing shrub.

Habitat: Moist deciduous and semi-evergreen forests, also in the plains.

Climbing shrub, stems prickly. Leaves lanceolate- elliptic, broadly oblong or ovate, acute or cuspidate at apex, base narrowed or cordate, 3 - 7 ribbed, umbel 1 - 3, on axillary peduncles. Flowers light green, stamens 6, berries globose smooth, glabrous.

Flowering and fruiting: October - May. (Plate - VII I)

PONTEDERIACEAE

MONOCHORIA

***Monochoria vaginalis* (Burm.f) Persl. ex Kunth.**

Local name: കരിളവളം, കൊളച്ചേമ്പ്.

Habit: Herb.

Habitat: Aquatic.

Rooted aquatic herbs; stems short; leaves radical, broadly ovate- lanceolate, entire, base cordate, glabrous; petiole 20cm or more depending on depth of water; flowers blue; tepals 6, free, petaloid, oblong-acute; stamens 6, unequal, longer filaments appendaged; style 3 fid; capsule oblong, ribbed; seeds many.

Flowering and fruiting: July - December.

COMMELINACEAE

COMMELINA

***Commelina benghalensis* Linn.**

Local name: കാമ്പം.

Habit: Herb.

Habitat: A common weed in wet or moist places.

Diffuse herbs, rooting at lower nodes; leaves ovate- oblong, obtuse or acute, pubescent, base truncate; spathe funnel-like, truncate at apex, 1.5cm across, puberulous; sepals three subequal, 2mm long; petals unequal, clawed, blue to 5mm long; stamens three, staminodes two; capsules three-valved; seeds pitted.

Flowering and Fruiting: September - December. (Plate - VIII E)

***Commelina diffusa* Burm.**

Habit: Herb.

Habitat: Wastelands.

Slender succulent herbs. Leaves ovate - lanceolate, puberulous, acuminate; sheaths loose, glabrous, ciliate at margins. Spathes ovate-lanceolate, base cordate. Flowers blue. Sepals three. Capsules oblong, beaked. Seeds tubercled, dark brown.

Flowering and Fruiting: December.

CYANOTIS

***Cyanotis cristata* (L.) D. Don.**

Habit: Herb.

Habitat: Common in open forest.

Decumbent herb, rooting at nodes. Leaves ovate-oblong, glabrous, obtuse, base rounded-cordate. Bracteoles ovate-falcate. Flowers purple, in axillary and terminal scorpioid cyme. Sepals oblong-lanceolate, hirsute. Petals oblong-spathulate. Filaments violet hairy. Capsules violet, hairy. Capsules glabrous.

Flowering and fruiting: July - October.

MURDANNIA

***Murdannia nudiflora* (Clarke.) Brueckn.**

Habit: Herb.

Habitat: Grasslands, also in the plains.

Slender herb. Leaves narrowly lanceolate or ovate-lanceolate, acuminate, base cuneate, rounded or cordate. Flowers white, in terminal, sessile, panicles. Capsules ellipsoid.

Flowering and fruiting: July.

***Murdannia pausiflora* Bruecken.**

Habit: Herb.

Habitat: Grasslands and moist localities.

Decumbent, tufted herbs with fibrous roots. Leaves ovate,

acute, hairy, cordate at base. Flowers 1-5 light yellow, in axillary and terminal cymes. Filaments glabrous. Pedicels curved in fruit.

Flowering and Fruiting: November. (Plate - VIII D)

***Murdannia spirata* (L.) Brucken.**

Habit: Herb.

Habitat: Grasslands and moist places.

Herb with fibrous roots, Leaves oblong or lanceolate, acute at apex, glabrous, cordate and semi amplexicaul at base. Flowers blue in branched, slender, panicles. Bracts minute, ovate, amplexicaul. Calyx lobes oblong. Filaments beard, capsules hairy. Flowering and Fruiting: July - August.

PALMACEAE

ARECA

***Areca catechu* L.**

Local name: കമുക്.

Habit: Tree.

Habitat: Cultivated.

Slender, erect tree; stems annulate. Leaves pinnate; leaflets linear, glabrous; lower ones plicate; upper ones coherent. Crown shaft prominent, tubular. Spadices branched. Spathes boat-shaped. Male flowers small. Petals obliquely-lanceolate, fragrant. Females large, few. Sepals 3, triangular. Stamens 6. Fruits ovoid orange.

Flowering and Fruiting: All the seasons.

Wood is used as rafters and poles in temporary constructions. The seed is the betel nut of commerce, used as a masticatory, also used in medicine.

BORASSUS

***Borassus flabellifer* L.**

Local name: കരിമ്പന.

Habit: Tree Palm.

Habitat: In dry areas and along bunds in paddy fields.

Common in plains.

Stems 25 - 35m long. Leaves palmately fan shaped, margins split into 60 - 80 segments with acuminate apex and spinulate margins. Male spadices branched, female simple.

Flowering and fruiting: March - June.

CARYOTA

***Caryota urens* L.**

Local name: ആനപ്പന, ചൂണ്ടപ്പന.

Habit: Tree Palm.

Habitat: Occasional at low elevations.

Stems 15 - 20m tall, smooth. Leaflets obliquely truncate and serrate at apex, cuneate at base. Spadix long, spathes 40 - 45cm long.

Flowering and fruiting: Throughout the year.

COCOS

***Cocos nucifera* L.**

Local name: തെങ്ങ.

Habit: Tree.

Habitat: Cultivated.

Stems slender, curved or straight, marked with a ring - like leaf scars; leaves long, leaflets numerous, linear-lanceolate; petioles long, stout; fruit green or yellowish, the cavity containing a potable milky fluid.

Wood hard, red outside, reddish-brown and softer within, used for rafters. The leaves are plaited into mats and used for thatching, fencing, partitions etc. Toddy is obtained by tapping the peduncles and is convertible into arrack and "jaggery". The kernel of the fruit is edible and yields an edible and burning oil. The fibres of the pericarp are used for cordage and matting.



Plate - 9. Herbarium prepared from campus flora: a. *Leucas zeylanica*; b. *Andrographis paniculata*; c. *Biophytum sensitivum*; d. *Melastoma malabathicum*; e. *Sesamum orientale*; f. *Syzygium zeylanicum*; g. *Spermococe latifolia*; h. *Mallotus philippensis*; i. *Chloris barbata*.

PANDANACEAE

PANDANUS

***Pandanus odoratissimus* L. f.**

Local name: പെരുംകൈത.

Habit: Climber

Habitat: Common in low elevations.

Leaves coriaceous, ensiform, caudate-acuminate, glossy green, margins with forward-pointing spinules, the keels with forward or backward-pointing spinules; spathes of the male spadix lanceolate or linear-lanceolate, white, fragrant; male spadix with numerous cylindrical spikes; ovary 5 - 12 celled; female spadix solitary; carpels confluent in groups of 4 - 10; syncarp yellow or red; drupes of 5 - 12 carpels, carpels turbinate, angular, apex rounded with a depressed centre.

ARACEAE

AMORPHOPHALLUS

***Amorphophallus paeoniifolius* (Dennst.) Nicolson.**

Local name: കാട്ടുചേന.

Habit: Herb

Habitat: Cultivated.

Large cormous herbs; corms to 10cm across; petiole stout, fleshy, muricate, 3-partite at apex; leaves tripartitely decomposed, leaflets elliptic, acute or acuminate, base decurrent, stigma usually bi- or tri-lobed, with a distinct style; berries orange-red. Flowering and fruiting: May- September.

***Colocasia esculenta* (Linn.) Schott.**

Local name: ചേന.

Habit: Herb

Habitat: In marshy places and in shallow ponds.

Tuberous herbs; subterranean tubers vertical with several tuberous stolons; leaves many; petiole long, sheathing at base, spongy; lamina peltate, ovate-acute, cordate-sagittate; spathe

yellow; spadix terete; male flowers above with 4-6 anthers in each synandria; female flowers basal, ovary globose style short, stigma discoid; neuters between male and female portions; appendix to 6 cm long.

Flowering and fruiting: September- January.

The tubers and leaves are used as vegetables. (Plate - VIII F)

POTHOS

***Pothos scandens* L.**

Local name: ആനപ്പുരമ്പ.

Habit: Climber

Habitat: Common in low elevations.

Leaves lanceolate, acuminate at apex, rounded at base; spathe 0.5 cms long. Spadix white.

Flowering and fruiting: October - March.

HYDROCHARITACEAE

VALLISNERIA

***Vallisneria spiralis* Linn.**

Habit: Herbs.

Habitat: Bottom of ponds and tanks.

Submerged, tufted, scapigerous herbs. Leaves linear, acute, entire or minutely serrulate. Flowers dioecious; male minute very many together in a shortly peduncled, ovoid, 3-lobed spathe; female solitary in a tubular 3-toothed spathe at the end of a very long filiform spirally coiled scape. Sepals 3. Petals 0. Stamens 1-3; anthers didymous. Staminodes in female 3, 2-fid. Ovary narrow not produced upwards; stigmas 3, broad, notched. Fruit linear, included in the spathe. Seeds numerous, oblong, testa membranous.

CYPERACEAE

CYPERUS

***Cyperus haspan* L.**

Habit: Herb.

Habitat: Common in rice fields and wetlands in plains.

Perennial rhizomatous herb. Leaves flat, scaberulous, spikelets green, digitate, stellately spreading, glumes oblong ovate, obtuse. Nuts yellowish obovoid verruculose.

Flowering and fruiting: February - May.

***Cyperus rotundus* L.**

Local name: കഴിമുത്തങ്ങ, മുത്തങ്ങ.

Habit: Herb.

Habitat: In the plains, fallow lands and agricultural fields.

Tufted, tuberous herb. Stem erect, rigid, triquetrous. Leaves several, flat, scabrous with brown sheath. Bracts 3, unequal; primary rays 5-7; secondary rays 1-3. Spikelets narrow, oblong 10 - 20 flowered. Glumes closely imbricating, ovate, membranous. Stamens 3. Nuts oblong, trigonous.

Flowering and fruiting: All seasons.

The tubers are aromatic and used in medicines.

FIMBRISTYLIS

***Fimbristylis dichotoma* (L.) Vahl.**

Habit: Herb.

Habitat: Degraded deciduous forests, cultivated lands and riverbanks.

Tufted herb; rhizome short; stem striate, glabrous, leaves linear, flat, abruptly acute at apex, glabrous; bracts shorter than inflorescence, inflorescence decompound, primary rays 5 - 7, secondary rays with 3 - 7 spikelets; spikelets ovoid, acute, rachilla winged; glumes broadly ovate to oblong, obtuse, mucronulate, keeled, 3 - nerved, margin hyaline; stamens 3; style flat, ciliate, base dilated, articulate; nut biconvex, obovate, truncate, margin

thickened, each side with 7 vertical ribs and between ribs transverse striations.

Flowering and fruiting: September - December.

KYLLINGA

***Kyllinga brevifolia* Rottb.**

Local name: മുത്തങ്ങപ്പുല്ല്.

Habit: Herb.

Habitat: Marshy areas, wastelands and roadsides.

Perennial, rhizome elongated, sheathed; stem spaced; leaves flat linear - lanceolate; heads solitary, ovoid, green; spikelets compact, compressed, single flowered; glumes 4, ovate, acuminate, shortly mucronate; stamens 3, style 2-fid; nut compressed, obovate, apiculate, yellowish brown.

Flowering and fruiting: October - May.

***Kyllinga bulbosa* P. Beauv.**

Habit: Herb

Habitat: Marshy areas.

Perennials. Leaves flat conduplicate, acuminate. spikelets greenish- white on sessile capitate globose heads, glumes ovate oblong, acuminate, margins hyaline. Nuts biconvex, yellowish.

Flowering and fruiting: December - March.

SCLERIA

***Scleria sumatrensis* Retz.**

Habit: Herb.

Habitat: Banks of canals and marshes.

Disc cupular, crenate. Stems stout, trigonous, angles smooth or scaberulous; sheath not winged, mouth truncate; spikelets numerous, sessile or shortly peduncled, solitary on the branches of terminal and axillary oblong panicles, bracteoles filiform; nut globose, brown, closely, rugosely pitted.

POACEAE
AXONOPUS

***Axonopus compresses* (Sw.) P. Beauv.**

Habit: Herb.

Habitat: Dry and moist deciduous forests, wastelands and paddy fields.

Perennials, creeping, stoloniferous; nodes bearded. Leaves oblong to linear-lanceolate, acute, margin ciliate; sheaths keeled; ligules membranous, fimbriate. Spikelets oblong - acute, elliptic or elliptic - lanceolate, sessile or shortly pedicelled in digitate racemes. Lower glumes absent; upper glumes ovate - elliptic or elliptic-lanceolate, hairy on dorsal side; lower lemmas elliptic-lanceolate, villous, epaleate; upper lemmas epaleate; hairy at apex; paleas oblong, infolded. Florets bisexual. Grains oblong.

Used as lawn grass.

Flowering and fruiting: Throughout the year.

BAMBUSA

***Bambusa bambos* (L.) Voss**

Local name: गूँ.

Habitat: Through out India, in areas upto 2100 m elevation.

The leaves are sweet, astringent, cooling, emmenagogue, ophthalmic, vulnerary, constipating and febrifuge. Bamboo leaves contain the highest protein levels, stems have less. The bamboo resin (Tabasheer, Banshalochan) is the siliceous secretion found in the internodes of the stems of various species of Bamboo. It occurs in fragments of masses, and is translucent or transparent and bluish white color. It is astringent, acrid, sweet, cooling, expectorent, constipating, cardiotoxic, haemostatic, aphrodisiac, diuretic.

Products offered: Bamboo leaves, bamboo exudate, banshalochan, tabasheer.

Bambusa Vulgaris can be grown best in a climate-controlled environment, where it can be sheltered with adequate water and

proper lighting conditions, though, it can be taken outdoors during the summer months. Since common bamboo enjoys plenty of moisture, keeping it well watered is a necessity for a healthy plant.

Bambusa vulgris and 'Budhas belly' are cultivated as ornamentals.

CHLORIS

***Chloris barbata* Sw.**

Habit: Herb.

Annuals or short-lived perennials. Culms tufted, erect, 10 - 80cm high; nodes glabrous. Leaves linear-lanceolate or linear, acuminate, rounded at base. Sheaths keeled. Ligules truncate, membraneous. Spikes 3 - 16, digitate, densely spiculate. Spikelets subsessile, 2-seriate, obovate, 2 - 3 flowered. Lower glume lanceolate, hyaline, one-nerved, keeled, scabrid along the keel. Upper glume lanceolate, hyaline, one-nerved, scabrid along the keel. Fertile lemmas ovate or ovate-elliptic, awned, coriaceous, 3-nerved, with submarginal fringes of white hairs, scabrid. Paleas elliptic or oblong-elliptic, hyaline, 2-keeled, 2-nerved. Sterile lemmas 1-2 on a stalk, obovate, truncate or emarginate, coriaceous, 3-nerved, awned. Stamens 3. Grains trigonous.

Flowering and fruiting: March-December. (Plate - 9 i)

CYMBOPOGON

***Cymbopogon flexuosus* (Nees ex Steud.) Wats.**

Local name: ഇഞ്ചിപ്പുല്ല്.

Habit: Herb.

Habitat: Deciduous forests and grass lands, also in the plains.

Aromatic tufted herbs; nodes hairy. Leaves linear-lanceolate, scabrid, rough. Leaf sheaths hairy or glabrous, often auricled. Panicles lax, greyish, druping. Lower glumes of sessile spikelets narrowly winged, 3 nerved. Lower glumes of pedicellate spikelets, lanceolate, acuminate.

Flowering and fruiting: October.

It is the source of the valuable aromatic oil known as oil of lemon grass. It is cultivated for this purpose in certain areas.

CYNODON

***Cynodon dactylon* Pers.**

Local name: കുറുകപ്പല്ല്.

Habit: Herb.

Habitat: Along banks of backwaters, bunds of paddy fields and wastelands.

Perennial creeping grass with erect culms. Leaves narrow, flat or complicate. Inflorescence of 2-8 fascicled or umbellate spikes; rachis slender. Spikelets all alike, sessile, laterally compressed, alternately 2-seriate, imbricate, not jointed at the base, 1-flowered; rachilla dis articulating at the base, rarely produced beyond the lemma.

DACTYLOCTENIUM

***Dactyloctenium aegypticum* (L.) P. Beauv.**

Local name: കവരപ്പല്ല്.

Habit: Herb.

Habitat: Marshy lands and open areas.

Annuals, culms creeping or geniculately ascending, rooting at the nodes; nodes glabrous, leaves oblong - lanceolate, or linear, acuminate, rounded or shallowly cordate at base, hispid or glabrous, sheaths keeled. Ligules ovate, fimbriate, membranous, spikes digitate, spikelets ovate or oblong, lower glume boat-shaped or ovate - acute when spread, keeled, keel minutely winged, scabrid. Upper glume ovate, elliptic or obovate, aristate. Lemmas ovate or ovate-lanceolate, aristate, keeled, chartaceous; palea ovate - lanceolate, acuminate, chartaceous, keeled. Stamens 3. Grain obovate or triangular, transversely rugose.

Flowering and fruiting: Throughout the year. (Plate - VIII C)

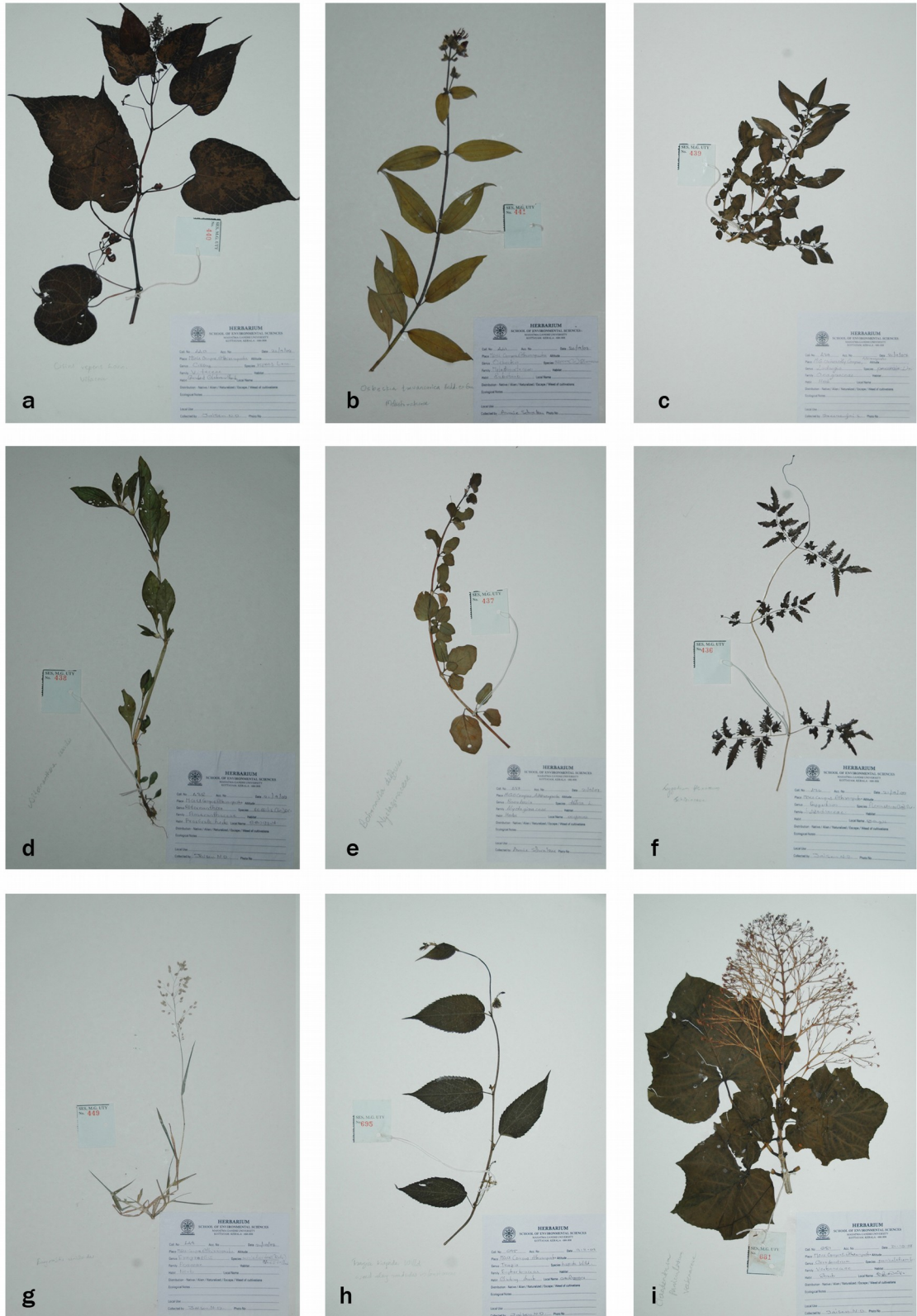


Plate - 10. a. *Cissus repens*; b. *Osbeckia travancorica*; c. *Ludwigia perennis*; d. *Alternanthera sessilis*; e. *Boarhavia diffusa*; f. *Lygodium flexuosum*; g. *Ergrostis uniloides*; h. *Tragia hispida*; i. *Clerodendrum paniculatum*.

ERAGROSTIS

***Eragrostis uniloides* Nees.**

Habit: Herb.

Habitat: Bunds of paddy fields, streams and banks of backwaters.

Annual or perennial, usually erect and slender herbs. Leaves narrow, flat, complicate or convolute. Inflorescence of terminal open or contracted panicles, rarely of simple spikes. Spikelets small, many, rarely 1-2 flowered, usually strongly laterally compressed, not articulated at the base; rachilla continuous or articulate between the lemmas. Glumes 2, purple pink, usually separately deciduous, broad, obtuse, acute or mucronate, never awned, back rounded, 1-keeled, 1-nerved or the upper sometimes 3-nerved. Lemmas imbricate, longer than the glumes which they resemble, acuminate or emarginate, 3 - nerved, ultimately deciduous; paleas deciduous with their lemmas or persistent, broad, 2 - keeled, keels smooth, scabrid or ciliate. Lodicules 2, very minute or 0. Stamens 1-3. Styles 2, free. Grain minute, globose, oblong-ovoid or obovoid, free within the lemma and palea.

ISCHAEMUM

***Ischaemum muticum* L.**

Habit: Herb.

Habitat: Banks of backwaters.

Perennials; culms branched, creeping; root stock stout. Leaves lanceolate, rigid, flat, cordate at base; ligules obscure. Spikes 2; sessile spikelets glabrous, smooth. Lower glumes oblong, 2-toothed, keels narrowly winged, ciliate above. Upper glumes large, 5-nerved, glabrous; lower lemmas oblong, obtuse, glabrous; paleas with a hyaline wing; upper lemmas oblong - lanceolate, keels ciliate. Pedicelled spikelets with hairy, inflexed lower glumes.

Flowering and fruiting: November - January.

OCHLANDRA

***Ochlandra travencorica* (Bedd.) Benth.**

Local name: ສາສ, ຫຼຸບູດ.

Habit: Shrub.

Habitat: Evergreen and semi- evergreen forests.

Erect woody shrub. Stems 2-6m tall, hollow-cylindric. Leaves oblong-lanceolate, scabrous, acuminate at apex, unequally rounded at base. Glumes mucronate; filaments jointed.

Flowering and fruiting: March.

Endemic to Western Ghats.

PASPALUM

***Paspalum conjugatum* Berg.**

Habit: Herb.

Habitat: Banks of backwaters and rivers.

Perennial, sometimes annual herb. Leaves narrow, flat or more or less introlled. Inflorescence of solitary, digitate or racemose spikes; rachis flat and winged or trigonous. Spikelets secund, 2-seriate, solitary or paired, sessile or nearly so, orbicular, oblong or ovate. Lower glume usually absent, rarely represented by a small scale; upper membranous, about equalling the spikelet, rarely shorter or absent, 3 or more nerved. Lemmas dissimilar; lower similar to the upper glume, empty; upper chartaceous to crustaceous, faintly nerved, its palea sub equal, similar and embraced by it, containing a bisexual floret. Lodicules 2. Stamens 3. Styles 2, free. Grain more or less biconvex, tightly enclosed in the hardened lemma and palea.

***Paspalum distichum* L.**

Habit: Herb.

Habitat: Banks of backwaters, paddy fields, streams and salt marshes.

Perennials with creeping stolons; culms 20 - 40cm tall. Leaves glabrous, flat, linear lanceolate, sheaths ciliate. Spikelets solitary, elliptic, biseriate in sessile divaricate racemes. Lower

glumes absent; upper glumes elliptic, pubescent on back, 5 nerved; lower lemmas similar to upper glumes, epaleate; upper lemmas elliptic-oblong, 3 nerved; paleas similar, margins inflexed with auricles near base. Grains elliptic-oblong.

Flowering and fruiting: July - January.

SACCIOLEPIS

***Sacciolepis indica* Linn.**

Local name: ബോച്ചപ്പുല്ല്.

Habit: Herb.

Habitat: Wetlands and marshy areas.

Annuals, tufted, slender erect or ascending, nodes glabrous. Leaves lanceolate, linear-lanceolate or linear, rounded or shallowly cordate at base, sheaths slightly keeled. Ligules membranous, rounded or truncate, shortly fimbriate. Panicles spiciform. Spikelets ovate-acute, elliptic or elliptic-lanceolate, slightly glabrous, gibbous. Lower glume ovate acute, chartaceous, 3-5 nerved. Upper glume ovate-oblong, acute, chartaceous, setose or glabrous. Palea minute scale or absent. Second lemma oblong-acute, coriaceous, shining. Palea oblong-acute, coriaceous, margins inflexed. Stamens 3, anthers deep violet. Stigmas violet.

Flowering and fruiting: May - December.

SPOROBOLUS

***Sporobolus diander* Beauv.**

Habit: Herb.

Habitat: Moist deciduous forests and wastelands.

Perennial, rarely annual, erect, prostrate or creeping herb. Leaves narrow, flat or convolute. Panicles effuse or spiciform, often pyramidal. Spikelets 1 rarely 2 flowered, jointed on the pedicels or rarely on the rachis; glumes membranous, muticous, unequal, the lower smaller, sometimes minute, persistent on falling singly. Lemmas muticous, ovate or oblong; paleas as long, sometimes emarginate, closely 2 nerved and often splitting between the nerves as the grains matures, enclosing a bisexual

floret. Lodicules 2, very minute or 0. Stamens 2 - 3. Styles 2, free. Grain oblong, obovoid or pyriform; pericarp thin, hyaline, loose; embryo large.

Usually eaten by cattle.

PTERIDOPHYTES

LYCOPODIACEAE

LYCOPODIELLA

***Lycopodiella cernua* (L.) Pic.**

Habit: Herb.

Main stem erect, terete, bearing branched roots at the base; main branches sub opposite, decussate, forked 2 - 3 times into secondary branches which bear upto 5 times forked, about 5 x 3cm tertiary branches. Leaves sparse on main stem, dense on the rest, spreading or slightly ascending, adnate, linear, acuminate, entire, pale green, stiff, herbaceous. Cones terminal on the ultimate branches, epudunculate, pendant; sporophylls yellowish-green, thin, broadly ovate, acuminate, base peltate, margin fimbriate; sporangia reniform, pale brown; spores trilete, pale green.

SELAGINELLACEAE

SELAGINELLA

***Selaginella tenera* (Hook & Grev.) Spring.**

Local name: ഞെപ്പച്ച.

Habit: Herb.

Stem erect, rooting at the base only, green to pink colour when fresh. Leaves dimorphic, contiguous on main stem and on axis of primary branches, oblong-ovate, obtuse or subacute, denticulate on the acroscopic margin, base unequal; sporophylls dimorphic, lateral sporophylls bear megasporangia, others with microsporangia; microspores brick red in mass.

SCHIZAEACEAE

LYGODIUM

Lygodium flexuosum (L.) Sw.

Habit: Climber.

Climbers, rhizomes short or long creeping, covered by dark hairs; fronds tripinnate, dormant bud borne on the axis of the branches of common stalk, pinnules cordate to oblong - lanceolate, margin entire or finely serrate; veins forked, reaching the margin; sporangia borne on finger - like outgrowths along the margin of the pinnules; spores trilete, exine densely verrucate.

Young shoots are used as leafy vegetables; plants are used as expectorant, rhizome boiled with mustard oil and locally applied to carbuncled and in rheumatism, sprains, scabies, ulcers, eczema. The aquatic extracts of rhizome cure gonorrhoea.

PTERIDACEAE

PTERIS

Pteris quadriaurita Retz.

Local name: പുത്രഞ്ചാരി.

Habit: Herb.

Rhizome sub erect or erect; scales lanceolate, pale brown, transparent and membranous at the periphery, dark brown, thick and opaque at the centre, apex acuminate, margin with long, thin hairs; stipes pale brown, stramineous or pale green, glabrous, glossy above. Lamina deltoid or broadly ovate, bipinnatifid; pinnae opposite, lanceolate with cordate, acuminate apex, base broadly cuniate; basal pinnae forked once at the base; pinnae lobbed to the costa; lobes oblong apex rounded, margin entire, spinules borne at the junction of the costa and the rachis and at the junction of costa and costules; veins; pinnate, distinct below, forked ones; pinnae dark green; texture thick herbaceous to sub coreaceous spores with verrucate exine.

HEMIONITIDACEAE

HEMIONITIS

***Hemionitis arifolia* (Burm.) Moore.**

Habit: Herb.

Habitat: Frequently seen along road sides.

Rhizome erect when young, short creeping when mature, densely covered by scales; scales ovate - lanceolate, dark at the centre, whitish at the periphery and entire, stipes compact, numerous, black or dark brown; polished, brittle, terrate, densely scaly all over when young, sparsely so when mature. Lamina simple, dimorphic, cordiform, deltoid, trilobed, entire; costa raised below, grooved above, densely scaly below; veins obscure both above and below, anastomosing closely, areoles seen as depressions in dry fronds; lamina pale green; texture chartaceous; long, soft, pale brown scales distributed all over the lower surface of the sterile laminae, very rare on adaxial side of fertile and sterile laminae. Sori continuous along the veins filling the entire surface of the lamina when mature, intermixed with hairs and scales; spores trilete, spherical, exine with minute reticulations.

The fronds are used in the treatment of aches and as vermifuge. In the Philippines crushed juice from the fronds is used for burns.

ADIANTACEAE

ADIANTUM

***Adiantum latifolium* Lam.**

Habit: Herb.

Rhizome creeping, long, often branched, densely scaly all over; scales lanceolate, uniformly pale brown, apex acuminate, margin sparsely fimbriate. Stipes arranged in two alternate rows, abaxially rounded, adaxially grooved, stiff, glossy, glabrous below, gradually become pubescent above. Lamina broadly ovate, bipinnate, apex acute, base broadly cuniate; primary pinnae one

or two half pairs, alternate, slightly ascending, distinctly stalked; largest pinnae oblong, lanceolate, acute; pinnules upto 12 pairs per primary pinna, basal 2 or 4 pairs slightly reduced, alternate, shortly stalked or sessile; veins slightly distinct above and below, forked about 5 times, reaching the margin; pinnae dark green, glabrous above and below; long narrow, pale brown hairs and scales densely distributed all over the costa and rachis; texture herbaceous. Sori oblong or reniform, distributed all along the upper margin, the dark brown reflexed margin incurved to form pale brown, thin, fimbriate indusium which protect the basal and lower side of the sori and thus the indusium is seated between the sorus and the lower surface of the pinnule; sporangia and spores abortive.

***Adiantum concinnum* Willd.**

Local name: പനമു.

Habit: Herb.

Rhizome erect or sub erect, densely scaly at apex, scales lanceolate, acuminate, margin entire. Stipes tufted, slender, dark brown, sparsely scaly at the very base, glabrous and glossy above. Lamina oblong- lanceolate, bipinnate or tripinnate, apex acute, base broadly cuneate; primary pinnae upto 10 pairs, alternate, lanceolate, apex acute with a terminal pinnule similar to the lateral ones; base broadly cuneate. Apex acute with a terminal pinna, base oblique, pinnules upto 4 pairs per secondary pinnae, alternate, shortly stalked, fan - shaped, sub - orbicular ovate or wedge shaped, base truncate or narrowly or broadly cuneate or acroscopic, base truncate, basispic, base slightly excised and narrowly cuneate margin deeply lobed into 2-3, primary lobed, which are again shallowly lobed. Veins slightly distinct above and below repeatedly flabellately forked, free, reaching the margin in pale green or dark green, glabrous above and below, texture thin, herbaceous. Sori distributed all along the margin of the pinnule except acroscopic or basispic, indusia reniform, glabrous, pale

brown, spores tetrahedral, deltoid in polar view.

GLEICHENIACEAE

DICRANOPTERIS

***Dicranopteris linearis* (Burm.f.) Underwood.**

Habit: Shrub.

Rhizome long, creeping, densely covered by ferruginous hairs. Stipes scattered, usually pale brown, glabrous. Lamina erect or scandent, forked once to several times, bearing accessory branches at or above the forks; ultimate leafy segments oblong, pinnatifid almost to the costa; segments oblong, veins forked, free; lamina pale green, often glaucous green, herbaceous or chartaceous or sub coriaceous, glabrous or sub glabrous or densely hairy. Sori median or sub median orbicular, exindisiate, sporangia dehiscing vertically. Spores trilet, exine smooth.

BLECHANACEAE

BLECHNUM

***Blechnum orientale* L.**

Habit: Herb.

Rhizome erect, upto 12 cm thick, densely clothed by scales all over; scales linear-lanceolate, apex acuminate or hair pointed, margin entire. Stipes tufted, dark or reddish-brown at the base, pale or grey-brown above, scaly at the very base, glabrous and glossy above, small tubercles present along the style. Lamina ovate-to linear-lanceolate, apex acute, base subtruncate or broadly cuneate, pinnae 10-56 pairs, spreading or slightly ascending, sessile or adnate by the basiscopic base, alternate, largest pinna oblong-linear-lanceolate, base broadly cuneate, oblique, apex long acuminate, margin entire; costa rounded below, grooved above; veins immersed, parallel, more or less perpendicular to the costa, pinnae pale or yellowish green, glabrous above and below, texture coriaceous. Sori linear along

either side of the costa, dark brown, continuous, indusiate; indusia dark brown, spores spherical or ovoid, yellowish-brown, exine with broadly winged anastomosed perisperm.

STENOCHLAENA

***Stenochlaena palustris* (Burm.) Beddome.**

Habit: Climber.

Habitat: Found along partially shaded roadsides or inside the forests in fully shaded places, also seen along canals and marshy places along coastal areas.

Rhizome long creeping, scandent, stramineous with few scattered scales, often reaching the top of trees, hairy, palmately arranged groups of fruits on the abaxial side; younger roots protected by scales; scales ovate, dark at the centre with straight, uniformly arranged cells, apex acuminate, margin ciliate, fronds scattered, dimorphic, sterile frond with stramineous and glabrous stipes; lamina ovate or oblong - lanceolate, slightly narrowed towards apex; pinnae spreading, shortly stalked, sub opposite or alternate; largest pinna lanceolate, apex acuminate, base cuniate, basiscopic base slightly excised, margin coarsely serrate with thick, hard, pale brown sclerotic border; costa slightly raised, shallowly grooved above and below; texture thick coriaceous. Fertile fronds born at the distal part of the plants or at the interval, more or less of the same size and shape of the sterile ones, but with much contracted pinnae; sori born all over the lower surface of the fertile segments, protected by pale brown, firm, entire, reflexed margin; spores monoletic, planoconvex or reniform, pale green, exine sparsely spinulose.

The young shoots are eaten either raw as salad or cooked. Owing to their durability when submerged in salt water the rhizomes are utilized as chordage in binding fish traps and as anchor ropes. They are also used for making baskets. The decoction of the leaf is taken in fever.



Plate - 11. Herbaria prepared from campus flora: a. *Ishamum muticum*; b. *Cyperus distans*; c. *Euphorbia hirta*; d. *Adiantum concinnum*; e. *Kyllingia triceps* (?); f. *Leea indica*; g. *Murdannia loriformis*; h. *Scoparia dulcis*; i. *Dicranopteris linearis*.

POLYPODIACEAE

DRYMOGLOSSUM

***Drymoglossum heterophyllum* (L.) Trimen.**

Habit: Herb.

Rhizome long creeping wiry, densely clothed by scales all over; scales appressed, peltate, dark brown at the point of attachment, apex acuminate. Fronds simple, dimorphic; stipes, scattered, terrate, articulate, densely scaly at the base; sterile leaf orbicular, ovate elliptic or lanceolate, apex rounded, margin entire, base broadly or narrowly cuniate; costa and veins immerse; lamina fleshy, pale or dark green, bearing stellate hairs densely below when young, sparsely or rarely when mature; fertile fronds oblong, apex rounded, margin entire; sori acrosticoid, usually covered all over the surface of the un narrowed part of the fertile fronds; orbicular or obovate sterile leaves bear sori submarginally on the distal half; sporangia intermingled with stellate hairs; spores reniform or plano convex, exine sparsely spinulose.

Distribution: Endemic in South India, Sri Lanka and Seychelles.

DRYNARIA

***Drynaria quercifolia* (L.) J. Sm. in Hook.**

Local name: തൃച്ചെട.

Habit: Epiphyte or lithophyte.

Habitat: Fully or partially shaded places.

Rhizome short creeping, densely clothed by scales; scales linear-lanceolate, uniformly pale brown to dark brown, apex long acuminate, margin dentate-ciliate; nest leaves ovate, apex acute, margin shallowly lobed, midrib and primary veins distinctly raised above and below, secondary and tertiary veins slightly raised above and below, veins interconnected; grey-brown, abaxially rounded, adaxially grooved, narrowly winged on either side, glabrous all over. Lamina oblong, pinnately lobed, terminated by a pinnule similar to the lateral ones, base decurrent; lobes upto 15 pairs, basal pairs much reduced; largest lobe oblong-lanceolate,

apex acute, margine entire, base decurrent; costa and veins raised above and below, interconnected by veinlets, areoles free from any included veinlets; pinnae pale green, glabrous, texture coreaceous. Sori seated at the juncture of veins, more or less in 2 rows along each primary vein, orbicular, exindusiate; spores reniform, pale brown, exine finely spinulose.

Rhizome bitter, astringent; fronds used in phthisis, hectic fever, dyspepsia and cough, and in Malaysia used as poultice on swellings; the decoction of the plant is used in typhoid fever.

LEPISORUS

***Lepisorus amaurolepidus* (Sledge) Bir & Trikha.**

Habit: Herb.

Rhizome short creeping, densely covered by scales; scales peltate, bicolorous, dark brown with thick walled cells at the centre, pale brown with thin walled cells towards periphery, apex acuminate, margin dentate. Stipes crowded, pale or grey-brown when dry, rounded abaxially, grooved adaxially, scaly at the very base, glabrous above. Laminae simple, elliptic-lanceolate, progressively narrowing from the middle towards base and apex, base narrowly cuneate and decurrent, apex usually acute or acuminate, rarely subacute, margin entire; veins immersed, indistinct above and below, anastomosing; lamina glabrous, chartaceous. sori superficial, arranged in two rows, medianly on either side of the midrib usually towards the distal half of the frond, hemispherical, spores monolete, plano - convex or ellipsoid, pale green, exine with dense small outgrowths.

Table 4.1.

List of plant species identified.

DICOTYLEDONS

1. ANNONACEAE

Sl.No.	Species name.	Local name.
1.	<i>Annona squamosa</i> L.	ആത്ത.
2.	<i>Artabotrys zeylanicus</i> Hook.	മനോരഞ്ജിനി.
3.	<i>Cananga odorata</i> (Lam.) Hook. f. & Thoms.	മഞ്ഞച്ചമ്പകം.
4.	<i>Polyalthia longifolia</i> (Sonner.) Thw.	അരണമരം.
5.	<i>Uvaria narum</i> (Dunal) Bl.	കൂരി, നറുപാണൽ.

2. MENISPERMACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cyclea peltata</i> (Lam). Hook.	പാടത്താളി.
2.	<i>Tinospora cordifolia</i> Miers.	ചിറ്റുമുത്.

3. CAPPARACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cleome viscosa</i> L.	നായ്ക്കടുകു.

4. FLACOURTIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Hydnocarpus pentandra</i> (Buch. - Ham.) Oken.	മരോട്ടി.

5. CLUSIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Calophyllum inophyllum</i> L.	പുന്ന
2.	<i>Garcinia gummi-gutta</i> Wt.	കൊടംപുളി.

6. MALVACEAE

Sl.No.	Species name.	Local name.
1.	<i>Abelmoschus moschatus</i> Medikus.	കസ്തൂരിവെണ്ട.
2.	<i>Hibiscus vitifolius</i> Linn.	വെള്ളൂരം.
3.	<i>Sida acuta</i> Burm.	മഞ്ഞക്കുറുന്തോട്ടി.
4.	<i>Sida cordifolia</i> L.	കുറുന്തോട്ടി.
5.	<i>Sida rhombifolia</i> L.	കുറുന്തോട്ടി.
6.	<i>Urena lobata</i> L.	ഉഴരം.

7. BOMBACACEAE

Sl.No.	Species name.	Local name.
1.	<i>Bombax ceiba</i> L.	ഇലവ്, ഉന്നപ്പൂള.

8. STERCULIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Helictress isora</i> L.	എടംപിരി വലംപിരി.
2.	<i>Waltheria indica</i> Linn.	

9. TILIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Grewia nervosa</i> (Lour.) Panigrahi.	ചേരിക്കൊട്ട.
2.	<i>Triumfetta rhomboidea</i> Jaq.	ഉഴർപ്പം.

10. LINACEAE

Sl.No.	Species name.	Local name.
1.	<i>Hugonia mystax</i> L.	മോതിരക്കണ്ണി.

11. OXALIDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Biophytum sensitivum</i> (L.) DC.	മുക്കുറ്റി.

12. RUTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Aegle marmelos</i> (L.) Corr.	കൂവളം.
2.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	പാണൽ.
3.	<i>Murraya exotica</i> Linn.	മരമുല്ല.
4.	<i>Murraya koenigii</i> (L.) Spreng.	കറിവേപ്പ്.

13. SIMARUBACEAE

Sl.No.	Species name.	Local name.
1.	<i>Ailanthus excelsa</i> Roxb.	മട്ടി, പൊങ്ങലറ്റം.

14. MELIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Azadirachta indica</i> A. Juss.	ആര്യവേപ്പ്.
2.	<i>Nargamia alata</i> Wight & Arn.	നിലനാരകം.
3.	<i>Switenia mahagoni</i> (L.) Jacq.	മഹാഗണി.

15. RHAMNACEAE

Sl.No.	Species name.	Local name.
1.	<i>Ziziphus oenoplia</i> (L.) Mill.	ചെറുതുടലി.
2.	<i>Zizyphus rugosa</i> Lam.	തുടലിമുളള്.

16. VITACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cayratia trifolia</i> (L.) Domin.	കാട്ടുപെരണ്ട.
2.	<i>Cissus discolor</i> Blume.	ഞെരിഞ്ഞാനുളി.
3.	<i>Cissus repens</i> Lam.	ഞെരിഞ്ഞാനുളി, എരുങ്ങാൻ.
4.	<i>Tetrastigma leucostaphylum</i> (Dennst.) Alston ex Mabb.	വലിയ ചൊറിയുളി.

17. LEEACEAE

Sl.No.	Species name.	Local name.
1.	<i>Leea indica</i> (Burm. f.) Merr.	ഞെട്ട, ചൊറിയൻതാളി.

18. SAPINDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cardiospermum helicacabum</i> L.	ഉഴിഞ്ഞ.

19. ANACARDIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Anacardium occidentale</i> L.	പറങ്കിമാവ്.
2.	<i>Holigarna arnottiana</i> Hook. f.	ചേര്.
3.	<i>Mangifera indica</i> Linn.	മാവ്.

20. FABACEAE

Sl.No.	Species name.	Local name.
1.	<i>Abrus precatorius</i> L.	കുനി.
2.	<i>Alysicarpus vaginalis</i> (L.) DC.	നിലദാരില.
3.	<i>Centrosema pubescens</i> Benth.	കാട്ടുപയർ.
4.	<i>Crotalaria pallida</i> Dryand.	ആനത്തകര.
5.	<i>Dalbergia latifolia</i> Roxb.	വിട്ടി.
6.	<i>Desmodium gangeticum</i> (L.) DC.	ദാരില.
7.	<i>Desmodium heterophyllum</i> (Willd.) DC.	
8.	<i>Desmodium triflorum</i> (L.) DC.	നിലംപരണ്ട.
9.	<i>Desmodium triquetrum</i> DC.	പൈമ്പലടയ്ക്ക, അടയ്ക്കാപാണൽ.
10.	<i>Pongamia pinnata</i> (L.) Pierre.	ഉങ്ങ്.
11.	<i>Tephrosia purpurea</i> (L.) Pers.	കൊഴുവ.
12.	<i>Vigna dalzelliana</i> (O. Kzte.) Verdc.	കാട്ടുഴുന്ന്.
13.	<i>Zornia gibbosa</i> Span.	കൊഴുപ്പ് മുറികൂട്ടി.

21. CAESALPINIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Bauhinia purpurea</i> L.	മന്ദാരം.
2.	<i>Caesalpinia mimosoides</i> Lam.	തീമുള്ളൂ.
3.	<i>Caesalpinia pulcherrima</i> (L.) Swartz.	രാജമല്ലി.
4.	<i>Caesalpinia sappan</i> L.	ചപ്പങ്ങം, പതിമുഖം.
5.	<i>Cassia fistula</i> L.	കണിക്കൊന്ന.
6.	<i>Chamaecrista leschenaultiana</i> (DC.) Degner.	
7.	<i>Delonix regia</i> (Boj. ex Hook.) Rafin.	അലസിപ്പൂമരം, ഗുൽമോഹർ.
8.	<i>Peltophorum pterocarpum</i> (DC.) Backer ex Heyne.	
9.	<i>Saraca asoca</i> (Roxb.) de Wilde.	അശോകം.
10.	<i>Senna tora</i> (L.) Roxb.	തകര.
11.	<i>Tamarindus indica</i> L.	പൂളി.

22. MIMOSACEAE

Sl.No.	Species name.	Local name.
1.	<i>Acacia auriculiformis</i> A. Cunn.	അക്കേഷ്യ.
2.	<i>Acacia pennata</i> (Linn.) Willd.	കാരിഞ്ച.
3.	<i>Adenanthera pavonina</i> L.	മഞ്ചാടി.
4.	<i>Albizia lebbeck</i> (L.) Benth.	നെന്മേനിവാക.
5.	<i>Mimosa diplotricha</i> C. Wt. & Sanvalle.	ആനത്തൊട്ടാവാടി.
6.	<i>Mimosa pudica</i> L.	തൊട്ടാവാടി.

23. ROSACEAE

Sl.No.	Species name.	Local name.
1.	<i>Rubus ellipticus</i> Sm.	

24. CRASSULACEAE

Sl.No.	Species name.	Local name.
1.	<i>Kalanchoe pinnata</i> (Lam.) Pers.	ഇലമഷി, ഇലമുളച്ചി.

25. RHIZOPHORACEAE

Sl.No.	Species name.	Local name.
1.	<i>Carallia brachiata</i> (Lour.) Merr.	വങ്കണം.

26. COMBRETACEAE

Sl.No.	Species name.	Local name.
1.	<i>Calycopteris floribunda</i> Lam.	പുല്ലാഞ്ഞി.
2.	<i>Terminalia catappa</i> L.	ബദാം.
3.	<i>Terminalia paniculata</i> Roth.	മരുത്.

27. MYRTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Psidium guajava</i> L.	പേര.
2.	<i>Syzygium cumini</i> (L.) Skeels.	ഞാവൽ.
3.	<i>Syzygium zeylanicum</i> (L.) DC.	പൂച്ചപ്പഴം.

28. MELASTOMATACEAE

Sl.No.	Species name.	Local name.
1.	<i>Melastoma malabathricum</i> L.	അതിരാണി, കലമ്പട്ട, കാട്ടുചക്കര.
2.	<i>Memecylon randerianum</i> SM & MR Almeida.	കായാവ്, കാശാവ്.
3.	<i>Osbeckia aspera</i> (L.) Blume.	

29. LYTHRACEAE

Sl.No.	Species name.	Local name.
1.	<i>Lagerstroemia speciosa</i> (L.) Pers.	പൂമരുത്.

30. ONAGRACEAE

Sl.No.	Species name.	Local name.
1.	<i>Ludwigia perennis</i> L.	നീർക്കരയാമ്പു.

31. PASSIFLORACEAE

Sl.No.	Species name.	Local name.
1.	<i>Passiflora foetida</i> L.	പൂച്ചപ്പഴം.

32. CARICACEAE

Sl.No.	Species name.	Local name.
1.	<i>Carica papaya</i> L.	പപ്പായ, കപ്പളം, കറമുസ.

33. CUCURBITACEAE

Sl.No.	Species name.	Local name.
1.	<i>Mukia maderaspatana</i> (L.) M. Roem.	മുക്കാപീര.
2.	<i>Solena amplexicaulis</i> (Lam.) Gandhi.	കാരക്ക, അരീക്കച്ചക്ക.

34. AIZOACEAE

Sl.No.	Species name.	Local name.
1.	<i>Glinus oppositifolius</i> (L.) DC.	
2.	<i>Mollugo pentaphylla</i> L.	പർപ്പുകപ്പുല്ല്.

35. APIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Centella asiatica</i> (L.) Urban.	കടങ്ങൽ, മുത്തിൾ.

36. RUBIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Canthium angustifolium</i> Roxb.	കട്ടാരമുള്ളി.
2.	<i>Canthium coromandelicum</i> (N. Burm.) Alston.	കാരമുള്ളി.
3.	<i>Chasalia curviflora</i> (Wall.) Thw.	വെള്ളക്കുറിഞ്ഞി
4.	<i>Hedyotis corymbosa</i> (L.) Lam.	പർപ്പുകപ്പുല്ല്.
5.	<i>Hedyotis pruinosa</i> L.	കുന്തമണിയൻ.
6.	<i>Ixora coccinia</i> L.	ചെത്തി.
7.	<i>Ixora cuncifolia</i> Roxb.	
8.	<i>Mitracarpus villosus</i> (Swartz) DC.	
9.	<i>Mussaenda bellila</i> Buch. - Ham.	വെള്ളില.
10.	<i>Pavetta tomentosa</i> Roxb.	പാവട്ട.
11.	<i>Psychotria flavida</i> Talbot.	
12.	<i>Spermacoce articularis</i> L.	താർതാവൽ.
13.	<i>Spermacoce latifolia</i> (Aubl.) Schum.	അപ്പപ്പുല്ല്.

37. ASTERACEAE

Sl.No.	Species name.	Local name.
1.	<i>Ageratum conyzoides</i> Linn.	കാട്ടുപു.
2.	<i>Bidens pilosa</i> L.	
3.	<i>Chromolaena odorata</i> (L.) King & Robinson.	കമ്മ്യൂണിസ്റ്റ് പച്ച.
4.	<i>Eclipta prostrata</i> (L.) L. Mant.	കഞ്ഞുണ്ണി, കയ്യോന്നി.
5.	<i>Elephantopus scaber</i> L.	ആനച്ചുവടി.
6.	<i>Elutheranthera rudralis</i> (Sw.) Sch.-Bip.	
7.	<i>Emilia sonchifolia</i> (L.) DC.	മുയൽച്ചെറിയൻ.
8.	<i>Spilanthes calva</i> DC.	അക്രാവ്, എരിപച്ച.
9.	<i>Synedrella nodiflora</i> (L.) Gaertn.	മുടിയൻപച്ച.
10.	<i>Tridax procumbens</i> L.	കമ്മിണിപ്പച്ച, ഒടിയഞ്ചിര.
11.	<i>Vernonia cinerea</i> (L.) Less.	പൂവാങ്കുന്തൽ.
12.	<i>Weddelia chinensis</i> (Osbeck.) Merr.	മഞ്ഞക്കഞ്ഞുണ്ണി.

38. SAPOTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Chrysophyllum cainito</i> L.	പുളിച്ചുക്ക.
2.	<i>Mimusops elengi</i> L.	ഇലഞ്ഞി.

39. OLEACEAE

Sl.No.	Species name.	Local name.
1.	<i>Myxopyrum smilacifolium</i> (Wall.) Blume.	ചതുരമുല്ല.

40. APOCYANACEAE

Sl.No.	Species name.	Local name.
1.	<i>Alstonia scholaris</i> (L.) R. Br.	ഏഴിലംപാല.
2.	<i>Allamanda cathartica</i> Linn.	കോളാമ്പിപ്പൂവ്.
3.	<i>Catharanthus roseus</i> (L.) G. Don.	ശവക്കോട്ടപ്പച്ച, ശവന്നാറി.
4.	<i>Cerbera odallam</i> Gaertn.	ഒതളം.
5.	<i>Ichnocarpus frutescens</i> (L.) Ait. & Aitton. f.	പാൽവള്ളി.
6.	<i>Rauvolfia serpentina</i> (L.) Benth.	അമല്ലൊരി, സർപ്പഗന്ധി.
7.	<i>Tabernaemontana heyneana</i> Wall.	കൂനമ്പാല.
8.	<i>Tabernaemontana divaricata</i> (L.) R.Br.	നന്യാർവട്ടം.
9.	<i>Nerium odorum</i> Sol.	അരളി.

41. ASCLEPIADACEAE

Sl.No.	Species name.	Local name.
1.	<i>Calotropis gigantea</i> (L.) R. Br.	എരിക്ക്.
2.	<i>Wattakaka volubilis</i> (L. f.) Stapf.	വട്ടക്കാക്കക്കൊടി.

42. PERIPLOCACEAE

Sl.No.	Species name.	Local name.
1.	<i>Hemidesmus indicus</i> (L.) R.Br.	നറുനീണ്ടി, നന്നാറി.

43. LOGANIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Strychnos nux-vomica</i> L.	കാഞ്ഞിരം.

44. MENYANTHACEAE

Sl.No.	Species name.	Local name.
1.	<i>Nymphoides indica</i> (L.) Kuntze.	ചിന്നാമ്പൽ, നെയ്യാമ്പൽ.

45. BORAGINACEAE

Sl.No.	Species name.	Local name.
1.	<i>Heliotropium indicum</i> Linn.	തേക്കട.

46. CONVOLVULACEAE

Sl.No.	Species name.	Local name.
1.	<i>Argyrea nervosa</i> (Burm. f.) Bojer.	സമുദ്രപ്പച്ച അടമ്പ്.
2.	<i>Evolvulus nummularis</i> (L.) L.	ശിവക്രാന്തി.
3.	<i>Ipomoea carnea</i> Jacq.	
4.	<i>Ipomoea mauritiana</i> Jacq.	പാൽമുതക്ക്.
5.	<i>Ipomoea nil</i> (L.) Roth.	നക്ഷത്രമുല്ല.
6.	<i>Ipomoea obscura</i> Ker-Gawl.	താളി.
7.	<i>Merremia tridentata</i> (L.) Hall. f.	വയറ.
8.	<i>Merremia vitifolia</i> (Burm. f) Hall. f.	മഞ്ഞക്കോളാമ്പി.

47. SOLANACEAE

Sl.No.	Species name.	Local name.
1.	<i>Datura metel</i> Linn.	കറുത്തുമ്മം.
2.	<i>Physalis angulata</i> L.	ഞൊട്ടാഞൊടിയൻ.
3.	<i>Solanum torvum</i> Sw.	ചുണ്ട.

48. SCROPHULARIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Limnophila heterophylla</i> (Roxb.) Benth.	മാങ്ങനാറി.
2.	<i>Lindernia antipoda</i> (L.) Alston.	
3.	<i>Scoparia dulcis</i> L.	കല്ലുരക്കി.
4.	<i>Torenia bicolor</i> Dalz.	കാക്കപ്പ.

49. BIGNONIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Tecoma stans</i> (Linn.)H.B.K.	

50. PEDALIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Pedaliium murex</i> L.	ആനത്തെരിഞ്ഞിൽ.
2.	<i>Sesamum orientale</i> L.	എള്ള.

51. ACANTHACEAE

Sl.No.	Species name.	Local name.
1.	<i>Andrographis paniculata</i> (Burm. f.) Wall.	കിരിയാത്ത.
2.	<i>Asystasia dalzelliana</i> Sant.	
3.	<i>Asystasia gangetica</i> (L.) T.	ഉപ്പിയം.
4.	<i>Barleria prionitis</i> L.	കനകാംബരം.
5.	<i>Blepharis maderaspatensis</i> (L.) Heyne ex Roth.	ഹേമകാന്തി.
6.	<i>Justicia japonica</i> Thumb.	
7.	<i>Strobilanthus ciliatus</i> Nees.	കരിങ്കുറിഞ്ഞി.

52. THUNBERGIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Thunbergia fragrans</i> Roxb.	മുരികൂട്ടി.

53. VERBENACEAE

Sl.No.	Species name.	Local name.
1.	<i>Clerodendrum inerme</i> (L.) Gaertn.	പെരിയില.
2.	<i>Clerodendrum paniculatum</i> L.	കൃഷ്ണകിരീടം.
3.	<i>Lantana camara</i> L.	അരിപ്പച്ചെടി.
4.	<i>Stachytarpheta jamaicensis</i> (L.) Vahl.	വേലിയേരി.
5.	<i>Tectona grandis</i> Linn.	തേക്ക്.

54. LAMIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Anisomeles ovata</i> R.Br.	കരിത്തമ്പ, ചെടയൻ.
2.	<i>Coleus blumei</i> Benth.	
3.	<i>Hyptis suaveolens</i> (L.) Poit.	
4.	<i>Hyptis capitata</i> Jacq.	
5.	<i>Leucas aspera</i> (Willd.) Link.	തുമ്പ.
6.	<i>Ocimum tenuiflorum</i> Linn.	തളസി, തുത്ത.

55. NYCTAGINACEAE

Sl.No.	Species name.	Local name.
1.	<i>Boerhavia diffusa</i> L.	തഴുതാമ.

56. AMARANTHACEAE

Sl.No.	Species name.	Local name.
1.	<i>Achyranthes aspera</i> L.	കടലാടി.
2.	<i>Aerva lanata</i> Juss.	ചെറുള.
3.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	പൊന്നാങ്കണി, കൊഴുപ്പ.

57. ARISTOLOCHIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Aristolochia indica</i> L.	ഗരുഡക്കൊടി, ഇരുശ്ചരമൂലി.
2.	<i>Thottea siliquosa</i> (Lam.) Ding Hou.	കറ്റിവയണ, കോടാശാരി.

58. PIPERACEAE

Sl.No.	Species name.	Local name.
1.	<i>Peperomia pellucida</i> . (L.) H.B.K.	മഷിത്തണ്ട്.
2.	<i>Piper nigrum</i> L.	കരുമുളക്.

59. LAURACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cinnamomum malabathrum</i> (Burm. f.) Blume.	വഴന, ഇലവങ്ങം.

60. LORANTHACEAE

Sl.No.	Species name.	Local name.
1.	<i>Dendrophthoe falcata</i> (L. f.) Etting.	ഇത്തിക്കണി, പുളളുന്നി.

61. SANTALACEAE

Sl.No.	Species name.	Local name.
1.	<i>Santalum album</i> L.	ചന്ദനം.

62. EUPHORBIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Acalypha ciliata</i> Forsk.	
2.	<i>Acalypha indica</i> L.	കപ്പമേനി.
3.	<i>Bridelia retusa</i> Spreng.	കൈനി.
4.	<i>Croton triglium</i> L.	നീർവാളം.
5.	<i>Euphorbia hirta</i> L.	നിലപ്പാല.
6.	<i>Flueggea leucopyrus</i> Wild.	അമ്പൂരിപ്പച്ചില.
7.	<i>Hevea braziliensis</i> (Willd. ex A. Juss.) Muell.-Arg.	റബ്ബർ.
8.	<i>Jatropha curcas</i> L.	കടലാവണക്ക്.
9.	<i>Macaranga peltata</i> Muell. Arg.	വട്ട, ഉപ്പുത്തനി.
10.	<i>Mallotus philippensis</i> (Lam.) Muell. - Arg.	കരങ്ങുമഞ്ഞൾ, ചെങ്കൊള്ളി.
11.	<i>Manihot esculenta</i> Crantz.	കപ്പ, മരച്ചീനി.
12.	<i>Phyllanthus amarus</i> Schum. & Thonn.	കീഴാർനെല്ലി.
13.	<i>Phyllanthus emblica</i> L.	നെല്ലി.
14.	<i>Phyllanthus urinaria</i> L.	കീഴാർനെല്ലി.
15.	<i>Sebastiania chamaelea</i> (L.) Muell. - Arg.	കൊടിയാവണക്ക്, ഞെട്ടാവണക്ക്.
16.	<i>Tragia involucrata</i> L.	കൊടിത്തൂവ.

63. ULMACEAE

Sl.No.	Species name.	Local name.
1.	<i>Trema orientalis</i> (L.) Blume.	അരണി.

64. MORACEAE

Sl.No.	Species name.	Local name.
1.	<i>Artocarpus hirsutus</i> Lam.	ആഞ്ഞിലി.
2.	<i>Artocarpus heterophyllus</i> Lam.	പിലാവ്.
3.	<i>Ficus benghalensis</i> Linn.	പേരാൽ.
4.	<i>Ficus exasperata</i> Vahl.	തേരകം.
5.	<i>Ficus hispida</i> L.	പാറകം.
6.	<i>Ficus racemosa</i> L.	അത്തി.

65. URTICACEAE

Sl.No.	Species name.	Local name.
1.	<i>Pilea microphylla</i> (L.) Liebm.	ശീവേലി.
2.	<i>Pouzolzia zeylanica</i> (L.)Bennett.	നെല്ലൂരപ്പ.

66. CASURINACEAE

Sl.No.	Species name.	Local name.
1.	<i>Casuarina equisetifolia</i> L.	ചുളമരം, കാറ്റാടി.

MONOCOTYLEDONS

1. ORCHIDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Zeuxine longilabris</i> Benth.	

2. ZINGIBERACEAE

Sl.No.	Species name.	Local name.
1.	<i>Zingiber zerumbet</i> Sm.	കാട്ടിഞ്ചി.

3. MARANTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Maranta arundinaceae</i> Linn.	കൂവ, ബിലാത്തിക്കൂവ.

4. COSTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Costus speciosus</i> (Koen.) J.E. Smith.	മലവയമ്പ്, ചണ്ണക്കൂവ, ചണ്ണക്കിഴങ്ങ്.

5. HYPOXIDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Curculago orchoides</i> Gaertn. Fruit.	നിലപ്പന.

6. DIOSCOREACEAE

Sl.No.	Species name.	Local name.
1.	<i>Dioscorea bulbifera</i> L.	കാട്ടുകാച്ചിൻ.
2.	<i>Dioscorea tomentosa</i> Koen. ex Spreng.	നെൽച്ചേമ്പ്.

7. LILIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Protasparagus racemosus</i> (Willd.) Oberm.	ശതാവരി.
2.	<i>Aloe vera</i> (L.) Burm.f.	കറ്റാർവാഴ.
3.	<i>Gloriosa superba</i> L.	മേന്തോന്നി.

8. SMILCACEAE

Sl.No.	Species name.	Local name.
1.	<i>Smilax zeylanica</i> L.	കരീലാഞ്ചി, വലിയകണ്ണി.

9. PONTEDERIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Monochoria vaginalis</i> (Burm.f) Persl. ex Kunth.	കരിങ്കുവളം, കൊളച്ചേമ്പ്.

10. COMMELINACEAE

Sl.No.	Species name.	Local name.
1.	<i>Commelina benghalensis</i> Linn.	കാമ്പവാഴ.
2.	<i>Commelina diffusa</i> Burm.	
3.	<i>Cyanotis cristata</i> (L.) D.Don.	
4.	<i>Murdannia nudiflora</i> (Clarke.) Brueckn.	
5.	<i>Murdannia pausiflora</i> Bruecken.	
6.	<i>Murdannia spirata</i> (L.) Brucken.	

11. PALMACEAE

Sl.No.	Species name.	Local name.
1.	<i>Areca catechu</i> L.	കമുക.
2.	<i>Borassus flabellifer</i> L.	കരിമ്പന.
3.	<i>Caryota urens</i> L.	ആനപ്പന, ചൂണ്ടപ്പന.
4.	<i>Cocos nucifera</i> L.	തെങ്ങ്.

12. PANDANACEAE

Sl.No.	Species name.	Local name.
1.	<i>Pandanus odoratissimus</i> L. f.	പെരുംകൈത.

13. ARACEAE

Sl.No.	Species name.	Local name.
1.	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson.	കാട്ടുചേന.
2.	<i>Colocasia esculenta</i> (Linn.) Schott in Schott & Endl.	ചേമ്പ.
3.	<i>Pothos scandens</i> L.	ആനപ്പരുവ.

14. HYDROCHARITACEAE

Sl.No.	Species name.	Local name.
1.	<i>Vallisneria spiralis</i> , Linn.	

15. CYPERACEAE

Sl.No.	Species name.	Local name.
1.	<i>Cyperus haspan</i> L.	
2.	<i>Cyperus rotundus</i> L.	കഴിമുത്തങ്ങ, മുത്തങ്ങ.
3.	<i>Fimbristylis dichotoma</i> (L.) Vahl.	
4.	<i>Kyllinga brevifolia</i> Rottb.	മുത്തങ്ങപ്പുല്ല്.
5.	<i>Kyllinga bulbosa</i> P. Beauv.	
6.	<i>Scleria sumatrensis</i> Retz.	

16. POACEAE

Sl.No.	Species name.	Local name.
1.	<i>Axonopus compresses</i> (Sw.) P. Beauv.	
2.	<i>Bambusa bambos</i> (L.) Voss	മുള.
3.	<i>Chloris barbata</i> Sw.	
4.	<i>Cymbopogon flexuosus</i> (Nees ex Steud.)Wats.	ഇഞ്ചിപ്പുല്ല്.
5.	<i>Cynodon dactylon</i> Pers.	കറുകപ്പുല്ല്.
6.	<i>Dactyloctenium aegypticum</i> (L.) P. Beauv.	കവരപ്പുല്ല്.
7.	<i>Eragrostis uniloides</i> Nees.	
8.	<i>Ischaemum muticum</i> L.	
9.	<i>Ochlandra travencorica</i> (Bedd.) Benth.	ഓട, ഇഗറ്റ.
10.	<i>Paspalum conjugatum</i> Berg.	
11.	<i>Paspalum distichum</i> L.	
12.	<i>Sacciolepis indica</i> Linn.	ബോച്ചപ്പുല്ല്.
13.	<i>Sporobolus diander</i> Beauv.	

PTERIDOPHYTES

1. LYCOPODIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Lycopodiella cernua</i> (L.) Pic.	

2. SELAGINELLACEAE

Sl.No.	Species name.	Local name.
1.	<i>Selaginella tenera</i> (Hook & Grev.) Spring.	ഓണപ്പച്ച.

3. SCHIZAEACEAE

Sl.No.	Species name.	Local name.
1.	<i>Lygodium flexuosum</i> (L.) Sw.	

4. PTERIDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Pteris quadriaurita</i> Retz.	പുത്രഞ്ചാരി.

5. HEMIONITIDACEAE

Sl.No.	Species name.	Local name.
1.	<i>Hemionitis arifolia</i> (Burm.) Moore.	

6. ADIANTACEAE

Sl.No.	Species name.	Local name.
1.	<i>Adiantum latifolium</i> Lam.	
2.	<i>Adiantum concinnum</i> Willd.	പന്നൽ.

7. GLEICHENIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Dicranopteris linearis</i> (Burm.f.) Underwood.	

8. BLECHANACEAE

Sl.No.	Species name.	Local name.
1.	<i>Blechnum orientale</i> L.	
2.	<i>Stenochlaena palustris</i> (Burm.) Beddome.	

9. POLYPODIACEAE

Sl.No.	Species name.	Local name.
1.	<i>Drymoglossum heterophyllum</i> (L.) Trimen.	
2.	<i>Drynaria quercifolia</i> (L.) J. Sm. in Hook.	മുളച്ചട.
3.	<i>Lepisorus amaurolepidus</i> (Sledge) Bir & Trikha.	

Figure 4.1.

Floral representation of M.G.U. Campus.

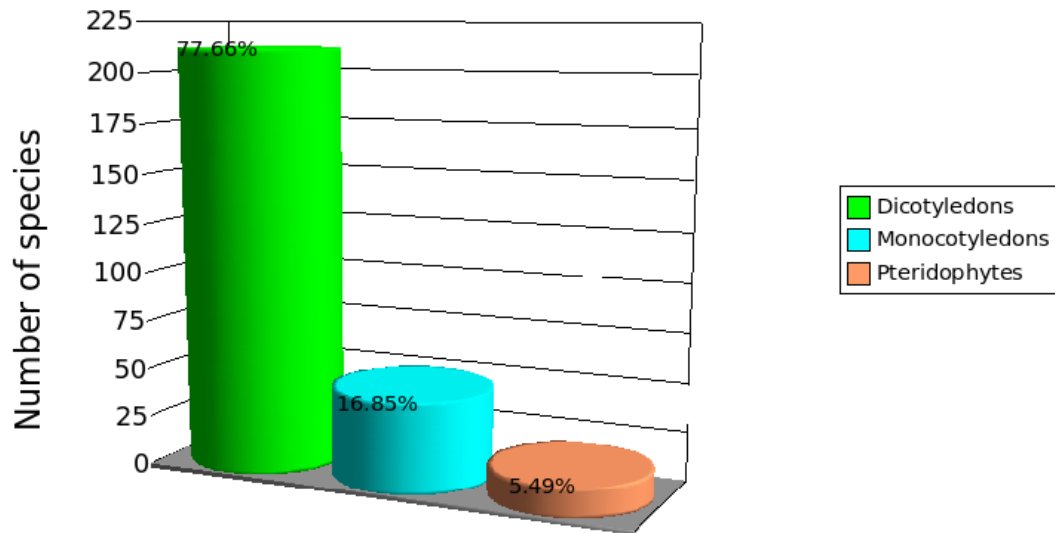


Figure 4.2.

Composition of Herbs, Shrubs, Trees and Climbers.

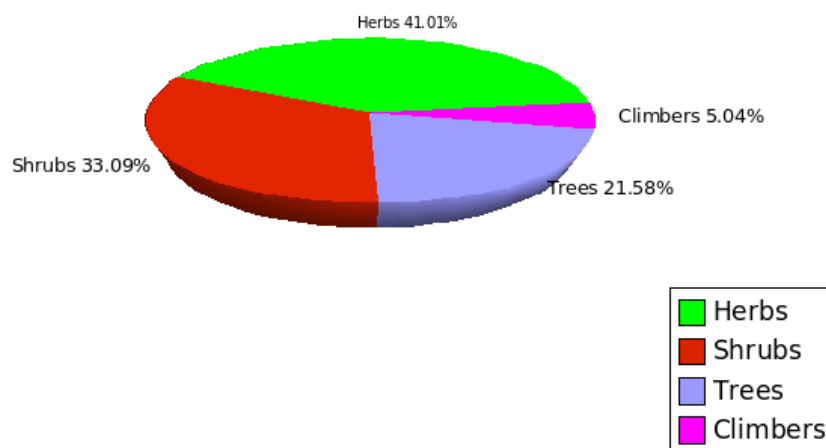


Figure 4.3.

Major Dicotyledonous Families

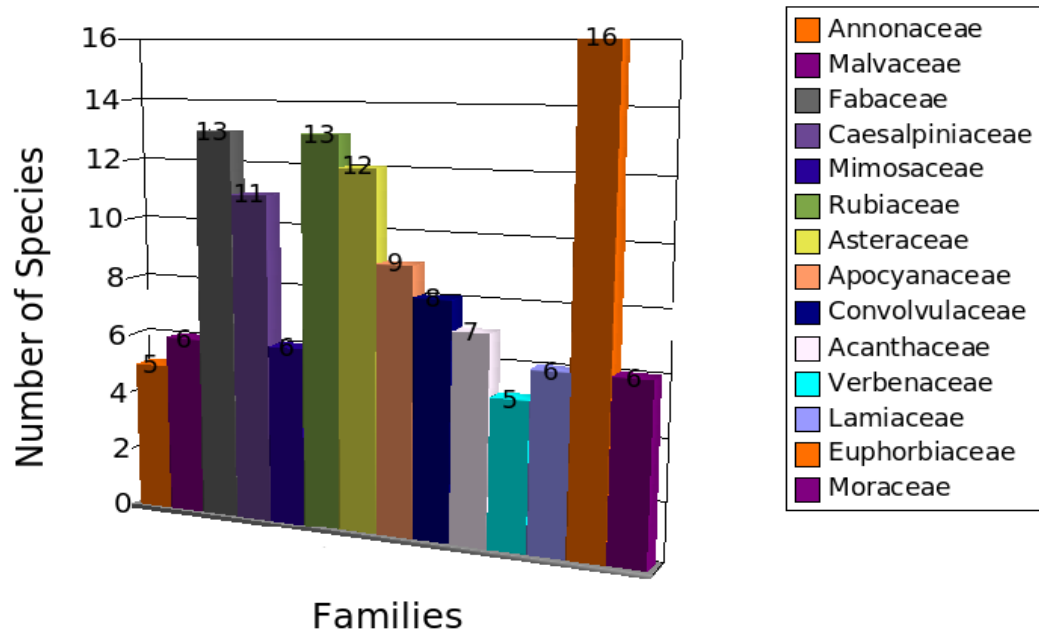


Figure 4.4.

Major Monocotyledonous Families

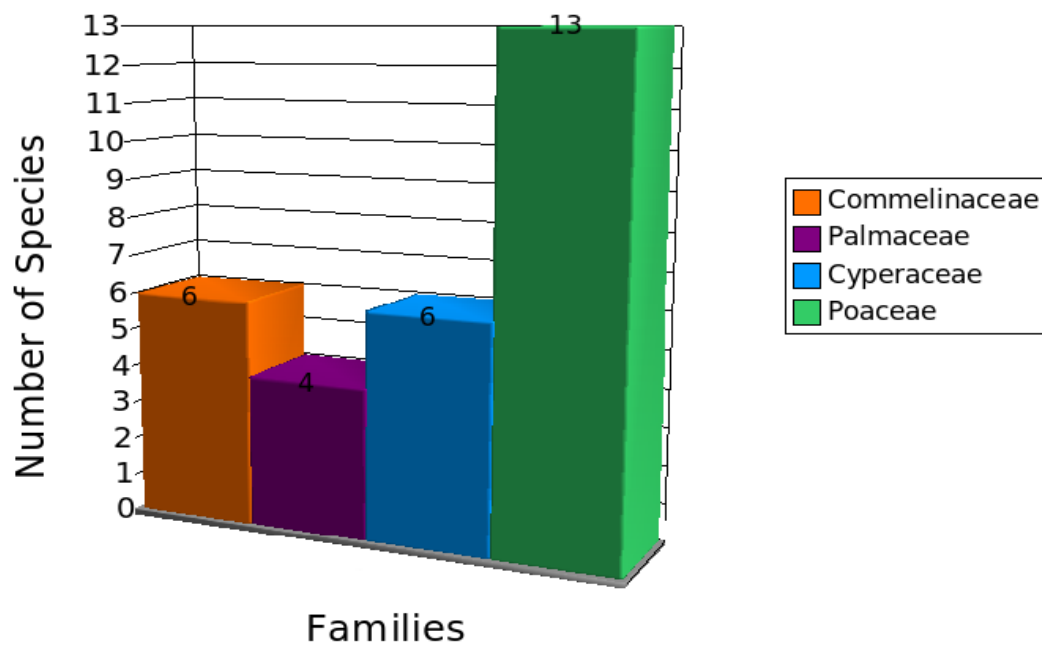


Table 4.2.**List of Vulnerable, Rare, Endemic, and Threatened species.**

Sl.No.	Species name.	Status.
1.	<i>Hydnocarpus pentandra</i> (Buch. - Ham.) Oken.	Endemic to Western Ghats.
2.	<i>Naregamia alata</i> Wight & Arn.	Endemic to Peninsular India.
3.	<i>Dalbergia latifolia</i> Roxb.	Vulnerable (IUCN 2000).
4.	<i>Saraca asoca</i> (Roxb.) de Wilde.	Vulnerable (IUCN 2000).
5.	<i>Terminalia paniculata</i> Roth.	Endemic to Peninsular India.
6.	<i>Syzygium cumini</i> (L.) Skeels.	Endemic to Southern Western Ghats.
7.	<i>Memecylon randerianum</i> SM & MR Almeida.	Endemic to Southern Western Ghats.
8.	<i>Hedyotis pruinosa</i> L.	Endemic to Southern Western ghats. (Rare.)
9.	<i>Mussaenda bellila</i> Buch. - Ham.	Endemic to Western Ghats.
10.	<i>Psychotria flavida</i> Talbot.	Endemic to Southern Western Ghats.
11.	<i>Tabernaemontana heyneana</i> Wall.	Endemic to Southern Western ghats.
12.	<i>Torenia bicolor</i> Dalz.	Endemic to Western Ghats.
13.	<i>Strobilanthus ciliatus</i> Nees.	Endemic to Peninsular India.
14.	<i>Cinnamomum malabathrum</i> (Burm. f.) Blume.	Endemic to Southern Western Ghats.
15.	<i>Dendrophthoe falcata</i> (L. f.) Etting.	Endemic to Peninsular India.
16.	<i>Santalum album</i> L.	Vulnerable (IUCN,2000).
17.	<i>Mallotus philippensis</i> (Lam.) Muell. - Arg.	Endemic to peninsular India.
18.	<i>Artocarpus hirsutus</i> Lam.	Endemic to southern western ghats.
19.	<i>Ochlandra travencorica</i> (Bedd.) Benth.	Endemic to Western Ghats.

4.3. Conclusion

- 1.** The flora of Mahatma Gandhi University campus is rich with a total of 273 identified angiosperm species.
- 2.** The floristic composition dominated by herbs (114 sps) followed by shrubs (92 sps), trees (60 sps) and climbers (14 sps).
- 3.** The flora composed of 19 Endemic species indicates the possible relics of diversity and distribution of evergreen forest inside the campus.
- 4.** The presence of 3 Vulnerable species indicate the need of conservation of different pockets of natural vegetation inside the campus.
- 5.** The record of medicinal plants inside the campus also supports the conservation strategy.

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CHAPTER: 5

FAUNA

(BIRDS, BUTTERFLIES, DRAGONFLIES

&

DAMSELFLIES)

5.1. INTRODUCTION

5.1.1. BUTTERFLIES

Butterflies have a special place in the insect world. They have magnificent colors and fly cheerfully from flower to flower in the sun. Due to their attractiveness and omnipresence they have acquired a niche in the prose and poetry of various cultures. Their caterpillars can be reared at home and the transformation from caterpillar to butterfly can easily be observed. Therefore, they make excellent subjects for natural history observations and scientific studies.

The most significant ecological function of butterflies is their role in plant pollination. In turn they derive their food from these plants. This mutualistic relationship between plants and butterflies has resulted in a co-evolution of these two over time. Areas of high butterfly diversity naturally harbour high plant diversity also. Butterflies also serve as food source for the avian fauna and thus play a vital role in sustaining the bird diversity of a region.

Being good indicators of climatic conditions as well as seasonal and ecological changes, they can serve in formulating strategies for conservation. However, conservation biologists and policy-makers have largely ignored them as well. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programmes (Gadgil, 1996).

In terms of indicator organisms for biodiversity studies, butterflies are an excellent choice. They are common almost everywhere, attractive and easy to observe. Many species, both common and rare, can be easily and reliably identified in the field,

without killing. They are also amongst the better-studied groups of organisms, with availability of field guides. Further, their diversity and community composition are dependent on that of plants, as their caterpillars have strict dependence on specific host plants. As they undergo metamorphosis, ecologically they contribute more to local diversity because of their dual fundamental role than monomorphic organisms. Therefore, they should be given more prominence in diversity studies.

About 17,200 species of butterflies are identified from all over the world. Out of these, India has a butterfly fauna comprising of 1501 species of which the Western Ghats harbours 332 species including 37 endemic species. These 332 species belong to 166 genera and 5 families (Kunte, 2000).

5.1.2. DRAGONFLIES AND DAMSELFLIES

Dragonflies and damselflies collectively called Odonates are amongst the prominent and colourful insects in tropical landscapes. They mostly occur in the vicinity of different freshwater habitats. Most species are seen as solitary individuals or in pairs during mating, although a few species occasionally occur in swarms.

The Odonates instantly attract attention with their amazing flight skills and beautiful colours. In addition to providing aesthetic pleasure, studying them could give us valuable insights about ecosystem health, especially of wetland. Being predators both at larval and adult stages, they play a significant role in the wetland ecosystem. Adult Odonates feed on mosquitoes, black flies and other blood-sucking flies and act as an important bio-control agent of these harmful insects.

About 6,000 odonate species are distributed all over the world. India is highly diverse with more than 500 known species. About 67 species of peninsular Indian Odonates are endemic (Subramanian, 2005). However, a large number of endemic Odonates are threatened due to large-scale habitat destruction. The impact of landscape changes going on since last fifty years or so in the Indian sub-continent on dragonfly distribution and status is not known. This can be tackled only by fresh field surveys to know the threat status and distribution of many species.

5.1.3. BIRDS

Birds are feathered, air breathing, warm blooded, oviparous, bipedal vertebrates. These are the most highly specialized craniates coming under the class-Aves and the phylum Chordata. Almost every part of their organization is modified for aerial life. The fore limbs are modified as wings. The sternum and shoulder-girdles are strikingly altered and serve as origin for the flight muscles and the mechanical framework to support their activity. The distribution of birds around the world is phenomenal. Birds are found in almost every geoclimatic zone, from the frozen Polar Region to the hot, humid equatorial zones, and even in arid deserts. There are 8,600 species of birds the world over, of which 1,200 species are found in India, which accounts for about one – seventh of the world’s birds. Globally the diversity of birds is greater in the tropical regions. This increased diversity of birds is directly related to the increased diversity of plants.

A number of environmental factors are known to influence the population of birds directly. Availability of food, detectability and capture, location of nesting sites, availability of nesting materials, presence of predators and competitors are the major factors influencing the foraging and breeding of birds and subsequently their population. One of the key aspects in

community structure is the food habits of a species which is critical in understanding the pattern and process of community organization (Wiens, 1989). Population studies have been traditionally used to monitor long term changes in avian populations and to assess both habitat quality and response of birds to both natural and human caused environmental changes (Wiens, 1989).

5.2. REVIEW OF LITERATURE

5.2.1. BUTTERFLIES

India, which is considered as center of biodiversity possess 1501 species of butterflies, among this the Western Ghats alone harbours 332 species (Kunte *et al.*, 2006). The most important work about Indian Butterflies was done by Wynter Blyth. Later he published a beautiful field guide to the butterflies of Indian region in 1957. The first scientific study about the Butterflies of Kerala was done by Fibricius and Cramer in 1775. Hampson (1894, 1895, 1896), Meyrick (1936- 1937), Talbot (1947) and Wynter-Blyth (1957) have made excellent contributions on the butterflies and moths of the Western Ghats. Subsequently, several workers like Hampson (Moths), Larsen (Butterflies), Mathew (Moths and Butterflies), Radhakrishnan (Moths and Butterflies), Menon (Moths) and Wynter-Blyth (Butterflies) have worked on the taxonomy and ecology of various groups of Lepidoptera.

220 species of butterflies have been reported from Western Ghats by Ferguson in 1891, and 282 species from the Coorg region by Yates (1935). Gaonkar (1996), in his study on the butterflies of W. Ghats, consolidated available information listing 17 additional species from the Kerala, Tamil Nadu and Karnataka regions of the Western Ghats. The seasonal pattern of butterflies in abundance and species diversity was studied by Kunte in 1997 followed by Arun in 2000.

Larsen reported two hundred and ninety nine species (from the Nilgiri Biosphere Reserve) in 1987- 1988. Recently one important work in Kerala was done by Jafer *et al* (1997) and identified 119 species of butterflies from the Periyar Tiger Reserve. Sreekumar and Balakrishnan (1998) studied the butterflies of Athirappally area reporting forty-four species. In

another study on the insect fauna of New Amarambalam, Mathew (2002) recorded 133 species of butterflies, of which 28 were having high conservation value being either rare or endemic.

The congregation of butterfly *Euploea core* at Aralam Wildlife Sanctuary was studied by Nair (2003). Sudheendra Kumar *et al.*, (2000) studied the habitat associations of 124 butterfly species in the Parambikulam WLS, by analyzing species records from 5 habitat types. The general belief that only moths attracted to light is also proved to be wrong by Nair (2001) when he recorded Gram blue *Euchrysops cnejus*, Tiny grass blue *Zezula hylax* and Nigger *Orsotrioena medus* attracted to light at Aralam Wildlife Sanctuary.

5.2.2. DRAGONFLIES

Fraser, Rao and Lahiri, Prasad and Kulkarni, Radhakrishnan, Emilyamma and Lakshminarayana have made valuable contributions to the study of Indian dragonflies. Fraser in his 3 volume treatises on the Odonates of the Indian sub continent gave a more or less detailed account of the fauna of Kerala. He (Fraser, 1933) described twenty new species of the family Platystictidae. In the next year (1934), he described thirteen new species of the family Gomphidae. Later, in 1936, he described seventeen new species belonging to the families Corduligastridae, Libellulidae and Aeschnidae.

Rao and Lahiri (1982) conducted a preliminary study of the odonates of Silent Valley and New Amarambalam reporting twenty-three species. Prasad and Kulkarni (2001) described thirty new species belonging to eight families from Nilgiri Biosphere Reserve. In the same year, Radhakrishnan and Lakshminarayana surveyed the Nilgiri Biosphere Reserve reporting eighty-eight species from the area. The faunistic surveys conducted by Zoological Survey of India in 1997, 1998 and 2001 reported 27

species from Thiruvananthapuram District. Of these, 17 species and subspecies are new additions to the Odonata fauna of Thiruvananthapuram District. (Emiliyamma and Radhakrishnan 2002).

Asaithambi and Manickavasagan (2002) described five new species belonging to Gomphidae and Libellulidae from Annamalai University campus. Radhakrishnan and Emiliyamma (2003) worked on the Odonates of Parambikulam Wildlife Sanctuary recording twenty-five species and subspecies belonging to eighteen genera and five families. They also prepared a systematic database of this group in Kerala listing one hundred and thirty seven species under seventy-nine genera and twelve families.

5.2.3. BIRDS

Scientific studies on the birds of Kerala commenced with Hume (1876, 1878) reporting the first and second list of birds of Travancore. Later, many studies were conducted on forest species in the Western Ghats (Ali, 1969; Zacharias, 1979; Gaston *et al.* 1979; Vijayan, 1979, 1984; Shukkur and Joseph, 1980; Zacharias and Mathew, 1988; Satheesan, 1990; Neelakantan *et al.* 1993, Santharam, 1995; Joseph, 1999 and Jayson and Mathew, 2000, 2002, and 2003).

Jayson (1999) conducted a study on the structure, composition and conservation of birds in the Mangalavanam mangroves of Kerala. Mid winter waterfowl census has been conducted in the Vembanad Lake and adjacent regions since 2001. Wetland birds of the Vembanad region have studied by Jayson (2002). The avifauna of Kerala Agricultural University Campus, Thrissur has been studied by Nameer *et al.* (2000). A checklist of birds of the Calicut University Campus has been compiled by Jafer and Pramod (2000).

5.3. METHODOLOGY

The study was mainly based on direct observation method. The entire area of the campus were covered during the study. The survey was done mainly in the morning and evening hours. A Nikon D 70 Camera and a pair of 7X50mm Binoculars were used in the study. The expertise of people in the respective fields was also utilized during the study.

5.3.1. BUTTERFLIES AND DRAGONFLIES

Various studies revealed that checklist surveys (active search method) are a more efficient means for initial determination of a species list for a site, whereas for long-term monitoring, the Pollard Walk is more practical and statistically manageable (Royer *et al.* 1998). In this study we made direct field observations and photographs were also taken. Standard reference materials such as Kunte (2000), Palot *et al.* (2003), Gunathilagaraj *et al.* (1998) and Haribal (1992) were used for identification. Some species were identified also with the help of experts. The taxonomic status of butterflies is adapted from Kunte (2000).

We have also attempted to provide an insight into the status of the butterflies in terms of the sightings we had during the visit. While this is by no means accurate, it does give an idea of the relative status of the abundance of the various species. We use the following notations:-

- C: Common- numerous sightings in all areas.
- MC: Moderately common- common, but only in certain areas or suitable habitat.
- LC: Less Common - Seen occasionally.
- R: Rare - Only one or two sightings.

The Dragonflies and Damselflies were identified with the help of reference materials revised by Mitra (2006) and Subramanian (2005). Some species were also identified with the help of experts. The nomenclature followed after Fraser (1933, 1934, and 1936) and Tyagi (1997) was the platform for identifying the dragonflies.

5.3.2. BIRDS

Observations were done with a 7 X 50mm binocular. Identification was done with the help of standard reference materials (Ali, 1999, Neelakantan, 1996, Grimmet *et al.*, 2000 and Pande *et al.*, 2003). Some field surveys were conducted with experts. The nesting activities were also noted.

5.4. RESULTS AND DISCUSSION

5.4.1. BUTTERFLIES

Total 86 species of butterflies belongs to five families were identified from the Mahatma Gandhi University Campus, during the study. Nymphalidae was found to be the most species rich family with 33 species whereas Pieridae represented the least number of species (Fig-5.1). As per the observations of Kunte (2006), Lycaenidae represented the maximum number of species and Papilionidae the least from Western Ghats. The variations in the diversity may be due to the wide difference in the ecological factors of the two ecosystems. The comparative status of the two ecosystems has been plotted (figure 5.2).

Out of the 19 species of Papilionidae and 97 species of Nymphalidae reported from Western Ghats, 11 species of Papilionidae (58%) and 33 species of Nymphalidae (34%) had been observed from the campus. The data clearly indicates better representations for these two families in the campus compared to Western Ghats.

Blue Tiger (*Tirumala limniace*), Glassy Blue Tiger (*Parantica aglea*), Common Cerulean (*Jamides celeno*), Emigrant species (*Catopsilia Pomona* and *Catopsila pyranthe*), Common Crow (*Euploea core*), Chocolate Pansy (*Junonia iphita*) etc. were commonly sighted in the campus. The species such as Paris Peacock (*Papilio paris*), Chocolate Albatross (*Appias lyncida*), Giant Orange Tip (*Hebomoia glaucippe*), Peacock Pansy (*Junonia almana*), Plum Judy (*Abisara echerius*), Tricolour Pied Flat (*Psedocoladenia indrani*) etc, were sighted only one or two times. The other butterflies shown medium occurrence.

The high diversity of butterflies in the campus may be due to the availability of host plants and the abundance of flowering plants like *Lantana*, *Ixora*, *Zinia*, *Caesalpinia*, *Stachitarpita* etc. in various small gardens in and around the campus. The species richness of Nymphalidae and Hesperidae families in the area may be due to the fact that majority of these species are not only attracted to flowers but they feed on virtually all the resources reported for butterflies: tree sap, rotting vegetable matter, animal droppings and wet soil. So their population can be found more in the entire area when compared to other families (Papilionidae, Pieridae, and Lycaenidae) which specifically prefers to stay in and around garden plants.

Table: 5.1 Systematic List of Butterflies in Mahatma Gandhi University Campus

Sl. No.	Scientific Name	Common Name	Status
PAPILIONIDAE			
1.	<i>Troides minos</i>	Southern Birdwing	MC
2.	<i>Pachliopta aristolochiae</i>	Common Rose	C
3.	<i>Pachliopta hector</i>	Crimson Rose	MC
4.	<i>Graphium sarpedon</i>	Common Blue Bottle	LC
5.	<i>Graphium agamemnon</i>	Tailed Jay	MC
6.	<i>Papilio clytia</i>	Common Mime	LC
7.	<i>Papilio demoleus</i>	Lime Butterfly	LC
8.	<i>Papilio polytes</i>	Common Mormon	C
9.	<i>Papilio polymnestor</i>	Blue Mormon	MC
10.	<i>Papilio paris</i>	Paris Peacock	R
11.	<i>Pachliopta pandiyana</i>	Malabar Rose	R
PIERIDAE			
12.	<i>Catopsilia pomona</i>	Common Emigrant	C
13.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	C
14.	<i>Eurema hecabe</i>	Common Grass Yellow	C
15.	<i>Delias eucharis</i>	Common Jezebel	LC

16.	<i>Leptosia nina</i>	Psyche	C
17.	<i>Appias lynceida</i>	Chocolate Albatross	R
18.	<i>Hebomoia glaucippe</i>	Giant Orange Tip	R

NYMPHALIDAE

19.	<i>Melanitis leda</i>	Common Evening Brown	LC
20.	<i>Elymnias hypermnestra</i>	Common Palmfly	C
21.	<i>Lethe europa</i>	Bamboo Treebrown	LC
22.	<i>Mycalesis perseus</i>	Common Bushbrown	C
23.	<i>Orsotrioena medus</i>	Nigger	MC
24.	<i>Ypthima huebneri</i>	Common Furring	C
25.	<i>Ypthima baldus</i>	Common Fivering	MC
26.	<i>Polyura athamas</i>	Common Nawab	LC
27.	<i>Acraea violae</i>	Tawny Coster	LC
28.	<i>Cupha erymanthis</i>	Southern Rustic	MC
29.	<i>Cirrochora thais</i>	Tamil Yeoman	MC
30.	<i>Neptis hylas</i>	Common Sailor	C
31.	<i>Pantoporia hordonia</i>	Common Lascar	LC
32.	<i>Moduza procris</i>	Commander	LC
33.	<i>Parthenos sylvia</i>	Clipper	LC
34.	<i>Tanaecia lepidea</i>	Grey Count	C
35.	<i>Euthlia aconthea</i>	Common Baron	LC
36.	<i>Ariadne merione</i>	Common caster	LC
37.	<i>Ariadne ariadne</i>	Angled Caster	LC
38.	<i>Junonia lemonias</i>	Lemon Pansy	MC
39.	<i>Junonia atlites</i>	Gray Pansy	MC
40.	<i>Junonia iphita</i>	Chocolate Pansy	C
41.	<i>Junonia almana</i>	Peacock Pansy	R
42.	<i>Cynthia cardui</i>	Painted Lady	R
43.	<i>Hypolimnas bolina</i>	Great Eggfly	MC
44.	<i>Hypolimnas misippus</i>	Danaid Eggfly	LC
45.	<i>Parantica aglea</i>	Glassy Blue Tiger	C
46.	<i>Tirumala limniace</i>	Blue Tiger	C
47.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	MC
48.	<i>Danaus chrysippus</i>	Plain or Common Tiger	MC
49.	<i>Danaus genutia</i>	Stripped Tiger	LC
50.	<i>Euploea core</i>	Common Crow	C

51. *Phalanta phalantha* Common Leopard LC

LYCAENIDAE

52. *Spalgis epius* Ape Fly R
 53. *Castalius rosimon* Common Pierrot C
 54. *Discolampa ethion* Banded Blue Pierrot MC
 55. *Neopithecops zalmora* Quaker LC
 56. *Jamides celeno* Common Cerulean C
 57. *Talicauda nyseus* Red Pierrot MC
 58. *Loxura atymnus* Yamfly LC
 59. *Rathinda amor* Monkey Puzzle LC
 60. *Rapala manea* Slate Flash LC
 61. *Spindasis vulcanus* Common Silverline R
 62. *Abisara echerius* Plum Judy R
 63. *Zesius chrysomallus* Red Spot R
 64. *Curetis thetis* Indian Sunbeam R
 65. *Zizina otis* Lesser Grass Blue LC
 66. *Prosotas nora* Common Line Blue LC

HESPERIIDAE

67. *Celaenorrhinus leucocera* Common Spotted Flat LC
 68. *Tagiades gana* Suffused Snow Flat LC
 69. *Tagiades litigiosa* Water Snow Flat MC
 70. *Psedocoladenia indrani* Tricolour Pied Flat R
 71. *Sarangesa dasahara* Common Small Flat LC
 72. *Iambrix salsala* Chestnut Bob MC
 73. *Udaspus folus* Grass Demon LC
 74. *Suastus gremius* Indian Palm Bob LC
 75. *Gangara thyrasis* Giant Red eye R
 76. *Matapa aria* Common Redeye LC
 77. *Barbo cinnara* Rice Swift C
 78. *Sipalia galba* Indian Skipper LC
 79. *Notocrypta curvifascia* Restricted Demon R
 80. *Taractrocera maevius* Common Grass Dart MC
 81. *Taractrocera ceramas* Tamil Grass Dart LC
 82. *Telicota ancilla* Dark Palm Dart MC

83.	<i>Aeromachus pygmaeus</i>	Pygmy Scrub Hopper	LC
84.	<i>Oriens goloides</i>	Indian Dartlet	R
85.	<i>Halpe homolea</i>	Indian Ace	R
86.	<i>Polytremis lubricans</i>	Contiguous Swift	R

C : Common, MC : Moderately Common, LC : Less Common, and R : Rare.

5.4.1 (a) DESCRIPTION OF BUTTERFLIES IDENTIFIED

FAMILY: PAPILIONIDAE (SWALLOWTAILS)

1. Southern Birdwing (*Troides minos*)

This is the largest butterfly in India, having a wingspan of 140-190 mm. It is endemic to South India. The upper surface of its forewings is deep black and that of its hind wings is golden yellow with black wing-borders. The female is similar to the male, but is less shiny and has a row of large triangular spots on the yellow areas of the hindwing. They are particularly attracted to flowers of *Ixora*, *Cleorodendrum*, and *Lantana* species.

Larval host plants: *Aristolochia indica*, *Aristolochia tagala*, *Thottea siliquosa*.

2. Common Rose (*Pachliopta aristolochiae*)

It is a black butterfly with a crimson body having a wingspan of 80-110mm. Males and females of this species are almost identical in appearance. The forewing of this butterfly is having white faded lines along the veins. There is a large white area in the hindwings, and seven red spots along the borders of hindwings. The crimson red body of this butterfly helps to distinguish it from Common Mormon. The red body, slow peculiar flight, bright colouration and pattern of the wings are meant to indicate to predators that this butterfly is inedible, being well protected by the poisons it has sequestered from its

larval food plant. Since it is rarely attacked by predators some edible butterflies mimic it, the classical example being that of the female morph of the Common Mormon (*Stichius* form).

Larval host plants: *Aristolochia indica*, *Aristolochia bracteolata*.

3. Crimson Rose (*Pachliopta hector*)

It is a very striking looking tailed butterfly having a wingspan of 90-110mm with prominent white bands on its forewings. The tailed hindwings have crescent shaped crimson spots in two rows. The upperside and underside of the wings are similar in markings. The body is a gaudy crimson in colour. The female is somewhat dull. It is very fond of flowers, especially lantana. Nectar appears to be essential for the butterfly and a higher nectar intake is thought to increase egg production.

Larval host plants: *Aristolochia indica*, *Aristolochia bracteolata*, *Thottea siliquosa*.

4. Common Blue Bottle (*Graphium sarpedon*)

This butterfly with a striking blue band having a wingspan of 80-90mm is known for its quick flight. The Blue Bottle has black upperwings and brown lowerwings. Both forewings and hindwings are marked by a central band in the form of a blue or blue green triangle, with apex pointing towards the body. The wings are pointed. The hindwings have a row of sub marginal crescent shaped blue spots. Some red spots are also seen on the underside of the wings. These butterflies are restless, visit flowers but never sit on them, but only hovers over. These butterflies can be found feeding on roadside seepages, settles on damp patches, and animal droppings.

Larval host plants: *Polyalthia longifolia*, *Cinnamomum camphora*, *Cinnamomum macrocarpum*.

5. Tailed Jay (*Graphium agamemnon*)

It is a nervous butterfly, settling seldom and only momentarily. It is a black butterfly with apple green spots and streaks on its wings. The wings are more elongated and narrower than any of the groups of Indian swallowtails. The hindwings have a short tail, which is longer in the female. On the underside the purple brown ground colour has the same green spotting as well as some dark patched and red spots on the underside of the hindwing.

Larval Host Plants: *Polyalthia longifolia*, *Uvaria narum*.

6. Common Mime (*Papilio clytia*)

This is a black-bodied swallowtail butterfly. Its wingspan ranges between 90-120mm. This tail-less swallowtail has two forms: clytia and dissimilis, in both the sexes. The form clytia mimics the Common Indian Crow and dissimilis form mimics the Blue Tiger. Both the forms have cream-coloured or yellow spots at the margin of the hindwing. This character is unique to the species, which helps in distinguishing it from its models and other mimics. They sit with their wings wide open while feeding on flowers and they also bask.

Larval Host Plants: *Cinnomomum camphora*, *Cinnamomum zeylanicum*, *Litsea chinensis*

7. Lime Butterfly (*Papilio demoleus*)

It is a medium sized tail less swallowtail butterfly having a wingspan of 80-100mm. It gets its name from its host plants that are usually citrus species, such as the lime. The butterfly is back with large yellow markings on the upperside. The underside is predominantly yellow with black markings. The abdomen is lemon yellow with longitudinal black lines. Some blue, red and yellow spots are found on the underside of the wings.

Larval host plants: *Citrus sp.*, *Glycosmis arborea*, *Murraya*

koenigii.

8. Common Mormon (*Papilio polytes*)

This is the most common butterfly having a wingspan of 90-100 mm. The male is jet black with a row of white spots along the central region of the hindwings. The margin of the forewing has a series of smaller white spots. The female has three forms: one resembling the male and the other two mimics the two red bodied swallowtails, Common Rose and Crimson Rose, but have black bodies. The males are smaller in size.

Larval host plants: *Murraya koenigaa*, *Aegle marmelos*, *Citrus sp.*

9. Blue Mormon (*Papilio polymnestor*)

This is the second largest butterfly in India, with a wingspan of 120-150 mm. It is a black butterfly with glistening pale blue markings on the upperside. On the underside, it is completely black with a red spot at the base of its wings and few pale markings. Sometimes in the females a red spot of comparable size and shape is also found at the base of the forewings on the upperside. The thorax and abdomen are black. Neither sexes of this butterfly have tails on its wings.

Larval host plants: *Atlantia racemosa*, *A. wightii*, *Glycosmis arborea*, *Citrus sp.*

10. Paris peacock (*Papilio paris*)

It is among the finest of butterflies and largest of the peacocks. It is having a wingspan of 90-140mm. The upperside of the black wings is dusted with green. The forewing is marked with a narrow, short green central band, which may be absent. The hindwing has large metallic blue eyespots that change shades, which is intended to confuse enemies. They give the impression that the insect is the head of an animal. This is how they deter

enemies. There is a crimson tornal spot and 3 sub marginal green crescent-shaped spots on the hindwings. The underside of its wings is dark brown. The fore wing has a broad grey band and the hindwing has a series of marginal bright crimson spots. The female is similar to the male.

Larval host plants: *Toddalia asiatica*, *Citrus sp.*, *Evodia roxburghiana*

11. Malabar Rose (*Pachliopta pandiyana*)

It resembles the Common Rose (*Pachliopta aristolochiae*) from which it can be differentiated by the much larger white patch on its hindwings. This butterfly is endemic to south India.

Larval host plants: *Aristolochia indica*, *Aristolochia bracteolata*

Family : Papilionide



Southern Birdwing



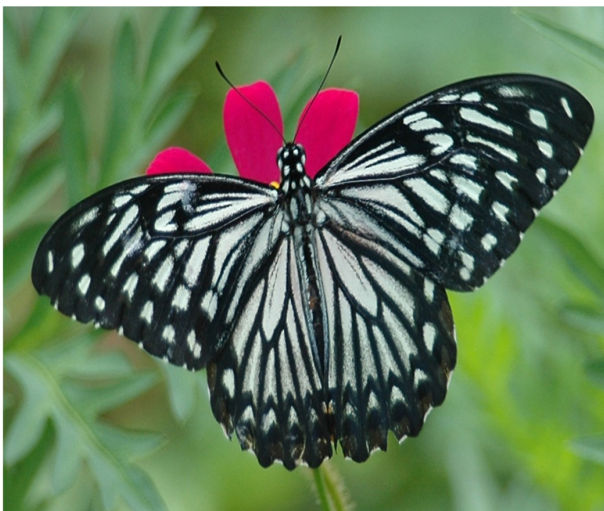
Tailed Jay



Paris Peacock



Blue Mormon



Common Mime
(Form "dissimilis")



Common Mime
(Form "clytia")



Common Mormon(Male)



Common Mormon(Female)



Common Rose



Common Blue Bottle



Lime Butterfly

FAMILY: PIERIDAE (WHITES & YELLOWS)

12. Common Emigrant (*Catopsilia pomona*)

The species gets its name from its habit of migration. This is one of the most variable butterfly species in India, as far as colouration and size of the adult are concerned. The colour of its wings ranges from white with basal areas of the wings, yellow of varying shades, to completely plain lemon yellow (hence another name lemon emigrant). Despite these variations, certain characters persist in all specimens. These are as follows: on the upperside, at least the bases of all the forewings are yellow, the front margin and the apex of the forewings are narrowly black in the male and broadly black in the female. In the female this margin may converge to a spot at the cell end. It is having a wing span of 55-80mm and is a strong flier.

Larval host plants: *Cassia fistula*, *Cassia tora*, *Cassia alata*, *Butea monosperma*

13. Mottled Emigrant (*Catopsilia pyranthe*)

Mottled emigrant is a slightly smaller butterfly than common emigrant and is having a wingspan of 50-70mm. The upperside is dull white and underside is finely strained with light brown or dark grey. The male has a narrow black border at the apex of its wings as well as a small cell-end spot and its underside is tinged with faint green. The female has a broader black border and large cell-end spot; its underside is tinged with yellow. It has an energetic and rapid jumping flight and males have a tendency to puddle. They visit the flowers of *Cassia spp.*, *Lantana* etc.

Larval host plants: *Cassia fistula*, *Cassia tora*, *Cassia alata*

14. Common Grass Yellow (*Eurema hecabe*)

This is an extremely variable species with many varieties and seasonal forms. This is having a wingspan of 40-50mm. This

is a bright yellow butterfly with black borders on the upperside of its wings. It has a weak fluttering flight. The butterfly may often be seen flying slowly and close to the ground, particularly over grass, hence this common name. But it is not dependent on grasses, its caterpillars feed on legumes. It feeds mostly on small low growing flowers like *calotroph*, *Tridax*, *Lantana* etc.

Larval host plants: *Cassia fistula*, *Cassia tora*, *Albizia* sp.

15. Common Jazebel (*Delias eucharis*)

This is one of the most beautiful butterflies in the Pieridae family. The wingspan of both male and female ranges from 66-85mm. The upperside of the wings of this butterfly is white; the underside is bright yellow with black veins and a marginal series of orange red spots, which are roughly pentagonal in shape. The female is more heavily marked. The Jezebel often flies high up in the canopy and usually comes lower down only to feed nectar in flowers. These butterflies may be seen basking on the top of tall trees with their wings closed, as all the dark markings that absorb heat and warm the body are on the underside of the wings.

Larval host plants: *Loranthus* sp., *Viscum* sp.

16. Psyche (*Leptosia nina*)

The Psyche is a small butterfly of the family Pieridae (wingspan 35-55mm). This is a bright white butterfly. The forewings have an apex with black borders. The only prominent mark is a big black spot on the forewings. The underside is also white but dull, overlaid with pale gray scales and marked with faint green striations. The wings appear papery because they are thin and therefore semi-transparent. It flies close to the ground in undergrowth and bushes, with slow closing and opening of wings, a hypnotising kind of rhythm, possibly this is why it has got the name Psyche. When it rests, it folds its hindwings over forewings in such a manner that it conceals the large discal spot, only leaving

behind, the visible protectively marked hindwing, which has fine brown striate and the tips of the forewing. Often settles on the ground. Seen flying throughout the day. Visit flowers of various low growing plants like: *Sida rhombifolia*, *Sida accuminata* etc.

Larval host plants: *Capparis spinosa*, *Capparis rheedii*, *Crateva religiosa*

17. Chocolate Albatross (*Appias lyncida*)

A medium sized butterfly with a wingspan of 55-70mm. The male is white above with chocolate brown or black markings and bright lemon below with chocolate coloured markings. The female is white and densely clouded with dark brown. They rest with wings closed.

Larval host plants: *Crateva religiosa*, *Capparis cleghornii*,

18. Giant Orange Tip (*Hebomoea glaucippe*)

The Giant Orange Tip is the largest of the orange tips (wingspan 80-100mm) and one of the strongest and fastest fliers among Indian butterflies. The upperside of both sexes is creamy white; the apex of the forewing is bright orange. The underside is straw coloured with very fine markings that resembles the veins of a senescing leaf. In the female the upperside hindwing has small black triangular markings at the end of the veins and a corresponding black spot immediately above them. It seldom spends much time near the ground. While feeding on nectar, it keeps its wings closed, particularly the female. In doing so, it remains well camouflaged as a senescing leaf, which its underside resembles.

Larval host plants: *Crateva religiosa*, *Capparis mooni*, *Capparis zeylanica*

Family : Pieridae



Common Emigrant



Common Emigrant



Grass Yellow



Psyche



Chocolate Albatross



Giant Orange Tip

FAMILY: NYMPHALIDAE (BRUSH-FOOTED BUTTERFLIES)

19. Common Evening Brown (*Melanitis leda*)

It is a medium sized butterfly, often attaining a wingspan of 60-80mm. The upper surface of wing is dull dark brown with two large prominent black spots on the forewing; over each black spot a small white spot is present. The very variable underside is buff or grey, with fine dark brown striations. They show seasonal variations. During the day time this butterfly rests camouflaged among fallen leaves on the forest floor and hence is marked in such a way that the colour and pattern on the wings merge with the surrounding leaf litter. They become active in the late afternoon. They are attracted to light like moths.

Larval host plants: *Oryza sativa*, *Apluda sp.*, *Cyrtococcum sp.*, *Eleusine sp.*, *Oplismenus compositus*, *Panicum sp.*, *Sorghum sp.* etc.

20. Common Palm Fly (*Elymnias hypermenstra*)

It is one of the most common and widely distributed species found in India. Its wingspan ranges between 65-80mm. This species is common in coconut plantations and localities where palms are grown. On the upperside the butterfly is bluish black with a series of blue sub marginal spots on the forewing. The underside is a speckled brown with a lighter shade "thumb print" at the apex of the forewing. There is also a white spot at the Costa of the hindwing. Its flight can be best described as a slow flapping and gliding motion. It has a propensity to rest on leaves very often after each short flight. Due to its fondness to shade, it is usually found flying under the cover of trees amongst the undergrowth. The butterfly species is diamorphic; females mimic butterfly species of genus *Danaus*.

Larval host plants: *Cocos nucifera*, *Areca catechu*, ornamental Palms.

21. Bamboo Treebrown (*Lethe europa*)

This is an extremely shy butterfly with a wingspan of 65-75mm. Usually found in bamboo groves, often seen resting on the ground or perched at higher vantage to guard its territory. This butterfly likes to feed on tree sap, animal dung, and over ripe fruit. It is mostly observed during the rainy season months and is most active in the early and late hours of the day. The butterfly is brown above, with females having a sub apical band on the forewing. The under sides bear a number of cryptic patterns with lilac ocelli on the forewing.

Larval host plants: *Bamboos*

22. Common Bushbrown (*Mycalesis perseus*)

This is a widely distributed butterfly that ranges from being common to very common wherever it occurs. This medium sized (wingspan 38-55mm), brown, inconspicuous butterfly has an eye-spot on the upperside of each forewing at the outer margin. The underside varies with seasonal forms. In the wet season there is a white line running from the leading margin of the forewing to the tornus of the hindwing. A series of eyespots (black spots with white centers) is enclosed in the area between this line and the wing margin. In the dry season this white line is usually absent, but it may be represented as a pale brown or thin white line. The black eye spots are reduced to mere indistinct dots. The male and female looks similar. Its preferred food includes tree saps, rotting fruits, and herbivore droppings.

Larval host plants: *Grasses*

23. Nigger (*Orsotrioena medus*)

Nigger is a medium sized butterfly with wingspan of 45 to 55mm. The Nigger is dark brown and unmarked on the upperside, whilst it has two large ocelli on the underside of the forewing and three more ocelli on the underside of the hindwing. There is a distinct white stripe extending across both wings on the

underside. It is most frequently seen flying close to the ground under trees and shrubs. Its flight is a series of zig zagging hops. It settles down on fallen fruit readily to feed on the fermenting juices. Once settled, it opens and closes its wings quickly now and again.

Larval host plants: *Oryza sativa*, *Saccharum officinarum*, Grasses

24. Common Four-ring (*Ypthima huebneri*)

Common Four-ring is one of the abundant butterflies found in India, it has a wing span of 30-40mm. It is smaller than other rings. The upper side is grayish brown and the under side is grayish white in colour. The fore wing has a large distinct eye-spot. Its hind wing is having four spots and three of the spots are very close to each other, hence the name Common Four-ring. In the dry season forms these spots will become faded. It is a weak flyer and keeps close to the ground most of the time, except when feeding on flowering creepers.

Larval host plants: Grasses

25. Common Five-ring (*Ypthima baldus*)

This butterfly is a weak flier and generally stays close to the ground. It is having a wingspan of 30-50mm. The under side is paler, whitish or faint brown, with brown streaks. On the fore wing there is a large eye-spot enclosed in a golden yellow ring. On the underside of the hindwing six eye-spots, in three pairs, are present. The pair of rings at the tornus of the hindwing is counted as one. The total number of the rings counted thus gives this species its common name. In the dry season form, the eye-spots are represented by dots. A large eye-spot on the upperside of each forewing is distinct when the butterfly is basking. The male and female are similar in appearance.

Larval host plants: Grasses

26. Common Nawab (*Polyura athamas*)

It is a medium-sized butterfly with a wingspan of 50-60 mm. The sexes are similar though the female is larger and have longer tails. In both sexes, the upperside is black to dark brown with creamy central areas that are contiguous on both forewing and hindwings. The two sub apical spots of the forewing are a similar cream colour, as are the sub marginal spots on the hindwing. It is a strong flier and may be seen flying around tree tops searching for females, or flying into trees in search of oozing sap, in which it delights. When disturbed, it quickly flies up into the trees and settles down on a leaf where it may remain for a considerable period of time.

Larval host plants: *Adenantha pavonina*, *Albizia lebbek*, *Acacia pennata*.

27. Tawny Coster (*Acraea violae*)

This is a medium sized reddish brown butterfly with rounded wing apices and rather long wings (Wingspan 45-55mm). The male is brightly coloured, while the female is quite dull. The wings of both sexes are somewhat transparent, though it is more so in the female. The upperside is studded with black spots and small markings. The marginal band of the hindwing on the uppersides is black and has small white spots. The corresponding band on the underside is much wider, but is almost entirely occupied by large white spots. It is an unpalatable species. It defends itself by exuding an unpleasant oily liquid when attacked - a strategy that helps it to escape from predators. It has the habit of opening and closing its wings as it nectars on flowers.

Larval host plants: *Passiflora edulis*, *Adenia hondala*.

28. Southern Rustic (*Cupha erymanthis*)

The Rustic is an orange-brown butterfly with a characteristic broad yellow discal patch on the forewings followed by a broad black apical area. Its wingspan is 50-60mm. A few black spots are present on the hindwings. The underside is predominantly yellowish brown with small white and dark brown markings. The males and females look similar. The Rustic is an active butterfly and usually appears on sunny days.

Larval host plants: *Flacourtia montana*, *Flacourtia indica*.

29. Tamil Yeoman (*Cirrochora thais*)

Upperside bright reddish yellow with green base. Forewing with black apical and terminal margins and a prominent medial transverse black line. Hindwing with a large quadrate white sotch on the anterior margin, a medial transverse black lunular line, a discal row of 6 small black spots, 2 sub marginal lunular lines and a third outer line. Underside pale olive brown in male, orange brown in female with a transverse medial purple white glossy band on both wings. Black spots on the hindwing smaller and lunular lines indistinct. Wingspan 62-75mm. Both sexes visit flowers and male occasionally water.

Larval host plants: *Hydnocarpus pentandra*, *Hydnocarpus alpina*.

30. Common Sailor (*Neptis hylas*)

It is having a wingspan of 50-60 mm. Both sexes are similar but the females are larger. The colour of the upperside is black with white oval shaped markings; the ones on the hindwing are closely spaced to form a band at the center of the wing. The shades of brown, chestnut and yellow on the underside vary considerably depending on the season. Its flight pattern is very

distinctive - a few wing beats followed by a spell of sailing with its wings held horizontally. It usually flies low to the ground. In the early morning hours, it often basks in the sun with its wings open. It feeds on nectar, ripe or spoiled fruits, fermenting juices or exudates from trees. While feeding, it rhythmically opens and closes its wings.

Larval host plants: *Bombax ceiba*, *Xylia xylocarpa*, *Vigna cylindrical*.

31. Common Lascar (*Pantoporia hordonia*)

A smaller butterfly with a wingspan of 45-50mm. Both male and female have upperside black with orange markings. In the upper part of the forewing discal spots are well separated. Its flight is very weak, keeps close to the ground, settling frequently either on the ground or on low growing bushes.

Larval host plants: *Acacia instia*, *Albizia odoratissima*

32. Commander (*Moduza procris*)

The Commander is a medium sized, strikingly coloured butterfly with a wingspan of 60-75mm. The upperside of its wings are bright reddish brown with a broad, discal white band across both wings. There are also a few white spots scattered on the wings. Its hind wings have wavy margins. The underside of the wings are a whitish grey toward the base and have a row of dull reddish brown and a row of black spots along the margins. Both sexes are similar in appearance. This butterfly has a swift flight with a few rapid wing beats and intermediate spells of gliding that are quite graceful. Although a powerful flier, it flies usually in short bouts and does not travel far. Male butterflies exhibit strong territorial behaviours.

Larval host plants: *Mussanda frontosa*, *Wendlandia thysoidea*.

33. Clipper (*Parthenos sylvia*)

Clipper is a fast flying bronze green butterfly and has a habit of flying with its wings flapped stiffly between the horizontal position and few degrees below the horizontal. This butterfly is having a wingspan between 105-125mm. It has a series of large, semi-transparent, snow-white spots on its forewings. The hindwings are marked with black spots. Numerous black spots and streaks are also present on the forewing as well as in the hindwing. The male and female looks similar.

Larval host plants: *Tinospora cordifolia*, *Adenia bondala*.

34. Grey Count (*Tanaecia lepidea*)

The Grey Count is a dark brown butterfly with a slight bronze coloured sheen. It is having a wingspan of 65-80mm. There are short black lines on the forewings, but the most striking characteristic is the pale grey or silvery white margin of the hindwings, which also extends to the lower half of the forewings. The underside is pale grey with numerous black markings. Both the sexes look alike. It feeds from wet soil, on tree sap and rotting fruits, occasionally bird droppings and may go high up in the trees in search of tree sap.

Larval host plants: *Melastoma malabathricum*, *Careya arborea*.

35. Common baron (*Euthalia aconthea*)

A medium to large brown butterfly with a wingspan of 50-80mm. This butterfly is characterized by a very strong and broad thorax that hints at their powerful flight. This coupled with pointed forewing and brown hindwing, gives them a majestic appearance. The sexes are dissimilar. The upperside of the male is dark velvety brown with darker bands and spots. The upperside of the female is a paler brown. Both sexes have a beautiful

olivaceous sheen on the upperside, particularly in the freshly emerged specimens; their undersides are pale gray. The male is much smaller than the female. This butterfly often visits rotten vegetables, fruits, toddy and sap etc.

Larval host plants: *Mangifera indica*, *Anacardium occidentale*.

36. Common Castor (*Ariadne merione*)

Common Castor is an orange butterfly with brown lines. It has a wingspan of 45-60mm. Upperside is reddish brown with transverse black wavy lines. In females, these wavy lines are broader. A white dot is present on the front margin of the forewings. The margins of the hindwings may or may not be wavy. The underside is often pale and duller in colour, and the black wavy lines are replaced by denser and suffuse brown bands. Common Castor is a very active butterfly but its wings are rather weak, so it mainly glides. It is fond resting on leaves, keeping the wings slowly moving sideways and always nearer to host plants.

Larval host plants: *Tragia involucrata*, *Tragia plukenetii*, *Ricinus communis*.

37. Angled Castor (*Ariadne ariadne*)

A medium sized rusty brown butterfly similar to Common Castor, but with distinct wavy wing margins. Its wingspan ranges between 45-60mm. The upperside is marked with fine wavy black lines over the entire wing surface. The white spot below the coastal margin of the forewing is distinctive. The underside is much darker than the upperside and has a few wavy bands bounded by faint black lines. The male is darker in colour. This butterfly has a weak flight and stays just a few feet above ground. Frequently, settling on flowers or other vegetation in its habitat. The flight is characteristic, a few downward power streaks followed by a short spell of gliding with its wings held horizontal. Once settled, it opens its wings completely, occasionally moving

them back and forth in a slow deliberate manner. Both sexes visit flowers readily.

Larval host plants: *Tragia involucrata*, *Tragia plukenetii*, *Ricinus communis*.

38. Lemon Pansy (*Junonia lemonias*)

Lemon Pansy is a brown butterfly with a wingspan of 45-60mm. Numerous eye spots as well as black and lemon yellow spots and lines on the upperside of the wings. The underside is dull brown with a number of wavy lines and spots in varying shades of brown and black. There is also an eyespot on the lowerside of the forewing. The wet and dry season forms differ considerably in colouration and even shapes. In the dry season the markings are reduced and in the wet season they are more prominent and larger. The colouration on the underside of the wing is also variable. In the wet season the markings are distinct and vivid, in the dry season they are obscure and pale, thus aiding the butterfly in camouflage among dried leaf (litter). Lemon Pansy is a very active butterfly and can be seen basking with its wings open facing the sun. It sits very low to the ground and can be approached easily. It feeds with its wings half open. It is a fairly strong flier and flies close to the ground with rapid wing beats and often returns to settle back in the same spots. The male and female look similar.

Larval host plants: *Sida rhombifolia*, *Hydrophilia auviculata*, *Barleria sp.*

39. Grey Pansy (*Junonia atlites*)

A medium sized light grey butterfly with a wingspan of 55-65mm. The upperside of grey pansies are pale grey or lavender-brown with dark greyish brown markings. The forewings have four transverse wavy lines in the cell, a round wavy band and a complete row of outer ocelli. Underside paler with markings as

above. Both sexes are similar. Grey pansies are usually found near water bodies and paddy fields. It is often seen in bright sunlight, gliding over open grassy patches and flowering bushes. They visit flowers of various plants.

Larval host plants: *Hygrophila auriculata*, *Barleria sp.*

40. Chocolate Pansy (*Junonia iphita*)

It is very common, widely distributed butterfly having a wingspan of 55-65mm. The upperside of the butterfly is dark olive brown with indistinct dark brown bands. There is a series of ocelli towards the outer margin of both wings on both surfaces, but most of them are faintly marked. The underside ground colour is darker with bands of wavy lines that vary between dry season and wet season forms. The female is easily identified by its white markings on the oblique line on the underside of the hindwing. It is usually seen at or near ground level or settled on low bushes or the ground, often basking in the sun. It regularly nectars on flowers such *Lantana*, *Duranta* and *Eupatorium*.

Larval host plants: *Hygrophila auriculata*, *Carvia callosa*.

41. Peacock Pansy (*Junonia almana*)

Peacock Pansy is a most common butterfly in our country. Wingspan is 60-65mm. Upperside is light yellowish brown with two ocelli each in both wings; that near apex of hindwing is large, having two white spots in peacock background and surrounded by yellow and black rings (hence the name). Forewing has dark coastal bars and both wings with brown wavy margins, underside leaf like, brownish in male and yellowish in female; ocelli is more prominent in female during dry season. Found basking during early morning in sunny patches. Like other pansies, highly territorial in behaviour and often chases away intruders. Visits flowers of *Aztec Marigold*, *Lantana*, and *Calotropis etc.*

Larval host plants: *Hygrophila auriculata*, *Barleria sp.*, *Gloxinia*

sp.

42. Painted Lady (*Cynthia curdii*)

Painted Lady is a large butterfly (wingspan 55-70mm) identified by the black and white corners of its mainly deep orange, black spotted wings. It has five white spots in the black forewings tips and while the orange areas may be pale here and there. The hindwings carry 4 small submarginal eyespots on dorsal and vented sides. In the morning the Painted Lady is often seen basking on the ground. After basking it becomes very active and flies around in search of flowers, its most loved food source. It has a habit of halting abruptly during flight, when it sits on the ground with its wings closed and the forewings half drawn between the hindwings, thereby camouflaging itself well. The Painted Lady is one of the most widely distributed butterflies of the world. It is migratory in nature.

Larval host plants: *Artemissia sp.*, *Blumea sp.*, *Debregeasia bicolor*.

43. Great Eggfly (*Hypolimnas bolina*)

A large brown butterfly with a wingspan of 70-110mm. The species has a high degree of sexual dimorphism. In the males, upperside of the wings are jet black, offset with three pairs of white spots- two on the forewing and one on the hindwing. These white spots are surrounded by purple iridescence. In addition the upperside of the hindwing bears a series of small white dots. The female is mimic with multiple morphs. The upperside of the wings of the female is a brownish black and does not have any spots like those of the male. The edges bear white markings which are similar to those of the Common Indian Crow. It is a strong flier, but the females mimic the behaviour of the Common Indian Crow and hence fly slower and more leisurely. However, it is capable of very swift flight when alarmed. The males are jealously territorial and often return to a favourable perch repeatedly even after being

disturbed.

Larval host plants: *Leportea interrupta*, *Portulaca oleracea*, *Sida rhombifolia*.

44. Danaid Eggfly (*Hypolimnys misippus*)

A medium sized Nymphalid with a wingspan of 65-75mm. The sexes are dissimilar. Both sexes have distinctly wavy wing margins. In adult males, the upperside is black with dark iridescent blue or violet ringed white, oval patches on both wings. Forewings have small oval spots in the apex. The female has two forms, both of which are excellent mimics of the Plain Tiger. The Common form is having brown with a black apex and a narrow white band below it. The rest of the wing is relatively unmarked except for a black spot towards the front margin of hindwing. The underside has two black spots on the hindwing. The second form for *inaria* does not have black band below the apex of the forewing. Danaid Eggflies are strong and energetic fliers. Males are highly territorial in nature and are more common than females. They are often found basking in the sun by resting on bushes or on the ground with continuous slow movement of the wings. Danaid Egg Fly visits flowers of Lantana, Sunflower, Aztec marigold etc.

Larval host plants: *Portulaca oleracea*, *Barleria cristata*, *Hibiscus sp.*

45. Glassy Blue Tiger (*Parantica aglea*)

A transparent blue-brown butterfly with a wingspan of 75-80mm. The upper side has numerous light gray streaks towards the base of the wings. The marking towards the outer margins are more or less oval. The marks on the underside match well to the markings of the upperside, though some of the marking are lined by additional darker grey areas. Sometimes the markings are ill-defined and blurred. It is the slowest flier within the group. It spends much of its time within five to ten feet above ground. It is the most shade loving of all the Danaids in the group

and is frequently seen nectering on flowers of the undergrowth like other Danaids, it has chemical defences that protect it against predators.

Larval host plants: *Calotropis gigantea*, *Cryptolepis buchananii*

46. Blue Tiger (*Tirumala limniace*)

Blue Tiger is one of the most common butterflies in India. It has a wingspan of 90-100mm. Sexes are similar. At rest, the male can be distinguished from the female by the bell shaped elevated scent patches located between the first and second veins of the hindwing. The upperside of both wings is black with pale blue markings. These markings are broad streaks of the base of the wings but become smaller and more circular towards the outer margins. The ground colour of the underside is a beautiful olivaceous brown. The markings below are similar to those on the upperside. It has a characteristic slow meandering flight and moves forward with a few wing beats followed by a spell of gliding. It is attracted to wide variety of flowers like Lantana, Aztec marigold etc. While alighting on a flower, they flutter their wings vigorously and while sipping nectar, keep the wing spread motionless. This species migrates occasionally.

Larval host plants: *Wattakaka volubilis*, *Calotropis gigantea*, *Asclepics cuvassavica* etc.

47. Dark Blue Tiger (*Tirumala septentrionis*)

This is a large butterfly with a wingspan of 75-95mm. It is similar to Blue Tiger. The upperside of the wings are black with pale blue markings (From blue tiger it differs on the upperside in the ground-colour being darker and the semi-hyaline markings narrower and more distinct). The underside background colour is dark brown with the rest of the markings similar to those on the upper surface. Both the sexes are similar and are indistinguishable in flight. Once settled, the male can be distinguished from the female by the elevated scent patches. They

are located on the second vein of the underside hindwing. Dark Blue Tiger is frequently found in the company of the Blue Tiger, though the less commoner of the two.

Larval host plants: *Wattakaka volubilis*, *Vallaris heyn*.

48. Plain Tiger (*Danaus chrysippus*)

A very beautiful graceful and slow flying butterfly with a wingspan of 70-80mm. The body is black with many white spots. The wings are tawny, the upperside being brighter and richer than the underside. The apical half of the forewing is black with a white band. The hindwing has 3 black spots around the center. The hindwing has a black enclosing a series of semicircular white spots. The male Plain Tiger is smaller than the female, but more brightly coloured. The Plain Tiger is protected from predator attacks due to the unpalatable alkaloids ingested during the larval stages. The butterfly flies slowly and leisurely, generally close to the ground and in a straight line. They visit flowers of Lantana, Riddle leaved Jatropha, sunflower, Common zinnia etc.

Larval host plants: *Calotropis gigantia*, *Ascalepies curassaviea*.

49. Striped Tiger (*Danaus genatia*)

The Common Tiger or Striped tiger is one of the common butterflies in India. This butterfly closely resembles the Monarch butterfly (*Danacus plexippus*) of the Americas. The wingspan is 72-100mm. The wings are tawny with heavy black markings along the veins (hence the name striped tiger). The upperside of the apex of the forewing is black. Below the apex, a row of elongated white marks forms a loose hand across the wing. The black marginal hand on the underside of the hindwing has two rows of small white spots. On the upperside the corresponding inner row is often incomplete. It is a strong flier, but never flies fast or very high. The wing beats are regular and fairly rapid, as compared to

the Plain Tiger. It visits gardens where it nectars on the flowers of *Lantana*, *Zinnia*, *Cosmos* etc.

Larval host plants: *Asclepia curassavica*, *Ceropegia intermedica*, *Stephanctis sp.*

50. Common Crow (*Euploea core*)

It is one of the most common butterflies found in almost every part of India. The upperside of this butterfly is glossy brown with marginal and terminal white spots either equal or decreasing in size. Underside is light brown coloured with markings as above. Wingspan is 80-95mm. The adult butterfly often sails with its curved abdomen and extended powder puff-like yellow hair pencils. This butterfly, being protected by its inedibility, flies slowly and leisurely, often meandering and sailing for short distances before alighting on a favourite flower, a damp spot or a place to rest. It flies at all levels but is most likely to be encountered a few feet off the ground. It is attracted to a host of wild flowers, including the introduced *Eupatorium odoratum* (This plant is also known to have the pyrrolizidine alkaloids which *Danaina* use in the synthesis of their pheromones). It is also attracted to ornamentals such as *Zinnias*, *Lantana*, *Durant* etc.

Larval host plants: *Ficus sp.*, *Cryptolepis buchananii*, *Mimusops elengi*, *Nerium oleander*, *Tylophora indica*.

51. Common Leopard (*Phalanta phalantha*)

The Common Leopard is a medium sized butterfly with a wingspan of 50-60mm with a tawny colour and marked with black spots. The underside of the butterfly is pale but glossier than the upperside. Both the male and female are similar looking. It is a sun loving butterfly and is most active in the hot noon sun. It has an active and sharp flight movement and often settles on branches of small trees and shrubs. It has a habit of flapping its wings for sometime after it settles. It basks with its wings spread flat or half

open. It has the habit of chasing away other butterflies and guarding its territory. It feeds from flowers, where it settles with its wings half-open. It visits the flowers of *Meyenia laxiflora*, *Gymnosporia montana*, *Lantana* etc.

Larval host plants: *Flacourtia indica*, *Flacourtia montana*, *Smilax* sp.

Family : Nymphalidae



Nigger



Tawny Coster



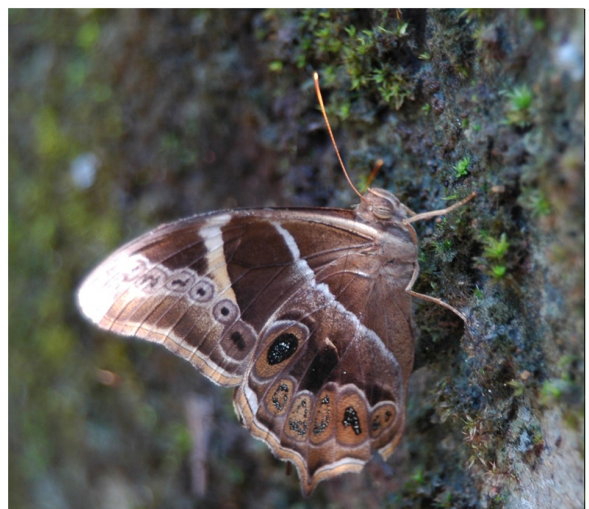
Common Sailer



Chocolate Pansy



Peacock Pansy



Bamboo Treebrown



Grey Count



Commander



Lemon Pansy



Common Palmfly



Common Lascar



Angled castor



Grey Pansy



Common Crow



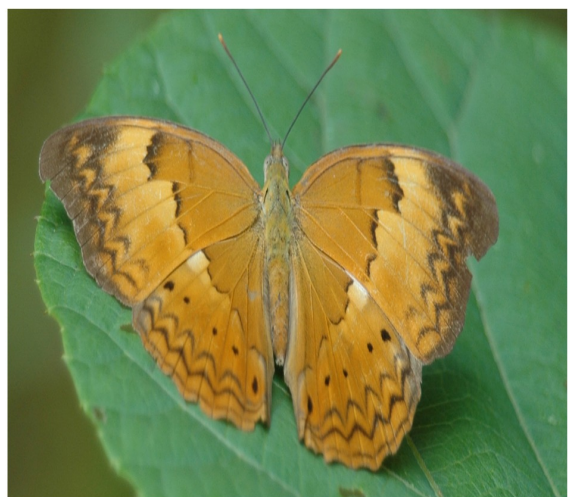
Blue Tiger



Dark Blue Tiger



Glassy Blue Tiger



Tamil Yeoman



Southern Rustic



Common Evening Brown



Danaid Eggfly



Great Eggfly



Common Leopard



Common Bush Brown



Clipper



Common Fivering



Plain Tiger

FAMILY: LYCAENIDAE (BLUES)

52. Apefly (*Spalgis epius*)

It is a small butterfly having wingspan about 10-14mm. It gets its name from the supposed resemblance of its caterpillar to the face of an ape. Its wings are dark-brown above, and a greyish buff underside with dark striations. There is a clearly defined white spot at the cell end of the forewing. This Lycaenid is unique in a way that its larva stage is carnivorous. The caterpillars feed not on plants, but on small, often powdery, relatives of bugs-the mealy bugs and scale insects. This butterfly flies rapidly and erratically.

Larval host plants: Not known

53. Common Pierrot (*Castalius rosimon*)

It is a small white butterfly with a white face and black eyes. Its wingspan ranges between 24-34mm. The sexes are very similar. The underside of its wings is white with black spots and streaks. The base of the upperside of both wings is a beautiful shiny pale blue, being more extensive in the female. The sub marginal bands above are much wider in the female than in the male. The butterfly has a distinct unmarked gap in the centre of its hindwings. It flies relatively fast and low to the ground and the males frequently settle on rocks and gravel patches. It is a nectar lover and comes readily to a wide range of plants with small flowers.

Larval host plants: *Ziziphus rugosa*, *Ziziphus xylopyrus*, *Ziziphus mauritiana*

54. Blue Banded Pierrot (*Discolamba ethion*)

A small blue with a wingspan of 20-25mm. Though the sexes look similar in overall markings, the blue iridescence on the upper surface of the male is unmistakable. The upperside of both wings

have wide sub marginal bands that are black or nearly so in the male, but brown in the female. There are well-defined central white bands on both wings that align with each other.

Larval host plants: *Ziziphus xylopyrus*, *Ziziphus mauritiana*, *Ziziphus oenoplia*

55. Quaker (*Neopithecops zalmora*)

This is a small very handsome white butterfly with a pure white face and black eyes. Its wingspan ranges between 20-30mm. They can be easily distinguished by their broad black forewings with central white areas and the absence of blue scales. On the underside a large black spot is present near the front margin of the hindwing. This species has a feeble flight and has usually been encountered singly.

Larval host plants: *Glycosmis arborea*, *Glycosmis parviflora*, *Glycosmis pentaphylla*

56. Common Cerulean (*Jamides celeno*)

A medium sized Lycaenid with a wingspan of 30-35mm. The underside of the wings of this small attractive butterfly is gray white in the wet season form and pale brown in the dry season form. The butterfly is tailed. Both the sexes have glistening pale blue uppersides. The male is brighter than the female and has narrow dark borders on its wings. A dark spot with an orange shade is present on the hindwing near to the tailed region.

Larval host plants: *Saraca asoca*, *Abrus precatorius*, *Pongamia pinnata*

57. Red Pierrot (*Talicaada nyseus*)

This is an unmistakable butterfly with its beautiful striking patterns and colours. The upper surface of its wings is black except for the lower portion of the hindwing, which is orange. On the under side the forewing is white with black spots more

towards the margin. The hindwing is very striking, it is white with black spots towards the base and the margin has a wide band of orange with white spots. There are a lot of variations found in black spots on hindwings. The two sexes are alike. The Red Pierrot is a very weak flier and therefore does not disperse very easily. It basks with its wings half spread.

Larval host plants: *Kalanchoe pinnata*, *Kalanchoe luciniata*

58. Yamfly (*Loxura atymnus*)

Yamfly is a tailed butterfly with a wingspan of 36-42mm. It is reddish orange on the upperside, with a black epical border on the forewings. The underside is orange yellow with some obscure markings. The tails are tipped with white and twirl in slight breeze, in the hop of fooling predators that this is the head of the butterfly. The species is not often seen, but where encountered, it is usually found singly. The butterfly enjoys basking in bright sunlight and normally flies at low levels where it flits from perch to perch.

Larval host plants: *Discorea pentaphylla*, *Smilax sp.*

59. Monkey Puzzle (*Rathinda amor*)

Monkey Puzzle is another interesting butterfly, which catches the attention of butterfly lovers with its beautiful wing pattern and colour. Both the sexes look similar and have a wingspan of 26-28mm. The upperside is dark brown with a white band in the forewing and the underside has black spots in white or yellow background. Each of hindwing has two dark spots and three tail like structures, the middle one larger than the other two. All this is apparently to confuse a predator as to which side is the head. This is a likely reason that the first naturalist may have named the species the Monkey Puzzle.

Larval host plants: *Ixora sp.*, *Plants of Rubiaceae*, *Euphorbiaceae etc.*

60. Slate Flash (*Rapala manea*)

The Slate Flash is a strong flier, having a wingspan of 30-33mm. Its wings are large and the body is comparatively small. The under-side is brown and marked with a thin slightly curved darker band that has a whitish margin at its outer edge. The upper surface of the wings in the male is dark slaty blue with a deeper blue glistening suffusion. The female is shiny purple blue, but paler. It is most active during the monsoon and post monsoon period. It usually chooses medium sized trees or tall shrubs on which it perches on unstretched branches. The choice of host plant seems heavily dependent on the presence of ants which guard and take care of its caterpillar.

Larval host plants: *Quisqualis indica*, *Ziziphus sp.*, *Acacia torta*

61. Common Silverline (*Spindasis vulcanus*)

A small 'blue' with a wingspan of 20-30 mm. The sexes are similar. The uppersides of the wings of both sexes are dark gray brown to slate. On the upperside of the hindwing of the male there is no shot blue, though some specimens do have a trace of it. On the underside hindwing, the central band is more separated from the outer band than in any other species, making the yellow area much wider and a distinctive feature. A butterfly that is truly difficult to disturb when nectaring on flowers - it is so oblivious to the outside world that it may even be caught with ones bare hands.

Larval host plants: *Canthium coromandelicum*, *Clerodendrum inerme*

62. Plum Judy (*Abisara echerius*)

Plum Judy is a small shade loving butterfly, venturing out rarely during the late afternoon or early morning. It is having a wingspan of 40-50mm. Upperside of male is purple brown with obscure markings; in female it is brown in colour. Hindwing is

prominently toothed. The bands in female are more whitish. It has a habit of landing and turning around almost immediately after alighting. It repeats this turning movements as it moves along branches. This is believed to help in evading predators by causing confusion about head orientation.

Larval host plants: *Embelia robusta*, *Ardisia sp.*

63. Red Spot (*Zesius chrysomallus*)

A medium sized Lycaenid with a wingspan of 38-45 mm. The undersides of both sexes are similar - a light gray background with rows of light buff colored markings. The upperside of the male is a uniform coppery brown or red with faint violet scales towards the base of the forewings. The violet scales are found more distally on the hindwing. The upperside of the females are highly variable, with some specimens showing very little blue. It has a strong flight and remains in the middle or the upper layer of the canopy, only occasionally coming to the ground. Settled on a small tree or high bush, it basks in the sun in the early morning hours with its wings partly open. It is entirely disinterested in flowers, but is attracted to tree sap. The female is commoner than the male.

Larval host plants: *Terminalia paniculata*, *Anacardium occidentale*, *Psidium guajava*

64. Lesser Grass Blue (*Zizeeria otis*)

Wingspan 18-23mm. The male is uniform dark blue above with dark narrow black bands on the outer margins of both wings. The base of the wings of the females are blue and are surrounded by a large black border on the front and outer margins. In both sexes, the ground color of the underside is a light brown and quite variable. There are numerous small black markings on both wings; the ones on the forewings are always larger and often a darker shade.

Larval host plants: *Alysicarpus vaginalis*, *Sesbania bispinosa*

65. Common Line Blue (*Prosotas nora*)

A small 'blue' with a wingspan of 20-25 mm. There is great variation in size and color of this butterfly. The undersides vary from gray to pale yellow with many specimens showing intermediate shades of brown. The upperside of the male is dark blue with a hint of purple. In the female, the blue is confined to the base of the wings and is surrounded by varying shades of dark brown. It is fond of bird droppings.

Larval host plants: *Pithecellobium dulce*, *Sapindaceae sp.*, *Myrtaceae sp.*

Family : Lycaenidae



Monkey Puzzle



Common Cerulean



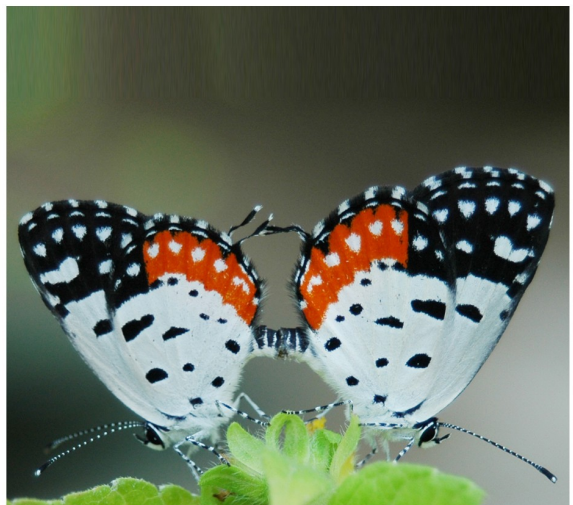
Banded Blue Pierrot



Common Pierrot



Slate Flash



Red Pierrot



Plum Judy



Yam Fly



Indian Sun Beam



Ape Fly



Lesser Grass Blue



Quaker

FAMILY: HESPERIIDAE (SKIPPERS)

66. Common Spotted Flat (*Celaenorrhinus leucocera*)

It is a shade loving butterfly with a wingspan of 45-55mm. This butterfly is dark-brown above. The forewing has a band of more or less connected discal spots, which are white and semi-transparent. The butterfly also has small white spots in the apex of the forewings. The hindwing has a few obscure, opaque yellow spots. The hindwing margins are chequered black and white. The male has a plain white antenna shafts, while the female has plain brown shafts with white clubs. It visits flowers and rests on the under side of leaves. It flies fast and low, usually close to the ground and aggressively defends its territory from other butterflies. When disturbed, it buzzes in circles around before settling down, near to where it was perched before.

Larval host plants: *Carvia callosa*, *Eranthemum roseum*, *Ecbolium diguistrinum*.

67. Suffused Snow Flat (*Tagiades gana*)

The wings of this butterfly are dark brown with darker spots along the discal area of the wings (Wing span 45-50). The tornal area of the hindwings are whitened and has diffused black spots along the edge. They fly so rapidly that only the whitened area of the hindwings are seen, giving the illusion of a smaller white butterfly in flight. It feeds on flowers such as *Strobilanthes*, *Clerodendron* etc. and occasionally visits wet soil.

Larval host plants: *Dioscorea oppositifolia*.

68. Water Snow Flat (*Tagiades litigiosa*)

It is a dark brown butterfly with a few semi-transparent spots on the forewing. The most distinctive characteristic of this butterfly is the outer two-thirds of the upper side of the hindwings, which are snow white. A series of large black spots are

present at the edge of the hindwing, contrasting with the white patch. Its wingspan ranges between 37-44mm. They fly so rapidly that only the whitened area of the hindwings may betray their presence. While active, they settle on the edge of a leaf with wings fully out-spread. It has behaviour of chasing any other objects that may be flying by. For resting, it goes to the under side of a leaf, applies its body close to the leaf and usually chooses shady plants upon which to do so. It is territorial; therefore it flutters around for only short while and may return to rest under the same leaf.

Larval host plants: *Dioscorea oppositifolia*, *Dioscorea sp.*, *Smilax sp.*

69. Tricolour Pied Flat (*Pseudocladenia indrana*)

Tricolour Pied Flat is one of the most beautiful butterfly among flats. Normal wingspan size is 35-40mm. In male, upperside of forewing has a three elongated sub-apical spots, conjoined discal spots, twice as large and irregular. Prominent black spots are present on the upperside of hindwing. In female below the sub-apical spots, there is a small dot. It makes its appearance early in the morning, often feeding on the flowers of common leucas sp.

Larval host plants: *Grewia nervosa*, *Xylia xylocarpa*, *Mallotus philippensis*

70. Common Small Flat (*Sarangesa desahara*)

The Common Small Flat has a wingspan around 30-35mm. Both male and female in appearance, being dull brownish-black above and greyer in colour below. This butterfly has a small semitransparent discal cell and apical spots. The dark spots on the underside of the forewing are large, dark and diffused. The butterfly though tiny, flies extra ordinarily fast but in an erratic and jerky fashion. Though the flight seems jerky and erratic, the butterfly lands smoothly on the substratum, and that too suddenly.

Its flight is always close to the ground and has the habit of sometimes returning to the same spot for perching. It always rest on the underside of the leaves, but basks on the upperside with its wings fully spread.

Larval host plants: *Asystasia spp.*, *Blepharis asperima*.

71. Chestnut Bob (*Lambrix salsala*)

Chestnut Bob is a small skipper butterfly with a wingspan of 26-30mm. The wings of this little butterfly are dark brown above and below. On the underside the wings are dusted with ferruginous brown and there are series of small silvery white spots. The spots on the hindwing are prominent and black edged. It skips quite close to the ground not very fast. Flight is dodging, visits low growing flowers and also has been observed on droppings and dung.

Larval host plants: Grasses, *Bambusa arundinaceae*

72. Grass Demon (*Udaspes folus*)

The Grass Demon is a black butterfly with a large white spot on the upperside of the hindwing and several smaller white spots on the forewing. The underside of its wing is mostly white with brown edges and spots. Wing span is 40-48mm. It usually flies in the shades among bushes and under trees keeping low and close to the ground. From time to time, it takes short flights, and occasionally, much longer excursions into the open clearings. Its flight is quick and path is very erratic making it very difficult to track when in flight. When basking, it sits on the uppersides of leaves with its hindwing fully expanded and forewing partly opened. The grass demon is a nectar lover and visits flowers like *Vinca rosea*, *Lantana* etc. It rarely visits bird or dung droppings.

Larval host plants: *Curcuma pseudomontana*, *C. aromatica*, *C. decipiens*, *Zingiber sp.*

73. Indian Palm Bob (*Suastus gremius*)

Indian Palm Bob is a brown butterfly (wingspan 32-42mm) with few spots on the forewing. The underside is overlaid with huff scaling with a number of sharply defined black spots. Three of these are in one line, two opposite to these three. These spots may be sometimes very small or faint, but are always present in the same pattern. There are semitransparent spots on the forewing. The male and female are identical in appearance. This is a fast flying butterfly, once disturbed from a place it is difficult to locate again. Flies close to the ground, often sits on the low plants, and basks with its hindwing fully opened and forewing partially opened. Visits low growing flowers particularly anaphalis sp. and some other Compositae plants.

Larval host plants: Palms, *Calamus sp.*, *Caryota urens*

74. Giant Red Eye (*Gangara thyrsis*)

Giant Red Eye is one of the largest butterfly in the HesperIIDae family. Its wingspan ranges between 70-76mm. It has chocolate brown wings with three large and three small apical, yellow spots on the forewings. Hindwings irrorated with grey scales in a series of bands across the wings. The eyes are large and wine-red. The two sexes look similar. It has crepuscular and nocturnal habits. Flight is rapid, visit flowers, for this it has got a long proboscis. Rests with its wings folded over its back on tree trunks, rops and on the underside of the leaf in the darkened part of the area during day time.

Larval host plants: Ornamental palms, *Cocus nucifera*, *Caryota urens*, *Calamus rotang*.

75. Common Red Eye (*Matapa aria*)

The Common Red Eye is much smaller (Wingspan 40-55mm), plain brown without any markings. The border of the hindwing is hairy and grey or pale yellow. The characteristic

feature of this small butterfly are the red eyes, which are very obvious in field observations. Common in thickly forested areas particularly in bamboo jungles. Generally remains in thickets, rarely comes out particularly in the morning to bask. Bask with wings closed but exposing maximum wing surface to the sun by keeping the body perpendicular to the sun's rays like many other skippers. It stays close to the ground.

Larval host plants: Bamboos

76. Rice Swift (*Borbo cinnara*)

This is a butterfly of open areas. It has dark brown wings that have semi-transparent spots on the forewings and white spots on the underside of the hindwings. The upperside of hindwings is unmarked. The semi-transparent spots on the forewings decrease in size from the lower margin of the wing towards the upper margin. There is a series of white spots, forming an arch on the underside of the hindwings. This butterfly flies close to the ground, settles frequently on the grass or herbs to bask or on flowers to feed. It is active throughout the day except the evenings. Its flight is swift with very rapid wingbeats. It feeds predominantly on low growing flowers, *Tridax*, *Stachitarpita jamicancis* etc.

Larval host plants: *Cymbopogon* sp., *Pennisetum* sp., *Setaria glauca*, *Eragrostis* sp.

77. Indian Skipper (*Sipalia galba*)

Having a wingspan of only 24-27mm, *Sipalia galba* is identified by its unique pattern of black and white spots and its small size. The upperside of its wings is black or dark brown, sometimes glossed light rusty brown and marked with small white spots. The underside is whitish. The hairy fringe of its wings is chequered black and white. The Indian Skipper keeps very close to the ground, usually within a meter. It is fond of flowers. It sucks

nectar from small flowers that are situated a few centimeters above the ground. Both sexes are similar.

Larval host plants: *Sida rhombifolia*, *Hibiscus sp.*, *Waltheria indica*

78. Restricted Demon (*Notocrypta curvifascia*)

It is a black butterfly with a wingspan of 38-50 mm. The forewing has a broad curved hyaline, white discal band and apical conjoined spots. Hindwing has no markings. Underside is dark brown with forewing markings more prominent. The male and female look identical. It is usually seen in moist deciduous forests. Restricted demon is a powerful flier flies always close to the ground. It settles low on bushes and herbs and does not stay far, so its activities are restricted to a small area. It visits flowers like *Lantana* during early morning and evening hours and rests on leaves during rest of the day.

Larval host plants: *Costus speciosa*, *Zingiber montana*

80. Tamil Grass Dart (*Taractrocera cerama*)

The Tamil Grass Dart is a little skipper (Wing span 23-30mm) with dark brown wings that are marked with yellowish orange small spots. This butterfly is very fond of open places and meadows. Flower seems to be major source of nourishment. It seems to prefer only smaller flowers such as *Dicliptra roxburghiana* and certain *Aesteraceous sp.* Its flight is weak. It flies in short bouts, but usually does not return to where it began. It basks with the hindwings spread flat and forewings half open.

Larval host plants: Grasses.

81. Dark Palm Dart (*Telicota ancilla*)

Having a wingspan of 34-36mm, this black butterfly has orange bands on the forewings, which narrow towards the apex. The hindwings are black with pale orange band. The male and

female have identical markings. Most commonly it is seen perched close, within 2 meter, to the ground. It is a fast and powerful flier that settles frequently on bird droppings. It s a shade loving butterfly but also basks with forewings held slightly apart and hindwing almost flat on the resting surface.

Larval host plants: *Bamboos, Oryza sp., Sacpharum sp.*

82. Pygmy scrubhopper (*Aeromachus pygmaeus*)

The Pygmy scrubhopper is our smallest skipper; grasslands are its favourite haunt. This tiny little butterfly is easily overlooked in field.

Family : Hesperiidae



Spotted Small Flat



Contiguous Swift



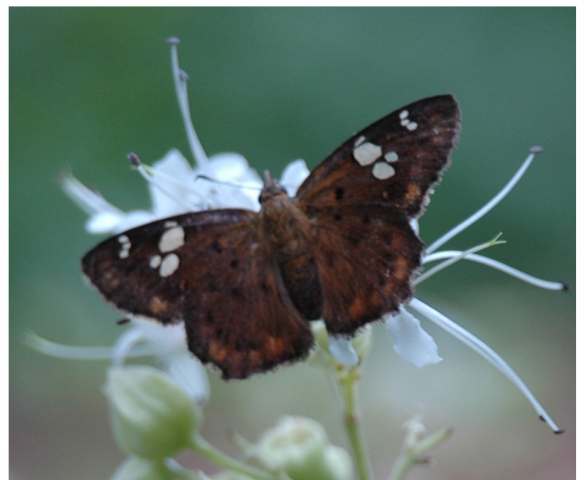
Giant Redeye



Common Redeye



Grass Demon



Tricolour Flat



Suffused Snow Flat



Water Snow Flat



Rice Swift



Dart (Genus: Potanthus)



Dark Palm Dart



Tamil Grass Dart



Indian Skipper



Chestnut Bob



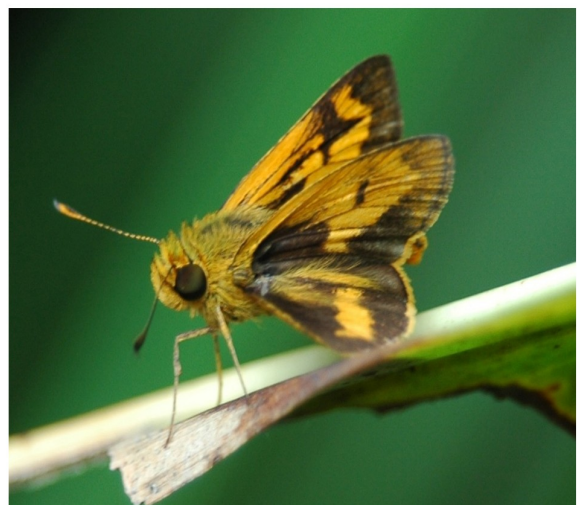
Pigmy Scrub Hopper



Indian Ace



Common Grass Dart



Indian Dartlet

5.4.2. DRAGONFLIES

During the present study, 24 species of dragonflies and five species of damselflies were identified from the Mahatma Gandhi University Campus, Kottayam (Table-5.2). Out of the 177 species of dragonflies belongs to five families recorded from Peninsular India, only 13 % species belonging to three families were found in the campus. Libellulidae is the most species rich family with 21 species followed by Gomphidae and Aeshnidae with one species each.

Table: 5.2 Systematic List of Dragonflies in the Campus

Sl.No.	Scientific Name	Common Name
Gomphidae		
1.	<i>Ictinogomphus rapax</i>	Common Clubtail
Aeshnidae		
2.	<i>Gynacantha dravida</i>	Brown Darner
Lebellulidae		
3.	<i>Acisoma panorpoides</i>	Trumpet Tail
4.	<i>Aethriamantha brevipennis</i>	Scarlet Marsh Hawk
5.	<i>Brachydiplax sobrina</i>	Sombre Lieutenant
6.	<i>Brachythemis contaminata</i>	Ditch Jewel
7.	<i>Bradinophyga geminata</i>	Granite Ghost
8.	<i>Crocothemis servilia</i>	Ruddy Marsh Skimmer
9.	<i>Diplocodes trivialis</i>	Ground Skimmer
10.	<i>Lathrecista asiatica</i>	Asiatic Blood Tail
11.	<i>Neurothemis fulvia</i>	Fulvous Forest Skimmer
12.	<i>Neurothemis tullia</i>	Pied Paddy Skimmer
13.	<i>Orthetrum chrysis</i>	Spine-tufted Skimmer
14.	<i>Orthetrum glaucaum</i>	Blue Marsh Hawk
15.	<i>Orthetrum luzonicum</i>	Marsh Skimmer

16.	<i>Orthetrum sabina</i>	Green Marsh Hawk
17.	<i>Potamarcha congener</i>	Yellow-tailed Ashy Skimmer
18.	<i>Rhodothemis rufa</i>	Spine-legged Redbolt
19.	<i>Rhyothemis veriegata</i>	Common Picture Wing
20.	<i>Tholymis tillarga</i>	Foggy-winged Twister
21.	<i>Trithemis aurora</i>	Crimson Marsh Glider
22.	<i>Urothemis signata</i>	Scarlet Basker
23.	<i>Tramea limbata</i>	
24.	<i>Hydrobasileus croceus</i>	

DESCRIPTION OF DRAGONFLIES

FAMILY: GOMPHIDAE

1. Common clubtail (*Ictinogomphus rapax*)

Male: Well separated bluish-grey eyes, black body with yellow markings and very conspicuous black leaf-like lateral expansions of eighth abdominal segment are useful characters of the male.

Female: Similar in colour but lacks the lateral expansions at the end of the abdomen.

Abdomen: 50-52mm. **Wing:** 55-60mm.

Habitat: Weedy tanks, ponds and channels in the lowlands and mid hill areas. Common locally.

FAMILY: AESHNIDAE

2. Brown Darner (*Gynacantha dravida*)

Male: Appears at dusk flying rapidly around muddy swamps and tank edges. Its colour is mostly dull brown mixed with patches of green and has a distinct constriction in the abdomen at segment 3, with auricles at segment 2; superior anal appendages are long feather-like projections with tiny hairs on inner surfaces; inferior appendages have a cone shape.

Female: Colouration similar to male; abdomen less constricted at segment 3; hind wing rounded; female appendages and parts of

ovipositor breaks and anal appendages can appear short and square.

Abdomen: 48-51mm. **Wing:** 45mm.

Habitat: Muddy edges of low country tanks. Appears at dusk and dawn. Uncommon.

FAMILY: LIBELLULIDAE

3. Common trumpet tail (*Acisoma panorpoides*)

Male: Very small size, it has a peculiar shaped basally dilated and abruptly tapering cylindrical light blue abdomen ending with yellow anal appendages, leaving no doubt in species this species identity.

Female: Is very similar to the male in shape of body and colour pattern, only azure blue of male being replaced by yellowish-brown. This fine species, however, is easily overlooked, because of its cryptic colour pattern and very short and weak flight among dense vegetation around water habitats.

Abdomen: 15-18mm. **Wing:** 16-22mm.

Habitat: Heavily weeded tanks, lakes and marshes from lowlands to mid-hills. Common.

4. Scarlet marsh hawk (*Aethriamanta brevipennis*)

Male: The small size, stout body with a brilliant red, depressed abdomen and blackish head and thorax plus the red spot on the hind leg are the most obvious signs to identify the male.

Female: Has a cylindrical golden-olive coloured abdomen. Both sexes have a characteristic well defined red or yellow spot on femora of hind leg.

Abdomen: 17-20mm. **Wing:** 24-23mm.

Habitat: Small weedy tanks surrounded by forest. Uncommon

5. Sombre Lieutenant (*Brachydiplax sobrina*)

Male: Small size, metallic blue frons, dark metallic markings on yellowish thorax, black abdomen and light blue pruinose body

characterise this species. Colour and amount of pruinescence varies with age and terminal segments of abdomen often black.

Female: Juvenile males and females are not pruinosed; distinguished by having a bright yellow and metallic black body; eyes with a thin strip of rusty red above, cream or olive green coloured below, and metallic blue frons.

Abdomen: 16-24mm. **Wing:** 22-26mm.

Habitat: Weedy tanks, ponds, channels, lagoons and irrigated paddy from lowlands to mid-hills. Locally common.

6. Ditch jewel (*Brachythemis contaminata*)

Male: Despite its small size, the bright orange tinted wings and reddish-orange abdomen of adult males are easy to spot. The colour of body and wing fascia varies greatly with the age.

Female: Lighter in colour, generally with clear wings and an olive brown abdomen with a narrow black stripe down the centre.

Abdomen: 18-21mm. **Wing:** 22-23mm.

Habitat: Large groups are found on edges of weedy tanks, ponds, marshes, channels, lagoons, slow flowing streams and rivers from the coast to the mid-hills and dry zones. Very common.

7. Granite ghost (*Bradinopyga geminate*)

Male: A highly camouflaged insect that clings to walls or rocks not too far from water sources and even cemented ponds; its most distinguishing feature is the white and black coloured pterostigma; abdomen marbled with dirty brown and a faded yellow pattern.

Female: Similar to the male.

Abdomen: 19mm. **Wing:** 22-23mm.

Habitat: Usually seen around cemented ponds, stone walls, and granite walls in both dry and wet areas, a good mosquito catcher. Uncommon.

8. Ruddy Marsh Skimmer (*Crocothemis servilia*)

Male: Beautiful, totally red coloured, with a thin black line of variable length along the top of the abdomen is one main identity clue. Additionally, wings with large amber coloured bases and red anal appendages will distinguish this species.

Female: Is identified by having an olivaceous brown body with same thin mid dorsal abdominal black line of variable length, the markings on the bases of the wings being much paler with bright yellow nerves.

Abdomen: 24-35mm. **Wing:** 31-37mm.

Habitat: Weedy tanks, ponds, marshes and irrigated paddy from lowlands to mid-hills. Very common.

9. Ground Skimmer (*Diplacodes trivialis*)

Male: The adult males of this small widespread species are characterized by thinly pruinose yellowish black body, clear wings and yellowish anal appendages. Abdomen can vary in colour with age, having a more bluish pruinescence.

Female: Similar to the teneral and juvenile males, having an olivaceous thorax, yellow-black marked abdomen and yellowish on surface of last abdominal segment and yellow anal appendages.

Abdomen: 18-22mm. **Wing:** 21mm.

Habitat: Weedy tanks, ponds, muddy pools, rice fields, shallow channels and slow flowing streams from the coast throughout lowlands to the mid-hills. The species is often found far from water on the beaches, road edges and footpaths, often resting on the ground. Very common.

10. Asiatic Bloodtail (*Lathrecista asiatica*)

Male: Medium sized slender bodied dragonfly with blue metallic frons and creamy white face, coppery brown and yellow thorax and bright blood-red abdomen with black terminal segments.

Female: Similar to males, except for a mid-dorsal yellowish green

stripe from segments 1 to 8 on an olivaceous brown abdomen and brown tipped wings to end of pterostigma.

Abdomen: 27-32mm. **Wing:** 35-36mm.

Habitat: Small forest tanks and puddles in lowlands and mid-hill regions often found away from water. Uncommon

11. Pied Paddy Skimmer (*Neurothemis tullia*)

Male: Adults have broadly black coloured wings with an outer white band that cannot be mistaken for any other species. Body colour of this small species varies considerably according to the age (juvenile is light brown), its slow undulating flight resembles a small butterfly.

Female: Dark brown tips and large dark spots in the middle of golden yellow wings, their abdomen is light brown and yellow.

Abdomen: 16-20mm. **Wing:** 21-22mm.

Habitat: Found in large groups around weedy ponds, tanks, marshes, channels, lagoons, slow flowing streams and rice fields from lowlands to mid-hills and dry zone tanks. Usually found throughout the year. Very common.

12. Spine-tufted Skimmer (*Orthetrum chrysis*)

Male: Bright blood-red colour of abdomen without any black markings, eyes dark brown, rusty brown thorax and conspicuous tuft of black bristles on upper surface of male's genitalia are main characters of this medium sized skimmer, setting it apart from the Eastern Scarlet Darter, Variable Basker or Spine-legged Reedling.

Female: Similar to male except colour is more orangered, sides of segment 8 expanded.

Abdomen: 27-30mm. **Wing:** 33-34mm.

Habitat: Small brooks, streams, pools and marshes in sub montane areas. Common locally.

13. Blue Marsh Hawk (*Orthetrum glaucum*)

Male: Blue pruinosed males are similar to Luzon and Triangle Skimmer, the dark amber spot on the hind wing, pruinosed thorax and dark face are separation characteristics. Body size and extent of pruinescence can vary greatly, segments 9-10 and anal appendages black.

Female: Has a reddish-brown thorax with pale yellow stripes; the abdomen has an alternating pattern of reddish-brown and yellow.

Abdomen: 28-35mm. **Wing:** 34-36mm.

Habitat: Small brooks, streams, pools and marshes in hilly regions. Common.

14. Marsh Skimmer (*Orthetrum luzonicum*)

Male: Similar to Brown-banded Skimmer but with a slender body, unmarked wing bases and light-bluish face (insert). The pale azure blue pruinescence varies greatly according to the age.

Female: Colour is more greenish-yellow; margins between segments are black and converge toward terminal segments, anal appendages are yellowish and the pterostigma is bright yellow-orange.

Abdomen: 30-32mm. **Wing:** 31mm.

Habitat: Marshes and swampy areas from the lowlands to the hill regions. Common.

15. Green Skimmer (*Orthetrum sabina*)

Male: The extraordinary shape of the abdomen, dilated first three segments, followed by an alternating yellowish-green and black pattern becoming laterally narrow with more black ending with yellow anal appendages, are identification features of both sexes.

Female: Similar to the male.

Abdomen: 30-32mm. **Wing:** 32-33mm.

Habitat: Weedy edges of tanks, ponds, irrigation channels, rice

fields, slow flowing streams and lagoons from lowlands to the hills. Very common.

16. Yellow-tailed Ashy skimmer (*Potamarcha congener*)

Male: Medium sized dragonfly with black and yellow colour pattern, blackish- purplish-blue pruinosed thorax and first half of abdomen and brownish tipped extreme apices of wings. According to the age, a wide range of colour and markings is present in males.

Female: Slightly pruinosed darkening with age on sides of abdomen with laterally dilated eighth abdominal segment. Keys to its identity are the yellow and brown striped thorax and brown tipped wings.

Abdomen: 29-32mm. **Wing:** 34mm.

Habitat: Weedy tanks and marshes from lowlands to mid-hills. Common locally.

17. Spine-legged Redbolt (*Rhodothermis rufa*)

Male: With its bright red colour this species greatly resembles Eastern Scarlet Darter, Red Skimmer and Variable Basker. The completely red thorax and abdomen without any black markings, hairy prothorax and prominent robust spines on the legs will help differentiate the adult males.

Female: Sub adult males and brownish coloured females have a characteristic cream coloured stripe reaching from prothorax to almost mid-abdomen; other characteristics are similar to the male.

Abdomen: 25-29mm. **Wing:** 34-35mm.

Habitat: Weedy ponds, tanks, channels and lagoons in the lowlands. Uncommon.

18. Common Picture Wing (*Rhyothemis variegata*)

Male: Relatively small, dark, metallic green and black body, with

a slow butterfly-like flight and richly marked wings having a golden tint with black tips and hindwings being basally decorated by variegated blackish-brown and golden yellow pattern, make this species easy to

observe and recognize.

Female: Differs from males in having clear apical half of forewings and almost fully blackish-brown and golden yellow coloured hindwings. Occasionally the andropomorphic female form is met which is very similar to male.

Abdomen: 20-25mm. **Wing:** 34-37mm.

Habitat: Weedy tanks, small ponds, paddy and marshes often appearing in large groups. Usually present throughout the year. Very common.

19. Coral-tailed Cloud Wing (*Tholymis tillarga*)

Male: A rapidly flying crepuscular dragonfly (also seen early morning), recognized by its rusty red abdomen and ochreous thorax. It has a brown front and a conspicuous opalescent whitish spot on the hindwings (insert).

Female: Less commonly seen, they have an olive-brown body and thorax; a small area of orange but lacking whitish spot on the hindwings.

Abdomen: 27-33mm. **Wing:** 34-35mm.

Habitat: Scrub jungle areas next to tanks, ponds, marshes, channels and lagoons in the lowlands and lower montane regions. Common.

20. Crimson Marsh Glider (*Trithemis aurora*)

Male: Bright pinkish-red abdomen to end of anal appendages, wings with red veins and brown basal areas characterise the males of this beautiful species.

Female: Greatly differs from the male in olivaceous thorax with similar black stripes, ochreous-black abdomen and paler golden spot on the bases of the wings. Similar to *S. fonscolombeii* female

which doesn't have the dark amber patch in the wings.

Abdomen: 21-29mm. **Wing:** 24-31mm.

Habitat: Weedy tanks and ponds, marshes, channels and slow flowing streams and rivers in the lowlands and mid-hills. Very common.

21. Scarlet Basker (*Urothemis signata*)

Male: Large dark brown patches on the hindwings will help to distinguish this beautiful red bodied dragonfly from other red coloured species, similar to Eastern Scarlet Darter, Red Skimmer or Spine-legged Reedling.

Female: Attractive pattern with dark brown or olive green mixed with black on back of abdomen and slightly different blackish-brown spot on the wings will help identify this female.

Abdomen: 26-27mm. **Wing:** 35mm.

Habitat: Weedy tanks, channels and slow streams in the lowlands and mid hill areas. Very common.

5.4.3. DAMSELFLIES

Table: 5.3 Systematic List of Damselflies in the Campus

Sl. No.	Scientific Name	Common Name
1.	<i>Ceriagrion cerinorubellum</i>	Orange-tailed Marsh Dart
2.	<i>Pseudagrion microcephalum</i>	Blue Grass Dartlet
3.	<i>Pseudagrion rubriceps</i>	Saffron-faced Blue Dart
4.	<i>Copera marginipes</i>	Yellow Bush Dart
5.	<i>Vestalis gracilis</i>	Clear-winged Forest Glory

Dragonflies : Family : Libellulidae



***Brachythemis contaminata* (Male)**



Hydrobasileus croceus



***Acisoma panorpoides* (Male)**



***Tholymis tillarga* (Male)**



***Aethariamanta bravipennis* (Male)**



***Aethariamanta bravipennis* (Female)**



***Orthetrum luzonicum* (Male)**



***Orthetrum luzonicum* (Female)**



***Tramea limbata* (Male)**



***Diplacodes trivialis* (Female)**



***Neurothemis tulia* (Male)**



***Neurothemis tulia* (Female)**



***Crocothemis servilia* (Female)**



***Crocothemis servilia* (Male)**



***Potamarcha congener* (Male)**



***Rhyothemis veriegata* (Male)**



***Neurothemis fulvia* (Male)**



***Neurothemis fulvia* (Female)**



***Orthetrum chrysis* (Male)**



***Lathrecista asiatica* (Male)**



***Urothemis signata* (Male)**



***Urothemis signata* (Female)**



***Brachydiplax sobrina* (Male)**



Rhodothemis rufa



***Trithemis aurora* (Male)**



***Trithemis aurora* (Female)**



Bradinopyga geminata



Orthetrum sabina



***Gynacantha dravida* (Male)**
Family - Aeshinidae



***Ictinogomphus rapax* (Male)**
Family - Gomphidae

5.4.4. BIRDS

In the present study, a total of 50 species of birds belongs to 12 orders and 26 families have been recorded from the campus (Table-5.4). The order Passeriformes showed the maximum species and family richness (27 species and 7 families). Ali (1969) and Neelakantan *et al.* (1993) reported 475 species in 65 families and 19 orders from Kerala. Thus M.G. University campus accounts for 10.5 percent species, 40 percent families and 63 percent orders of birds of Kerala.

Out of the total species recorded from the campus, seven (14%) are migratory birds (Table-5.5). Nesting of six species (12%) had been observed in the Campus (Table-5.6) during the study.

Migratory birds observed from the campus are mostly winter visitors. Species such as Barn Swallow (*Hirundo rustica*), Paradise Flycatcher (*Terpsiphone paradise*), Golden Oriole (*Oriolus oriolus*), and Indian Pitta (*Pitta brachyuran*), some times migrate to outside of India to Eurasia. An unusual nesting of Chestnut Bittern (*Ixobrychus cinnamomeus*) was observed. The nest was located in a thick growth of ferns in the steep wall of the quarry in the campus. The birds *Psittacula krameri* (Rose-ringed Parakeet), *Glaucidium radiatum* (Jungle Owlet), *Accipiter badius* (Shikra), found in the campus are included in the rare birds list in the book "A Brief Outline of the Biodiversity Conservation Strategy and Action Plan for Kerala, 2003".

Table: 5.4 Systematic List of Birds in the Campus

Sl. No	Scientific Name	Common Name
	Order: Pelecaniformes	
	Family: Phalacrocoracidae	
1	<i>Phalacrocorax niger</i>	Little Cormorant
	Order: Ciconiformes	
	Family: Ardeidae	
2	<i>Ardeola grayii</i>	Indian Pond Heron
3	<i>Bubulcus ibis</i>	Cattle Egret
4	<i>Egretta garzetta</i>	Little Egret
5	<i>Mesophoyx intermedia</i>	Median Egret
6	<i>Ixobrychus cinnamomeus</i>	Chestnut Bittern
	Order: Accipitriformes	
	Family: Accipitridae	
7	<i>Spilornis cheela</i>	Crested serpent eagle
8	<i>Accipiter badius</i>	Shikra
	Order: Gruiformes	
	Family: Rallidae	
9	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen
	Order: Columbiformes	
	Family: Columbidae	
10	<i>Treron pompadora</i>	Greyfronted Green Pigeon
11	<i>Columbia livia</i>	Blue Rock Pigeon
	Order: Psittaciformes	
	Family: Psittacidae	
12	<i>Psittacula krameri</i>	Rose-ringed Parakeet
	Order: Cuculiformes	
	Family: Cuculidae	
13	<i>Cuculus varius</i>	Common Hawk-cuckoo
14	<i>Eudynamys scolopacea</i>	Asian Koel
15	<i>Centropus sinensis</i>	Greater Coucal

	Order:Strigiformes	
	Family: Strigidae	
16	<i>Glaucidium radiatum</i>	Malabar Jungle Owlet
	Order: Apodiformes	
	Family: Apodidae	
17	<i>Cypsiurus parvus</i>	Palm Swift
	Order:Coraciiformes	
	Family: Alcedinidae	
18	<i>Halycon smyrnensis</i>	White-breasted Kingfisher
	Family:Meropidae	
19	<i>Merops orientalis</i>	Small Green Bee-eater
20	<i>Merops philippinus</i>	Blue-Tailed Bee-eater
	Order: Piciformes	
	Family: Capitonidae	
21	<i>Megalaima viridis</i>	Small Green Barbet
	Family: Picidae	
22	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker
	Order: Passeriformes	
	Family: Pittidae	
23	<i>Pitta brachyuran</i>	Indian Pitta
	Family: Hirundinidae	
24	<i>Hirundo rustica</i>	Barn Swallow
25	<i>Hirundo daurica</i>	Redrumped Swallow
	Family: Oriolidae	
26	<i>Oriolus oriolus</i>	Golden Oriole
27	<i>Oriolus xanthornus</i>	Black-Headed Oriole
	Family: Dicruridae	
28	<i>Dicrurus macrocercus</i>	Black Drongo
29	<i>Dicrurus paradiseus</i>	Large Racket-tailed Drongo

	Family: Sturinidae	
30	<i>Acridotheres tristis</i>	Common Myna
	Family: Corvidae	
31	<i>Dendrocitta vagabunda</i>	Rufous Tree Pie
32	<i>Corvus macrorhychos</i>	Indian Jungle Crow
33	<i>Corvus splendens</i>	Indian House Crow
	Family: Irenidae	
34	<i>Aegithina tiphia</i>	Common Iora
	Family: Pycnonotidae	
35	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul
36	<i>Pycnonotus cafer</i>	Red Vented Bulbul
	Family: Muscicapidae	
	Subfamily: Timaliinae	
37	<i>Turdoides striatus</i>	Jungle Babbler
	Subfamily: Monarchinae	
38	<i>Terpsiphone paradisi</i>	Paradise Flycatcher
	Subfamily: Sylvinae	
39	<i>Prinia hodgsonii</i>	Greybreasted Prinia
40	<i>Orthotomus sutorius</i>	Tailor Bird
41	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler
42	<i>Phylloscopus trochiloides</i>	Greenish Leaf Warbler
43	<i>Copsychus saularis</i>	Southern Magpie-Robin
44	<i>Zoothera citrine</i>	Orange-headed Ground Thrush
	Family: Motacillidae	
45	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail
	Family: Dicaeidae	
46	<i>Dicaeum erythrorhynchos</i>	Tickell's Flowerpecker
	Family: Nectariniidae	
47	<i>Nectarinia zeylanica</i>	Purple-rumped Sunbird
48	<i>Nectarinia lotenia</i>	Loten's Sunbird
49	<i>Nectarinia asiatica</i>	Indian Purple Sunbird
	Sub Family: Estrinae	
50	<i>Lonchura striata</i>	White rumped Munia

Table: 5.5 List of Migratory Bird Species Identified

Sl. No.	Scientific Name	Common Name	Family
1.	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Meropidae
2.	<i>Pitta brachyuran</i>	Indian Pitta	Pittidae
3.	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae
4.	<i>Oriolus oriolus</i>	Golden Oriole	Oriolidae
5.	<i>Terpsiphone paradise</i>	Paradise Flycatcher	Monarchinae
6.	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler	Muscicapidae
7.	<i>Phylloscopus trochiloides</i>	Greenish Leaf Warbler	Muscicapidae

GENERAL CHARACTERISTICS OF BIRDS IDENTIFIED

Order: Pelecaniformes

Family: Phalacrocoracidae (Cormorants and Darters)

1. Little Cormorant (*Phalacrocorax niger*)

A glistening black duck-like water bird with a longish stiff tail and slender compressed bill sharply hooked at the tip. A small white patch on throat, and suggestion of a nuchal crest. Both the sexes are alike. An expert diver and under water swimmer. Seen sitting upright on a favorite river side perch, with outstretched wings. Oily wings get water-logged after prolonged immersion in water, and the wings are thus dried before the next dive.

Status: Common

Order: Ciconiformes

Family: Ardeidae (Herons, Egrets and Bitterns)

2. Indian Pond Heron (*Ardeola grayii*)

An egret-like marsh bird, largely snow-white but effectively obliterated while at rest by a camouflaging earthy brown mantle. In flight the glistening white wings, tail rump, and under parts

flash into prominence. In the breeding season a bunch of filamentous maroon hair-like plumes covers the back, and a long white occipital crest adorns the head. Sexes alike. It is seen hunched at the edge of every possible water body, ready to strike at a suitable prey when it comes in the range. Moves slowly in search of a quarry.

Status: Common

3. Cattle Egret (*Bubulcus ibis*)

Snow-white overall, very similar to the Little Egret, with which it may sometimes be confused. But the colour of its bill yellow (instead of black) always diagnostic. In the breeding season the head, neck and back turn a distinctive golden, orange buff. Sexes alike. Often seen attending grazing cattle, riding on their backs, pecking ticks, or catching insects that are disturbed as the cattle graze in pastures.

Status: Common

4. Little Egret (*Egretta garzetta*)

The Little Egret is a white bird with long black legs, yellow feet and a slim black bill. It has long black legs with yellow feet and a slim black bill. In the breeding season, the adult has two long nape plumes and gauzy plumes on the back and breast. The bare skin between the bill and eyes becomes red or blue. Juveniles are similar to non-breeding adults but have duller legs and feet. Little Egrets are mostly silent but make various croaking and bubbling calls at their breeding colonies and produce a harsh alarm call when disturbed. Its food consists of fish, frogs, crustaceans, water insects, etc.

Status: Resident

5. Chestnut Bittern (*Ixobrychus cinnamomeus*)

Chestnut wings, upper parts white centrally striped throat. Upper breast chestnut and black; rest of under parts pale chestnut. Female duller, with buffy-rufous underparts streaked with dark brown. Solitary, among reeds and brushwood on marshes.

Status: Resident, subject to local movements dependent on water conditions; possibly also migratory to some extent.

Order: Falconiformes

Family: Accipitridae (Hawks and Vultures)

6. Crested Serpent Eagle (*Spilornis cheela*)

The Crested Serpent Eagle is a medium-sized raptor at about 55-75cm in length. Adults have dark brown upperparts and head, and have a hooded appearance at rest. The underparts and underwing coverts are pale brown. The tail and underside of the flight feathers are black with broad white bars. When perched, they appear large headed and owl-like due to the shape of the face and positioning of the eyes. The call is a distinctive *Kluee-wip-wip* with the first note being high and rising. They call a lot in the late mornings from perches or as they rise on the thermals in the mornings. Sexes are visually similar, but young birds have a whitish head, underparts and underwing, the latter showing darker barring. It is a specialist reptile eater, which mainly hunts snakes and lizards.

7. Shikra (*Accipiter badius*)

The bird is a small raptor (26-30cm) with short broad wings and a long tail, both adaptations to fast maneuvering. The adult Shikra has pale grey upperparts, and is white, finely barred reddish below. Sexes are similar except that female is larger than the male. The juvenile is brown above and white, spotted with brown below. It has a barred tail. The normal flight of this

species is a characteristic ‘flap-flap-glide’. Its hunting technique is similar to other small hawks, relying on surprise as it flies from a hidden perch or flicks over a bush to catch its prey unaware. The normal call notes are harsh and challenging, not unlike that of the Black Drongo.

Status: Resident. Common

Order: Gruiformes

Family: Rallidae (Rails, Coots)

8. White-breasted Waterhen (*Amaurornis phoenicurus*)

A slaty grey, stub-tailed, skulking marsh bird with prominent white face, supercilia, throat, breast, and middle of abdomen, and rusty red under the tail. Sexes alike. The absurd little stub tail, carried erect or cocked, is constantly twitched up, flashing the chestnut underneath into prominence. The calls, uttered from within a bush, begin with amazingly loud hoarse croaks and chuckles and settle down to a monotonous, metallic *krr-kwak-kwak-krr-kwak-kwak*, etc., or *kook-kook-kook*. Its food consists of insects, worms, molluscs, grain and shoots of paddy and marsh plants.

Status: Resident. Fairly common.

Order: Columbiformes

Family: Columbidae (Pigeons and Doves)

9. Greyfronted Green Pigeon (*Treron pompadora*)

A small green pigeon with the upperparts largely purplish chestnut-maroon in the male. Shoulder of wing (median and greater coverts) black. Crown and nape grey. Lower parts greenish yellow; upper breast faintly tinged with orange or pink. Under tail-coverts cinnamon. A broad yellow band on closed wing contrasting with black flight feathers. Female lacks the chestnut on the mantle which is olive-green, and has the shoulder of wing less black and mixed with grey. Lives in flocks and visits fruiting trees.

Status: Resident

10. Blue Rock Pigeon (*Columbia livia*)

A familiar slaty grey bird with glistening metallic green, purple and magenta sheen on upper breast and round the neck. Two dark bars on the wings. Both sexes are alike. Aggressive and selfish when feeding. It is well adapted to urban life. The call notes are the familiar *gootr-goo, gootr-goo, etc.*, uttered with head lowered and bobbing and throat puffed out, the bird turning round and round the while.

Status: Resident, Common

Order: Psittaciformes

Family: Psittacidae (Parrots)

11. Rose-ringed Parakeet (*Psittacula krameri*)

A slim grass-green parakeet with the typical short, heavy, deeply hooked red bill. The male has a rose-pink and black collar; female without. Flies with agility and swiftness, hurtling through the air, between trees and houses. Perches on narrow ledges on vertical surfaces with the tail as a strut, often upside down. Highly destructive to fruit groves and crop. Their well known loud, sharp screaming calls *keek-keea-keek*, etc. are uttered on the wing and at rest. It can recite words taught to it.

Status: Common.

12. Common Hawk-cuckoo (*Cuculus varius*)

The Common Hawk-cuckoo also popularly called the Brainfever bird is a medium sized cuckoo. It is called a Hawk-cuckoo because of its resemblance to the Shikra hawk. Appearance: Ashy grey above; whitish below, cross-banded with brown. Broadly banded tail. Sexes alike. When flying into trees, they resemble sparrowhawks (Shikra) and upon landing on the perch they shake their tails from side to side. During summer

months, the call is easily detected by its repeated calls : a loud, screaming *dee dee dit*, repeated with monotonous persistency 5 or 6 times, rising in crescendo and ending abruptly. Diet chiefly insectivorous and consists largely of caterpillars.

Status: Resident but subject to local migration.

Order: Cuculiformes

Family: Cuculidae (Cuckoos)

13. Asian Koel (*Eudynamys scolopacea*)

Male glistening black with yellowish green bill and crimson eyes. Female brown, profusely spotted and barred with white. Male sings *kuoo-kuoo-kuoo*, in crescendo. Female-harsh Kik. During the breeding season the male becomes extremely noisy. The *kuoo* calls begin low but rise in scale with each successive repetition until at the 7th or 8th they reach feverish pitch and then break off abruptly. Causes damages to orchards by partially eating fruits.

Status: Resident.

14. Greater Coucal (*Centropus sinensis*)

A clumsy, glossy black bird with conspicuous chestnut wings and long, broad, black, graduated tail. Adults have a red iris, while the immature birds have a black iris. Both sexes are alike. Singly or in pairs, stalking along the ground in undergrowth. A poor flier, but as often seen in trees as on the ground. Clambers about and hops from branch to branch with great agility, hunting for food, which consists chiefly of caterpillars, large insects and lizards. It also eats birds' eggs, nestlings young mice, etc. The call is a deep, resonant *coop-coop-coop-coop*, in series of 6 or 7 (sometimes 20 or more, repeated quickly but varying in tempo. No sooner does one bird begin to call than another in the distance in a sort of uneven duet joins him.

Status: Resident. Common.

Order: Strigiformes

Family: Strigidae (Owls)

15. Malabar Jungle Owlet (*Glaucidium radiatum*)

A small dark reddish brown owl, finely barred above and on upper breast and flanks with blackish, chestnut and white. Abdomen white. Both sexes look alike. Most active after dusk and early morning before sunrise, but also freely on the move during daytime. The bird gives itself away by flying off fussily from its perch on the approach of an observer. It settles high up on another tree a short distance away, sitting upright and motionless, looking remarkably like a snag of the branch, with its head screwed round to stare at the intruder. The call is a loud, pleasant *kao-kao-kao-kuk-kuk*, etc., the refrain repeated 4 or 5 times getting faster in tempo and fainter, and ending abruptly. Another familiar call is a bubbling, continuous *woioioioioi-keek*, the final screech being in a much higher key. Their diet is mainly insectivorous.

Status: Resident. Common.

Order: Apodiformes

Family: Apodidae (swifts)

16. Palm Swift (*Cypsiurus parvus*)

A slim, plain, sooty, grey bird, with thin, deeply forked pointed tail. In flight, the long narrow wings look like a miniature bow with the slender body set in for an arrow. Both sexes are alike. Flying about gregariously over open country wherever palms occur. A shrill, joyous triple call-note *ti-ti-tee* constantly uttered.

Status: Resident

Order: Coraciiformes

Family: Alcedinidae (Kingfishers)

17. White-breasted Kingfisher (*Halycon smyrnensis*)

A brilliantly coloured turquoise-blue kingfisher with deep chocolate-brown head, neck and lower underparts. Chin, throat and center of breast white, forming a conspicuous 'shirt-front'. Long, heavy, pointed red bill. A white wing-patch prominent in flight. Both the sexes are alike. Singly, in cultivated and woody country, both near and away from water. In addition, to fish and frogs, a considerable proportion of its food consists of lizards, grasshoppers and other insects procured on dry land. Its call or 'song' is a loud, not unmusical, chattering scream delivered from the top of some tall tree or other exposed perch chiefly in the early morning. Besides this, a loud cackling call is usually uttered in flight.

Status: Resident

Family: Meropidae (Bee-eaters)

18. Small Green Bee-eater (*Merops orientalis*)

A slender bright green bird tinged with golden rusty on head, hindneck and upper black. Chin, cheeks and throat verditer blue bordered by a black gorget. Central pairs of tail-feathers prolonged into blunt pins. Slender, long slightly curved blackish bill. Both sexes are alike. Pairs or parties, on telegraph wires, stakes or bush-tops in open country. Flight is an aerobatic sally on outstretched wings. Captures apparently invisible bees from the air, in its curved beak, comes to a favorite perch, batters the bee and then devours it. Call is a pleasant tit, tit, tit, tree, tree, tee given from a perch, after a good catch.

Status: Resident, but subject to local migratory movements.

19. Blue-Tailed Bee-eater (*Merops philippinus*)

Distinguished from Common Green Bee-eater by its large

size, blue rump and tail including the central pin-feathers, black stripe through the eyes, and deep chestnut throat and breast. Sexes alike. Seen in small flocks. Subject to marked seasonal local migration. Its flight is swifter and the swoops after winged insects are more graceful. The call-notes, *te-tew? te-tew?* are deeper and easily distinguishable. .

Status: Migratory

Order: Piciformes

Family: Capitonidae

20. Small Green Barbet (*Megalaima viridis*)

A dumpy grass-green bird distinguished by its dark brown crown and nape with a blackish band running backward from the eye, the short white supercilium, and the broad white line from the lores through the ear-coverts. Chin and throat whitish. Breast whitish, streaked with brown. Abdomen and vent pale green. Small naked circumorbital patch dull coloured and inconspicuous. Both sexes are alike. Arboreal. Feeds in the company of mynas, bulbuls, pigeons, babblers, orioles keeping to the canopy, remaining almost invisible. The call is a loud monotonous at times tiring *Krrr-rr* coming from the canopy followed by a succession of *kutroo, kutroo* incessantly from dawn to dusk. .

Status: Resident. Common.

Family: Picidae (Woodpeckers)

21. Lesser Golden-backed Woodpecker (*Dinopium benghalense*)

In the male crown and occipital crest crimson. Upper plumage chiefly golden yellow and black; underparts buffy white streaked with black and white. The Female has the forecrown black, stippled with white, and only the occipital crest crimson.

Otherwise like the male. Frequently found in close proximity of human habitation, being particularly abundant in the coconut plantations. A harsh laugh *Chi, chi* is given in flight. High frequency drumming *Trr, Drr* is heard as the bird hammers the tree trunk with the beak.

Status: Resident. Common

Order: Passeriformes

Family: Pittidae (Pittas)

22. Indian Pitta (*Pitta brachyura*)

A gaudily coloured, stub-tailed thrush-like bird, green, bright blue, fulvous, black and white with crimson-pink abdomen, vent and under tail-coverts. In flight a round white spot near the tip of the wings is conspicuous. sexes alike. Mainly terrestrial, but roosts in low trees. Hops about on the ground like a thrush, turning over dead leaves and digging into the damp earth with its stout bill for insects and grubs, which composes its food. The stumpy tail is constantly wagged up and down, slowly and deliberately. The call-note most commonly heard is a clear double whistle, *wheet-tew* which is repeated at the rate of 3 or 4 whistles in ten seconds.

Status: Migratory

Family: Hirundinidae (Swallows and Martins)

23. Barn Swallow (*Hirundo rustica*)

Glossy steel blue above, white or pale pinkish white below. Forehead, chin and throat chestnut, the last bordered with a blue-black pectoral or breast band, usually broken in the middle. Typical deeply forked swallow tail. The female is similar to the male, but the tail streamers are shorter, the blue of the upperparts and breast band is less glossy and the under parts are paler. The juvenile is browner and has a paler rufous face and whiter under parts. It also lacks the long tail streamers of the

adult. Low twitters and chirps are uttered on the wing. Song is uttered by male when breeding.

Status: Winter visitor. Common.

24. Red Rumped Swallow (*Hirundo daurica*)

The Red-rumped Swallow (*Hirundo daurica*) is a small passerine bird in the swallow family. They resemble Barn Swallows, but are darker below and have pale or reddish rumps. Other useful identification features are the pale throat, pale ring around the nape and the black undertail coverts which contrast sharply with the pale belly. Red-rumped Swallows also have fatter more 'pumped-up' bodies which are greatly elongated at the rear end so the tail looks longer, even though the tail prongs of the adults are actually shorter. They are fast fliers and they swoop on insects while airborne. They have broad but pointed wings.

Status: Resident.

Family: Oriolidae (Orioles)

25. Golden Oriole (*Oriolus oriolus*)

Male is a golden yellow, female is dull green. Both have a black eye stripe and wing bands. Entirely arboreal. Keeps to the foliage canopy of trees, but occasionally descends to low bushes such as lantana when in ripe fruit. These birds are noisy. The ordinary call is a harsh *chee-ah* followed as a rule by liquid flute-like whistles sounding something like *pi-lo-lo*. It has a strong and dipping flight.

Status: Migratory

26. Black-Headed Oriole (*Oriolus xanthornus*)

A golden yellow bird with jet black head, throat and upper

breast, and some black in wings and tail. In young birds the head is streaked with yellow; the chin, throat and breast streaked black and white. Sexes alike. Purely arboreal. It has a variety of loud mellow flute-like calls. A harsh nasal *kwak* is commonly uttered. Its food consists of fruits and insects.

Status: Common. Resident.

Family: Dicruridae (Drongos)

27. Black Drongo (*Dicrurus macrocercus*)

A glossy jet black bird with long deeply forked tail. Sexes alike. Commonly seen perched on wires, dead trees, fence-posts and the like, keeping a sharp look-out for insects and pouncing on them on the ground or capturing them in the air. Devours winged insects in midair sallies, often upto late midnight, around halogen street lamps. They have a number of harsh challenging calls, come closely resembling those of the Shikra hawk. Noisy *Chee, titi, chichuk, cheece, cheece*. Musical calls uttered.

Status: Common. Resident.

28. Large Racket-tailed Drongo (*Dicrurus paradiseus*)

A glistening metallic black drongo with a conspicuous backward curving tuft or crest from forehead. Outer tail feathers long, thin and wire-like, ending in twisted spatula-shaped rackets. Sexes alike. It is a noisy bird with a large variety of loud metallic musical calls of its own, besides which it is a perfect mimic of other species.

Status: Resident. Fairly common.

Family: Sturnidae (Starlings & Mynas)

29. Common Myna (*Acridotheres tristis*)

A perky, well-groomed, dark brown bird with black head, neck and upper breast, and bright yellow bill, legs and bare skin round the eyes. A large white patch on the wing conspicuous in flight. Sexes alike. It is a noisy bird with varied calls, squabbles, chatters and even pleasant notes. *Keek, kreek, chirr, chirr* uttered. A typical whirring noise is heard, when the bird takes to wings.

Status: Resident. Common.

Family: Corvidae (Crows, Tree Pies, etc.)

30. Rufous Tree Pie (*Dendrocitta vagabunda*)

A long-tailed, chestnut-brown, arboreal bird with sooty head and neck. Broad black tips to greyish tail and whitish patches on wings particularly conspicuous in flight. Sexes alike. The dipping flight - a noisy flapping alternated with short glides-with the graduated tail outspread, is characteristic. It is a social bird usually seen in pairs or family parties which keep up a loud clattering conversation, *ke-ke-ke-ke-ka-kaa* and so on. They also have a number of pleasing melodious, rather metallic, calls.

Status: Resident. Common

31. Indian Jungle Crow (*Corvus macrorhychos*)

A uniformly gloss, jet-black crow with a heavy bill and deep guttural voice. Sexes alike. Omnivorous. Largely commensal on man and often an unmitigated nuisance. But living on municipal refuse and garbage, it serves as a useful scavenger. Its call is a deep, hoarse croaking kaws, *Kaa, kaa* when alone, with the neck extended and tail moving up and down.

Status: Resident. Common.

32. Indian House Crow (*Corvus splendens*)

Like the Jungle Crow but somewhat smaller; distinguishable also by its dusky grey neck. Sexes alike. Decidedly more urban, more gregarious and more cunning than the Jungle Crow. A commensal of man, omnivorous and a useful scavenger in towns. Has community roosts to which large number gather from considerable distance each night.

Status: Resident. Common.

Family: Irenidae (Iora, Leaf Birds etc.)

33. Common Iora (*Aegithina tiphia*)

A glossy jet black and golden yellow tit-like bird with two white bars across the wing. Female yellowish green throughout, with greenish brown wings and a broad white bar across the shoulder. In non-breeding plumage the male resembles the females, but retains the black tail. In the female this is yellowish-green. Usually seen in pairs which hunt for caterpillars and insects among the foliage, hopping from twig to twig and frequently clinging sideways or upside down to peer under leaves. Sweet musical whistles Pheeu, whee, whee and chirruping notes are uttered more so on cloudy days.

Status: Resident. Common.

Family: Pycnonotidae (Bulbuls)

34. Red-whiskered Bulbul (*Pycnonotus jocosus*)

Readily distinguished from the Redvented Bulbul by the narrow, pointed upstanding and forwardly curved black crest, and white underparts. The broad black band across the breast, and the crimson 'whiskers' and undertail patch are other diagnostic features. Both the sexes are alike. Accomplished songster. Sings

an array of melodious notes when breeding. A rollicking *pett-grew* is the commonest call.

Status: Resident.

35. Red Vented Bulbul (*Pycnonotus cafer*)

A perky smoke-brown bird with partially crested black head, scale-like markings on breast and back, and a conspicuous crimson patch under the tail which is tipped white. White rump particularly noticeable in flight. Sexes alike. The food consists chiefly of fruits and berries. Insects and flower nectar also figure largely in their diet. The species has a number of pretty and joyous calls. Well known song *Pit, wit, wit, peep, peep*.

Status: Resident

Family: Muscicapidae

Sub-Family: Timaliinae (Babblers)

36. Jungle Babbler (*Turdoides striata*)

This bird is grey brown below, with some mottling on the throat and breast. The upperparts are a slightly darker shade. The head is grey, and the bill is yellow. They are poor fliers. The Jungle Babbler lives in flocks of seven to ten or more, hence the name 'seven sisters'. It is a noisy bird, and the presence of a flock may generally be known at some distance by the harsh mewing calls, continual chattering, squeaking and chirping produced by its members. The birds keep up a harsh conversational *ke-ke-ke* as they move about. It feeds mainly on insects, but also eats nectar and berries.

Status: Resident. Common

Sub-Family: Monarchinae (Monarch Flycatchers)

37. Paradise Flycatcher (*Terpsiphone paradisi*)

The adult male is silvery white with two streamers or ribbon in tail, and crested metallic black head. Female and young male

chestnut, young male with streamers; female without. The aerial sallies of the male, with tail ribbons undulating gracefully is a sight not easily forgotten. The notes commonly uttered are a harsh and grating *che-chwe*. During the breeding season these are supplemented by a number of pleasanter and more musical calls.

Status: Winter visitor.

Sub-family: Sylviinae (Warblers)

38. Greybreasted Prinia (*Prinia hodgsonii*)

The Grey-breasted Prinia is a small warbler. It is typically found in open woodland, scrub jungle, and other open areas with some grass. They have short rounded wings, a longish tail, strong legs and a short black bill. In breeding plumage, adults are grey-brown above, with no supercilium, a black eye stripe and orange eyering. They have a rufous wing panel. Grey-breasted Prinia's underparts are white with a grey breast band. The sexes are identical. Non-breeding birds have browner upperpart plumage and a white supercilium, but lack the breast band. Young birds are like non-breeding adults but more rufous above. Like most warblers, Grey-breasted Prinia is insectivorous. The song is a repetitive *chiwee-chiwee-chiwee-chip-chip-chip*.

Status: Resident. Common.

39. Tailor Bird (*Orthotomus sutorius*)

A small yellowish olive-green bird with whitish underparts, a rust-coloured crown, and long pointed middle feathers of the tail, which is habitually carried cocked. Bill long, straight and thin, and comparatively long legs. The female is similar, but lacks the elongated feathers in the tail. Seen singly or in pairs in shrubbery. Restless and confiding. It has loud cheerful calls, *towit-towit* or *pretty-pretty-pretty* seemingly out of all proportions of its size.

Status: Resident. Common.

40. Blyth's Reed Warbler (*Acrocephalus dumetorum*)

A smaller replica of the Indian Great Reed Warbler, olive-brown above, fulvous or buffy white below, with a whitish supercilium and dusky lores. Sexes alike. Seen singly in bushes and undergrowths, hopping about and creeping through the stems and twigs in search of insects which constitute its diet. Usually utters a *tschuk-tschuk* call that indicates its presence.

Status: Migratory

41. Greenish Leaf Warbler (*Phylloscopus trochiloides*)

This is a typical leaf-warbler in appearance, greyish-green above and off-white below. Its single wing bar distinguishes it from most similar species, except Arctic Warbler, *Phylloscopus borealis*. It is slightly smaller than that species and has a thinner bill, without a dark tip to the lower mandible. Its song is a high jerky trill.

Status: Migratory.

42. Southern Magpie-Robin (*Copsychus saularis*)

A handsome robin-like bird, black above, white below from breast down. A white patch on the wings and the white outer tail-feathers are conspicuous. Tail usually carried cocked up and jerked and flicked open from time to time. In the female the black portions are slightly browner or greyer. Singly or in pairs, about human habitation. In colouration may be confused with the Large Pied Wagtail but the latter has a prominent white eyebrow, its typical habitat is different, and it does not carry its tail cocked. A monotonous *Swee, swee-ee, churr*, in the non-breeding season. Pleasant song uttered during breeding. Mimics bird songs.

Status: Resident.

Sub-Family: Turdinae

43. Orange-headed Ground Thrush (*Zoothera citrina*)

Male head, nape and underparts orange-chestnut, vent and undertail-coverts white. Rest of upperparts bluish grey; a white wing bar; outer rectrices lightly tipped white. Female like male but mantle strongly tinged with olive-brown. This bird is very shy, but often comes out if undisturbed. Feeds on the ground among fallen leaves and rubbish for insects. When disturbed flies up into bush or tree where it sits silent and motionless. Mimics calls of bulbul, tailor bird, babbler. Alarm calls, songs and whistles are given.

Status: Migratory, not uncommon in the foot-hills of Kerala.

Family: Motacillidae (Pipits and Wagtails)

44. Large Pied Wagtail (*Motacilla maderaspatensis*)

A large typical wagtail, black above, white below. Head, chin, throat and breast black. A broad white supercilium. Black and white wings and tail. Pattern of colouration very like that of the Magpie-Robin, but the presence of the white supercilium is diagnostic. In the female the black portions are sometimes duller and browner. Singly or in pairs, at rocky streams. Usually met by placid rocky streams, irrigation tanks, pools etc. Wags the tail as it runs, stops and then moves again. Harsh alarm calls are given.

Status: Resident. Fairly common.

Family: Dicaeidae (Flowerpeckers)

45. Tickell's Flowerpecker (*Dicaeum erythrorhynchos*)

A restless, plain-looking olive brown bird with greyish white underparts, with short, slender, slightly curved flesh-coloured bill. Sexes alike. This is the smallest member of Indian avian world. Its food consists chiefly of the berries of the tree parasites *Loranthus* and *viscum*, and this species, along with other

flowerpeckers, is largely responsible for the dispersal of their seeds. In flight, as well as while hopping restlessly amongst the *Loranthus* clumps, it utters an almost incessant sharp *chick-chick-chick*. This is occasionally varied by a series of twittering notes in the nature of a song.

Status: common.

Family: Nectariniidae (Sunbirds)

46. Indian Purple-rumped Sunbird (*Nectarinia zeoylonica*)

Head, upperparts, chin, throat and breast mostly metallic green, crimson and purple. Underparts from breast down bright yellow. A band of dull crimson and then one of black across the breast. Female brown to olive-brown above; bright yellow with chin and throat greyish-white. No eclipse plumage in male. It is very fond of the nectar of flowers. The song of the male uttered while he pivots from side to side on his perch and excitedly opens and closes his wings and tail, is *tityou, tityou, tityou, trr-r-r-tit, tityou, tityou, tityou, etc.*

Status: Resident. Common.

47. Loten's Sunbird (*Nectarinia lotenia*)

Male: Above-black with glistening metallic green and purple sheen. Below-chin, throat and sides of breast metallic green and purple; a maroon-coloured band across breast; mixed yellow and scarlet tufts of feathers at the 'armpits'; rest of underparts dull sooty brown. Long slender curved bill. Tail short and rounded. Female: brown to olive-brown above; pale dull yellow below, brightest on abdomen. Tail blackish brown, narrowly tipped with white on lateral feathers. Singly or in pairs, in wooded country on flowering shrubs. A sharp metallic *chit, chit*, is commonly uttered.

Status: Resident. Fairly common.

48. Indian Purple Sunbird (*Nectarinia asiatica*)

Male in breeding plumage glossy jet black all over with glistening metallic purple sheen above; violet-blue and purple sheen below. Slender curved bill short rounded tail and bright yellow-and-scarlet feather tufts in the 'armpits'. Distinguished from Loten's Sunbird by absence of maroon breast-band, and by glossy purple-black underparts instead of dull sooty brown. Female very like that of Loten's Sunbird-brown to olive brown above, pale dull yellow below-but with narrower white tips to the lateral tail-feathers. Male in non-breeding plumage like female but with blacker wings and tail and a broad black streak running down middle of yellow throat and breast. A *Wich, wich, chip, chip* call is uttered monotonously.

Status: Resident. Common.

Family: Ploceidae

Subfamily: Estrinae (Munias)

49. White Rumped Munia (*Lonchura striata*)

A small black and white finch with heavy bluish conical bill and wedge-shaped pointed tail. Head, throat and breast deep black. Upperparts chocolate-brown finely streaked with white. Wings and tail blackish-chocolate. Lower breast and abdomen and a broad band across rump white. Sexes alike. Flocks, about cultivation and in forest clearings.

Status: Resident.

Table: 5.1 Systematic List of Butterflies in Mahatma Gandhi University Campus

Sl. No.	1. Scientific Name	Common Name	Status
PAPILIONIDAE			
1.	<i>Troides minos</i>	Southern Birdwing	MC
2.	<i>Pachliopta aristolochiae</i>	Common Rose	C
3.	<i>Pachliopta hector</i>	Crimson Rose	MC
4.	<i>Graphium sarpedon</i>	Common Blue Bottle	LC
5.	<i>Graphium agamemnon</i>	Tailed Jay	MC
6.	<i>Papilio clytia</i>	Common Mime	LC
7.	<i>Papilio demoleus</i>	Lime Butterfly	LC
8.	<i>Papilio polytes</i>	Common Mormon	C
9.	<i>Papilio polymnestor</i>	Blue Mormon	MC
10.	<i>Papilio paris</i>	Paris Peacock	R
11.	<i>Pachliopta pandiyana</i>	Malabar Rose	R
PIERIDAE			
12.	<i>Catopsilia pomona</i>	Common Emigrant	C
13.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	C
14.	<i>Eurema hecabe</i>	Common Grass Yellow	C
15.	<i>Delias eucharis</i>	Common Jezebel	LC
16.	<i>Leptosia nina</i>	Psyche	C
17.	<i>Appias lyncida</i>	Chocolate Albatross	R
18.	<i>Hebomoia glaucippe</i>	Giant Orange Tip	R
NYMPHALIDAE			
19.	<i>Melanitis leda</i>	Common Evening Brown	LC
20.	<i>Elymnias hypermnestra</i>	Common Palmfly	C
21.	<i>Lethe europa</i>	Bamboo Treebrown	LC
22.	<i>Mycalesis perseus</i>	Common Bushbrown	C
23.	<i>Orsotrioena medus</i>	Nigger	MC
24.	<i>Ypthima huebneri</i>	Common Furring	C
25.	<i>Ypthima baldus</i>	Common Fivering	MC
26.	<i>Polyura athamas</i>	Common Nawab	LC
27.	<i>Acraea violae</i>	Tawny Coster	LC

28.	<i>Cupha erymanthis</i>	Southern Rustic	MC
29.	<i>Cirrochora thais</i>	Tamil Yeoman	MC
30.	<i>Neptis hylas</i>	Common Sailor	C
31.	<i>Pantoporia hordonia</i>	Common Lascar	LC
32.	<i>Moduza procris</i>	Commander	LC
33.	<i>Parthenos sylvia</i>	Clipper	LC
34.	<i>Tanaecia lepidea</i>	Grey Count	C
35.	<i>Euthlia aconthea</i>	Common Baron	LC
36.	<i>Ariadne merione</i>	Common caster	LC
37.	<i>Ariadne ariadne</i>	Angled Caster	LC
38.	<i>Junonia lemonias</i>	Lemon Pansy	MC
39.	<i>Junonia atlites</i>	Gray Pansy	MC
40.	<i>Junonia iphita</i>	Chocolate Pansy	C
41.	<i>Junonia almana</i>	Peacock Pansy	R
42.	<i>Cynthia cardui</i>	Painted Lady	R
43.	<i>Hypolimnas bolina</i>	Great Eggfly	MC
44.	<i>Hypolimnas misippus</i>	Danaid Eggfly	LC
45.	<i>Parantica aglea</i>	Glassy Blue Tiger	C
46.	<i>Tirumala limniace</i>	Blue Tiger	C
47.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	MC
48.	<i>Danaus chrysippus</i>	Plain or Common Tiger	MC
49.	<i>Danaus genutia</i>	Stripped Tiger	LC
50.	<i>Euploea core</i>	Common Crow	C
51.	<i>Phalanta phalantha</i>	Common Leopard	LC
LYCAENIDAE			
52.	<i>Spalgis epius</i>	Ape Fly	R
53.	<i>Castalius rosimon</i>	Common Pierrot	C
54.	<i>Discolampa ethion</i>	Banded Blue Pierrot	MC
55.	<i>Neopithecops zalmora</i>	Quaker	LC
56.	<i>Jamides celeno</i>	Common Cerulean	C
57.	<i>Talicauda nyseus</i>	Red Pierrot	MC
58.	<i>Loxura atymnus</i>	Yamfly	LC
59.	<i>Rathinda amor</i>	Monkey Puzzle	LC
60.	<i>Rapala manea</i>	Slate Flash	LC
61.	<i>Spindasis vulcanus</i>	Common Silverline	R
62.	<i>Abisara echerius</i>	Plum Judy	R

63.	<i>Zesius chrysomallus</i>	Red Spot	R
64.	<i>Curetis thetis</i>	Indian Sunbeam	R
65.	<i>Zizina otis</i>	Lesser Grass Blue	LC
66.	<i>Prosotas nora</i>	Common Line Blue	LC

HESPERIIDAE

67.	<i>Celaenorrhinus leucocera</i>	Common Spotted Flat	LC
68.	<i>Tagiades gana</i>	Suffused Snow Flat	LC
69.	<i>Tagiades litigiosa</i>	Water Snow Flat	MC
70.	<i>Pseudocoladenia indrani</i>	Tricolour Pied Flat	R
71.	<i>Sarangesa dasahara</i>	Common Small Flat	LC
72.	<i>Iambrix salsala</i>	Chestnut Bob	MC
73.	<i>Udaspus folus</i>	Grass Demon	LC
74.	<i>Suastus gremius</i>	Indian Palm Bob	LC
75.	<i>Gangara thyrasis</i>	Giant Red eye	R
76.	<i>Matapa aria</i>	Common Redeye	LC
77.	<i>Barbo cinnara</i>	Rice Swift	C
78.	<i>Sipalia galba</i>	Indian Skipper	LC
79.	<i>Notocrypta curvifascia</i>	Restricted Demon	R
80.	<i>Taractrocera maevius</i>	Common Grass Dart	MC
81.	<i>Taractrocera ceramas</i>	Tamil Grass Dart	LC
82.	<i>Telicota ancilla</i>	Dark Palm Dart	MC
83.	<i>Aeromachus pygmaeus</i>	Pygmy Scrub Hopper	LC
84.	<i>Oriens goloides</i>	Indian Dartlet	R
85.	<i>Halpe homolea</i>	Indian Ace	R
86.	<i>Polytremis lubricans</i>	Contiguous Swift	R

C	Common
MC	Moderately Common
LC	Less Common
R	Rare

Table: 5.2 Systematic List of Dragonflies in the Campus

Sl.No.	Scientific Name	Common Name
	Gomphidae	
1.	<i>Ictinogomphus rapax</i>	Common Clubtail
	Aeshnidae	
2.	<i>Gynacantha dravida</i>	Brown Darner
	Lebellulidae	
3.	<i>Acisoma panorpoides</i>	Trumpet Tail
4.	<i>Aethriamantha brevipennis</i>	Scarlet Marsh Hawk
5.	<i>Brachydiplax sobrina</i>	Sombre Lieutenant
6.	<i>Brachythemis contaminata</i>	Ditch Jewel
7.	<i>Bradinophyga geminata</i>	Granite Ghost
8.	<i>Crocothemis servilia</i>	Ruddy Marsh Skimmer
9.	<i>Diplocodes trivialis</i>	Ground Skimmer
10.	<i>Lathrecista asiatica</i>	Asiatic Blood Tail
11.	<i>Neurothemis fulvia</i>	Fulvous Forest Skimmer
12.	<i>Neurothemis tullia</i>	Pied Paddy Skimmer
13.	<i>Orthetrum chrysis</i>	Spine-tufted Skimmer
14.	<i>Orthetrum glaucaum</i>	Blue Marsh Hawk
15.	<i>Orthetrum luzonicum</i>	Marsh Skimmer
16.	<i>Orthetrum sabina</i>	Green Marsh Hawk
17.	<i>Potamarcha congener</i>	Yellow-tailed Ashy Skimmer
18.	<i>Rhodothemis rufa</i>	Spine-legged Redbolt
19.	<i>Rhyothemis veriegata</i>	Common Picture Wing
20.	<i>Tholymis tillarga</i>	Foggy-winged Twister
21.	<i>Trithemis aurora</i>	Crimson Marsh Glider
22.	<i>Urothemis signata</i>	Scarlet Basker
23.	<i>Tramea limbata</i>	Tramea limbata

Table: 5.3 Systematic List of Damselflies in the Campus

Sl. No.	Scientific Name	Common Name
1.	<i>Ceriagrion cerinorubellum</i>	Orange-tailed Marsh Dart
2.	<i>Pseudagrion microcephalum</i>	Blue Grass Dartlet
3.	<i>Pseudagrion rubriceps</i>	Saffron-faced Blue Dart
4.	<i>Copera marginipes</i>	Yellow Bush Dart
5.	<i>Vestalis gracilis</i>	Clear-winged Forest Glory

Table: 5.4 Systematic List of Birds in the Campus

Sl. No	Scientific Name	Common Name
.	Order: Pelecaniformes	
	Family: Phalacrocoracidae	
1	<i>Phalacrocorax niger</i>	Little Cormorant
	Order: Ciconiformes	
	Family: Ardeidae	
2	<i>Ardeola grayii</i>	Indian Pond Heron
3	<i>Bubulcus ibis</i>	Cattle Egret
4	<i>Egretta garzetta</i>	Little Egret
5	<i>Mesophoyx intermedia</i>	Median Egret
6	<i>Ixobrychus cinnamomeus</i>	Chestnut Bittern
	Order: Falconiformes	
	Family: Accipitridae	
7	<i>Milvus migrans</i>	Common Pariah or Black Kite
8	<i>Accipiter badius</i>	Shikra
	Order: Gruiformes	
	Family: Rallidae	
9	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen
	Order: Columbiformes	
	Family: Columbidae	
10	<i>Treron pompadora</i>	Greyfronted Green Pigeon
11	<i>Columbia livia</i>	Blue Rock Pigeon
	Order: Psittaciformes	
	Family: Psittacidae	
12	<i>Psittacula krameri</i>	Rose-ringed Parakeet
	Order: Cuculiformes	
	Family: Cuculidae	
13	<i>Cuculus varius</i>	Common Hawk-cuckoo
14	<i>Eudynamys scolopacea</i>	Asian Koel
15	<i>Centropus sinensis</i>	Greater Coucal

	Order: Strigiformes	
	Family: Strigidae	
16	<i>Glaucidium radiatum</i>	Malabar Jungle Owlet
	Order: Apodiformes	
	Family: Apodidae	
17	<i>Cypsiurus parvus</i>	Palm Swift
	Order: Coraciiformes	
	Family: Alcedinidae	
18	<i>Halycon smyrnensis</i>	White-breasted Kingfisher
	Family: Meropidae	
19	<i>Merops orientalis</i>	Small Green Bee-eater
20	<i>Merops philippinus</i>	Blue-Tailed Bee-eater
	Order: Piciformes	
	Family: Capitonidae	
21	<i>Megalaima viridis</i>	Small Green Barbet
	Family: Picidae	
22	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker
	Order: Passeriformes	
	Family: Pittidae	
23	<i>Pitta brachyuran</i>	Indian Pitta
	Family: Hirundinidae	
24	<i>Hirundo rustica</i>	Barn Swallow
25	<i>Hirundo daurica</i>	Redrumped Swallow
	Family: Oriolidae	
26	<i>Oriolus oriolus</i>	Golden Oriole
27	<i>Oriolus xanthornus</i>	Black-Headed Oriole
	Family: Dicruridae	
28	<i>Dicrurus macrocercus</i>	Black Drongo
29	<i>Dicrurus paradiseus</i>	Large Racket-tailed Drongo

	Family: Sturinidae	
30	<i>Acridotheres tristis</i>	Common Myna
	Family: Corvidae	
31	<i>Dendrocitta vagabunda</i>	Rufous Tree Pie
32	<i>Corvus macrorhychos</i>	Indian Jungle Crow
33	<i>Corvus splendens</i>	Indian House Crow
	Family: Irenidae	
34	<i>Aegithina tiphia</i>	Common Iora
	Family: Pycnonotidae	
35	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul
36	<i>Pycnonotus cafer</i>	Red Vented Bulbul
	Family: Muscicapidae	
	Subfamily: Timaliinae	
37	<i>Turdoides striatus</i>	Jungle Babbler
	Subfamily: Monarchinae	
38	<i>Terpsiphone paradisi</i>	Paradise Flycatcher
	Subfamily: Sylvinae	
39	<i>Prinia hodgsonii</i>	Greybreasted Prinia
40	<i>Orthotomus sutorius</i>	Tailor Bird
41	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler
42	<i>Phylloscopus trochiloides</i>	Greenish Leaf Warbler
43	<i>Copsychus saularis</i>	Southern Magpie-Robin
44	<i>Zoothera citrine</i>	Orange-headed Ground Thrush
	Family: Motacillidae	
45	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail
	Family: Dicaeidae	
46	<i>Dicaeum erythrorhynchos</i>	Tickell's Flowerpecker
	Family: Nectariniidae	
47	<i>Nectarinia zeylanica</i>	Purple-rumped Sunbird
48	<i>Nectarinia lotenia</i>	Loten's Sunbird
49	<i>Nectarinia asiatica</i>	Indian Purple Sunbird
	Sub Family: Estrinae	
50	<i>Lonchura Malacca</i>	Black-headed Munia

Table: 5.5 Migratory Bird Species Identified

Sl.N	Scientific Name	Common Name	Family
o.			
1.	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Meropidae
2.	<i>Pitta brachyuran</i>	Indian Pitta	Pittidae
3.	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae
4.	<i>Oriolus oriolus</i>	Golden Oriole	Oriolidae
5.	<i>Terpsiphone paradise</i>	Paradise Flycatcher	Monarchinae
6.	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler	Muscicapidae
7.	<i>Phylloscopus trochiloides</i>	Greenish Leaf Warbler	Muscicapidae

Table: 5.6 Nesting Bird Species

Sl.No.	Scientific Name	Common Name	Family
1.	<i>Ixobrychus cinnamomeus</i>	Chestnut Bittern	Ardeidae
2.	<i>Pycnonotus jocosus</i>	Red-Whiskered Bulbul	Pycnonotidae
3.	<i>Corvus splendens</i>	House Crow	Corvidae
4.	<i>Columbia livia</i>	Blue Rock Pigeon	Columbidae
5.	<i>Acridotheres tristis</i>	Common Myna	Sturinidae
6.	<i>Halycon smyrensis</i>	White-breasted Kingfisher	Alcedinidae

Fig. 5.1: Status of different butterfly families in the study area

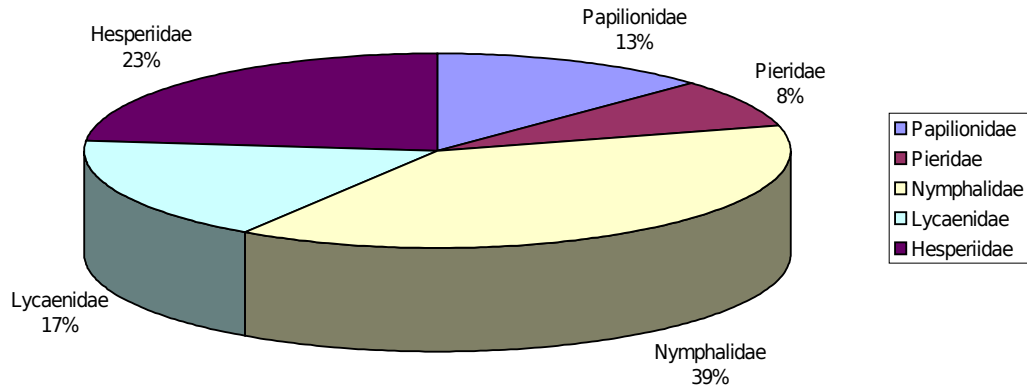
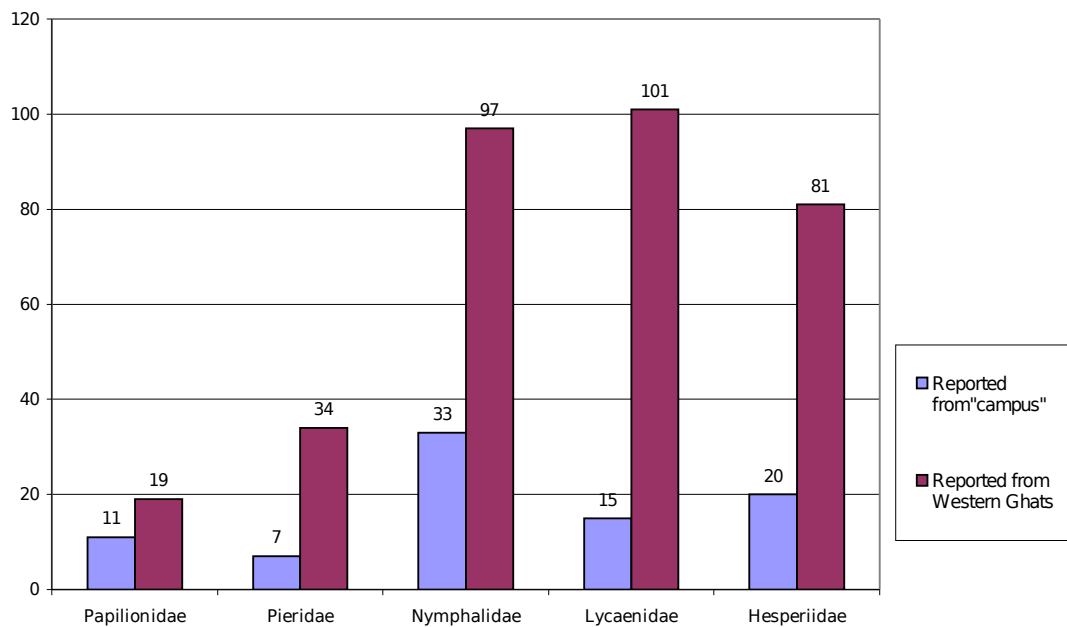


Fig. 5.2: Comparison of Butterfly Species in Different Families with respect to Western Ghats



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CHAPTER: 6

*PHYSICO-CHEMICAL
CHARACTERISTICS OF
WATER AND SOIL*

6.1 Introduction

Fresh water resources are precious and finite and are central to sustainable development, economic growth, social stability and poverty alleviation. During this century, the fast growing world population, industrialization and expansion of irrigated agriculture have dramatically increased the pressure on fresh water resources. Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. The rainfall in India shows very high spatial and temporal variability which leads to the problems like flood, drought etc. in several parts of the country. Water pollution and wasteful use of fresh water threaten development projects and make water treatment essential in order to produce safe drinking water. But the world's water resources are under pressure and in danger because of potential pollution and contamination risks due to over use and misuse of the resources. Many natural water bodies in India receive millions of liters of wastewater and agricultural run off, with different concentrations of pollutants in varying forms. To assess the level of contamination and type of treatment required, both water and waste water requires proper and reliable analytical measurements before treatment.

Soil is the complex body on the surface of [lithosphere](#) subject to [soil formation](#) processes, comprised by [mineral](#) and [organic matter](#), as well as [living organisms](#). Soil is among our most important natural resources because of its position in the landscape and its dynamic physical, chemical, and biological functions. Soil quality influences the vegetation status and ground water recharge of a particular area.

6.2. Review of Literature

6.2.1 Water Quality

In 2004, Patil *et al.* studied the physico-chemical parameters of water samples from dug wells in Dhule region and they reported that pH, EC, Ca, Mg, hardness, alkalinity etc. found significant variations during winter, summer and rainy seasons.

Drusilla *et al.* (1996) studied the water quality parameters of lotic systems in and around Courtallam in Tamil Nadu. The study reported that parameters like temperature, pH, BOD & COD are less in monsoon season compared to pre monsoon season, while DO content showed minimum in pre monsoon compared to monsoon season. The other parameters such as alkalinity, total solids and CO₂ etc seen less in monsoon. All these variations were influenced by rainfall.

Ground water usually contain negligible amounts of suspended and organic impurities but may contain appreciable amount of mineral impurities (Ca²⁺, Mg²⁺, K⁺ etc.) brought in to solution due to disintegration of mineral deposits and insoluble carbonate or alumino silicate rocks by the combined action of high under ground temperature, hydration, dissolved oxygen, and carbon dioxide and organic acids produced by aerobic and or anaerobic decay of organic matter with which water has been in contact (Vermani and Narula, 1989). They also pointed out that the surface waters rich in turbidity, suspended impurities of decaying organic matter, sand and finely divided clay, micro organism and bacteria and small amount of mineral salts (mainly Ca²⁺, Mg²⁺, Na⁺ etc.) dissolved form of top soil.

High chloride concentration in fresh water is an indication of organic load (Thresh *et al.*, 1994). Munamer (1970) suggested

that a higher concentration of chloride in water is an index of pollution from animal origin and there is a direct correlation between chloride concentration and pollution level.

Das *et al.* (2003) conducted a study on the water quality of rivers, drains and wetlands of Guwahati city. The study revealed that extremely polluted water quality of Bharalu River indicated by very low level of dissolved oxygen, high BOD, COD, phosphorous and ammonical nitrogen making the river unsuitable for aquatic life. Increased BOD and bacterial level has been considered as an indication of high degree of pollution (Campbell, 1978; Mahadevan and Krishnaswamy, 1984).

6.2.2 Soil Quality

Soil moisture is an important factor across a range of environmental processes, including plant growth, soil biogeochemistry, erosion, and land-atmosphere heat and water exchange (Wigneron *et al.*, 1998). Soil is integrally and intimately connected with the rocks beneath, the vegetation grown above and the water trickling through it (Valdia, 1987).

Crop yield is typically closely related to nutrient supply and/or availability. Understanding the way plants use N in each part of the life cycle is the key to maintaining and improving crop yield (Sinclair *et al.* 1989). Nitrogen supply not only affects plant growth in terms of biomass but also the size and proportion of organs and their structure (Pearman *et al.* 1977; Greenwood *et al.* 1991; Lemaire *et al.* 1992; Jeuffroy *et al.* 1997) Increased Nitrogen supply increases the number of cells per leaf and their size, and as a result, the way proteins are synthesized. This allows for efficient growth and expansion of cells.

Phosphorus availability is commonly lower in strongly acidic and alkaline soils because of increased P reactivity with soil and formation of insoluble compounds with aluminum and iron in acid soils and with calcium in alkaline soils. The pH associated with the maximum P availability in soils usually is between roughly pH 6.0 to 7.0.

Wet soils are generally darker than dry soils and feel smoother and heavier (Baver *et al.*, 1972). The pH of the soil is greatly influenced by organic matter addition from trees and the acids produced during microbial decomposition (Miller *et al.*, 1997).

Well aggregated, fine textured soil with ample organic matter content generally hold large quantities of water, making them good substrate for plant growth (Barnes *et al.*, 1999).

Soil nitrogen availability limit plant growth, yet increased nitrogen deposition due to atmospheric pollution has been implicated in the decline of forest productivity in heavily industrialized parts of the northern temperate zones (Schulze, 1989).

The relation between total nitrogen and nitrogen availability to plants is still unclear in large part because the nature of soil organic nitrogen is only now beginning to be understood (Sollins *et al.*, 1999).

Turn over of organic phosphorous controls the availability of phosphorous to plants through organic matter decomposition or the release of phosphorous from microbial biomass (Lajtha *et al.*, 1999). The original source of potassium is the primary minerals and potassium feldspar (Miller *et al.*, 1997).

6.3. Materials and Methods

6.3.1 Sample Collection

a. Water Sampling

Water samples were collected from the selected eleven sites including wells, bore wells, rain water storage tank, quarry and an open water body in the Mahatma Gandhi University campus. Water samples were collected in one litre polyethylene bottles which were pre-cleaned with diluted HCl and washed well in tap water. All the samples were properly labelled and parameters like temperature and pH were measured from the location itself. The details of the sampling sites are represented in the Table-1.

Table 6.1: Details of the Sampling sites.

Sl. No	Sampling sites	Codes	Latitude	Longitude
1	Well	S ₁	9° 39' 19.1"	76° 32' 5.8"
2	„	S ₂	9° 39' 16.1"	76° 32' 13.7"
3	„	S ₃	9° 39' 20.3"	76° 39' 52.9"
4	„	S ₄	9° 39' 23.6"	76° 31' 52.9"
5	„	S ₅	9° 39' 20.7"	76° 31' 5.8"
6	Rain water storage tank	S ₆	9° 39' 31.5"	76° 31' 53.2"
7	Quarry	S ₇	9° 39' 31.1"	76° 31' 51.2"
8	„	S ₈	9° 39' 33.5"	76° 31' 33.5"
9	Well	S ₉	9° 39' 35.4"	76° 31' 49.4"
10	„	S ₁₀	9° 39' 33.6"	76° 31' 53.8"
11	Bore well	S ₁₁	-	-

b. Soil sampling

Soil samples were collected using an augur from 18 different sites from the Mahatma Gandhi University Campus,

Kottayam on October 2007. Samples were collected from just under the rooting zone of grasses (at a depth of 15cm) in a polythene cover and properly labeled with date, time and place. The soil samples were air dried, powdered and treated properly for further analysis.

6.3.2. Analytical Methods for Physico - Chemical Parameters

6.3.2.1 Water Quality

Physio-chemical analysis of water samples were done as per the standard methods (APHA, 1998) and the methods are given below.

a. Temperature

The temperature is a variable factor and is influenced by time, slope etc. It varies during the day and night times, in sun and shade, at different depths of water bodies and during the whole year with the change in climate. Temperature of the water body influences the dissolved oxygen content and also the biological activity of the water body.

Water temperature was recorded with a good grade, mercury filled Celsius thermometer. By immersing the thermometer directly in the water for a period of time sufficient to permit constant reading, and the temperature was recorded.

b. pH

pH is a term universally used to express the intensity of the acid or alkaline condition of a solution. It is a measure of hydrogen ion concentration, or more precisely the hydrogen ion activity. It was measured using a pH meter. pH meter was calibrated using standard buffer solutions of pH 9.2 and 4.

c. Acidity

Acidity of water is its capacity to neutralize a strong base to a fixed pH and it is caused by the presence of strong mineral acids, weak acids and hydrolyzing salts of strong acids. In natural unpolluted freshwaters, the acidity is mostly due to the presence of CO₂ in the form of carbonic acid.

Acidity is determined by titration with standard NaOH solution. To a 25 ml sample 3 - 5 drops of phenolphthalein indicator was added and titrated with 0.02 N NaOH solution to a permanent pink colour.

Acidity as

$$\text{mg CaCO}_3/\text{L} = \frac{\text{Volume of NaOH} \times \text{Normality of NaOH} \times 1000 \times 50}{\text{Vol. of sample}}$$

d. Total alkalinity

Alkalinity is the measure of the capacity of water to neutralise a strong acid. The alkalinity in the water is generally imparted by the salts of carbonate, bicarbonate, phosphate, nitrates, borates, silicates etc; together with the hydroxyl ions in the free state. Alkalinity is the sum of all the titrable bases. Total alkalinity can be estimated by titrating the sample with a strong acid (HCl), first to a pH 8.3 using phenolphthalein as an indicator and the further to pH between 4.2 and 5.4 with methyl orange.

Alkalinity as

$$\text{CaCO}_3 \text{ in mg/L} = \frac{\text{Vol. of HCl} \times \text{Normality of HCl} \times 1000 \times 50}{\text{Vol. of the sample}}$$

e. Chloride

Chloride is the common anion found in the water. The presence of chloride in natural waters can be attributed to the discharge of agricultural, domestic and industrial waste waters,

dissolution of salt deposit, and salinity intrusions in coastal regions. Chloride in drinking water is generally not harmful to human beings. High concentration of chloride in irrigation water may be harmful to many plant tissues.

In natural or slightly alkaline solution, Potassium chromate can indicate the end point of the silver nitrate titration of the chloride. Silver chloride is precipitated quantitatively before red silver chromate is formed.

Chloride

$$\text{mg/L} = \frac{\text{Vol. of AgNO}_3 \times \text{Normality of AgNO}_3 \times 35.45 \times 1000}{\text{Vol. of the sample}}$$

f. Hardness

Hardness is the property which prevents the lather formation with soap and increase the boiling point of water. The major cations imparting hardness are calcium and magnesium. The anions responsible for hardness are bicarbonates, carbonates, sulphates and chlorides. Hardness can be determined by complex metric titration. Calcium and magnesium form a complex of wine red colour with Eriochrome Black T at pH of 10.0 ± 0.1 . The EDTA has got a stronger affinity towards Ca^{++} and Mg^{++} and, therefore, by addition of EDTA the former complex is broken down and new complex of blue colour is formed.

$$\text{Hardness as CaCO}_3 \text{ in mg/L} = \frac{\text{Vol. of EDTA} \times 1000}{\text{Vol. of sample}}$$

g. Dissolved oxygen

Dissolved Oxygen (DO) acts a major factor for maintaining the health of water body because most organisms other than anaerobic microbes perish rapidly when O_2 level of water falls below zero. Very high levels of organic inputs, such as human or animal sewage or waste from processing foods can generate such

high bacterial metabolism, which use up oxygen (Verma and Agarwal, 1983). DO levels in the natural water depend on the physical, chemical and biochemical activities in water and its analysis is a key test in water pollution control.

Dissolved oxygen was measured by the Winkler method with azide modification. The manganous sulphate reacts with alkali (NaOH or KOH) to form a white precipitate of manganous hydroxide which in the presence of oxygen, get oxidised to a brown colour compound. In the strong acid medium, manganic ions are reduced by iodide ions which get converted to iodine equivalent to the original concentration of oxygen in the sample. The iodide can be titrated against thiosulphate using starch as an indicator. The end point is the disappearance of blue colour.

DO mgO₂/L =

$$\frac{\text{Vol. of Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O} \times \text{Normality of Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O} \times 8 \times 1000}{\text{Effective volume}}$$

h. Biological Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is a chemical procedure for determining how fast biological organisms use up oxygen in a body of water. It is usually performed over a 5-day period at 20° Celsius. Most pristine rivers will have a 5-day BOD below 1 mg/l. Moderately polluted rivers may have a BOD value in the range of 2 to 8 mg/l.

Two sets of BOD bottles were filled with samples without air bubble. Among these, one set was used for estimate the initial DO and the other one was incubated at 20 ± 5°C for 5 days in a BOD incubator. On the fifth day, the DO of the sample was analysed. The difference of the initial and the final DO is the BOD.

$$\text{BOD (mg O}_2 \text{ /L)} = (D_0 - D_5)$$

Where, D_0 = initial DO,

D_5 = DO after 5 days

i. Chemical Oxygen Demand (COD)

COD is estimated by open reflux method. The organic matter present in sample gets oxidized completely by $\text{K}_2\text{Cr}_2\text{O}_7$ in the presence of H_2SO_4 to produce CO_2 and H_2O . The excess $\text{K}_2\text{Cr}_2\text{O}_7$ remaining after the reaction is titrated with $\text{Fe}[\text{NH}_3]_2[\text{SO}_4]$. The dichromate consumed gives the O_2 required for the oxidation of the organic matter.

The COD values include the oxygen demand created by biodegradable as well as non biodegradable substances. The sample is refluxed with $\text{K}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 in the presence of mercuric sulphate to neutralize the effect of chlorides, and silver sulphate catalyst. The excess of $\text{K}_2\text{Cr}_2\text{O}_7$ is titrated against ferrous ammonium sulphate using ferroin as indicator. The end point is indicated by a color change from blue-green to reddish brown. The amount of $\text{K}_2\text{Cr}_2\text{O}_7$ used is proportional to the oxidisable organic matter present in the sample.

$$\text{COD mg/L} = \frac{(\text{B}-\text{A}) \times \text{Normality of } \text{K}_2\text{Cr}_2\text{O}_7 \times 1000 \times 8}{\text{Volume of sample}}$$

Where, B = Volume of titrant (FAS) used for blank.

A = Volume of titrant (FAS) used for sample

j. Sulphate

The sulphate ion is one of the most important universal anions that occur on natural waters. The origin of most sulphate compounds is from the oxidation of sulfite ores, the presence of shales, or the industrial wastes. High concentrations of sulphate

in drinking water can cause a laxative effect when combined with calcium and magnesium.

It was determined by turbidimetric method. Sulphate ions precipitated as barium sulphate in hydrochloric acid medium by addition of barium chloride. The concentration of sulphate can be determined from the absorbance of light at 420 nm by the barium sulphate and then comparing it with a standard curve. The amount of precipitation is proportional to the concentration of sulphate ions in the sample.

100 ml of sample was taken in a conical flask and added 5 ml of conditioning reagent. Place the flasks over a magnetic stirrer and during stirring add a spoonful of barium chloride crystals. After stirring, the reading was taken on a spectrophotometer at 420nm exactly after 4 minutes. Similarly a set of standards was prepared and a standard curve was prepared. The amount of sulphate in sample was calculated from the graph.

k. Nitrate

Nitrate is an important parameter for determining the pollution load of a system. The major source of nitrate in aquatic systems includes animal wastes, chemical fertilizers and surface runoff. 10ml of sample was refluxed with 30% NaCl, 4:1 H₂SO₄ and brucine sulphanilic acid. Nitrate and brucine react to produce a yellow colour, the intensity of the colour was measured at 410nm using spectrophotometer. The reaction is highly dependent upon the heat generated during the test. The reaction was carried out in controlled heating at constant time. The concentration of NO₃ - N was determined from the standard curve.

l. Phosphate

Phosphorous appears exclusively as phosphate in aquatic environments. Phosphorous is essential to the growth of

organisms and can be the nutrient that limits the primary productivity of an aquatic ecosystem. Phosphate in large quantities in fresh waters indicates pollution, through sewage and industrial wastes. Natural sources are mainly weathering of phosphorous bearing rocks and decomposed organic matter. $\text{PO}_4\text{-P}$ in natural surface water mostly ranges from between 0.005 and 0.020 mg/l.

The sample is digested with persulphate mixture which converts all the forms of phosphorous including organic and inorganic to ortho phosphates. After digestion total phosphorous is measured quantitatively using ammonium molybdate and stannous chloride. The intensity of colour developed is measured at 690 nm using spectrophotometer. The concentration of phosphorous in the sample is compared with the standard curve.

m. IRON

Iron is one of the most troublesome elements in water supplies. Making up at least 5 % of the earth's crust, iron is one of the earth's most plentiful resources. Rainwater as it infiltrates the soil and underlying geologic formations dissolves iron, causing it to seep into aquifers that serve as sources of groundwater for wells. Although present in drinking water, iron is seldom found at concentrations greater than 10 milligrams per liter (mg/l) or 10 parts per million. However, as little as 0.3 mg/l can cause water to turn a reddish brown color. Iron is mainly present in water in two forms: either the soluble ferrous iron or the insoluble ferric iron. Water containing ferrous iron is clear and colorless because the iron is completely dissolved. In under ground waters which are deprived of oxygen, they are present in reduced form. Iron is not hazardous to health, but it is considered a secondary or aesthetic contaminant. Essential for good health, iron helps transport oxygen in the blood.

Iron is determined by the phenanthroline method. Fe is reduced to the ferrous state by boiling with acid and hydroxylamine. It is then treated with 1, 10-phenanthroline at pH 3.2 to 3.3. Three molecules of phenanthroline chelate each atom of ferrous ion to form an orange red complex. The complex was measured colorimetrically at 510nm. The concentration of iron in the sample is compared with the standard curve.

6.3.2.2 Soil Analysis

Soil is the complex body on the surface of lithosphere subject to soil formation processes, comprised by mineral and organic matter, as well as living organisms. Soil is natural resource which nurtures and gives abode to microbes, plants, animals. Soil with its minerals, organic nutrients and water retention capacity forms the vital part of the biosphere. Soil microbiota help in the decomposition of soil organic materials and recycling .There is also a food web among soil organisms.

a. Soil Moisture

The activity of soil organisms are controlled by the water content of soil. Soil moisture is the primary regulator of physical, chemical and biological activities of soil. Soil moisture is an important factor across a range of environmental processes, including plant growth, soil biogeochemistry, erosion, and land-atmosphere heat and water exchange (e.g., Wigneron et al., 1998).

This valuable environmental indicator helps to estimate the soil-water balance – the pattern of how much water is stored in a soil over a year. Moisture content is affected by rainfall variation and soil properties. When soil moisture measurements are available for a whole profile, they can be used to predict floods, droughts, or the optimal timing for crop irrigation.

Soil moisture is determined by gravimetric method, in which a known weight of air dried soil is dried at 105°C until constant weight is obtained and the weight loss is expressed as percentage. In this method soil sample were taken in a pre weighed can box and the box was weighed again with the soil sample. It is then placed in an electric oven at 105°C for about 24hrs to dry the soil to a constant weight. Then the samples were taken and cooled in a dessicator and weighed again. From the loss in weight of soil the % moisture was calculated.

b. Soil pH

The soil pH value is a measure of soil acidity or alkalinity and is an indication of the soil's chemistry and fertility. The pH affects the chemical activity of the elements in the soil, as well as many of the soil properties. Soil pH directly affects nutrient availability. The pH of soil or more precisely the pH of the soil solution is very important because soil solution carries in it nutrients such as Nitrogen (N), Potassium (K), and Phosphorus (P) that plants need in specific amounts to grow, thrive, and fight off diseases. If the pH of the soil solution is increased above 5.5, Nitrogen (in the form of nitrate) is made available to plants. Phosphorus, on the other hand, is available to plants when soil pH is between 6.0 and 7.0.

If the soil solution is too acidic plants cannot utilize N, P, K and other nutrients they need. In acidic soils, plants are more likely to take up toxic metals and some plants eventually die of toxicity (poisoning). The pH value of a soil is influenced by the kinds of parent materials from which the soil was formed. Soils developed from basic rocks generally have higher pH values than those formed from acid rocks. Rainfall also affects soil pH.

Soil pH was measured by using a pH meter. Soil and water suspension was prepared in the ratio 1:2 and this suspension was

stirred at regular intervals for 20 to 30 minutes. pH of the suspension was measured after calibrating the instrument with buffer solution.

c. Soil Organic Carbon

The amount of organic carbon in soil at a given time is a function of carbon input and carbon decomposition rates, as influenced by soil temperature and soil moisture (rainfall and evaporation), and soil type. Land clearing disrupts this balance by removing vegetation, thereby reducing the carbon dioxide (CO₂) sink and transfer of carbon to soil as well as by increasing CO₂ emissions from dead biomass and soil carbon.

The organic carbon of soil is estimated by using titrimetric determination (Walkley & Black, 1934). A known weight of soil is treated with an excess volume of standard K₂Cr₂O₇ in the presence of concentrated H₂SO₄. The soil is slowly digested at low temperature by the heat of dilution of H₂SO₄ and the organic carbon in the soil is thus oxidised to carbon dioxide (CO₂). The highest temperature attained by the heat of dilution reaction produced on the addition of H₂SO₄ is approximately 120°C which is sufficient to oxidise the active forms of soil organic carbon but not the mere inert form of carbon that may be present. The excess of K₂Cr₂O₇ not reduced by the organic matter is titrated against a standard solution of ferrous ammonium sulphate in the presence of NaF or phosphoric acid and diphenyl amine indicator. End point is when the colour flashes from violet through blue to bright green.

d. Available Phosphorus

Phosphorous, a major element in soil organic matter and in natural terrestrial ecosystem is derived from the weathering of minerals in parent rock material. It is usually second most limiting nutrient for terrestrial primary production [after nitrogen] and is

often the primary limiting nutrient in fresh water ecosystem

5gm of soil was weighed and transferred to a 100 ml conical flask. 50 ml of extractant solution was added to this. The contents of the flask were shaken for exactly 5 minutes and filtered through Whatman No. 42 filter paper. A blank is also prepared. 5ml of the soil extractant was taken followed by the addition of Dickman & Bray's reagent. The contents of the flask were mixed thoroughly with about 5ml of distilled water. Finally, 1 ml of working SnCl_2 solution with immediate mixing and made up to the mark with distilled water. The intensity of the colour was measured just after 10 minutes, using spectrophotometer at 660 nanometer. The concentration of the phosphorous was measured from the standard curve.

e. Available Potassium

Potassium (K) plays many essential roles in plants. It is an activator of dozens of enzymes responsible for plant processes such as energy metabolism, starch synthesis, nitrate reduction and sugar degradation. K is extremely mobile and helps to regulate photosynthesis. Both water soluble and exchangeable potassium are most accessible to plants. Available potassium, which includes both the water soluble and exchangeable are potentially available or fixed.

5 gm of soil was weighed and transferred to a 150ml conical flask. This was added to 25ml of neutral Ammonium acetate solution (Morgan, 1995).. It was shaken for 5 minutes and filtered. The filtrate was fed into the atomiser of the flame photometer. The amount of potassium was noted.

f. Total Nitrogen

The nitrogen found in soils is predominantly associated with soil organic matter. Nitrate is the principal form in which nitrogen

is taken up by plants, due to its mobile nature and greater abundance than ammonium. However, inorganic N represents only 2 to 5% of the total nitrogen in the soil. Total nitrogen (TN) is a measure of both inorganic and organic forms of nitrogen and is expressed as percentage. Levels of N vary with temperature and moisture in the same way as levels of soil organic matter, that is, N increases with cooler temperatures and more moisture.

The Kjeldhal method was employed for the determination of total nitrogen. It involves digestion of sample to convert organic – N to a NH_4^+ -N and determination of ammonium –N in the digest by distillation. It measures only organic and ammonium forms of N excluding nitrate nitrogen. Organic and ammonical N is converted to ammonium sulphate and ammonium gas is distilled in to boric acid and titrated with a dilute strong acid such as hydrochloric acid.

g. Total Acidity

Soil acidity is among the important environmental factors which can influence plant growth and can seriously limit crop production. Acidity is due to hydrogen (H^+) ion concentrations in the soil. Total acidity is the sum of exchangeable acidity and non-exchangeable acidity.

Total acidity was determined by Kappen method (1934). 40 gm of soil is treated with 100ml N NaOAc solution .The extract is titrated against 0.1N NaOH solution using 2 – 3drops of phenolphthalein indicator.

h. C/N ratio

The C/N ratio is an important property controlling the release of nitrogen. During the decomposition of organic materials nitrogen can either be released (mineralized) or tied up

(immobilized). Organic matter with a high C/N ratio will immobilize nitrogen and reduce the amount of plant-available nitrogen. Conversely, materials with a low C/N ratio will mineralize nitrogen and increase plant-available nitrogen. The course of decomposition of organic matter is affected by the presence of carbon and nitrogen. The C: N ratio is generally lower in subsoil than in topsoil.

Total nitrogen was determined by Kjeldahl method and organic carbon content in soil sample was estimated by Walkley and Black method (1934).

6. 4. RESULTS AND DISCUSSION

Water is an important limiting factor for the ecosystem, agriculture, human settlements and livelihood. Water requirement is increasing very rapidly with the growth of human and animal population, irrigation and industries. Water has different physico-chemical properties, which are responsible for its specificity. The water chemistry provides the knowledge of multi dimensional aspects of water.

The present study aims to determine the water quality status of different water sources in Mahatma Gandhi University campus during October 2007. Water samples from eleven different locations were analyzed for physico-chemical parameters and the results were given in Table 2. The results of the soil analysis are represented in the Table 3.

6.4.1 PHYSICO- CHEMICAL PARAMETERS OF WATER

a. Temperature

Temperature varied from 26 to 32⁰C. The minimum temperature recorded from S2 site and the maximum recorded from S7 site. Both Open water body and rain waster storage tank showed water temperature more than 30⁰C and this may be due to the direct availability of sunlight. Comparatively low water temperature observed in well samples.

b. pH

pH has no direct effect on health, however, a low value, below 4 will produce sour taste and higher value 6.5 show alkaline taste (Purandra *et al.*, 2003). In the present study, it was observed that all the samples are acidic in nature and the pH ranged from 4.87 to 6.73 (Table 2). The least value recorded from S₂ site and the peak value from S₇ site (Figure; 1). S₃, S₄ and S₁₀ sites have the pH of 5 (Table 2 and Figure 1). According to BIS

(1983) and WHO (1984) prescribed a pH range of 6.5 to 8.5 for drinking water. All the samples except S₇ showed the pH below the drinking water standards.

c. Acidity

Total acidity is within the permissible limit. Acidity is of little concern from sanitary or public health viewpoint (Gopaldaswami *et al.*, 2003). From the analysis, it was observed that the acidity ranged from 2mg CaCO₃/L to 46 mg CaCO₃/L. Maximum acidity recorded from S₂ site, while the S₆ and S₇ showed the minimum acidity (Figure 2). Acidity is positively correlated with the pH values.

d. Alkalinity

The value of alkalinity varied from 4 mgCaCO₃/L to 20 mgCaCO₃/L (Table 2). The maximum value recorded from both S₈ and S₁₁ sites. Sites like S₄, S₆ and S₁₀ showed minimum alkalinity with 4mg/L (Figure 2).

e. Chloride

Munawer (1970) suggested that higher concentration of chloride in water is an index of pollution of animal origin and there is a direct correlation between chloride concentration and the pollution level. In the present study, the chloride level ranged from 9.9 mg/L to 49.98 mg/L. The minimum value recorded from both S₇ and S₈ sites and the maximum recorded from S₂ site. According to Bureau of Indian Standards for drinking water (ISO: 10500-1983), the desirable limit for Chloride is 250 mg/L; hence chloride was under permissible level in the study area (Figure; 3).

f. Hardness

According to Rai (1974) the total hardness is an index of water quality and is of considerable significance in connection

with the discharge of principal and domestic sewage. From the present study, it was found that the maximum value, 39.2 mg/l recorded from S₁₁ site, the bore well sample and the minimum value, 4.9 mg/l recorded from S₆ site, rain water storage tank (Table 2 & Figure;3). According to Bureau of Indian Standards for drinking water (IS: 10500-1983), the desirable limit of total hardness is 300 mg/L and all the samples in the present study are within the permissible limit.

g. Nitrate

High nitrate level in ground water may serve as indicator of the type of the pollution. The great contribution of nitrate to ground water is from decaying organic matter, sewage and nitrate fertilizers (Purandara *et al.*, 2003). In the present study nitrate values varied from 0.013 mg/L to 1.47 mg/L (Table 2 & Figure 6). Maximum concentration of nitrate was recorded from S₂ site and the minimum value recorded from S₅ site. Nitrate concentration in the sampling sites were within the permissible limits prescribed by IS: 10500 – 1983 with 45mg/L.

h. Phosphate

Phosphates are often the limiting nutrients for the growth of many organisms in water and can lead to rapid eutrophication in water sources. Such rapid growth can create problems of taste and odour in hot climate where the DO in waters is already low (Murali and Rani, 2005). Phosphate is usually present in low concentration in natural unpolluted water. In the present study, concentration of phosphate ranged from 0.004 to 0.22 mg/l. The minimum value observed at S₄ site and maximum in S₃ site (Figure; 6).

i. Sulphate

The sulphate ion is one of the most important universal anions that occur on natural waters. In the present study, the sulphate varied from 6 mg/l to 44 mg/l (Table 2). The peak value recorded from both S₁ and S₆ sites, and the minimum value from S₉ site. (Figure 7). The permissible limit of sulphate is 200mg/L (BIS) and the results showed that all the values are below the permissible limit.

j. Dissolved Oxygen (DO)

Dissolved oxygen measures the extent of organic pollution load of a water body. A very low and very high DO value indicates the polluted nature of any water body (Garg *et al.*, 1998). In the present study, the minimum value of 1.2 mgO₂/l recorded from S₈ site and the maximum value of 8.51 mgO₂/l recorded from S₇ site (Table 2). According to Bureau of Indian standards for drinking water (ISO: 10500-1983), the desirable limit of DO is 6 -10 mgO₂/l. All the samples except S₆ and S₇ have low DO values than the permissible limit. Both S₆ and S₇ sites are open water bodies with direct atmospheric contact and that may be the reason for high DO concentration.

k. Biological Oxygen Demand (BOD)

BOD accounts for organic matter present in the system and the quantity of oxygen required for the stabilization. Morrissette and Mavinic (1978) also advocated that the decomposition of organic matter was an important factor in the consumption of dissolved oxygen. In the present study, BOD varied from 0.76 mg/l to 1.97 mg/l (Table 2). The lowest value of 0.76 mg/l recorded from S₁₁ site and the highest value of 1.97 mg/l was recorded from S₂ site. According to Bureau of Indian standards for drinking water (IS: 10500-1983), BOD values above 6 mg/l are considered as slightly polluted water, but in the present study all the samples

are coming under the prescribed limit (Figure; 4).

l. Chemical Oxygen Demand (COD)

The DO is an important parameter, which affects both chemical and biological reactions in an ecosystem, whereas the COD is the reliable parameter in judging the extent of organic pollution (Abbasi, 1997). The COD is a measure of the oxygen equivalent to organic matter content of water that is susceptible to oxidation by strong oxidizing agent. Among 11 samples analyzed, S₂ showed the maximum COD value with 115mgO₂/L and both S₁ and S₃ recorded the minimum value with 7.96 mgO₂/L.

m. Iron

Iron is one of the earth's most plentiful resources, making up at least five percent of the earth's crust. Rainfall seeping through the soil dissolves iron in the earth's surface and carries it into almost every kind of natural water supply, including well water. According to Indian standards for Drinking water (BIS 10500:1991), the desirable limit of iron present in drinking water should be 0.3 mg/l.

In the present study, iron concentration ranged from 0.005 to 0.57 mg/l (Table 2). The minimum value recorded from S₁ well site and the maximum from the bore well site, S₁₁. All the samples except S₁₁, were within the desirable limits (less than 0.3 mg/l), and the maximum value may be due to the leachate of iron ores to the ground water.

Table 6.2: Physical parameters and Chemical Parameters of water

Parameters	S₁	S₂	S₃	S₄	S₅	S₆	S₇	S₈	S₉	S₁₀	S₁₁
Temperature (°C)	27	26	27	27	28	31	32	31	28	27	27
pH	5.7	4.8	5	5	5.8	6.1	6.7	5.2	4.9	5	6.2
Acidity (mgCaCO ₃ /l)	26	46	34	30	14	2	2	10	34	44	28
Alkalinity (mgCaCO ₃ /l)	6	6	8	4	6	4	12	20	12	4	20
Chloride (mg/l)	27.49	49.98	37.48	22.49	14.99	12.49	9.9	9.9	12.49	14.99	44.98
Hardness (mgCaCO ₃ /l)	14.7	19.6	14.7	9.8	9.8	4.9	9.8	14.7	9.8	9.8	39.2
Nitrate (mg/l)	0.221	6.512	0.084	1.55	0.057	0.221	0.221	0.084	5.98	4.651	4.43
Sulphate (mg/l)	44	20	24	18	18	44	24	8	6	24	20
Phosphate (mg/l)	0.1	0.14	4.4	0.08	0.5	0.26	0.32	0.16	0.28	0.3	0.34
COD (mg/l)	7.96	115.53	7.9	111.55	51.79	83.66	71.71	31.87	15.93	19.92	27.88
Iron (mg/l)	0.005	0.0225	0.19	0.027	0.122	0.008	0.025	0.225	0.04	0.01	0.57
Potassium (mg/l)	1.5	1.5	1.5	1.8	1.4	1.5	1.6	3.5	1.5	1.4	5
DO (mg/l)	2.8	4.8	2.8	3.2	4.4	8.1	8.5	1.2	4	3.2	4.4
BOD (mg/l)	0.81	1.97	1.63	0.81	1.21	1.62	0.81	0.81	0.81	1.22	0.76

6.4.2 Physico-Chemical Characteristics of Soil

a. Soil pH

The soil pH value is a measure of soil acidity or alkalinity. Heavy rain cause leaching of minerals making soil highly acidic (Maro *et al.*, 1993). The soil pH values ranged from 3.34 – 5.74 (Table 3). The minimum pH recorded from S₁₀ and the maximum from S₁₅ site.

b. Soil Moisture

Soil moisture is commonly defined as the amount of water contained in a unit volume of soil. Moisture content of the soil samples ranged from 12.76 % to 27.19 % (Table 3). The minimum soil moisture recorded S₆ site and maximum from S₁ site. Vegetation cover, leaf litter and rainy season were influenced the soil moisture content in the soil (Nair *et al.*, 1998)

c. Total Acidity

The total acidity is the sum of exchangeable acidity and non-exchangeable acidity. In the present study total acidity of the soil samples ranged from 0.75 -1.95 meq/100mg. (Figure; 14). Maximum value of total acidity was recorded from S₁₅ site and minimum value from S₁ site.

d. Total Nitrogen

Total nitrogen is merely an indicator of the soil potential for the element, but not the measure in which it becomes available to the plant. During growth and development, an average of only 0.5 % - 2.5% of the total nitrogen is converted in to forms accessible to the plant. In the present study total nitrogen values varied from 0.05% to 0.35 % (Table 3 & Figure 15). Maximum value of total nitrogen was recorded from S₂ site and minimum value were recorded from S₁.

e. Available Pottasium

Potassium concentration in the samples ranged from 101.9 Kg/ha to 739.2 Kg/ha. (Table 3 & Figure 13). Maximum value of available potassium was recorded from S₁₀ site and minimum value was observed at S₂ site.

f. Available Phosphorous

Phosphorus (P) is essential for plant growth. Soils may contain several hundred to several thousand pounds of phosphate per acre. However, much of the phosphate in soils is not available to growing plants. In the present study, concentration of phosphorous available for plant growth ranged from 2.8 Kg/ha to 91.84 Kg/ha (Table 3 & Figure; 12). Maximum value of available phosphorous was recorded at S₁₅ site and minimum value was recorded at S₁ site.

g. Organic Carbon

Carbon is held within the soil, primarily in association with its organic content. Soil organic matter, of which carbon is a major part, holds a great proportion of nutrients, cations and trace elements that are of importance to plant growth. It prevents nutrient leaching and is integral to the organic acids that make minerals available to plants. Organic carbon buffers soil from strong changes in pH (Leu, 2007). It is widely accepted that the carbon content of soil is a major factor in its overall health. In the present study, organic carbon content ranged from 0.178 % to 0.895 %. Maximum value was observed in S₈ site and a minimum value was observed in S₁ (Table 3 & Figure 15).

h. C/N Ratio

Organic matter with a high C/N ratio will immobilize nitrogen and reduce the amount of plant-available nitrogen. Conversely, materials with a low C/N ratio will mineralize nitrogen

and increase plant-available nitrogen. In the present study, it was found that carbon to nitrogen ratio in soil samples ranged from 1.057 % to 3.56 % (Table 3 & Figure 16).

Table 6.3: Physico-chemical characteristics of soil

Sites	Parameters							
	pH	Moisture (%)	Phosphorus (Kg/ha)	Potassium (Kg/ha)	Total Nitrogen (%)	Total Acidity (meq/100mg)	Organic Carbon (%)	C/N Ratio (%)
S1	4.1	27.19	2.8	103.04	0.05	0.4	0.17	3.56
S2	4.4	23.06	34.72	101.92	0.35	0.75	0.37	1.05
S3	4.5	18.46	23.52	386.4	0.3	1	0.37	1.2
S4	4.2	23.3	57.12	110.88	0.26	1.5	0.57	2.2
S5	4.8	25.29	36.96	330.4	0.16	0.95	0.44	2.6
S6	3.4	12.76	21.16	116.48	0.22	1.3	0.4	1.8
S7	4.4	24.43	23.52	207.2	0.25	1.4	0.53	2.1
S8	4.6	15.87	5.6	330.4	0.5	0.75	0.89	1.7
S9	4.7	14.39	31.92	177.4	0.23	1.2	0.48	2.05
S10	3.3	16.86	45.92	739.2	0.29	1.4	0.6	2.06
S11	4.9	19.9	23.52	464.8	0.28	1.05	0.57	2.05
S12	4.7	19.36	91.05	481.6	0.16	1.1	0.52	3.1
S13	4.3	18.5	74.25	196	0.12	1.15	0.65	5.19
S14	4.3	16.32	26.88	156.8	0.18	1.6	0.62	3.44
S15	5.7	17.53	91.84	190.4	0.26	1.95	0.59	2.2
S16	4.2	20.88	84	224	0.29	1.75	0.54	1.8
S17	4.6	18.78	43.6	156.8	0.25	0.95	0.44	1.7
S18	4.7	18.72	23.52	218.4	0.32	1.3	0.6	1.8

6.5 Conclusion

Water is an elixir of life and is the life sustaining molecule in the earth. Freshwater resources are polluting day by day due to several anthropogenic activities even though the need of water increases along with population explosion. The present study aims to find out the physico-chemical characteristics of water and soil resources of Mahatma Gandhi University campus Kottayam district.

From the investigation it was found that all the water samples are acidic in nature. Water samples from rain water storage tank and open quarry satisfied the permissible limit prescribed by the BIS. COD level in the samples indicating the organic pollution in the water bodies, which reflects in the DO and BOD levels. Comparatively bore well sample showed significant variation in physico-chemical parameters than other samples. Iron concentration exceeds the permissible limit in the bore well samples. Among different water resources studied, water samples from rain water storage tank and quarry sites showed good quality in terms of physico-chemical characteristics.

From the study it was generally found that the soil is acidic in nature and the C/N ration is comparatively less which indicates the high nitrogen availability to the plants. High level of available phosphorus and potassium indicates the fertile nature of soil.

Detailed scientific investigations including bacteriological studies of water are needed for the sustainable utilization of these resources.

GRAPHS

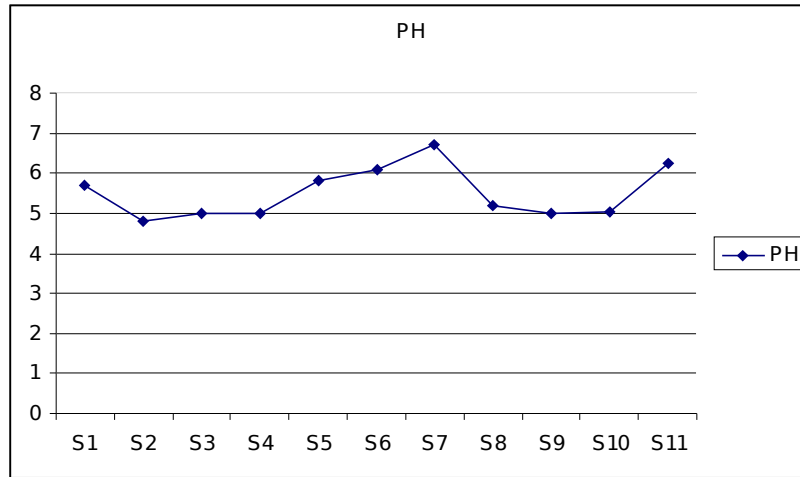


Figure 6.1: Variation in water pH

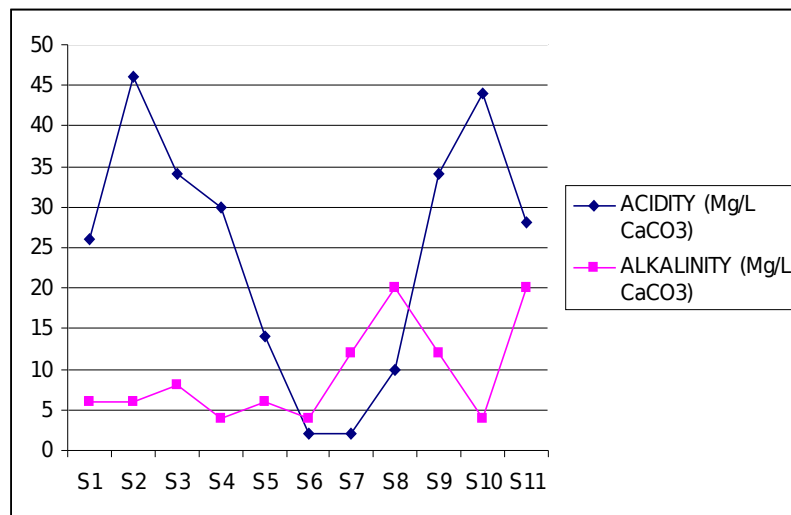


Figure 6.2: Variation in Acidity and Alkalinity of water

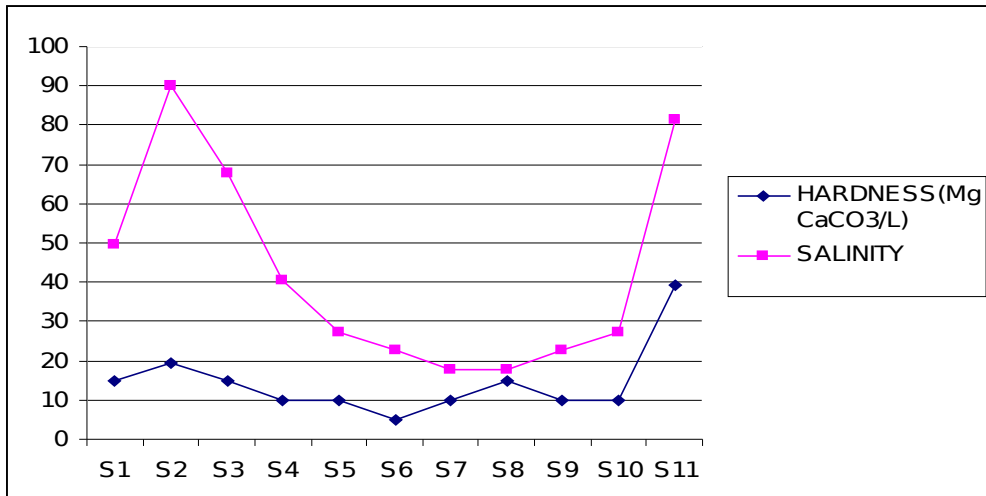


Figure 6.3: Variation in Hardness and Salinity of water

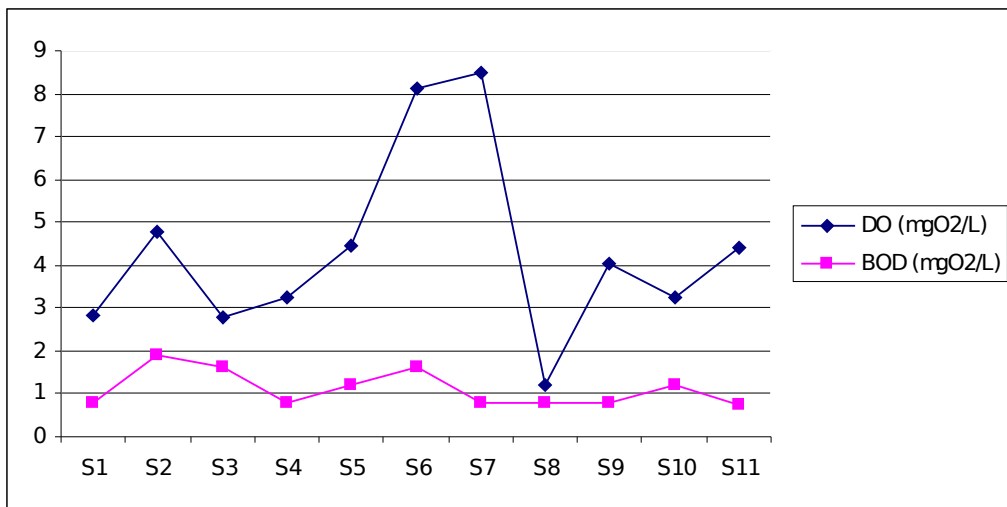


Figure 6.4: Variation in DO and BOD of water

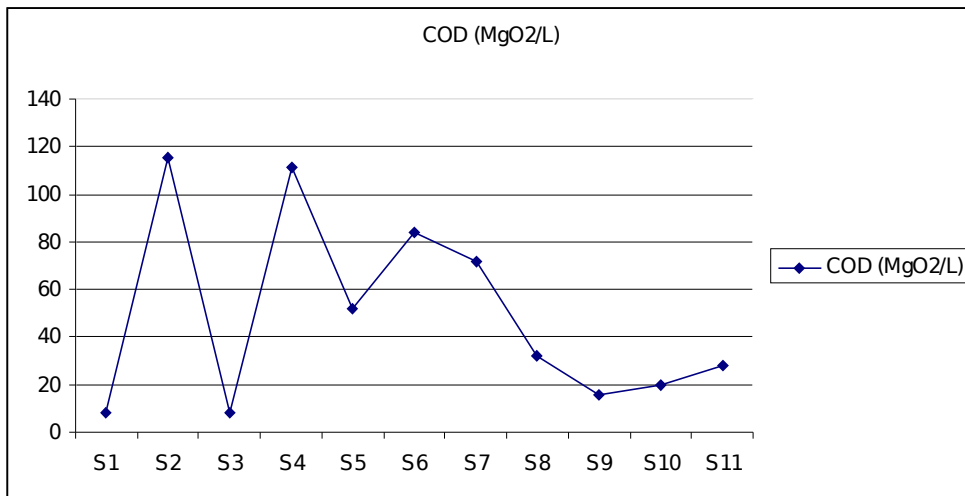


Figure 6.5: Variation in COD of water

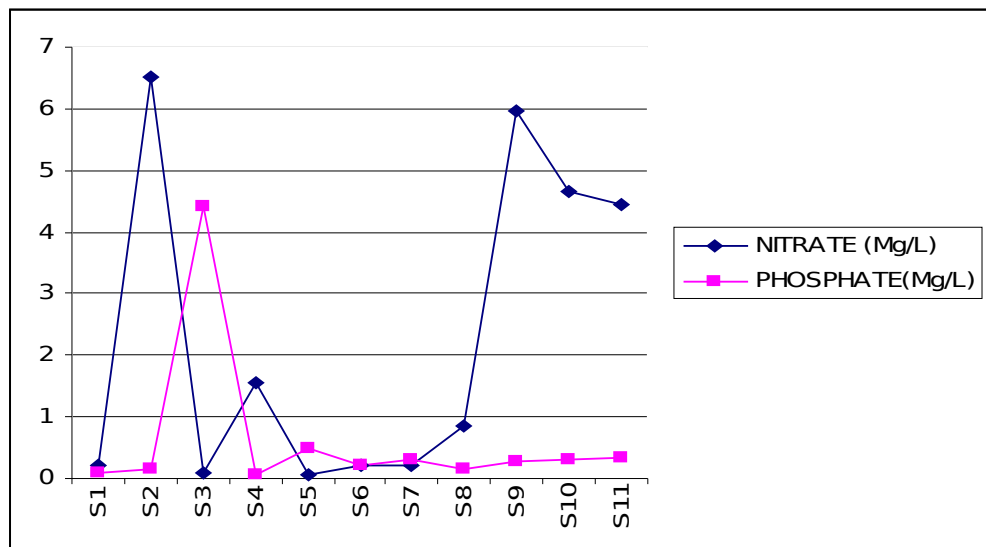


Figure 6.6: Variation of Nitrate and Phosphate in water

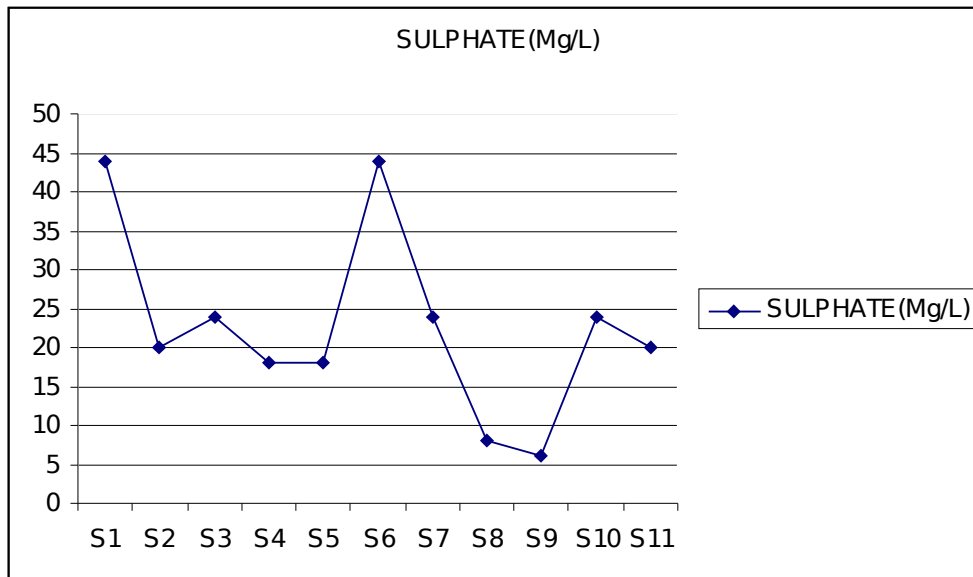


Figure 6.7: Variation of Sulphate in water

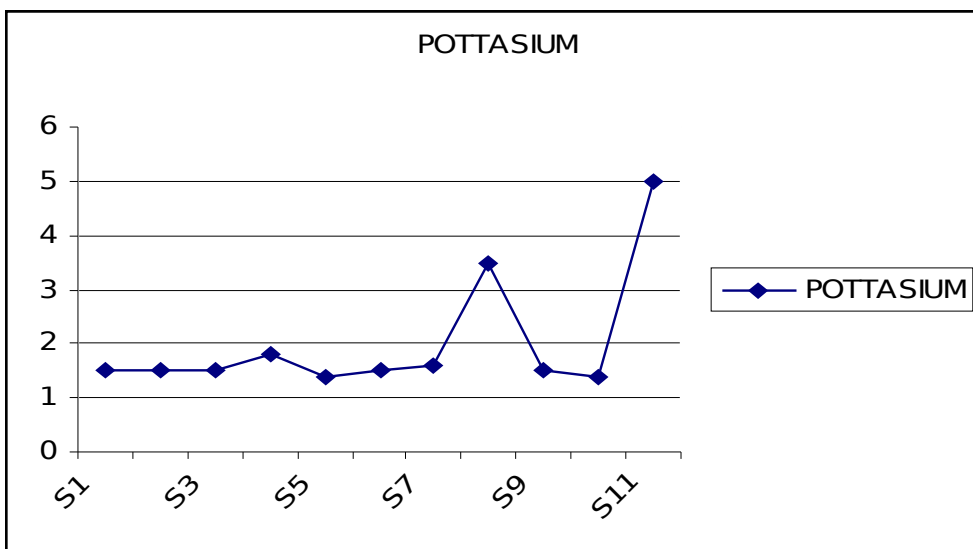


Figure 6.8: Variation of Potassium in water

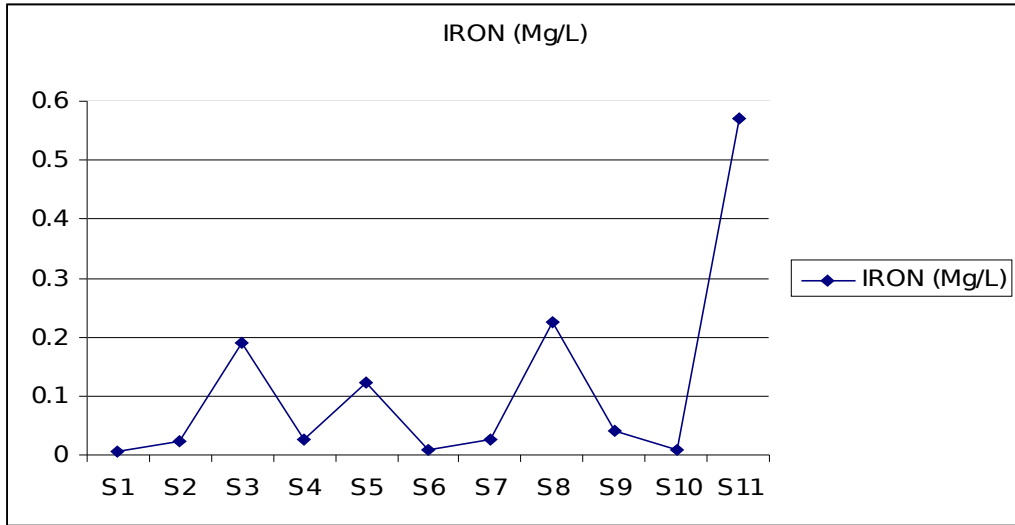


Figure 6.9: Variation of iron in water

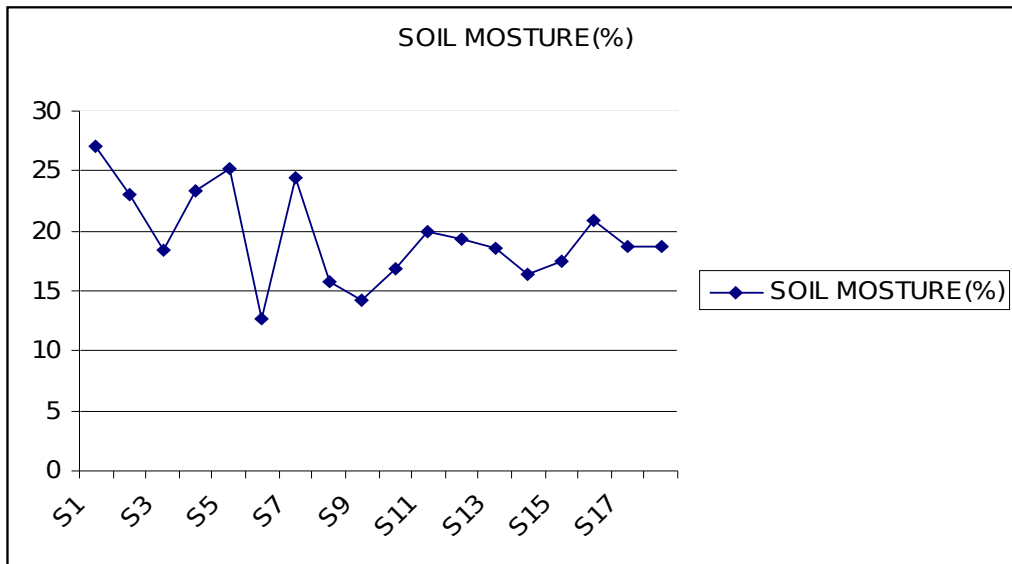


Figure 6.10: Variation in Soil moisture

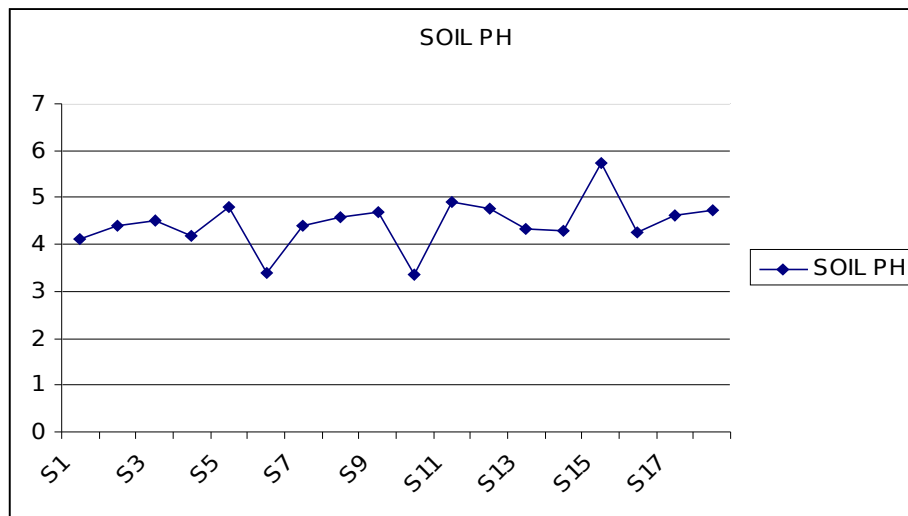


Figure 6.11: Variation in Soil pH

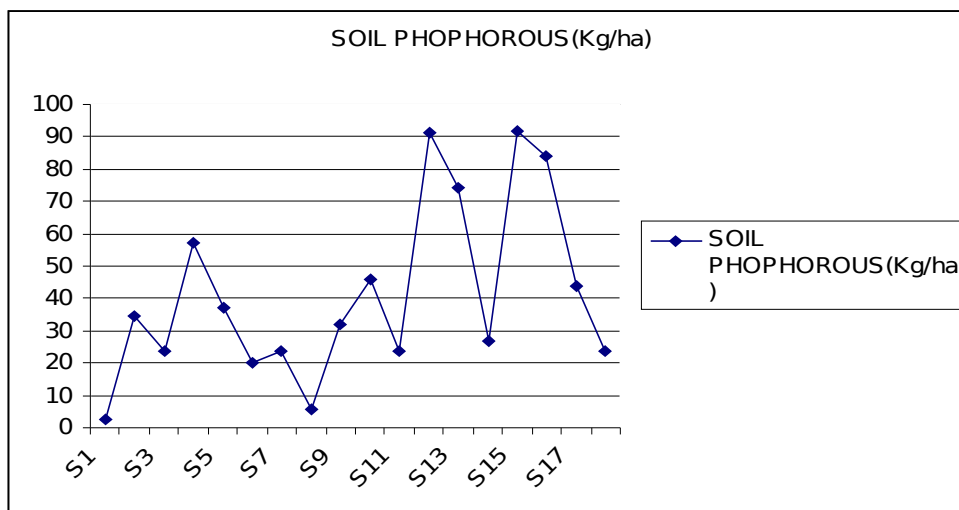


Figure 6.12: Variation in Soil Phosphorous

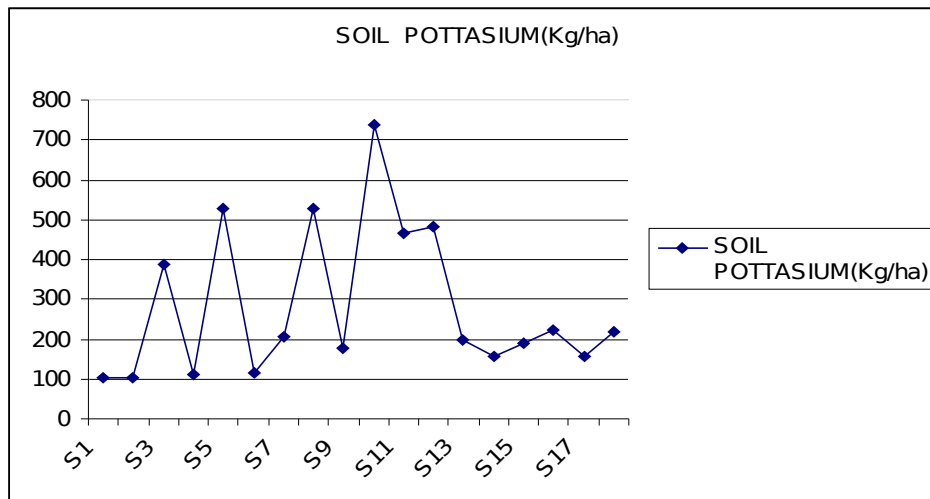


Figure 6.13: Variation in Soil potassium

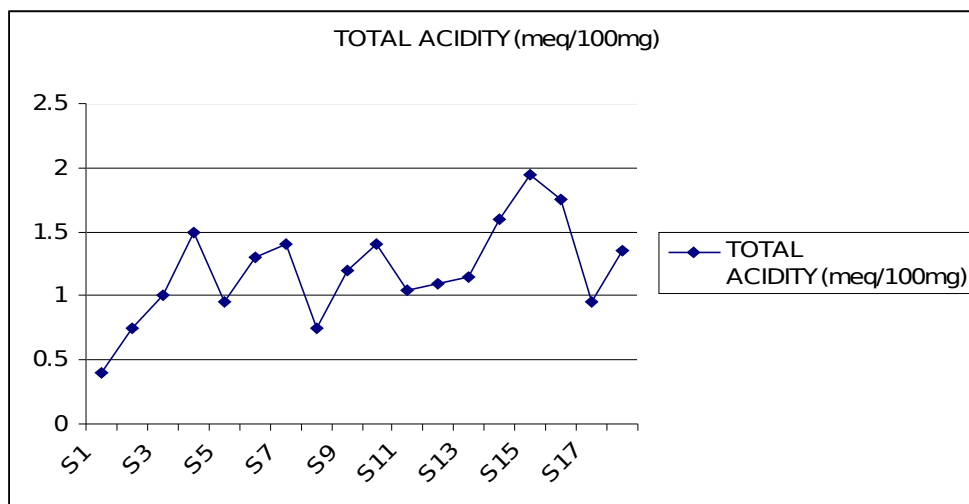


Figure 6.14: Variation of Total Acidity in soil

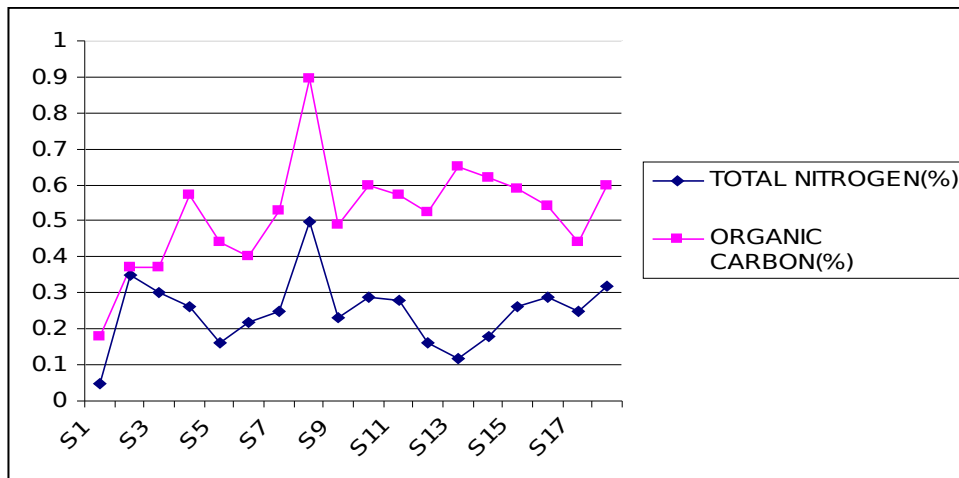


Figure 6.15: Variation in Total nitrogen and organic carbon of soil

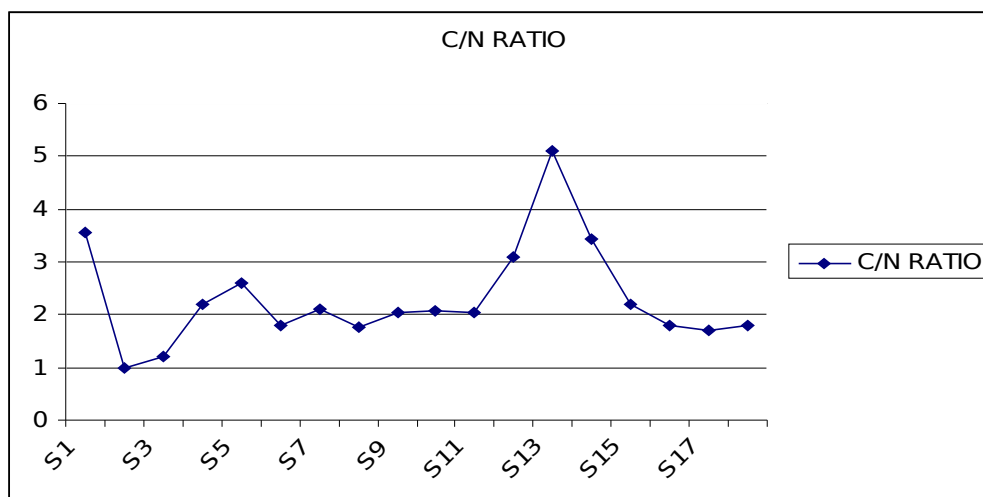


Figure 6.16: Variation in C/N Ratio

6.6. REFERENCES

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CHAPTER : 7

*CONCLUSION AND
RECOMMENDATIONS*

CONCLUSION AND RECOMMENDATIONS

The number and types of species a habitat supports, indicate its health. Mahatma Gandhi University campus supports a rich biodiversity evidenced by this preliminary study. Nonetheless, species recorded in our study could be an underestimate of the total number of species. Eventhough,the biodiversity of the campus is fairly high,this habitat is threatened with the unplanned developmental activities like clearing of thickets,construction of building and felling of trees. So,there is a need for a detailed study to understand the impact of all the developmental activities on the area's flora and fauna.

It is difficult to manage and conserve the biological diversity by the State government or Central government,but the people of our great nation and rather every citizen of the country irrespective of male or female, caste or creed or religion,have to be aware of resource wealth of our country and they should take all measures to conserve and protect our rich biodiversity not only for better living of our present generation but also for future generations. We hope our study will serve as an aid in.

Participatory mode of involvement of the people at ground level to acquire more knowledge about the biodiversity conservation will help to maintain and sustain the bio-resources and biodiversity. Planting more indigenous plant species may save the habitat from destruction and will help to restore the biodiversity loss. Moreover, environmental awareness programme among the authorities, students and teachers and nearby villagers should be started for the

conservation of biodiversity of our campus.

As an initial step towards conservation, each department of the university has to take steps to maintain a garden of their own. Steps may be taken for planting more flowering and fruit bearing trees along the campus. Medicinal plants can be planted by replacing the rubber and mangium plantations in the campus. The Nalpathimala is an area with immense water holding potential, but currently no conservation measures had been taken to sustain it. An afforestation programme in this area along with proper soil and water conservation measures are needed. The proper maintenance of check-dam would also be of great significance to ensure the water availability as well as biodiversity of the campus.

However, these are rather preliminary results;but we believe that they indicate directions along which we must work further to organize comprehensive programme of monitoring our natural resources. It will be our endeavor to build upon these preliminary results and develop a sound programme of monitoring biodiversity and other natural resources in the Mahatma Gandhi University campus.