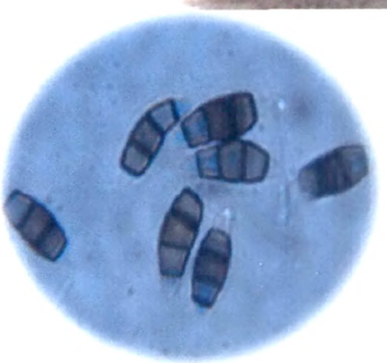
INTRODUCTION



Ecosystems are responsible for much of our Climate Physiology. The Ecosystem is a core function of a working Forest However, simply planting trees will not create a working Forest Ecosystem. To accomplish that you must have virtually all the plant species that Nature provides from the smallest Flowers through woody shrubs and under Forest Ecosystems are responsible for much of our Climate Physiology. The Ecosystem is a core function of a working Forest However, simply planting trees will not create a working Forest Ecosystem. To accomplish that you must have virtually all the plant species that Nature provides from the smallest Flowers through woody shrubs and understory trees. Then you add the Birds, Animals and Insects. Only then will the synergy of these elements begin a working Forest Ecosystem.

The working forest Ecosystem is a virtual clean climate machine. It cleans the air removes particulate matter, cools the air and adds moisture. The forests absorb existing air polluted separating the elements freeing and releasing the oxygen disposing of the minor elements and using the CO_2 for food synthesis and further growth. Forests release water during transpiration vapour which rises and form clouds.

As ecological threats to forest health and sustainability intensify and new threats are emerging, forest pathology plays an increasingly important role in recent times.

Forests

The forest in the state may be classified into eleven categories (after Champion and Seth, 1968). Important categories are: Tropical moist deciduous forests, mixed dry deciduous forests (dry-teak and non-teak forest), Scrub forests and mangrove forests.

Type of Forests in Gujarat:

The main forest types of Gujarat are as follow

Sub-group 3-B -**South Indian moist deciduous forests**: Dangs, Valsad and Surat.

1. Sub- group 4-B-**Swamp forests or tidal forests**: Kachchh, Jamnagar, Bhavnagar, Bharuch and Surat.
2. Sub-group 5-A-**Southern Tropical dry deciduous forests**; Dangs, Gir-Girnar, Sabarkantha and Panchmahals..
3. Sub-group 6-B **Northern tropical thorn forests**: Saurashtra, Kachchh and North Gujarat, Little Rann of Kutch (LRK) and Great Rann of Kachchh (GRK) and Banni.

Forest Cover of Gujarat:

1. Open Forest (canopy density between 10 to 48%) 5504Sq.km (29.23%).
2. Dense Forest (Canopy density 48%) 6430 Sq.km (34.15%)
3. Scrub/Degraded/Cultivation/Water body/Saline area 4463 Sq.km. (23.7%)
4. Grasslands 1428 Sq.km. (7.45%)
5. Mangroves 1031 Sq.km. (5.48%)

(i) Tropical moist deciduous forests

These forests are found in sub humid southern most hilly areas of the state viz. Dangs, Valsad, Vyara in Surat, Bharuch and Narmada districts where average rainfall is not more than 1025 mm. these forests are not evergreen, top layer of trees are more than 8m tall and they shed their leaves during March and April, though middle layer and ground cover generally remain fairly green. The dominant trees in these forests are:

Tectona grandis L.f. and *Shorea robusta* Gaertn.f. are more dominant. The other evergreen associates are *Acacia chundra* (Rottler) Willd., *Anogeissus latifolia* (DC) Wall ex. Bedd, *Butea monosperma* (Lam.) Taub., *Dendroclalamus strictus* (Roxb.)

CG.Nees, *Diospyros melanoxylon* Roxb., *Mitragyna parvifolia* L., *Terminalia crenulata* Roth., *T. alata* Hewne ex. Roth., *T. chebula, Lagerstroemia parvifolia* L., *Pterocarpus marsupium* Roxb., *Schleichera oleosa* (Lour) Oken., *Dillenia pentagyna* Roxb., *Miliusa tomentosa* (Roxb.) Sinclair, *Trema orientalis* (L.) Bl., *Kydia calycina* Roxb., *Clausena heptaphylla* Roxb., *Olea diocia* Roxb., *Oroxylum indicum* Vent., *Bambusa arundinacea* (Retz.) Willd., etc. During monsoon, these forests resemble just as evergreen forests, however, some species shed their leaves during March- April except *Tectona grandis* which shed its leaves during winter season. The common woody climbers reported in these areas are *Diploclisia glaucescens, Dioscorea belophylla, D. hipsida, D. oppositifolia, Cayratia carnosa, Ventilago maderaspatana, Derris heyneana, Hyptage benghalensis,* etc.

A number of epiphytes and terrestrial orchids, characteristics of moist forest, further enrich the photodiversity of these beautiful forests. The important orchid species in these forests are: *Aerides crispum* Lind., *A. maculosum* Lind., *Dendrobium barbatulum* Lind., *D. microbulbon, D. Ovatum* (L.) Krazl., *D. peguanum, Habenaria commelinifolia* (Roxb.) Wall. Ex Lind., *H. Furcifera* Lind., *H. gibsonii var. foliosa* Hook. F., *H. grandifloriformis* Blat.and Mclan, *H. longicorniculata, H. marginata var. fusifera* (Colebr.)Lind. Ex Wall., *Malaxis mackinnonii, Nervilia aragoana, N. discolor, Oberonia falconeri, Peristylus lawii* (Wight.) Hook.f., *Platanthera susannae* (L.) Lind., *Vanda tessellate* (Roxb.) Hk. Ex G Don., *Zeuxine strateumatica* (L.) Schlechter, etc. the ground flora is dominated mainly by shade loving species of *Ageratum, Abutilon, Cassia, Cleome, Eupatorium, Cynoglossum* and other grass species, etc.

(ii) Mixed dry deciduous forests

These forests are mixed growth of trees and remain deciduous during dry season. The lower canopy in these forests is also deciduous with occasional evergreen being

present in the moist areas. The under growth is comprising shrubs and ground flora flourish well during rains. These forests can be further divided into 'dry teak forests' and 'dry non-teak forests'. The former type occurs in Rajpipla, Chhota-udepur, Panchmahal, Sabarkantha in north-east and Junagadh and Amreli district in Saurashtra. The 'dry non-teak forests' are found in some parts of Bansakantha district in north Gujarat and Rajkot district in Saurashtra. The main difference between these forests types is that in dry teak forest, *T. grandis*, dominates the vegetation, while in latter type it is very poorly represented and dominating species is *A. latifolia* or *A. chundra*. The other associates of these are: *B. monosperma, D. melanoxylon, Mitragyna parvifolia, Schleichera oleosa, Lannea coromandelic, Terminalia crenulata*, etc. *Boswellia serrata* becomes most dominant tree on the top of hills in some forest ranges. The other scattered tree species reported in these forests are: *Haldina cordifolia, Albizzia lebbeck* (L.) Benth , *A. odoratissima, Bauhinia racemosa* Linn., *Bridelia retusa* Willd., *Buchanania lanzan* Spreng., *Carea arborea* Roxb., *Cochlospermum religiosum* (L.) Alston., *Dalbergia latifolia* Roxb., *D. paniculata* Roxb., *Embilica officinalis* L., *Garuga pinnata* Roxb., *Hymenodictyon excelsum* (Roxb.) Wall., *Sterculia urens* Roxb., *Pterocarpus marsupium, Desmodium oojcinensis* (Roxb.) H. ohashi, etc. Most of these trees are 8 m or more high and are heliophytes. The trees or shrubs which are rather less tall and constitute middle layer are: *Holarrhena pubescens, Wrightia tinctoria, Aegle marmelos* (L.) Corr. Serr., *Alangium salvifolium* Lam., *Casearia elliptica* Willd., *Flacourtia indica* (BrumF.) Mer., *Gardenia turgida* J. Ellis., *Mallotus philippensis* (Lam.) Muell. Arg., *Zizipus xylopyrus* (Retz.) Willd. etc.

On the top of some of these forest ranges *Dendrocalamus strictus* clumps are associated with *Boswellia serrata*. On low and isolated hillock the common shrubs

present are: *Carissa congesta, Capparis sepiaria* L., *Maytenus emarginatus* Willd., *Mimosa hamata* Willd., *Cassia auriculata* L., *Trema orientalis* (L.) Bl., *Xeromphis spinosa* (Thum.) Keay., *Woodfordia fruticosa* (L.) Kurz., etc. The common climbers and twinners associated with these plants are: *Abrus precatorius* L., *Acacia pinnata, Asparagus racemosus* Willd., *Aspidopterys parvifolia, Cansjera rheedii* J. Gmelin., *Celastrus paniculata* Wild, *Cissus repanda* Wahl., *Clematis hedysarifolia* DC., *Combretum ovalifolium* Loefl., *Cryptolepis buchanani* R & S, *Cylista scariosa, Hiptage benghalensis, Millettia racemosa* (Roxb.) Benth., *Wattakaka volublis* (L.f.) Stapf. *etc.*

The ground flora which makes its appearance green during monsoon comprises of following common species: *Acanthospermum hispidum* DC., *Achyranthes aspera* L., *Anisochilus carnosa, Barleria prattensis* Sant., *Bidens biterbata* (Lour.) Merr. and Sherff., *Blainvillea acmella* L., *Cassia absus* L., *C. Tora* L., *Clitoria biflora* Dalz., *Curcuma inodora* Blat., *Dicliptera roxbhurghii* Nees., *Trachyspermum stictocarpum* (C.B. Clarke) H. Wolff, *Sida* spp., etc. The common grasses intermingled with these herbaceous plants are: *Apluda mutica* L., *Dicanthium annulatum* (Forssk.)Stapf and species of *Arthraxon, Eragrostis, Digitaria, Brachiaria and Panicum*, etc.

Fossil records of parasitic fungi date back to Devonian period, which possibly suggest that plant disease originated along with the plants; much before man came on earth. When man started growing food they also unwittingly started culturing the parasites. The outbreak of plant diseases, then must have occurred much before recorded history. Mention of plant diseases are found in ancient Greek and Indian citations though they knew little about them.

First authentic records of plant disease are found in the writings of Theophrastus – "The Father of Botany". While describing trees, cereals, pulses he also described their

diseases. He recorded the harmful effects of wind, weather location. He and other Greek philosophers of the time believed that the diseases originated from the plants or from the environment.

An Italian botanist Micheli in 1729 made an extensive study of fungi and their reproductive structures. He discovered the role of spores and experimentally proved that the fungi originated from their spores. This was the first experimental proof that fungi are autonomous organisms which produce seed – like bodies and not capricious creatures of the spontaneous generation.

India is one of the 12 mega-biodiversity countries of the world. About 70% of total geographical India area has been surveyed so far, in which 46,000 plants have been described. A healthy forest needs protection from all kinds of disturbances caused by a variety of biotic & abiotic stresses (Sarbhoy, 2005).

Forest is a dense growth of trees, together with other plants, covering a large area of land. It is an ecosystem—a community of plants and animals interacting with one another and with the physical environment. Gujarat state has 19.6 m. ha. forest cover, which is 9.61% of the geographical area of the state.

The south and south-eastern parts of the state support the growth of a tropical deciduous forest typified by *Tectona grandis* L.f., *Shorea robusta* Gaertn. f. for which the district of Valsad is well known. The forest of the state can be divided into the following broad categories, depending upon their environmental adjustments and the general morphological character of the representative species. It is estimated that the forest products contribute about 1% of world gross domestic product (GDP).

Gujarat has about 19.66 lakh hectares of land under forest. A large part of the forest cover which is economically exploitable is distributed in the districts of Dangs, Panchmahals, Broach, Surat, Bulsar, Junagadh, Sabarkantha and Banaskantha. Dangs,

Surat and Broach, which are the three southern districts of the state have a sizable area under forest. The districts of Panchmahals and Sabarkantha in north-east Gujarat and Junagadh in Saurashtra are other important areas of forest cover. The south and south-eastern parts of the state support the growth of a tropical deciduous forest typified by teak, *Shorea robusta* for which the district of Valsad is well known.

All shades trees are attacked by one or more fungi that cause scattered, rather definite round to oval, angular or irregular shaped spots on the leaves. These spots become usually become conspicuous from late June through August. Leaf spots are most common diseases of shade trees. Most of the diseases are favored by cool weather, light and frequent rains, fog or heavy dews, high humidity, and crowded or shady plantings. Leaf spot infections that start early in the growing season can lead to premature defoliation. If it occurs over two or more successive years, it can seriously weaken a tree, reduce its growth, and its susceptibility to bark borers, winter injury and other diseases. Leaf spot commonly increase in number and size in late summer and early autumn as the leaf begin to senesce. The occurrence of leaf spot disease late in the growing season generally does not seriously affect the health of a tree. Certain leaf spots have special name such as anthracnose, black pot, downy spot or white mold, ink spot, anthracnose, leaf blister, scab, shot hole, sooty blotch and tar spot. (Patacky, 1998)

Moist Deciduous Forests

Moist Deciduous Forests occur in Dangs and parts of Vyara in Surat division. These forests are not evergreen and shed their leaves during March and April, though the under-wood and shrub cover are fairly green. Teak is an important species which drops its leaves only in the cold weather in localities which are relatively dry or cold,

but is almost evergreen in the moist parts of its distribution. Teak needs a moderately good rainfall and a well-drained terrain. The associates of teak in the moist deciduous forests are *Terminalia tomestosa* and *Anogeissus latifolia.*

Dry Deciduous Forests

There are mixed growth of trees which are deciduous during the dry season. The lower canopy in these forests is also deciduous with occasional evergreen or sub greens being present in the moister area. There is an undergrowth of shrubs, but the light reaches the surface allowing the growth of grass which occasionally develops into a savanna-type grass field. Bamboos are not luxuriant. Other trees of the dry deciduous forests are teak, *Boswellia serrata, Anogeissus latifolia* and *Diospyros melanoxylon.* Dry deciduous forests with teak occur in north-east Gujarat, particularly in Sabarkantha district. The forests of Junagadh are valuable for their yield of timber and of grass growing on their outer margin.

LEAF SPOT

Leaf spot and leaf blights reduce the photosynthetic area of the plants and thus impair the food manufacturing capacity. Such diseases involve production of toxins which cause injury to the host cell. Leaf spot diseases out number all other diseases. A close look at any plat will reveal that it expresses leaf spot symptoms at one stage or the other. Environmental conditions and age of plant determine the frequency of the spots. The symptoms comprise a varied pattern of expression. Infection may be apical, marginal or scattered. Lesions may be of various shapes and shades. They are usually self – limiting and necrotic areas which present a discrete pattern. Association of imperfect fungi and bacteria is more common with diseases. Usually such diseases result in destruction of cellular contents and collapse of the cell walls. Changes in the

protoplast are brought about by the proteolytic enzymes. In general, the primary effect of the pathogen results in degradation of protoplast is brought constituents.

Many of the leaf spot causing fungi like *Alternaria, Helminthosporium, Pestalotia* and *Phyllosticta* are capable of degrading pectic and cellulosic material in vitro and this may be possibly an indirect evidence regarding functioning of the enzyme systems in the host tissues. Pecolytic enzymes are also known to be formed by certain bacterial leaf spot pathogens like *Pseudomonas tabaci* and *P. angulatum.* The necrogenic capabilities of the leaf spot pathogens have naturally led to the conclusion that forms highly potent specific toxins. Several leaf spot infections sometimes result in total defoliation. Akai (1951) showed the formation of abscission cells around the necrotic areas in peach leaf spots induced by *Xanthomonas pruni.* Infection by *Cladosporium carpophilum* (Samuel, 1927) leads to perforation of spots in the leaves of *Prunus amygdalus*. Leaf spots and leaf blights resemble each other in the expression of symptoms as well as mechanism of pathogenesis. Many leaf blight causing organisms, are however, capable of killing the host partially or totally, not only by direct destruction of the tissue but also by systemic dispersal of the toxic substances far beyond the original region of infection.

Leaf spot symptoms vary depending upon the plant host and the causal fungus. A typical leaf spot is a rather definitely delimited necrotic lesion, often with a brown, black, tan or reddish centre and a darker margin. These spots vary in size from pin-head to those that encompass the entire leaf. Partial to complete defoliation of the tree or ornamental may occur under certain circumstances.

Although many different fungi are known to cause leaf spots, their disease cycles are often similar. In most cases, the causal fungus overwinters on fallen leaves. In spring, often in conjunction with rain and wet weather, spores are produced by the

fungus and subsequently discharged and carried by wind or splashing rain to newly emerging leaves. Once on the leaf surface and with appropriate environmental conditions, the fungal spores germinate, penetrate the leaf, and cause infection. Leaf spots are generally favoured by cool, wet weather early in the growing season. By the time symptoms are apparent, it is usually too late to apply fungicides for control.

Plants selected for the study

***Tectona grandis* L.f.**

The plant *Tectona grandis* is native to India and Myanmar and is found in the monsoon vegetation forest. It is commonly known as teak. It is a large deciduous tree with a height up to 35 meters, leaves simple, opposite, broadly elliptical or acute or acuminate, with minute glandular dots; the Flowers are white in color and small with a pleasant smell.

Teak is an important species which drops its leaves only in the cold weather in localities which are relatively dry or cold, but is almost evergreen in the moist parts. Teak needs a moderately good rainfall and a well-drained terrain. The associates of teak in the moist deciduous forests are *Terminalia tomestosa* (Roxb.)W & A. and *Anogeissus latifolia* (DC.)Wall.ex Bedd. Trees of the dry deciduous forests are teak, *Boswellia serrata* Triana and Planch, *Anogeissus latifolia* (DC.)Wall.ex Bedd and *Diospyros melanoxylon* Roxb found with grasses and bamboos.

Chemical Constituents

The various phytoconstituents reported are tectoquinone, 5-hydroxylapacol, tectol, betulinic, aldehyde, betulinic acid, squalin, lapachol. The plant is used in the

treatment of urinary discharge, bronchitis, common cold and headache, as a laxative, sedative, diuretic and in scabies. We have earlier reported that the methanolic extract of the leaves showed a significant wound healing, analgesic and anti inflammatory activity. The extract was investigated to determine the nature of the phytoconstituents responsible for these activities. Literature survey has revealed that plant metabolites like phenolic compounds (simple phenols, phenolic acids, Flavonoids, tannins etc), and sterols play an important role in many of the activities like wound healing, analgesic, anti inflammatory and anti microbial activity. This paper reports the isolation and identification of phenolic compounds gallic acid, ellagic acid, rutin and quercitin.

Uses

Teak is used extensively in India to make doors and window frames, furniture, and columns and beams in old type houses. It is very resistant to termite attacks. Mature teak fetches a very good price. It is grown extensively by forest departments of different states in forest areas.

Leaves of the teak wood tree are used in making Pellakai gatti (jackfruit dumpling), where batter is poured into a teak leaf and is steamed. This type of usage is found in the coastal district of Udupi in the Tulunadu region in South India. The leaves are also used in gudeg, a dish of young jackfruit made in Central Java, Indonesia, and give the dish its dark brown color. Teak is used as a food plant by the larvae of moths of the genus *Endoclita* including *E. aroura*, *E. chalybeatus*, *E. damor*, *E. gmelina*, *E. malabaricus*, *E. sericeus* and *E. signifer* and other Lepidoptera including Turnip Moth.

Teak is used extensively in boat decks, as it is extremely durable and requires very little maintenance. The teak tends to wear in to the softer 'summer' growth bands first, forming a natural 'non-slip' surface. Any sanding is therefore only damaging. Use of modern cleaning compounds, oils or preservatives will shorten the life of the teak, as it contains natural teak-oil a very small distance below the white surface. Wooden boat experts will only wash the teak with salt water, and re-caulk when need this cleans the deck, and prevents it from drying out and the wood shrinking. The salt helps it absorb and retain moisture, and prevents any mildew and algal growth. People with poor knowledge often over-maintain the teak, and drastically shorten its life.

Terminalia arjuna (Roxb.) Wight & Arn.

A large evergreen tree with smooth grey bark exfoliating in large, thin, irregular sheets, often tinged with green and red. The leaves are oblong, opposite and sub-opposite. The leaves on the lower surface usually carry a pair of prominent glands close to the top of the leaf-stalk. The flowers are pale-yellowish-white, cup-shaped, resembling myrobalan, small and crowded on a long axis. It flowers from March to June when its honey attracts swarms of bees. The fruit is a winged nut, the leathery wings are usually five in number and are closely veined, the veins not spreading horizontally but tending to curve upwards. The fruit is tan-coloured when dry.

Chemical - Constituents

Plant contains triterpene arjunolitin. Roots and root bark contain triterpenoid glycoside arjunoside I-IV, triterpene terminic acid. Stem bark contains flavone arjunolone, arjunglucoside, tannin, arjunic acid, arjunetin, arjungenin. Fruits contain Beta-sitosterol, friedelin, methyloleanolate, gallic acid, ellagic acid, arjunic acid, ceresidin,arjunone.

Uses

Its bark is astringent and is used in fever and in fractures and convulsions; it is also taken as a cardiac tonic. Bark styptic, tonic, febrifuge and anti-dysenteric; pulverised bark gives relief in symptomatic hypertension and acts as a diuretic in cirrhosis of liver. Fruits are tonic and deobstruent. Juice of leaves is used in earache.

Bambusa arundinacea (Retz.) Willd

Native to tropical and subtropical areas of Asia, especially in the monsoon and wet Tropics. A tall, thickset bamboo; stem up to 33 m high, tufted on a stout rootstock. Leaves up to 20 cm long, linear-lanceolate. Inflorescence an enormous panicle often occupying the whole stem.

Bambusa is a large genus of clumping bamboos. The plant grows wild all over India, mainly in forests of western and southern parts of the country. *Bambusa arundinacea* can grow up to 1500 – 2000 meters of elevation. It is an erect, 15-35 meter tall, thorny grass, with many stems. The plant is hollow between the joints, with 2-3 alternate thorns on the stem. Their leaves are sheathing, linear, 20 cm long and 2 cm broad, lanceolate, tapering in the pointed tips. The flowers are produced in bunches, yellow or yellowish green in long panicles. The fruits are oblong grains, resembling like yava fruits, hence called as vamsayava.

Chemical - Constituents

Young shoots contain cholin, betain, enzymes, benzoic acid and a cyanogenetic glycoside, (taxiphyllin), oxalic acid, reducing sugars, resins, waxes, silica and other minerals. Juice of sprout contains benzoic and hydrocyanic acids. The plant also contains silicic acid, oxides of iron, potash and lime (Ghani, 2003).

Uses

The stem and leaves are cooling and laxative; useful in diseases of blood, leucoderma and inflammatory conditions. The sprouts are laxative and beneficial in strangury. The siliceous concretion found in the joints of the female bamboo is largely used in homeopathic medicine as tonic and aphrodisiac; useful in cough and cold, congestion and asthma. The leaves are considered emmenagogue; given to check diarrhoea in cattle and horses. Thin green layer of the bark is used to arrest bleeding. The roots are used to treat joint pains.

***Madhuca indica* J. F. Gmel**

Mahua: The Honey Tree

Madhuca indica is the botanical name of Madhuka tree which belongs to family Sapotaceae.

M. indica is a medium to large deciduous tree fast growing upto 20m height (Fig—). Tree possesses evergreen or semi-evergreen leaves which cluster near ends of branches, elliptic or elliptic-oblong, pubescent and turn to glabrous at maturity. Young leaves are pinkish red. Flowers white to cream colour with tubular, fleshy and juicy corolla, clustered at the end of branches. Fruits berry ovoid, green at maturity and turn pinkish yellow when ripe. Fruits are pulpy with large ovoid seed, numbers of seeds vary from 1 to 4, seed color brown to black. Fruits occur in single or bunch up to 30-40. Leaf fall takes place between February to April and at the same time flowering commences. Fruits mature generally in the months of May-June. Tree blooms at night and in early morning hours flowers fall on the ground and collected by local tribal population for commercial use.

In Sanskrit, the plant is known as Madhuka. Mahua is its Hindi name. It is used for timber, flowers and fruits. It has several medicinal properties.

Medicinal uses

Roasted leaves of the tree are mixed with sesame oil and applied on swelling and inflammation. Patients suffering from piles are supplemented with 12-15 drops of seed oil. It works as laxative. Bark decoction is good in diabetes. Topical application of seed oil is recommended for stiffness and arthritis. Seed oil provides soothing effect to the skin. A decoction of the bark can be given internally in rheumatic diseases. The leaves of *Madhuca* are effective in the treatment of eczema. Flowers used as expectorant are good cure for curing bronchial asthma. Flowers are used as sweet, some ethnic food like chapati are prepared by tribal women. Mahua cake is used as manure; it has pesticidal properties.

Uses:

Madhuca fat is satisfactory for production of washing soaps. The oil extracted from seeds is used in cooking, soap making and manufacture of margarine. It is used for edible purposes culinary, hair oil, illumination, keeps body glossy and warm.

Madhuca cake can be used as cheap organic manure and possesses insecticidal property. Also used with shikakai for hair-wash.

The flowers used as vegetable, for making vinegar and liquor.

Seed paste is applied to cure muscle fatigue and relieve pain in the muscle and joints to improve the texture and vigor of skin. Bark decoction is used in curing bleeding gums and ulcers. *Madhuca* oil extracted from the seeds has laxative properties. It helps to cure piles by relieving chronic constipation. The leaves of *Madhuca* are effective in the treatment of eczema.

***Diospyros melanoxylon* Roxb.**

Coromandel Ebony or East Indian Ebony (*Diospyros melanoxylon*) is a species of flowering tree in the family Ebenaceae that is native to India and Sri Lanka.

D. melanoxylon is a medium-sized tree or shrub up to 25 m, in height and 1.9 m girth. The bark is pelican in colour, exfoliating in rectangular scales. The primary root is long, thick and fleshy at first, afterwards woody, greyish, often swollen in upper part near ground level. The roots form vertical loops in sucker-generated plants. Leaves opposite or alternate and coriaceus, up to 35 cm long, tomentose on both sides when young, becoming glabrous above when fully grown. Male flowers are mauve in colour, tetramerous to sextamerous, 1-1.5 cm long, sessile or nearly sessile in short peduncles, mostly 3-flowered. Female flowers mauve, mostly extra-axillary or sometimes solitary, axillary generally 2, opposite each other, larger than the male flowers. Fruits olive green, ovoid or globose 3-4 cm across; 1-8-seeded berries. Pulp yellow, soft and sweet. Seeds compressed, oblong, shiny, often banded. The generic name is derived from the Greek 'dios' (divine), and 'pyros' (fruit), referring to the excellent fruit of the genus. The specific name is Greek and means 'dark wood'.

Its common name is derived from the coast of southeastern India, Coromandel; locally it is known as *temburini* or by its Hindi name *tendu.* It is used in making an Indian cigarette product known as beedi in wrapping the tobacco together to be smoked. Bark of East Indian Ebony is hard and dry, burns with spark and sound.

Uses: *Diospyros melanoxylon* leaf is considered to be the most suitable wrapper on account of the ease with which it can be rolled and its wide availability. Leaves of many other plants like *Butea monosperma; Shorea robusta* etc. also find use as Bidi wrappers in different parts of the country but the texture, flavour and workability of

Diospyros leaves are unmatchable. The wide-scale use of *D. melanoxylon* leaves in Bidi industry is mainly based on their enormous production, agreeable flavour, flexibility, resistance to decay and capacity to retain fire. The broad morphological characters on which leaves, are selected and categorized for Bidi making are size, thickness of leaves, texture, relative thickness of midrib and lateral veins.

Forest trees suffer with a large number of fungal pathogens. Efforts have been made by Bakshi (1976), Bilgrami *et al.* (1979,1981), Jamalludin *et al.*, (2001), Dadwal and Jamaluddin (2001) Arya & Arya (2002) to report new leaf spot diseases of forest trees. Considering the huge losses to forest biomass and ultimate reduction in yield an effort is required to find out effective control measures.

Fungi growing on leaves in a parasitic fashion are termed as foliicolous fungi. These fungi are either obligate parasites (biotrophs) or necrotrophs. The fungi cause diseases which can be identified by disease symptoms. Fungi may cause large scale mortality in the nursery or they could seriously affect plantations by reducing the biomass or loss of valuable germplasm collection. The diseases caused by powdery and downy mildews & anthracnose result in severe losses of foliage. Further, if the plants are like Tea (*Camellia sinensis* (L.) Kuntze) or Timru (*Diospyros melanoxylon* Roxb.) the infection on leaves means production of toxins which will be ultimately consumed by human beings in form of tea or bidi leaves.

Fungi rank second only to insects as a cause of plant diseases, which result in heavy loss of plant products. Pathogenic fungi alone cause nearly 20% reduction in the yield of major food and cash crops. (Agrios, 2000). One third global agricultural production is reportedly destroyed each year due to plant diseases. Variety of control measures presently are in use. In physical methods, use of sunlight and UV radiations *etc.* are included, while the most commonly known means of controlling fungal

diseases in fields and green houses and sometimes in storage is through the use of chemical compounds that are toxic to fungi. No doubt the use of chemicals has been found very effective in controlling fungal diseases but some major problems threaten to limit the continued use of fungicides. Firstly some fungi have developed resistance to chemicals. This necessitates use of higher dosage or the development of new chemicals to replace those to which fungi are resistant. Secondly some fungicides are not readily biodegradable and tend to persist for years in the environment. This leads to third problem, the detrimental effects of chemicals on organisms other than target fungi, (Brady, 1984). Because of these problems associated with the use of chemicals, researchers are now trying to use environmentally safe alternative methods of fungal control.

The search for simple biodegradable bioactive compounds of plant origin against fungi has been the target of interest for ecologically safe products. (Soundharrajan *et al.,* 2003)

Aqueous extracts of many allelopathic plants are known to exhibit antifungal effect. Allelochemicals reduce the germination of spores and mycelial growth of pathogenic fungi. Many research workers have tried to find safe and economical control of plant diseases by using extracts of different plant parts. (Bhowmick and Chaudhary, 1982; Vir and Sharma, 1985; Jeyrajan *et al.,* 1988; Swada *et al.,* 1971; Singh *et al.,* 1980; Sumbali and Mehrotra, 1981; Loke, 1990; Kazmi *et al.,* 1993.)

Fungi already reported from *T. grandis* include
Acorocybe hansfordii
Auricularia polutricha
Calderiomyce
Cephalosporium curtipes
Cercospora tectonae
Chaconia tectonae
Circinotrichium pseudocladium
Didymobotrichium pubescens
Fusarium sp
Ganoderma applanatum
Grammothele effuse – reflexa
Hypomyces haematococcus
Irpex flavus
Microxyphium fagi
Myrangium tectonae
Nectaria haematococcus
Olivea tectonae
Pestalotia sp.
Phyllosticta tectonae
Podospora nanaopodalis
Polyporus adustus
Prathoda saparva
Sarcinella sp.
Sphaceloma tectonae
Synnematium jonesii
Tilachlidium pinnatum
Uncinula tectonae
Veronaea tectonae

***Terminalia arjuna* Roxb.**
Colletotrichium arjunae
Fomes durissimus
Pestalotiopsis disseminata
Sphaceloma terminaliae
Uredo termenalia
Xylaria trichopoda

***Diospyros melanoxylon* Roxb.**
Aecidium rhytismodieum
Aecidium miliare
Cercospora kaki
Pseudocercospora kelleri
Sarcinella gorakhpurensis
Stereum lobatum

***Madhuca indica* L.**
Cylindroncladium scorparium
Pestalotia dichaeta

Pestalotia sp.
Phyllachora madhuca
Phyllachora madhucae
Polystictus steinbelianus
Scopela echinulata
Sarcinella sp.
Sphaceloma madhucae

***Bambusa arundinacea* Nees**
Amauroderma rugosus
Anthostomella bambusae
Botrydiplodia theobromae
Cerodothis aurea
Craterellus cornucopiodes
Dacryopinax spathularia
Daedalea flavida
Daedalea quercina
Flammula dilepis
Fomes durus
Fomes hypoplstus
Guepinia ramosa
Hexagonia apiaria
Irpex flavus
Merulius similis
Phyllachora sp.
Polyporus friabilis
Polystictus steinheilianus
Polyporus anthelimínticus
Polyporus rubidus
Polystictus oblectans
Polystictus perennis
Poria diversipora
Schizophyllum commune
Sporomiella intermedia
Thelephora palmata
Tramella fucifromis
Trametes persoonii
Tremellodon gelatinosum

Plants used for Biocontrol

Plants are the richest source of renewable bioactive organic chemicals. The total number of plant based chemicals may exceed 4,00,000 of these 10,000 are secondary metabolites, whose major role in the plants is reportedly defensive (Swain, 1977).

The screening of plant extracts for antimicrobial activity has shown that a great number of these plants contain active compounds. The presence of antibacterial, antifungal, and other biological activities has been demonstrated in extracts of different plant species used in traditional medicine practices. (Hashem, 2011)

Basic researches for over more than forty years in the fields of biological and biochemical have made it possible to envisaged not only how new pesticides may be synthesized but also a completely new approach for the protection of plants using secondary plant products, which may be toxic to a specific pest yet harmless to man. There has been a renewed interest in botanical pesticides because of several distinct advantages (1) Pesticidal plants are generally much safer than conventionally used synthetic pesticides. These pesticides will not cause harm in nature. (2) Plant based pesticides will be renewal in nature and would be economical. (3) Some plants have more than one chemical as an active principle responsible for their biological properties. These may either be selected for one particular biological effect or may have diverse biological effects (Singh, 1993).

Efforts are being made these days to shift from the conventional use of chemicals to the use of eco-friendly botanicals for the management of plant parasitic nematodes. Organic amendments are not only safe to use but also have the capacity to improve soil structure and fertility (Trivedi, 2002).

1. *Alangium salviifolium* (Linn.f.) Wang **Alangiaceae**

A deciduous, rambling shrub or a tree, up to 10m in height with a maximum girth of 1.2 m widely distributed over the plains and foothills, throughout the greater part of India. Bark pale yellow brown, aromatic, rough with shallow cracks, exfoliating in sub – corky scales, leaves alternate, variable in shape, oblong or elliptic – oblong, acuminate, base rounded or acute, glabrous above and sparsely pubescent beneath, up to 15 cm long – petioled flowers white fragrant, in axilary fascicles; drupe ellipsoid, black, crowned by persistent calyx edible; seeds large enclosed in red mucilaginous, sweet but rather astringent pulp.

Roots have been used in Ayurvedic medicine. The root bark is very bitter, and is reputed as acure for skin diseases. It is credited with anthelmintic, purgative and emetic properties. It contains an alkaloid which when administered in small doses causes a transient fall in blood pressure followed by a sustained rise, depression of the heart, and irregular respiration. The bark exhibits anti – tubercular activity, and is active against gram – positive organisms.

The leaves are applied as poultice in rheumatism. They contain the alkaloids, alangimarckine ($C_{29}H_{37}N_3O_3$ mp 186^0), ankorine, deoxytubulosine, 3' – epitubulosine has been isolated. The leaves also contain stigmasta – 5,22,25 – trien 3β – ol, β-sistosterol, friedelin and N – benzoyl – L – phenylalaninol (m p 169). The presence of myristic acid, three triterpenoids, viz. triterpene A ($C_{30}H_{50}O_2$, m p 248 – 50^0) isoalangidiol ($C_{30}H_{52}O_2$ m p 224 – 63^0) and alangidiol ($C_{30}H_{52}O_2$, m p 262 – 63^0).
The alkaloidal extract of these leaves showed mild adrenolytic, non – specific antispasmodic, hypotensive and anti – cholinesterase activity. A quartenery base isolated from the water – soluble fraction of the alcoholic extract produces a fall in

carotid blood pressure of anaesthized dogs. An alcoholic extracts of the leaves showed hypoglycaemic activity in albino rats.

2. ***Alisicarpus vaginalis* (L.) DC.** Var. nummulariformis (DC.)Baker

Prostrate or suberect, glabrous or sparsely hairy herbs, often with radially spreading branches. Leaves 1 – 4.5 x 0.9 – 3.5 cm, ovate – oblong, elliptic – oblong or nearly orbicular, glabrous above, sparsely hairy beneath. Flowers purple or violet, in 3 – 7 cm long. Terminal and axillary, lax or compact racemes. Pods 1.3 – 2.5 cm ellipsoid – oblong, glabrous, brown, smooth.

3. ***Butea monosperma* (Lam.) Taub.**

A deciduous tree with somewhat crooked trunk up to 15 m in height and 1.6 – 2.0 m in girth; commonly found throughout India except in arid regions. Bark bluish grey or light brown; leaves long petioled, 3 – foliolate, leaflets coriaceous. Broadle obovate from a cuneate or deltoid base, glabrescent above, denselt finely silky below, flower buds dark brown, flowers bright orange red, sometimes yellow, in 15 cm long racemes on bear branches, pods pendulous, silky tomentose 1- - 13 cm long containing 1 seed at its apex: seed flate, reniform 3.3 - 3.8 cm x 2.2 – 2.5 cm. The tree is silviculturally important as it is one the most commonest on the plains of India and capable of thriving where most species will not grow. It grows in water logged situations on black cotton soils, even on saline, alkaline and swampy badly drained soils and on barren lands.

The bark is reported to posses' astringent, bitter, pungent, alterative, aphrodisiac, and anthelmintic properties. It is useful in tumours bleeding piles and ulcers. The decoction is prescribed in cold, cough, fever, various forms of haemorrage, menstrual disorders and in the preparation and elixirs. An alcoholic

extract of the bark is reported to inhibit the activity of *Escherichia coli*. The roots are useful in elephantiasis and in curing night blindness and other defects of sights. They are also reported to cause temporary sterility in women.

The green leaves are commonly lopped for fodder; the yield of milk in buffaloes feed with *Butea* leaves, is reported to improve. Their digestibility is comparable to that of straw: their caloric content is reported to be 3.761 cal/g dry weight. The leaves are also reported to contain alkaloids. They are credited with astringent, tonic, diuretic and have aphrodisiac properties. They are used to cure boils, pimples and tumourous haemorrhoids and are internally given in flatulent colic, worms and piles. The leaves are extensively used for platers, cups, native umbrellas and for wrapping. They are also used as bidi wrappers and as manure.

The flowers yield brilliant but very fugitive yellow dye. It is contained in the sap and may be obtained in the form of decoction or an infusion from dried flowers. The addition of alum or an alkaline substance deepens the colour to orange and also makes it less fugitive. The decoction is used to dye cotton fabrics, sola articles and wooden carpets and to control white ants in the field. The flowers are reported to posseses astringent, diuretic, aphrodisiac and tonic properties. They are used to reduce swellings for bruises and sprains. They are also effective in leprosy, leucorrhoea and gout.

4. *Calotropis procera* (Ait.) Ait.f. Asclepediaceae

A small erect and compact shrub covered with cottony tomentum, up to 5.4 m in height, found growing wild throughout India. Bark soft, corky leaves sub sessile, broadly ovate, ovate – oblong, mucronate, cottony pebscent when young, flowers white, purple spotted or pink, with erect petals scented in long pedunculated cottony,

umbellate cymes which become glabrous; follicles sub – globose, ellipsoid or ovoid, recurved 7.5 – 10.0 cm x 5.0 – 7.5 cm; seeds broadly ovate, acute, flattened narrowly margined, light brown, coma 3.2 cm, comprising a tuft of silky hairs. It grows mainly on coarse, sandy and alkaline soils. The growth is luxuriant on waste and fallow lands, roadside on the ruins of building, sea shores, river banks etc.

The latex contains the cardiac glycosides, calotropin, uscharin, calotoxin, calactin and uscharidin. Calotropin is the common aglycone of all the glycosides. Calotropin has marked anti – blood coagulating activity used for treating coronary thrombosis. *C. procera* contains voruschin, proceroside two genins, uzarigenin and syriogenin, α and β – amyrin and β – sitoserol.

Leaves possess antifungal properties. An aqueous extract of the leaves inhibit the larva hatching of root – knot nematode. Leaves contain ascorbic acid (241 – 411 mg/kg dry weight). The leaf yield o– pyrocatechuic acid and an alkaloid. The guinea worms are controlled. Fresh terminal leaf buds given internally for three days on empty stomach before sunrise were reported to cure migraine completely. The tender fresh leaves are often in the indigenous system of medicine to cure fits and convulsions in children. The extracts of the leaves which have been smeared with oil and rock salt is poured into ear for earache. Leaves are bandaged on painful rheumatic joints, swellings, sores, and wounds. A powder of leaf is dusted on wounds and ulcers to inhibit excessive granulation. Alcoholic and aqueous and petroleum ether extracts of leaves have shown anti implantation activity. A decoction of leaves along with soap is an effective remedy against white ants and aphids. Powdered leaf show insecticidal property. Young shoot and roots have been reported to be used as tooth brush and to cure toothache.

5. *Cymbopogon martini* (Roxb) Wats. Poaceae

Cymbopogon martinii is a species of grass in the lemon grass genus best known by the common name palmarosa. Other common names include Indian geranium and rosha or rosha grass. This perennial grass is native to southeast Asia, especially India, and it is cultivated for its oil. The essential oil of this plant, which contains the active compound geraniol, is valued for its scent and for a number of traditional medicinal and household uses. Palmarosa oil has been shown to be an effective insect repellent when applied to stored grain and beans, an antihelmintic against nematodes, and an antifungal and mosquito repellent. Palmarosa oil, which has a scent similar to roses, is added to soaps and cosmetics.

6. *Cynodon dactylon* Rich.ex Pers. Poaceae

The plant is also used in biliousness, vomiting, burning sensation, hallucinations, fever, menorrhagia, leucorrhoea, chronic diarrhoeae, dysentery, catarrhal opthalmia, epistaxis, retention of urine. Its extract has significant application in dropsy, syphilis, piles and chronic gleet.

An aqueous extract of leaves containing significant amounts of amino acids shows anticonvulsant activity. The chloroform extract of the leaves exhibited potent antimicrobial activity against Gram positive and Gram negative bacteria, the activity is due to aromatic acids. Arundorin, furfural, furfural alcohol, B- ionone,2- (4' – hydroxyl – phenyl) prpionic and 3 – methoxy – 4' – hydroxybenzoic acids) phytol, B sitoserol – D – glucoside, stigmasterol acetate and a phagostimulant, phytore.

7. *Datura stramonium* Linn **Solanaceae**

The leaves contain the flavonoids, chrysin, liquitigenin, naringenin, kaempferol, quercetin, and the withanollde, withastramonolide. Capscidiol one of the major sespeterpine, phytoalexin, is isolated from the herb in response to infection to pathogens. It has phytotoxic and fungitoxic properties. It also inhibits pectinolytic enzymes *in vitro* and affects the molecular structure of isolated membrane of parasitic fungus *Phytopthora capsici* Lean. It exhibited muscle relaxation in vitro. The ingestion of seeds causes altered perception of environment visual hallucinations, mydriasis (dilation of eye pupil) and tachycardia. High level of ingestion may cause depression of the central nervous system. A teaspoonful of leaf juice is given with warm milk to expel the intestinal worms particularly tape worms. The decoction of the leaves is reported to effectively control wheat rust on detached leaves. The ethanolic extracts of the plant exhibited antifungal activity against rice pathogens *Pyricularia oryzae*, *Rhizocotonia solani*, *Fusarium moniliforme,* and *Curvularia lunata*. The leaf extracts exhibited antifeedeant and insecticidal activities. Soil application of seed and leaf powder reduced the number of primary galls *Meloidogyne incognita*. The species is a common weed of various crop. The fungal pathogen *Alternaria alternata* was found capable of killing one week old seedlings when it was sprayed on them.

8. *Grevillea robusta* R. Br. **Proteaceae**

A native of Australia it is evergreen tree with a long conical crown reported to attain a height of about 150 ft in its native habitat but growing to a moderate size in India. Leaves alternate, 6 – 12 in. long, fern like, deeply pinnate, dark green above silvery

below, flowers orange – coloured, solitary or several together, borne in racemes, 3 -4 in. long on short leafless branches of old wood, fruit an oblique

Coriaceous follicle, containing 1 or 2 seeds. The tree is grown nearly throughout India at elevations of 2000 – 6000 ft. and produces itself naturally from seeds. It is resistant to drought and to frost, but is rather brittle and should not be grown in situations exposed to high winds. The tree with its fern – like foliage is ornamental when young, but becomes ragged and unsightly as it ages. It is cultivated as a shade tree in tea and coffee plantations and is commonly planted in gardens and avenues. The tree comes to bloom from March to May.

The leaves of the tree are valued as green manure in coffee and tea plantations. The tree is not generally lopped, but the copious litter of dropping leaves is forked or ploughed in. Analysis of leaves gave following moisture, 50.9; organic matter 45.9; ash 3.2, nitrogen 0.53; calcium (CaO), 1.30; potassium (K_2O) 0.42; and phosphorus (P_2O_5) 0.06%. Leaves contain quebrachitol (0.4%) and arbutin. The former a polylcohol) which has properties similar to those of mannitol, sorbitol and inositol, can be used in preparation of lacquers.

9. *Eclipta alba* (L.) Hassk. Asteraceae

The plant exhibit anti inflammatory activity. Its decoction constituents one of the ingredients of ayurvedic preparation RENONE which is highly effective in rheumatoid arthritis. The herb contains wedelolactone and demethyl wedelolactone possessing potent antihepatotoxic properties. The plant is an active ingredient of many herbal formulations prescribed for liver ailments. It is one of the ingredients of the ayurvedic formulations HEPATOGARD which is reported to reverse the biochemical and histopathological changes in the liver induced by paracetamol. The herb is also

one of the ingredients of a compound formulation STIMIMULIVE which show significant protection against hepatotoxicity of antitubercular drugs. Besides hepatoprotection significant improvement in the appetite and body weight in patience of tuberculosis has also been observed. Ethanolic extracts of aerial parts of the plant neutralized the lethal activity of the venom of S. American rattle snake *in vitro* and *in vivo* in rats. Three compounds isolated from the plants i.e. wedalolactone, sistoserol and stigmasterol were probable responsible for the effect. Alcoholic extract of the hern has antiviral activity against Ranikhet disease. Plant juice cures skin infection. Bringhraj oil obtained from the plant is applied to scalp before night time in imsomnia. The herb is also used as an ingredient of tooth paste and shampoos. It also contains an alkolid ecliptin. The plant is a good source of thiophene derivatives which are active against nematodes. The petroleum ether extract of aerial parts contain terhienyl aldehyde, ecliptal C_{13} H_8S_3O, mp 146 °C). Besides stigmasterol and β-sitoserol. The aerial parts also contain 2 – an – geloyloxy methylene – 5' – (but-3 –en-1-ynyl)- dithyopene. The roots are very rich in thiopene acetylenes. They contain the di – thiophene derivatives.

E. alba is reported to be effective in the treatment of peptic ulcers. Immunoactive property has also been observed against surface antigen of hepatitis B virus. Methanolic extract of the whole plant from Japan showed the presence of 6 – oleananetriterpene glycosides, eclalbasaponin. They were characterized as echinocystic acids, glycosides. The plant is used as forage for cattles. The shoots are rich in crude protein (10 %) and can be used as livestock feed.

10. *Heterophragma adenophyllum* Seen. Bignoniaceae

The plant is used in skin diseases. It showed antiviral and antihypertensive activities. The leaves contain ursolic acid, olenoic acid and β-amyrine. The anticancer benzoquinones, lepachol, lepachon, dehydro α – lepachone, dehydro – iso- α lepachone, dehydrotectol and tectol have been reported from the root and heartwood.

11. *Pluchea lanceolata* (DC.) Oliv. & Hiern Asteraceae

The plant is a stout herb growing 0.33-2 meters in height. The stem is grooved, rough and very hairy. The leaves are elliptical, large, 3-6 cm long and 2-3 cm broad, and have long petioles. The fruits, slender achene's, 0.4 cm long, bearded with 0.75 cm long pappus hairs. The flowers are yellow, many in heads, 0.5-1 cm in diameter. The fresh root is brown and becomes grayish on drying. The fresh roots resemble in aroma of camphor.

The plant is used for the inflammations and bronchitis, psoriasis, cough and piles. It is also used as antipyretic, analgesic, laxative and nerve tonic. The decoction of plant is used to prevent the swellings of joint in arthritis, rheumatism and neurological diseases. The roots are antipyretic, bitter, laxative and thermogenic and are used for allaying the pain caused by the sting of scorpions. Plant extract is used as a cooling agent in summer. The leaves are aperient and used as a laxative, analgesic and antipyretic.

It is the highly praised panacea for cough, hiccup and bronchial asthma, to reduce the excessive body fats. Puskaramula restrains the itching sensation and oozing in the skin diseases and thus facilitates the wound healing. It is pacifying to the brain and helps in strengthening it in mental debility.

On extraction of the plant with hexane and isolation, the compounds obtained are dihydroisoalan tolactone, isoalantolactone and alantolactone. From the roots, sitosterol, octadecanoic acid and D-mannitol have been isolated also. Two biologically active new sesquiterpene lactones., inunal and isoalloalantolactone are isolated. Alantolactone, isoalantolactone and dihydroisoa – lantolactone isolated from roots. A germacranolide – inunolide – from root oil. Also alloalantolactone isolated from roots and characterized. Two new sesquiterpene lactones inunal and isolloalantolactone – isolated and characterized.

12. *Terminalia arjuna* (Roxb.) Wight & Arn. Combretaceae

A large evergreen tree, with a spreading crown and drooping branches, common in most parts of India and also planted in many parts for shade and ornamental value. Stems rarely long or straight, generally buttressed and often fluted, bark very thick, grey or pinkish green, smooth, exfoliating in large, thin, irregular sheets; leaves sub – opposite, oblong or elliptic, coriaceous, usually10 – 15 cm. long occasionally 25 cm, chordate short, acute or obtuse at the apex; flowers in panicled spikes; fruits2.5 – 5.0 cm long, nearly glabrous, ovoid or oblong, with 5 -7 hard, winged angles.

The tree is common throughout the greater part of the Indian Peninsula along rivers, streams, ravines and dry water courses.

The powdered bark seemed to give relief in symptomic complaint of hypertension; it apparently had a diuretic and a general tonic effect in cases of the liver.

Leaves are feed to tasar silkworms. They contain crude protein, 10.10, crude fibre, 7.78, reducing sugars, 4.30 total sugars, 5.75; starch, 11.09, minerals 7.09%. The juice of fresh leaves is used in earache.

13. *Tridax procumbens* Linn. Asteraceae

The leaves are cooked as vegetables: they are also eaten by cattles. Analysis of the leaf gave (dry basis) crude protein 26.3, crude fibre 17.0, ether extract 1.8, sol. Carbohydrate 39.0, ash 15.9, K_2 O 8.4, CaO 4.6, P_2 O_5 1.1, and MgO 1.7 %. Fumaric acid is present in the leaves. The presence of β- sitoserol and tannin has also been reported in the plant. The leaves are reported to be employed in bronchial catarrh, dysentery and diarrhoea and for restoring hair. The leaf juice possesses antiseptic, insecticidal and parasiticidal properties: It is used to check hemorrhage from cuts, bruises, and wounds. Petroleum ether extracts of the floral heads is toxic to webbing cloth moth and larvae of black carpet beetle. Flower contains luteolin, glucoluteolin, quercetin and iso quercetin. The pollen may cause allergy in some people. The herb has become pest in many parts.

14. *Vogelia indica* Gibs. ex Wight Plumbaginaceae

Shrub or herbs. Stems striate or reduced to a caudex. Leaves simple, alternate or basal, sessile or petiolate but petiole usually indistinct from blade; stipules absent; leaf blade entire or rarely pinnately lobed, with chalk glands on both surfaces. Inflorescences terminal or axillary , unbranched or branched, spicate , spicate-racemose, subcapitate , capitate, or paniculate, all composed of 1--10 helicoid cymes;, 1--5-flowered; bracts. Flowers bisexual, actinomorphic, sessile or very shortly pedicellate. Calyx persistent, hypogynous, tubular to funnelform, 5-ribbed, 5-lobed. Corolla hypogynous, petals connate but sometimes only at base, lobes or segments 5 and twisted. Stamens opposite corolla lobes, hypogynous or inserted at corolla base; anthers 2-locular, dehiscing longitudinally. Pistil 1. Ovary superior, 1-locular. Styles 5, free or connate. Stigmas 5. Ovule 1, pendulous from a basal funicle. Capsules

usually enclosed within calyx. Seeds 1 per capsule; embryo straight, surrounded by thin starchy endosperm.

15. *Withania somnifera* (L.) Dunal **Solanaceae**

An erect, evergreen, tomemtose shrub, 30 – 150 cm high, found throughout the drier parts of India in waste places and on bunds, also cultivated to a limited extent for the medicinal roots. Ashwagandha is mentioned as an important drug in the ancient ayurvedic literature. It consisted of the roots which were prescribed for hiccups, female disorders, cough, rheumatism and drops. Aswangandha is useful in the treatment of inflammatory conditions, ulcers and scabies when applied locally.

The leaves of the plant from different habitats contain different withanoides – a group of C_{28} steroids characterized by a 6 – membered lactone ring in the 9 – carbon atom side chain, a differing I substitution patterns. Withaferin-A is the most important of the withanolides isolated so far, to which the curative properties of the leaves are attributed.

1.1 List of Plants used for biocontrol study

Sr. no.	Leaf extract of Plants	Family	Active components
1.	*Adathoda vasica* Nees	Acanthaceae	Vasicine, Vasicinone
2.	*Alangium salvifolium* (Linn.f.) Wang.	Alangiaceae	Alangimarckine, ankorine, campesterol, episterol, alangidiol and isoalangidiol.
3.	*Alysicarpus vaginalis* (L.) DC	Fabaceae	glycyrrhizin and acrid resins
4.	*Butea monosperma* (Lam.) Taub	Fabaceae	Alkaloids
5.	*Calotropis procera* (Aiton)Wt.	Asclepediaceae	Asclepin and mudarin
6.	*Cymbopogon martini*	Poaceae	Citronellol, geraniol, neral
7.	*Cynodon dactylon* Rich. ex Pers.	Poaceae	Arundorin, furfural
8.	*Dalbergia sisoo* Roxb.	Fabaceae	Sissotrin and an isoflavone-O-glycoside
9.	*Datura metel* L.	Solanaceae	Tropane alkaloids
10.	*Eclipta alba* (L.) Hassk	Asteraceae	Demethylwedelolactone, polypeptides, polyacetylenes, thiophene-derivatives, triterpenes and flavonoids
11.	*Grevillea robusta* A. Cunn	Proteaceae	Graviquinone
12.	*Heterophragma adenophyllum* (Wall. ex G. Don) Seem. ex Benth. & Hook. f.	Bignoniaceae	Ursolic acid, oleanic acid, β – amyrin
13.	*Pluchea lanceolata* (DC.) Oliv. & Hiern	Asteraceae	Quercetin, Isohamnetin
14.	*Polyalthia longifolia* Sonn.	Annonaceae	Sesquiterpenes
15.	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretceae	Tannins, arjunolic acid.
16.	*Tridax procumbens* L.	Astereaceae	β-sitosterol-3-O-β-D-xylopyranoside
17.	*Vogelia indica* ex.Wt.	Plumbaginaceae	
18.	*Withania somnifera* (L.) Dunal	Solanaceae	Withaferin-A, withanolides

Objectives

- Survey of different forest areas to find out the occurrence of leaf spot diseases in selected tree species.
- Isolation of fungi from the diseases leaves and purification of the cultures.
- Pathogenicity test of isolated fungi.
- To study the Phyllosphere mycoflora of *Madhuca indica* and *Diospyros melanoxylon.*
- To study the cultural characters of certain leaf spot fungi.
- To control and noteworthy diseases by application of botanical pesticides.