

**CORE PAPER- VIII**

**PLANT SYSTEMATICS ECONOMIC BOTANY  
AND  
ETHNOBOTANY**

**UNIT - III**

# Rubiaceae

## Systematic position

Class-Dicotyledons

Sub class -Gamopetalae

Series –Inferae

Order - Rubiales

Family-Rubiaceae

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**Distribution of Rubiaceae:** It is commonly known as Madder or Coffee family. It includes 6000 species and 500 genera. In India it is represented by 551 species. The members of this family are distributed in tropics, sub-tropics and temperate regions.

## Vegetative characters

**Habit and Habitatat.** Trees -*Adina cordifolia* Shrubs- *Gardenia* (mostly), some are twinners- *Paederia* Climbers -*Uncaria* Herbs -*Gallium* Epiphytic eg *Hymenopogon parasiticus* Helophytic, or mesophytic, or xerophytic, or hydrophytic (*Limnosipanea*). Majority are perennials a few annuals, cultivated as well as wild

**Root** –branched tap root

**Stem**- aerial,erect or weak, cylindrical or angular herbaceous *Gallium*

or woody ,armed with spines *Randia dementorum* ,glabrous,pubescent hairy or smooth *Stephegyne*, branched, dichasial cymein *Gallium*.

**Leaf - Cauline and ramal Leaves stipulate. Stipules interpetiolar (between the petioles , or intrapetiolar;** between the petiole and axis .leafy *Gallium* divided *Borreria* hair like *Pentas* sometimes fused to form a sheath *Gardenia*Petiolate, subsessile or sessile *Gallium* Leaves opposite *Cinchona* or whorled *Gallium* simple; Lamina entire; *Cinchona* opposite decussate *Ixora* ), reticulate

## Floral characters:

**Inflorescence-** Flowers aggregated in ‘inflorescences’, or solitary (less often); in cymes, or in panicles, *Cinchona* or in heads (rarely, e.g. *Morindeae*, *Gardenia*). The ultimate inflorescence units compound cyme *Mussaenda*Inflorescences with involucre bracts (when capitate), or without involucre bracts;

**Flowers** -Bracteate *Gardenia* ebracteate *Cinchona* Bracts persistent –*Hymenopogon* Pedicellate,subsessile *Gardenia* sessile *Randin*Bracteolate or ebracteolate, complete or

*incomplete actinomorphic,, Rarely Zygomorphic **Randeletin** bisexual unisexual **Coprosma** , epigynous regular; mostly 4 merous, or 5 merous; cyclic; tetracyclic. Free hypanthium absent. Calyx 4 **Gallium** 5 **Coffea** gamosepalous, tubular ,complanate cup shaped **Urophyllum** Funnel **Mitchella** enlarged and brightly coloured **Mussaenda.** ); persistent, **Anthocephalus***

*Corolla 4 **Gallium** , or 5, **coffea** or 5 –11 **Gardenia**; 1 whorled; companulate **Coprosma** , Funnel twisted in **Octotropisula** tubular **Ixora** salvar form in **coffea** or valvate, cinchona imbricate, **Guettarda** bilabiate (rarely). gamopetalous;*

### **Androecium**

*exclusively of fertile stamens. Stamens 2-Silvianthus 4 **Gallium** 5 **Cinchona** inserted near the base of the corolla tube **Coffea** Epipetalous alternipetalous filaments short or absent in **Ixora** anther dorsifixed **Coffea** basifixed **Cinchona**, midway down the corolla tube, or in the throat of the corolla tube; isomerous with the perianth; oppositisepalous; alternating with the corolla members. dehiscing via longitudinal slits (mostly), or dehiscing via pores (apically, e.g. **Argostemma**); introrse;*

### **Gynoecium**

*Bicarpellary pentacarpellary **Leptodermis** 4(–9) carpelled. Carpels usually reduced in number relative to the perianth. The pistil 1 celled (rarely), or 2(–9) inferior (nearly always), or superior (only **Gaertnera** and **Pagamea**). Styles 1 (often simple), or 2(–5); free, or partially joined Stigmas bifid Gynoecium syncarpous; Ovary 1 locular (rarely e.g. **Gardenia**), or 2(–9) locular. Gynoecium when bilocular (i.e. usually), transverse. Epigynous disk often present. Gynoecium stylate. papillate; Placentation when unilocular, parietal; when two or more locular, axile.,*

### **Fruit**

*fleshy, or non-fleshy; dehiscent, or indehiscent, or a schizocarp. Mericarps when schizocarpic 2(–9); comprising achenes, or comprising nutlets, or comprising drupelets (?). Fruit when non-schizocarpic a capsule, or a berry, **Ixora** or a drupe.*

### **Economic importance**

**Food-**Staple foods are not found in the Rubiaceae; instead, some species are consumed locally and fruits may be used as famine food. Examples are African medlar fruits (e.g. *V. infausta*, *V. madagascariensis*), African peach (*Nauclea latifolia*), and noni (*Morinda citrifolia*).

**Beverage-**The most economically important member of the family and the world's second-most important commodity (after petroleum) is the genus *Coffea* used in the production

of coffee. *Coffea* includes 124 species, but only three species are cultivated for coffee production: *C. arabica*, *C. canephora*, and *C. liberica*.

**Medicinal**-The bark of trees in the genus *Cinchona* is the source of a variety of alkaloids, the most familiar of which is quinine, one of the first agents effective in treating malaria. Woodruff (*Galium odoratum*) is a small herbaceous perennial that contains coumarin, a natural precursor of warfarin, and the South American plant *Carapichea ipecacuanha* is the source of the emetic ipecac. *Psychotria viridis* is frequently used as a source of dimethyltryptamine in the preparation of ayahuasca, a psychoactive decoction. The bark of the species *Breonadia salicina* have been used in traditional African medicine for many years. The leaves of the Kratom plant (*Mitragyna speciosa*) contain a variety of alkaloids, including several psychoactive alkaloids and is traditionally prepared and consumed in Southeast Asia, where it has been known to exhibit both painkilling and stimulant qualities, behaving as a  $\mu$ -opioid receptor agonist, and often being used in traditional Thai medicine in a similar way to and often as a replacement for opioid painkillers like morphine.

### **Ornamentals**

Originally from China, the common gardenia (*Gardenia jasminoides*) is a widely grown garden plant and flower in frost-free climates worldwide. Several other species from the genus are also seen in horticulture. The genus *Ixora* contains plants cultivated in warmer-climate gardens; the most commonly grown species, *Ixora coccinea*, is frequently used for pretty red-flowering hedges. *Mussaenda* cultivars with enlarged, colored calyx lobes are shrubs with the aspect of *Hydrangea*; they are mainly cultivated in tropical Asia. The New Zealand native *Coprosma repens* is a commonly used plant for hedges. The South African *Rothmannia globosa* is seen as a specimen tree in horticulture. *Nertera granadensis* is a well-known house plant cultivated for its conspicuous orange berries. Other ornamental plants include *Mitchella*, *Morinda*, *Pentas*, and *Rubia*.

**Dyes**-Rose madder, the crushed root of *Rubia tinctorum*, yields a red dye, and the tropical *Morinda citrifolia* yields a yellow dye.

### **Common plants in Rubiaceae**

- *Coffea arabica* (Coffee)
- *Cinchona officinalis* (Quinine)
- *Hamelia*: ...
- *Rubia*: ...
- *Gardenia*: ...
- *Ixora*: ...
- *Mussaenda*:

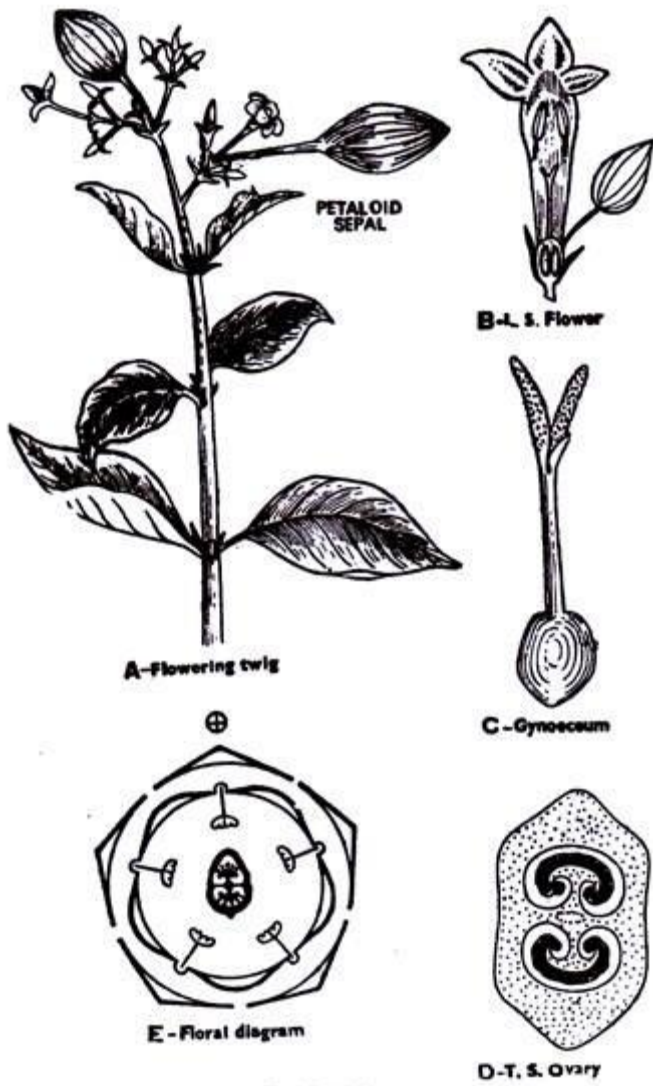


Fig. 67.1. *Mussaenda*.

# Asteraceae

## Systematic position

Kingdom: Plantae

Class : Dicotyledons

Sub class : Gamopetalae

Series : Inferae

Order : Asterales

Family : Asteraceae

## Distribution of Asteraceae

The family is commonly known as Sunflower family. It is the largest family of dicotyledons, comprising 950 genera and 20,000 species, out of which 697 species occur in India. They are world wide in distribution and abundant in tropics and in cold arctic or alpinic regions.

## Vegetative characters

**Habit:** Herbs (*Ageratum*, *Lactuca*, *Dahlia*, *Sonchus*), shrubs (*Inula*, *Senecio*) rarely trees (*Vernonia arborea* and *Leucomeris*). Many of the plants are xerophytes (*Proustia*), hydrophytes (*Cotula*) some are semiaquatic (*Caesulia axilaris*).

**Root:** Tap root, sometimes modified into tubers (*Dahlia*).

**Stem:** Erect, or prostrate, herbaceous or woody (*Artemisia*), hairy, sometimes with latex. Stem tubers are also present (*Helianthus*); tubers are edible (*H. tuberosus*); cylindrical; glabrous, solid or fistular, stem may be leaf-like (*Baccharis*).

**Leaf:** Alternate rarely opposite (*Zinnia*, *Dahlia*) or whorled; leaves may be radical, petiolate or sessile, exstipulate, mostly simple sometimes scale-like (*Senecio*), uncostate or multicostate reticulate venation.

## Floral characters:

**Inflorescence:** A head or capitulum, consisting of a few or large number of flowers or florets closely arranged on an axis surrounded by involucre bracts. The whole head or capitulum is apparently similar to a single flower because the involucre bracts perform the function of protection. In *Helianthus* the outer or peripheral, ligulate and zygomorphic florets are called ray-florets; whereas inner or central, tubular and actinomorphic ones are called disc-florets. In capitulum or head the form of flowers and distribution of sex also varies.

## On the basis of form of flowers the heads are of three types:

1. Heterogamous or radiate heads. The outer or ray-florets are ligulate and zygomorphic and inner or disc-florets tubular and actinomorphic e.g. *Helianthus*.
2. Homogamous-rayed or ligulate heads. All the flowers in the head are ligulate, zygomorphic and alike; e.g. *Sonchus*.

3. Homogamous-non-rayed or discoid heads. All the flowers are tubular, actinomorphic and alike, e.g., *Ageratum*.

Distribution of sex: The flowers of a head may be all hermaphrodite (*Ageratum*), or ray-florets are female or neuter and inner ones hermaphrodite, or male; rarely the complete head bears unisexual flowers.

**Flower:** Bracteate, sessile, (*Sonchus*, *Ageratum*), complete or incomplete, hermaphrodite or unisexual, pentamerous, tubular (actinomorphic) or ligulate (zygomorphic), epigynous and inconspicuous.

**Ray-florets:** Zygomorphic, ligulate, pistillate, or neuter or sometimes also bisexual, epigynous.

**Calyx:** Modified into pappus or absent or scale-like.

**Corolla:** Petals 5, gamopetalous, highly coloured, ligulate, strap-shaped, valvate.

**Androecium:** Absent.

**Gynoecium:** Either absent or if present then bicarpellary, syncarpous, inferior, unilocular with basal placentation, one anatropous ovule; style one; stigma bifid.

**Fruit:** Absent; if present cypsela.

**Floral formula:**  $\text{Br. } \oplus \text{ } \wp \text{ or neuter K pappus } \text{C} (5) \text{A} \overline{\text{G}}(2) \text{ or } 0.$

**Disc florets:**

**Flower:** Bracteate, sessile, complete, hermaphrodite, actinomorphic, pentamerous, epigynous and tubular.

**Calyx:** Modified into pappus or scale, persistent.

**Corolla:** Petals 5, gamopetalous, tubular, coloured.

**Androecium:** Stamens 5, epipetalous, syngenesious, ditheous, introrse, dehiscent longitudinally.

**Gynoecium:** Bicarpellary, syncarpous, inferior, unilocular with single anatropous ovule, basal placentation; style simple, long, stigma bifid.

**Fruit:** Cypsela.

**Floral formula:**  $\text{Br } \oplus \wp \text{ K pappus } \text{C}_{(5)} \text{A}_{(5)} \overline{\text{G}}_{(2)}$ .

### Economic Importance

**1. Food:** Leaves of *Lactuca sativa* are used as salad. The roots of *Helianthus tuberosus* are edible.

**2. Oil:** The seeds of *Helianthus* and *Artemisia* yield oil.

**3. Medicinal:** *Solidago* used in dropsy. *Artemisia* yields santonin which is used as vermifuge. The roots of *Taraxacum* used in bowel disorders. The juice of *Emillia sonchifolia* leaves has cooling effect and is used in eye inflammation and also for night blindness. *Eclipta alba* used as tonic in spleen enlargement. *Centipeda orbicularis* is used in cold and toothache.

**4. Rubber:** It is obtained from *Solidago laevenworthii* and *Taraxacum*.

**5. Insecticide:** The capitula of *Chrysanthemum roseum* and *C. cinerriefolium* are dried, powdered and used as insecticide.

**6. Ornamental:** *Zinnia*, *Dahila*, *Cosmos*, *Chrysanthemum*, *Calendula*, *Helichrysium*, *Aster* *Helianthus* etc. are well known garden plants.

**7. Weeds:** *Xanthium*, *Blumea*, *Sonchus*, *Vernonia* are the common weeds.

#### Important Types of Asteraceae:

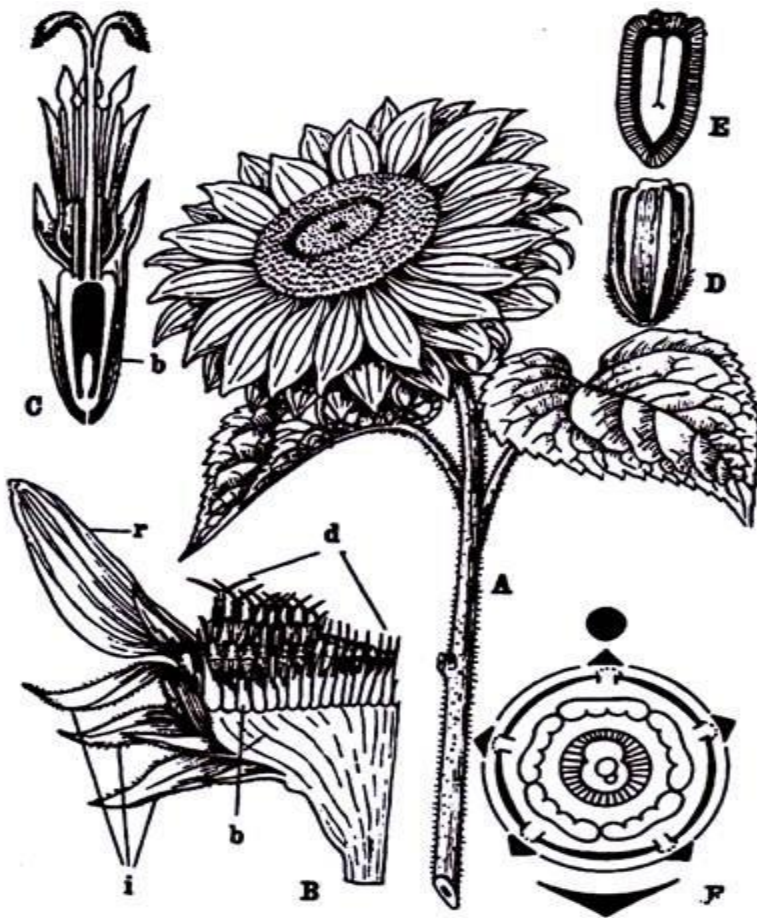


Fig. 68.1. *Helianthus annuus*.



### 1. Helianthus annuus

Floral formulae – Ray floret – Br op Neuter or ♀ K pappus C (5) A0  $\overline{G(2)}$  or 0

Disc floret – Br ⊕ ♂ K (pappus)  $\overline{C(5)}$   $\overline{A(5)}$   $\overline{G(2)}$

### 2. Sonchus asper:

Floral formula: Br op ♂ K pappus  $\overline{C(5)}$   $\overline{A(5)}$   $\overline{G(2)}$

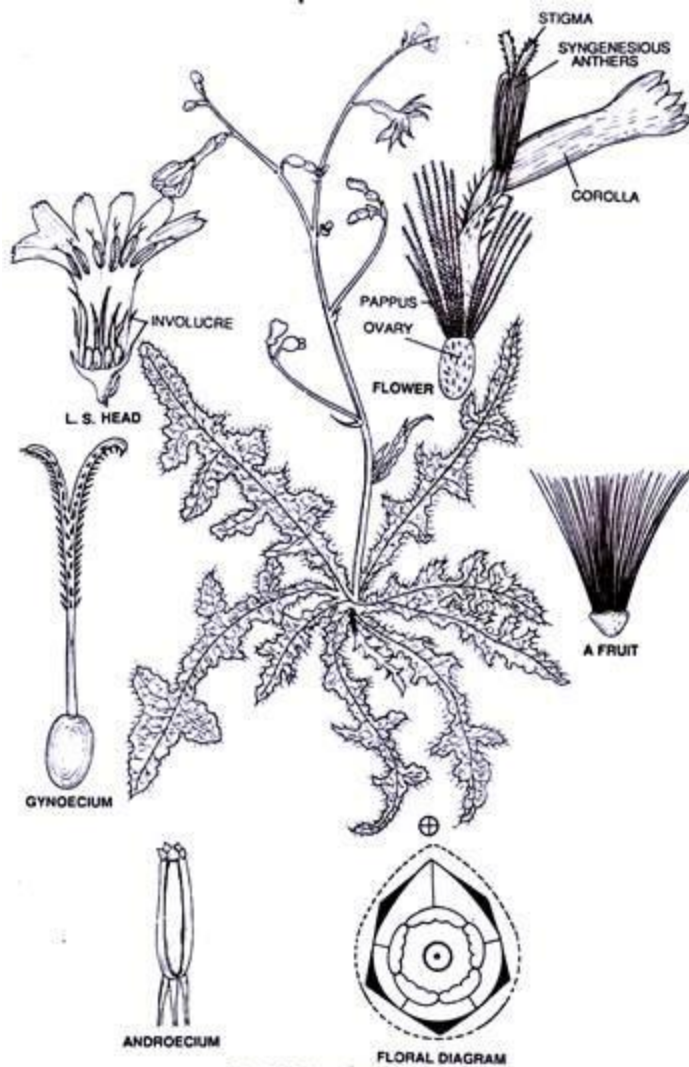


Fig. 68.2. *Launea asplenifolia*.

### 3. Launea asplenifolia

Floral formula: Br op ♂  $K_{pappus}$   $\overline{C(5)}$   $\overline{A(5)}$   $\overline{G(2)}$

### 4. Ageratum conyzoides:

Floral formula: Br ⊕ ♂  $K_5$  pappus  $\overline{C(5)}$   $\overline{A(5)}$   $\overline{G(2)}$

### Common plants of Asteraceae

1. *Ambrosia artemisiifolia* (Rugweed)
2. *Blumea balsamifera*
3. *Calendula officinalis*
4. *Carthamus tinctorius* (Safflower)
5. *Chrysanthemum cinerariaefolium*
6. *Chrysanthemum coccineum*
7. *Chrysanthemum marchallii*
8. *Cichorium intybus* (Chicory)
9. *Cynara scolymus* (Globe Artichoke)
10. *Helianthus annuus* (Sun flower)
11. *Helianthus tuberosus* (Jerusalem Artichoke)
12. *Lactuca sativa* (Garden lettuce)
13. *Lactuca virosa*
14. *Spilanthes paniculata*
15. *Tagetes minuta* (Stinking roger)
16. *Tanacetum vulgare* (Tansy)
17. *Taraxacum officinale* (Common dandelion)
18. *Tragopogon porrifolium* (Vegetable oyster)
19. *Tussilago farfara* (Coughwort)

# Apocynaceae

## Systematic position

Kingdom: *Plantae*

Class : Dicotyledons

Sub class : Gamopetalae

Series : Bicarpellatae

Order : Gentianales

Family : Apocyanaceae

## Distribution of Apocynaceae

It is commonly known as Oleander family. It comprises 180 genera and 1500 species out of which 84 species or 30 genera are present in India. The members are most abundant in tropics and sub-tropics.

## Vegetative characters

**Habit:** Herbs (*Catharanthus*), shrubs (*Carissa*, *Nerium*), twinners (*Vallaris*), tree (*Alstonia*) with latex.

**Root:** A much branched tap root system.

**Stem:** Usually herbaceous (*Catharanthus*) erect, woody, solid, branched, green or succulent with latex.

**Leaves:** Simple, opposite (*Catharanthus*) or whorled (*Nerium*), petiolate or sub-sessile, exstipulate, margin entire, unicostate reticulate venation.

## Floral characters

**Inflorescence:** Usually cymose either terminal or axillary, may be cyme (*Carissa*) or umbellate cyme (*Rauwolfia*).

**Flower:** Bracteate or ebracteate, pedicellate, complete, hermaphrodite, actinomorphic, tetra or pentamerous, often with corona.

**Calyx:** Sepals 5, rarely 4, gamo- or polysepalous, deeply lobed, small, often glandular at the base, imbricate or valvate.

**Corolla:** Petals 5, gamopetalous forming a corolla tube which may be long or short, corona present (hairy scales or outgrowth), usually twisted, sometimes imbricate, rarely valvate.

**Androecium:** Stamens 4 to 5, epipetalous, alternipetalous, filament short, free, ditheous, connate to stigma, dehiscing longitudinally, introrse.

**Gynoecium:** Bicarpellary, syncarpous ovaries are free below but united by style only, superior style short, enclosed in a tube formed by the corolla; stigma thickened distally; when ovaries are



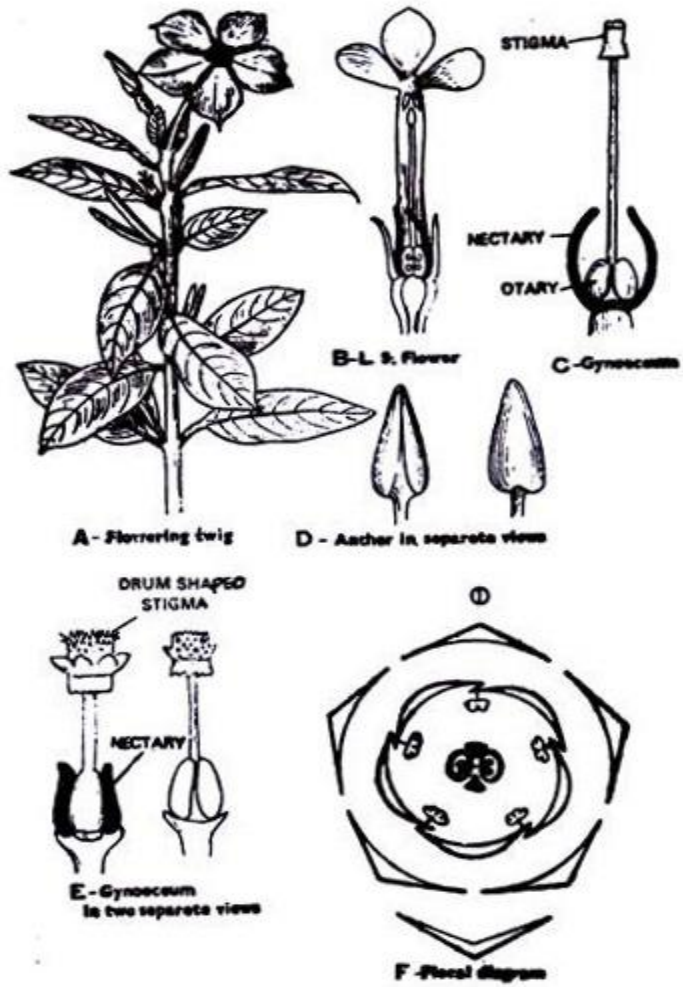


Fig. 74.1. *Catharanthus roseus*.

Floral formula:  $\text{Br. } \oplus \text{ } \overline{\text{K}_5} \text{ C}_{(5)} \text{ A}_5 \text{ G}_{(2)}$

# Solanaceae

## Systematic position

Kingdom: Plantae

Class : Dicotyledons

Sub class : Gamopetalae

Series : Bicarpellatae

Order : Polymoniales

Family : Solanaceae

## Distribution of Solanaceae:

The family is commonly called 'Potato family'. It is a large family well distributed in tropics and sub-tropics, though a few members are found in temperate zone. The family includes 2,000 species belonging to 90 genera. In India it is represented by 70 species of 21 genera.

Several members are cultivated through out the world for their great economic importance; among them are *Solanum tuberosum* (Potato), *Solanum melongena* (Brinjal), *Lycopersicon esculentum* (Tomato) etc.

## Vegetative characters

**Habit:** Mostly herbs (*Petunia*, *Withania*), shrubs and trees.

**Root:** A branched tap root system.

**Stem:** Aerial, erect, climbing (*Solanum jasminoides*), herbaceous, or woody, cylindrical, branched, solid or hollow, hairy, or glabrous, underground stem in *Solanum tuberosum*.

**Leaves:** Cauline, ramal, exstipulate, petiolate or sessile, alternate sometimes opposite, simple, entire pinnatisect in *Lycopersicon*, unicostate reticulate venation.

## Floral Characters

**Inflorescence:** Solitary axillary, umbellate cyme, or helicoid cyme in *Solanum*.

**Flower:** Bracteate or ebracteate, pedicellate, complete, hermaphrodite, actinomorphic, pentamerous, hypogynous.

**Calyx:** Sepals 5, gamosepalous, tubular or campanulate, valvate or imbricate, persistent, green or coloured, hairy, inferior.

**Corolla:** Petals 5, gamopetalous, tubular or infundibuliform, valvate or imbricate aestivation, scale or hair-like outgrowth may arise from the throat of the corolla tube, coloured, inferior.

**Androecium:** Stamens 5, epipetalous, polyandrous, alternipetalous, filaments inserted deep in the corolla tube, anthers dithecal, usually basifixed or dorsifixed, introrse, inferior.

**Gynoecium:** Bicarpellary, syncarpous, ovary superior, bilocular, unilocular in *Henoonia*, axile placentation placentae swollen, many ovules in each loculus, ovary obliquely placed; in some cases nectariferous disc is present; style simple; stigma bifid or capitate.

**Fruit:** A capsule or beery.

**Floral formula:**  $Br \oplus \text{♀} K_{(5)} \overset{\curvearrowright}{C_{(5)}} A_5 \underline{G_{(2)}}$

### Economic Importance

The family is of great economic importance.

**1. Food:** Many members viz., *Solanum tuberosum* (Potato), *Solanum melongena* (Brinjal), *Lycopersicon esculentum* (Tomato), *Capsicum* (H. Mirch) etc. are used as vegetables. *Physalis peruviana* (H. Rasbhari) produces edible berries.

**2. Medicinal:** *Atropa belladonna* contains alkaloid Atropine; this is used in Belladonna plaster. Atropine is used in eye testing. *Nicotiana tabacum* (tobacco) yields Nicotine. *Hyoscyamus niger*, *Solanum nigrum*, *Datura* (H. Dhatura), *Withania somnifera* (Ashwagandha) are used medicinally.

**3. Narcotics:** Tobacco is obtained from leaves of *Nicotiana tabacum* and variously used in cigars, bidi, chewing, jarda etc.

**4. Ornamentals:** *Petunia*, *Cestrum*, *Lycium*, *Salpiglossis*, *Schizanthus* are cultivated in gardens for ornamentals.

### Common plants of the family

**1. Browallia:**

**2. Cestrum nocturnum (H. Rat Ki Rani or Queen of the night):**

**3. Datura metal (H. Dhatura or Thorn apple):**

**4. Petunia:**

**5. Lycopersicon esculentum:**

**6. Physalis peruviana:**

**7. Solanum nigrum (H. Mako):**

**8. Withania somnifera (H. Asgandh, Sanskrit – Ashwagandha):**

1. *Solanum nigrum* (Fig. 78.1):

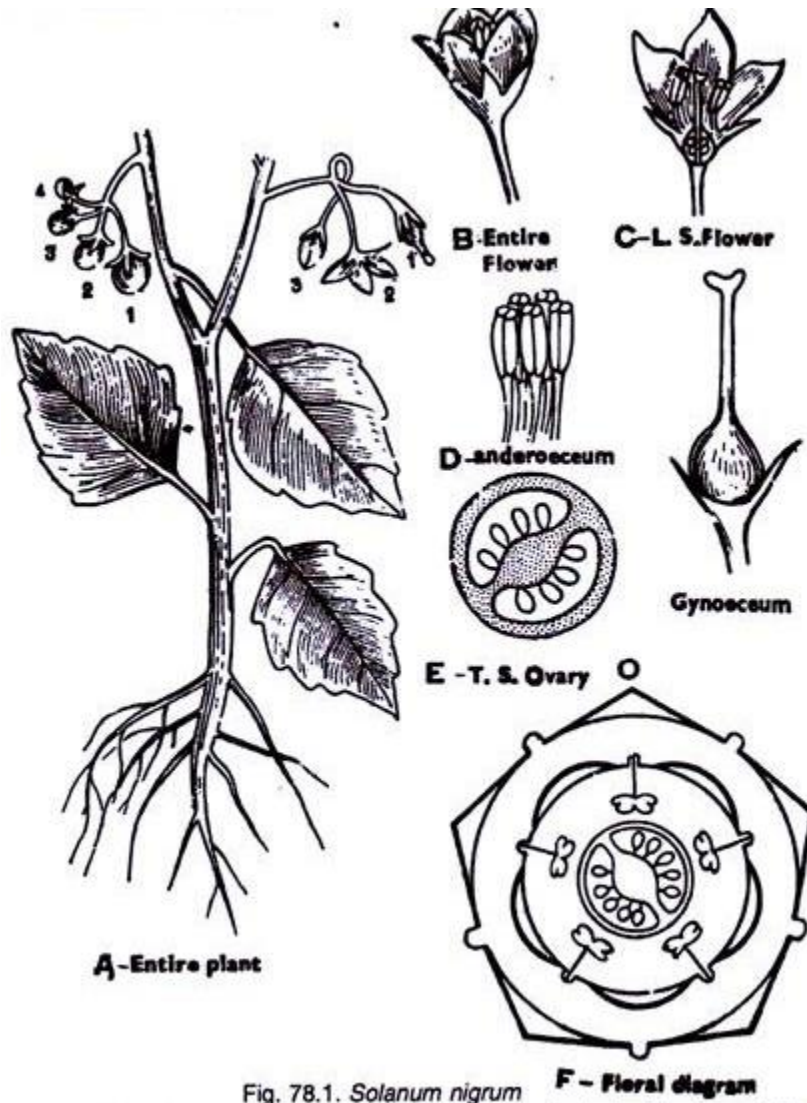


Fig. 78.1. *Solanum nigrum*

Floral formula:  $\oplus \overset{\circ}{\underset{\circ}{\text{K}}}_{(5)} \overset{\circ}{\underset{\circ}{\text{C}}}_{(5)} \overset{\circ}{\underset{\circ}{\text{A}}}_{(5)} \underline{\text{G}}_{(2)}$



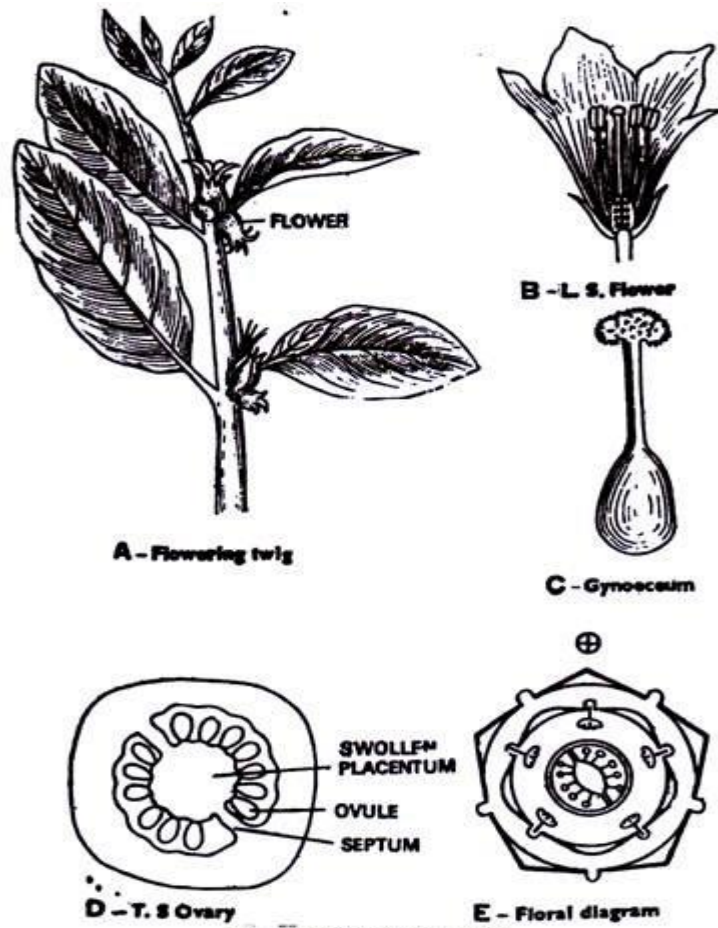


Fig. 78.2. *Withania somnifera*.

*Withania somnifera*

Floral formula:  $\oplus \text{ } \overline{\text{K}}_{(5)} \text{ } \overline{\text{C}}_{(5)} \text{ } \overline{\text{A}}_5 \text{ } \overline{\text{G}}_{(2)}$

3. *Datura metel*:

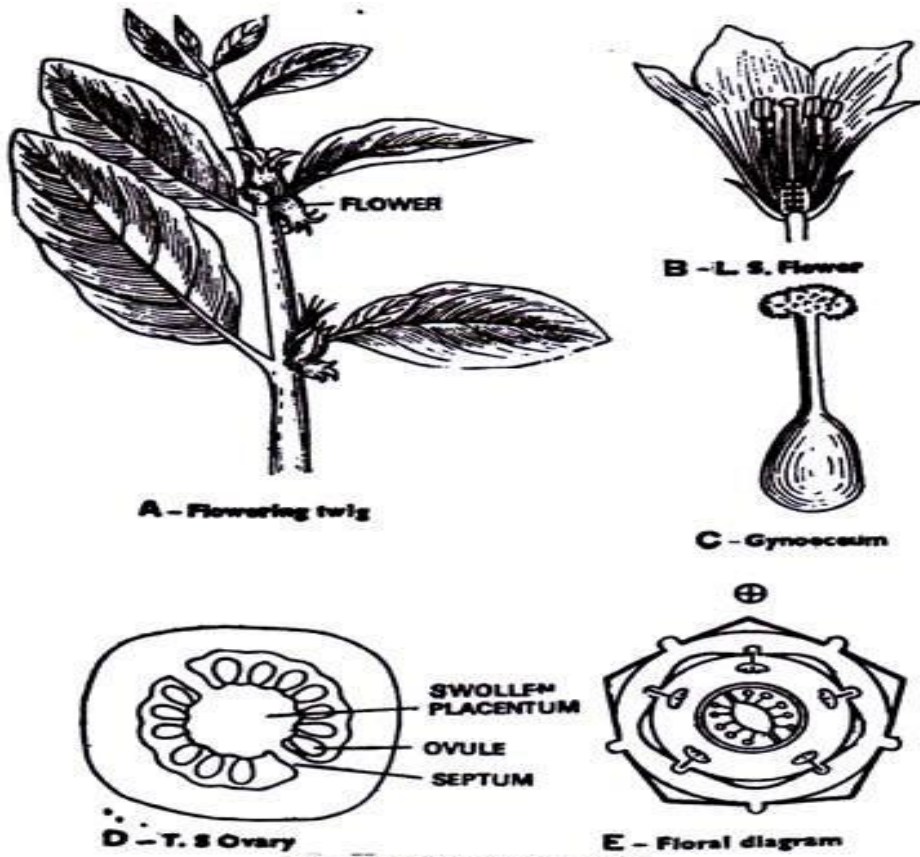


Fig. 78.2. *Withania somnifera*.

Floral formula:  $Br \oplus \wp K_{(5)} \overset{\curvearrowright}{C}_{(5)} A_5 G_{(2)}$

4. *Petunia alba* (Fig. 78.3):

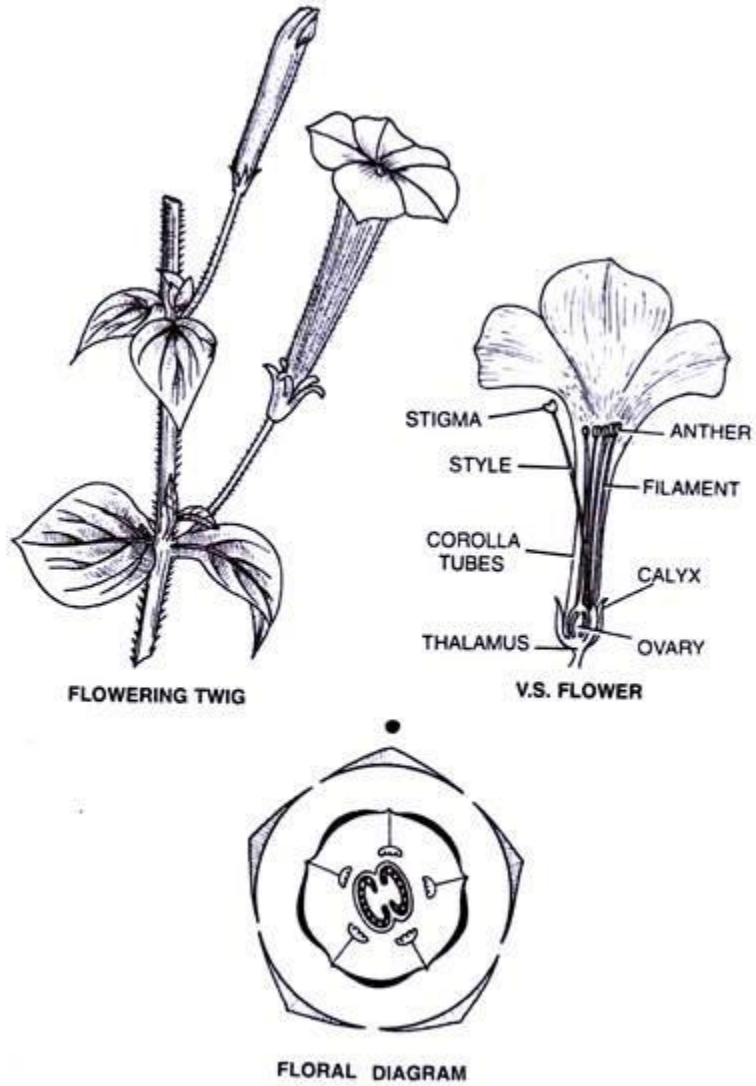


Fig. 78.3. *Petunia alba*.

Floral formula:  $Br \oplus \text{♀} K_{(5)} \overset{\curvearrowright}{C}_{(5)} A_5 \underline{G}_{(2)}$ .

# Acanthaceae

## Systematic position

Kingdom: Plantae

Class : Dicotyledons

Sub class : Gamopetalae

Series : Bicarpellatae

Order : Personales

Family : Acanthaceae

## Distribution of Acanthaceae

It is commonly known as Acanthus family. It includes 250 genera and 2500 species. The family is chiefly distributed in tropics and sub-tropics. In India 508 species are present.

## Vegetative characters

**Habit:** Plants are mostly herbs, shrubs or a few climbers (*Thunbergia*)-, some xerophytes (*Barleria*, *Blepharis*, *Acanthus*), aquatic (*Asteracantha longifolia*).

**Root:** Branched tap root system.

**Stem:** Aerial, erect, underground (*Ruellia tuberosa*), herbaceous or woody, branched cylindrical, node swollen, climbing or twining (*Thunbergia*), spinous (*Barleria*).

**Leaves:** Opposite decussate, simple, exstipulate, petiolate, usually entire, acute apex, hairy, cystoliths are present in the epidermal cells of stem and leaves.

## Floral characters

**Inflorescence:** Solitary axillary (*Thunbergia*), spike (*Blepharis*) racemes, dichasial or monochasial cymes.

**Flower:** Bracteate, bracteolate, bracts and bracteolates conspicuous, pedicellate or sessile, and brightly coloured, hermaphrodite, complete, zygomorphic, pentamerous, or tetramerous, hypogynous, nectariferous disc present below the ovary wall.

**Calyx:** Sepals 4 or 5 gamosepalous, mostly bilabiate, hairy, imbricate, inferior.

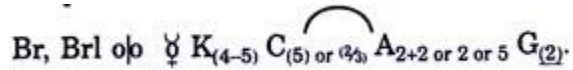
**Corolla:** Petals 2 to 5, bilipped, gamopetalous, variously coloured, imbricate or twisted, inferior.

**Androecium:** Generally 4, rarely 5 (*Penstemon*), in some 2 fertile stamens and 2 staminodes, epipetalous, filaments free, ditheous, dorsifixed, alternate with the corolla lobes, one anther lobe may be smaller than the other and unequally placed, anthers sometimes spurred.

**Gynoecium:** Bicarpellary, syncarpous, superior, bilocular, axile placentation, carpels median, one or more ovules per loculus, style simple, stigma bilobed, disc present below the ovary.

**Fruit:** Loculicidal capsule or rarely drupe.

**Floral formula:**



### **Economic Importance of Acanthaceae**

**1. Medicinal:** Many plants of the family are medicinal. *Adhatoda vasika* and *Barleria cristata* are used in cough. Roots of *Rhinanthus*, *Ruellia* are also used in medicine. Roots of *Ecbolium* are used in jaundice. *Andrographis paniculata* is used for liver diseases. Fruits and leaves of *Phlogacanthus thyrsoiflorus* are used for fever. Leaves of *Phlogacanthus tubiflorus* when rubbed in water yields lather which is used like soap for washing purposes.

**2. Ornamental:** Many plants are cultivated for ornamental purposes viz., *Acanthus*, *Barleria*, *Justicia*, *Thunbergia*, *Jacobinia*, *Ruellia*, are often used as hedge.

### **Common plants of the family**

1. *Acanthus ilicifolius*
2. *Barleria*
3. *Adhatoda vesica*
4. *Lepidagathis cuspidata*
5. *Peristrophe bicalyculata*
6. *Phlogacanthus*
7. *Ruellia*
8. *Thunbergia*

*Adhatoda vasika*

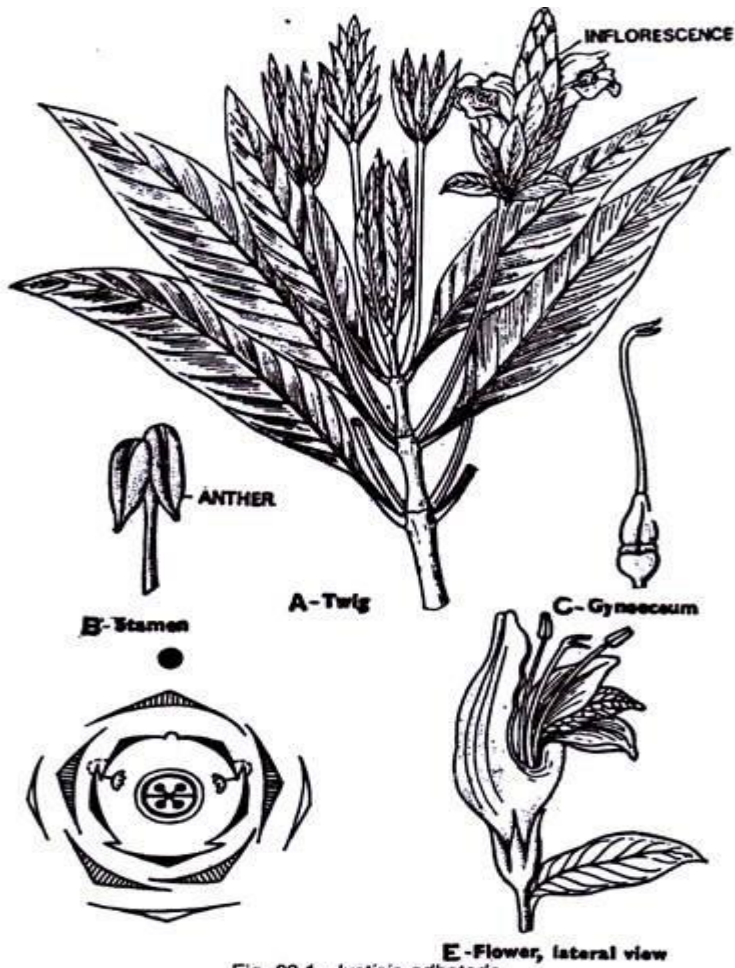


Fig. 83.1. *Justicia adhatoda*.

## Verbenaceae

### Systematic position

Kingdom: Plantae

Class : Dicotyledons

Sub class : Gamopetalae

Series : Bicarpellatae

Order : Lamiales

Family : Verbinaceae

### *Distribution*

The family is commonly called Verbena family. It includes 77 genera and 3,020 species, out of which 21 genera and 125 species occur in India. The members of family are inhabitants of tropical and subtropical regions, they also extend into temperate lands.

### Vegetative characters

**Habit:** Mostly annual or perennial herbs, may be shrubs or trees (*Tectona*) or rarely woody climbers or halophyte (*Avicennia*) in tropical shores.

**Root:** Tap, branched, pneumatophore in *Avicennia*.

**Stem:** Erect, herbaceous or woody, young branches quadrangular, in some branches spiny.

**Leaves:** Simple or palmately or pinnately (*Peronema*) compound, opposite or whorled, exstipulate, entire or divided.

### Floral characters

**Inflorescence:** Cyme or racemose spikes often with an involucre of coloured bracts; cymose is usually dichasial (*Clerodendron*).

**Flower:** Zygomorphic, hermaphrodite, rarely unisexual by abortion (*Aegiphila*), hypogynous, pentamerous or tetramerous (*Physopsis*), rarely actinomorphic (*Physopsis*) complete.

**Calyx:** Sepals 5 lobed, gamosepalous, persistent, bell shaped or tubular, rarely 4 to 8 valvate, inferior.

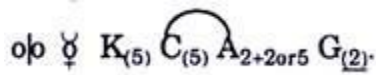
**Corolla:** Petals 5 or 4 lobed, gamopetalous petals unequal, tubular or cylindrical, bi-lipped, imbricate, inferior.

**Androecium:** Stamens 4, didynamous, fifth stamen may be staminode or absent rarely 5 present (*Tectona*), epipetalous, bithecous, filaments free, dorsifixed, introrse, dehiscence longitudinal.

**Gynoecium:** Bicarpellary, syncarpous, rarely carpels 4 (*Duranta*) or 5 (*Geunsia*) superior in early stage bilocular but soon divided into 4 or many loculed by false septa, axile placentation or free central in *Avicennia*; style terminal, stigma entire or bilobed.

**Fruit:** Drupe rarely schizocarpic capsule enclosed by persistent calyx.

**Floral formula:**



**Economic Importance of Verbenaceae:**

The family is great economic importance.

**1. Timber:** The wood of *Tectona grandis* (Teak) is extremely hard and lasting. The wood is largely used in manufacturing of ships and good quality furniture. Teak is grown in forests of Burma, Madhya Pradesh and Assam. The wood of *Gmelina arborea* is used in making drums, sitars and other musical instruments.

**2. Medicinal:** The roots of *Clerodendron* are used in asthma and cough. The decoction of leaves of *Lantana camara* is given in tetanus and rheumatism. The leaf's juice of *Gmelina arborea* is used in gonorrhoea, cough and ulcers.

**3. Oils:** *Lippia alba* produces a valuable oil.

**4. Tanning:** The bark of *Avicennia* is used in tanning.

**5. Febrifuge:** The leaves of *Vitex negundo* serve as febrifuge. The branches of this plant are kept over stored grains to keep off insects.

**6. Ornamental:** *Lantana*, *Verbena officinalis*, *Duranta*, *Congea tomentosa*, *Callicarpa*, *Clerodendron*, *Petrea* are cultivated in gardens.

**Common plants of the family:**

1. *Avicennia alba*

2. *Callicarpa arborea*

3. *Clerodendron*

4. *Duranta repens*

5. *Lantana indica*

6. *Tectona grandis*

7. *Verbena officinalis*:

8. *Vitex negundo*:





Fig. 86.1. *Duranta plumeri* Jacq.  
A. Part of the flowering twig. B. Flower in L.S. (enlarged). C. Floral diagram.

# Lamiaceae

## Systematic position

Kingdom: Plantae

Class : Dicotyledons

Sub class : Gamopetalae

Series : Bicarpellatae

Order : Lamiales

Family : Lamiaceae

## Distribution of Lamiaceae:

It is commonly called Mint family. The family includes 260 genera and 3200 species of world wide distribution. In India it is represented by 400 species.

## Vegetative characters

**Habit:** Plants are mostly aromatic herbs or shrubs (*Leonotis, Pogostemon*). Tree habit is found in the Brazilian genus *Hyptis* and climbing habit in American species of *Scutellaria*.

**Root:** Tap, branched, rarely adventitious (*Mentha*).

**Stem:** Aerial, herbaceous, rarely woody, erect or prostrate, quadrangular, hairy, branched, solid or hollow, sometimes underground suckers (*Mentha*).

**Leaves:** Opposite decussate, rarely whorled, simple, petiolate or sessile, exstipulate, hairy with aromatic smell, entire, pinnatifid (*Perovskia*), unicostate reticulate venation.

## Floral characters:

**Inflorescence:** Very commonly verticillaster consisting of a pair of condensed dichasial cymes at each node; often the verticillasters are grouped together in a thyrsus form; rarely solitary (*Scutellaria*).

**Flower:** Pedicellate or sessile, bracteate, complete, zygomorphic rarely actinomorphic (*Mentha, Elsholtzia*), hermaphrodite, rarely unisexual (*Nepeta, Thymus*), pentamerous hypogynous.

**Calyx:** Sepals 5, gamosepalous, bilabiate (*Salvia, Thymus*) campanulate (*Teucrium*), persistent, valvate or imbricate aestivation. When a bilabiate calyx is present the arrangement of the sepals may be (1/4) as in *Ocimum* or (2/3) as in *Calamintha*.

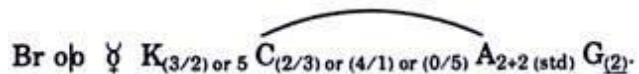
**Corolla:** The corolla possesses a tubular base which widens towards the mouth. Petals generally 5, gamopetalous and the five teeth are sub-equal and mostly bilabiate. In *Mentha* a four lobed corolla arises due to the fusion of two upper teeth. When a distinct bilabiate condition is found the arrangement of the petals may be gamopetalous 2/3 i.e. two petals in the posterior upper lip and three in the anterior lower lip (*Salvia*, *Nepeta*, *Leucas* etc.).

In *Ocimum*, *Coleus*, *Plectranthus* etc. the petals arrangement is gamopetalous 4/1 i.e. four petals in the posterior upper lip and only one petal in the anterior lower lip. In extreme cases the arrangement may be gamopetalous 0/5 i.e. all the five petals forming the lower lip so that the corolla becomes one lipped. Aestivation in the petals is valvate or imbricate.

**Androecium:** Bicarpellary, syncarpous, superior, situated on hypogynous honey secreting disc; bilocular becomes tetralocular by the formation of false septum; axile placentation, one ovule in each loculus; style gynobasic (arising from the base of the ovary), stigma bilobed. The gynoecium character is thus uniform without any variation.

**Fruit:** Usually schizocarpic carcerulus or achenes or nutlets rarely drupaceous.

**Floral- formula:**



### Economic Importance of Lamiaceae

- 1. Food:** Tubers of *Stachys sieboldi* are edible. Leaves of *Mentha viridis*, *Ocimum basilicum*, *Melissa officinalis* etc. are used as condiments.
- 2. Medicinal:** Many plants of this family are used in medicines. *Ajuga bracteosa*, *Leucas cephalotes* are used in fever. *Mentha piperata* and *Thymus serpyllum* give Menthol and Thymol respectively, which are extensively used in medicines. Leaves of *Ocimum kilimandus charicum* give camphor. *Ocimum sanctum* and other species of *Ocimum* are used in various ailments.
- 3. Ornamental:** Several species of *Salvia*, *Coleus*, *Ajuga*, *Leonotis*, *Dracocephalum*, *Thymus*, *Lavandula* etc. are cultivated in gardens for ornamental purposes.
- 4. Perfumes:** Aromatic oil is extracted from *Thymus*, *Lavandula* (*Lavender oil*), *Rosmarinus* (*Rosemary oil*), *Calamintha*, *Pogostemon* etc.
- 5. Dye:** Fruits of *Lycopus europaeus* yield red dye.

### Common plants of the family

- 1. *Coleus aromaticus***

2. *Leucas lantana*:
3. *Lavandula vera*
4. *Mentha piperata*
5. *Roylea*:
6. *Ocimum santcum* (H. Tulsi):
7. *Salvia*:
8. *Thymus vulgaris*:

1. *Ocimum sanctum*

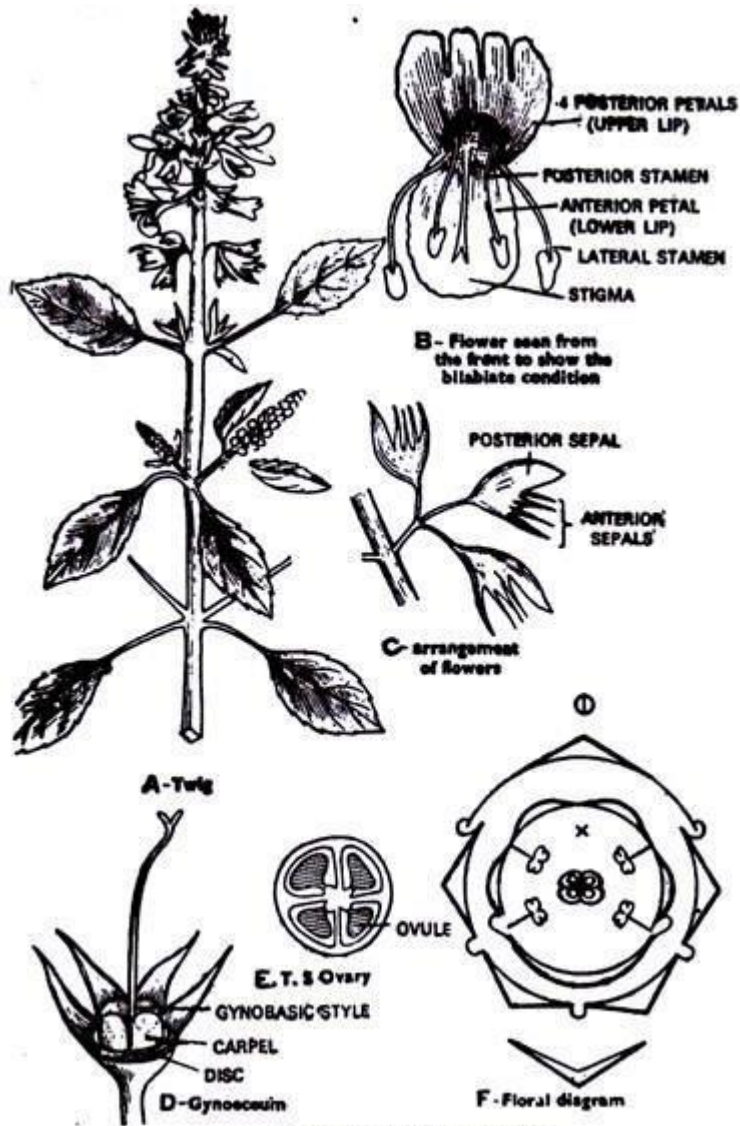


Fig. 85.1. *Ocimum sanctum*.