

Systematic and economic importance of Magnoliaceae:

Trees and shrubs; two ranked stipulate leaves, stipules enclose young buds; flowers hermaphrodite, actinomorphic, large; perianth usually trimerous, whorled or spiral; stamens and carpels numerous; apocarpous, spirally arranged on elongated axis, fruit an etario of follicles or berries, sometimes samara.

A. Vegetative Characters:

Habit:

Trees or shrubs sometimes climbing. Oil sacks present in stem and leaves.

Root:

Tap branched.

Stem:

Erect, aerial, woody, branched.

Leaves:

Alternate, simple, entire, commonly ever-green, coriaceous, stipules large (Magnolia) covering young leaves.

B. Floral Characters:

Inflorescence:

Solitary terminal or axillary.

Flower:

Largest and sometimes, 25 cm in diameter (Magnolia, Fraseri), complete, regular, actinomorphic, unisexual (Drimys), usually bisexual, hypogynous, aromatic. Floral axis (torus) long to long convex.

Perianth:

Nine to many, free, all alike and petaloid or the three outer ones green (Liriodendron), arranged in whorls of three, imbricate and cyclic (Magnolia and Michelia) or acyclic (spiral) arranged on an elongated or semi-elongated convex torus, free, inferior.

Androecium:

Stamens many, free, often spirally arranged in a beautiful series, filaments short or absent, anther lobes linear, with a prolonged connective.

Gynoecium:

Carpels numerous, free, superior, arranged spirally on a cone-shaped elongated thalamus (gynophore), rarely carpels are fused, e.g., Zygomorph, placentation marginal.

Fruit:

An aggregate of berries or follicles, sometimes, a samara as in Liriodendron

Seed:

Large, with abundant oily endosperm, and bright or orange testa which makes them highly decorative.

Pollination:

due to large and scented flowers

Floral formula:

Distribution of Magnoliaceae:

Magnoliaceae or the Magnolia family embraces 10 genera and about 100 species. The members of this family belong to the temperate regions of northern hemisphere, with centres of distribution in eastern Asia, Malaysia, eastern North America, West Indies, Brazil and North-east and south east India.

Economic Importance of Magnoliaceae:

1. Medicinal:

The root bark and dried roots of *Michelia champaca* are used as purgative, while the flowers and fruits are used as carminative and in certain renal troubles and venereal diseases like gonorrhoea. The bark of *Drimys winteri* and *Illicium verum* is useful in medicine.

2. Timber:

The wood of *Michelia excelsa* is an excellent commercial timber known as “white wood”. *M. acuminata*, *Manglietia hookeri*, *Michelia baillonii*, *M. dottsopa* and *Pachylarnax pleiocarpa* produce valuable timber used for mill work, furniture, musical instruments, toys etc.

3. Ornamentals:

The species of *Magnolia* and *Michelia* are of surprising beauty because of their conspicuous white and yellow-tinted, fragrant flowers. Flowers of *Michelia champaca* are used by women to ornament their hair and also offered in temples.

Michelia champaca yields ‘champaca oil’ from the flowers, camphor from the wood and scented water from the leaves.

Systematic and economic importance of Sterculaceae:

Plants herbs or trees with stellate hairs; fibrous stem and mucilage sacs; leaves alternate, stipulate; flower regular, hypogynous, hermaphrodite rarely unisexual; sepals and petals 5 each; stamen in two whorls, outer staminodes, inner united into a tube, fertile stamens alternated with staminodes, monadelphous stamens bithecal; carpels 5, syncarpous, ovary pentalocular, axile placentation, sometimes raised on andro-gynophore; fruit schizocarpic.

A. Vegetative characters:

Habit:

Trees, shrubs and a few herbs-with stellate hairs, rarely climber (*Ayenia*).

Root:

Tap, branched.

Stem:

Erect, branched, fibrous wood and with mucilage sacs.

Leaf:

Simple or palmately compound or lobed or with entire margins, alternate, stipulate, stipule caducous.

B. Floral characters:

Inflorescence:

Panicle, cyme or cymes or in clusters.

Flower:

Actionomoprhic, hypogynous, hermaphrodite or unisexual by abortion of one of the members of essential whorl; pentamerous

Calyx:

Sepals 3-5, valvate, basally connate.

Corolla:

Petals 5 or none (Sterculia, Heritiera), free, imbricate, corolla turned either to left or right, petals sometimes adnate to the stamined column.

Androecium:

Stamens in two whorls, those of outer whorl are antisealous and reduced to staminodes, scales or absent, those of inner whorl antipetalous, definite or indefinite, and monadelphous, anthers bithecous.

Gynoecium:

Capels 3-5, syncarpous, ovary superior, pentalocular or multilocular sometimes raised above by the development of gynophore, axile placentation. each chamber with 2 to many ovules.

Fruit:

Usually schizocarpic capsule or typical capsule, indehiscent or dehiscent, sometimes splitting into cocci.

Seed:

Numerous, with fleshy endosperm, often winged, arillate.

Pollination:

Entomophilous.

Distributions of Sterculaceae:

The Cocoa family comprises about 50 genera and 750 species, largely confined to the tropics and subtropics.

Economic Importance of Sterculaceae:

Food:

The seeds of *Theobroma cacao* on grinding yield cocoa and chocolate. The seeds are first fermented and then roasted before grinding. Fruits of *Gauzuma ulmifolia* and seeds of *Sterculia* are edible.

2. Medicinal:

The root-bark or roots of *Abroma augusta* are menagogue (used in female diseases).

Cola nuts obtained from *Cola vera* and *Cola acuminata* contain Caffein and their; when chewed they help to overcome fatigue. They are also used in some refreshing drinks.

3. Insect repellent:

Flowers of *Pterospermum* are very good insect repellants and disinfectants.

4. Wood:

It is obtained from *Heritiera*, *Sterculia* species. *Mansonia dipikae* yields timber.

5. Ornamentals:

Abroma, *Dombeya*, *Pentapetes*, *Pterospermum acerifolium* etc. are often planted as ornamentals.

Systematic and economic importance of Rutaceae:

Leaves gland dotted, simple or compound; flower hermaphrodite, hypogynous, actinomorphic with a disc below the ovary; corolla polypetalous; stamens ten, obdiplostemonous; carpels 5 or many, ovary superior, multilocular; fruit capsule or berry; aromatic odour is present.

A. Vegetative characters:

Habit:

The plants are generally shrubs (*Murraya*, *Limonia*, *Zanthoxylum*), trees (*Aegle*, *Citrus*, *Feronia*), rarely herbs (*Ruta graveolens*) with strong fragrance. *Paramignya* is a shrub but climbs by means of axillary thorns.

Root

Tap root, branched often infected with fungus

Stem:

Woody (*Citrus*, *Feronia*), erect, cylindrical, branched, solid often thorny (*Citrus*), gland dotted.

Leaves:

Alternate (Citrus, Murraya) or opposite (Evodia), petiolate, petiole may be winged (Citrus aurantium), simple or compound-pinnate (Murraya), palmate (Aegle and Citrus) smooth gland dotted, glands with essential oils, exstipulate, margin entire or serrate, unicostate reticulate venation. In Citrus petiole is winged.

B. Floral characters:

Inflorescence:

Usually cyme or axillary or terminal corymb (Murraya paniculata) some times racemose or solitary.

Flower:

Pedicellate, ebracteate, hermaphrodite, or unisexual (Zanthoxylum, Evodia, Feronia), actinomorphic rarely zygomorphic (Dictamnus and Correa), hypogynous, complete, pentamerous or tetramerous (Acronychia and lateral flowers of Ruta).

Calyx:

Sepals 5 or 4, free or fused; in zygomorphic flower it becomes gamosepalous and tubular; imbricate; sometimes deciduous.

Corolla:

Petals 5 or 4, polypetalous rarely gamopetalous (Correa speciosa) or absent (Zanthoxylum), variously coloured, imbricate.

Androecium:

In majority of cases the stamens are obdiplostemonous and 10 in number; in Citrus numerous stamens with polyadelphous condition; in Zanthoxylum 3 stamens and in Skimmia 5 stamens; anthers introrse, ditheous, basifixed or versatile.

Gynoecium:

Pentacarpellary and only slightly united at the base or the sides forming a deeply lobed ovary with fused styles originating from the centre. In Citrus and Toddalia the carpels are fully united. In Feronia the carpel is only one celled with many parietal placentae. In other genera the placentation is of the axile type. Typically the ovary is superior with a prominent nectariferous disc below it. Ovule anatropous.

Fruit:

In Flindersioideae there is septicidal or loculicidal capsule; in Toddalioideae a drupaceous fruit; hesperidium in Citrus and berry in Murraya.

Seed:

Endospermic or exalbuminous.

Pollination:

Entomophilous; insects are attracted by the coloured petals, the nectar secreted by the disc is easily available. The flowers are protandrous. Thus in *Ruta* the stamens arise

successively to the centre of the flower and after shedding the pollen grains wither away and fall back again.

The stigma now matures and if no insect visitor has come then the stamens rise again and the pollen grains that still remain are once again shed over the stigma. Thus self pollination is effected.

Distribution of Rutaceae:

The family is commonly called orange family. The family comprises 150 genera and 1300 species out of which India contributes 71 species. The members of the family are distributed in tropical and temperate regions and they are predominant in South Africa and Australia.

Economic Importance of Rutaceae:

1. Fruits:

The genus *Citrus* provides a number of fruits:

(a) *C. aurantifolia* (H-Kaghzi nimbu) has citric acid in its fruits and used in bilious vomiting. The fruit wall has essential oils.

(b) *C. aurantium* var. *bergamia* (H-Nimbu). The ripe fruit is digestive and a tonic, fruit wall gives oil of bergamot.

(c) *C. aurantium* var. *bigardia*. (H-Khatta). Rich in pro-vitamins A and vitamin B. Oil present in fruit wall.

(d) *C. maxima* (H-Chakotra) produces edible fruits.

(e) *C. sinensis* (H-Musumbi). The fruit is widely used during illness; it purifies blood, reduces thirst and improves appetite.

(f) *C. reticulata* (H-Santara or Narangi). The ripe fruit is highly nutritive and rich in assimilable calcium, the fruit wall also produces citrus oil.

(g) *C. limettioides* (H-Mitha Nimbu) is useful in fever and jaundice; oil also obtained from the wall.

(h) *C. limon* (H-Pahari Nimbu). The juice of ripe fruits is useful in rheumatism and dysentery.

(i) *Aegle marmelos* (H-Bel). This is normally edible. The fruit is particularly useful in stomach disorders. The plant is considered holy and its leaves used in worshipping the God Shiva

(j) *Feronia limonia* (H-Kaith bel). The fruits edible; leaf and bark used medicinally

2. Medicinal:

Citrus is not only edible but produces vitamins particularly vitamin C (ascorbic acid). *Barosma betulina* produces buchu from its leaves which is useful in urinary diseases.

Pilocarpus microphyllus:

The active principle is pilocarpine which causes contraction of the pupil – it is just opposite to atropine. Jaborandi is prepared from the leaflets of this plant; this is useful in kidney diseases.

Murraya koenigii. (H-Katnim) has several medicinal properties. The green leaf is eaten raw in dysentery while bark and roots are useful in bites of poisonous animals when applied externally. The leaves are also used in curry powder particularly by S. Indians.

3. Ornamental and miscellaneous:

Plants like *Ruta*, *Luvunga scandens*, *Ptelea*, *Calodendrum*, *Limonia*, *Murraya* are cultivated in gardens for their fragrant flowers.

Zanthoxylum piperitum gives Japan pepper. *Ruta graveolens* gives French oil of Rue; *Galipea officinalis* yields cusparia bark.

Systematic and economic importance of Anacardiaceae

Anacardiaceae: Characters, Distribution and Types

Characters of Anacardiaceae:

Leaves alternate, exstipulate, simple or pinnately compound; auxiliary panicle inflorescence; flower pentamerous, hermaphrodite, actinomorphic, stamens 10 inserted at the base of an annular disc (intrastaminal disc); Carpels 1-2, Ovary superior with one pendulous or ascending ovule; fruit a drupe.

A. Vegetative characters::

Habit:

Generally trees and shrubs and rarely woody vines containing resin passages with gum or acrid juice.

Root:

Tap, root, deep.

Stem:

Erect, woody, hard, with resinous bark.

Leaves:

Alternate, (opposite in *Dobinea*) simple (*Mangifera*) or pinnately compound (*Rhus*, *Odina*), exstipulate.

B. Floral characters:

Inflorescence:

A terminal or axillary panicle.

Flower:

Small, complete, usually actinomorphic rarely zygomorphic, pentamerous, hermaphrodite but often unisexual (*Rhus*, *Pistacia*, *Odina*) by reduction of androecium or gynoecium, a nectar secreting disc or gynophore present; hypogynous.

Calyx:

Usually 5 sepals, sometimes 3 to 7, free, or basally connate or semi-connate, imbricate.

Corolla:

Petals 5-3 or absent (*Pistacia*) polypetalous rarely connate, imbricate, sometimes fused with the receptacle to form a hypanthium.

Androecium:

Stamens ten in two whorls of 5 each all fertile (*Buchanania*), in *Anacardium*, 10-7 of which only one is functional and the rest are staminodes; filaments free, basally connate,

stamens arise from the base of an intrastaminal disc, this disc may sometimes be modified into a gynophore, anther bithecal, introrse.

Gynoecium:

Tricarpellary rarely pentacarpellary, syncarpous, unilocular, superior, one pendulous ovule; in *Buchanania* – ovary pentacarpellary and pentalocular with only one ovule; styles 1-5, widely separated.

Fruit:

Usually drupe, mesocarp resinous, and fleshy in *Mangifera*, sometimes nut (*Anacardium*).

Seed:

Cotyledon thick with little or no endosperm and curved embryo.

Pollination:

Entomophilous.

Distribution of Anacardiaceae:

The family is also called Mango or Cashew family. It includes 80 genera and over 600 species according to Jones and Liechsinger (1987). Chiefly tropical but occurs in S. Europe, temperate Asia and also America. *Mangifera* extends from India to Malaya and the Philippines.

Economic Importance of Anacardiaceae:

1. Food:

Many plants yield edible fruits such as *Mangifera indica* (mango), *Anacardium occidentale* (Cashew-nut), *Buchanania lanzan* (Chironji), *Harpephyllum caffrum* (Kaffir plum), *Spondias pinnata* (Hog plum), *Pistacia vera* (pistachio-nuts).

Pistacia lentiscus (mastic tree) yields a mastic resin used in chewing gums, alcoholic beverages etc.

2. Varnish:

Many species of *Rhus* and *Semecarpus* yield resins and varnishes.

3. Gum:

Lannea coromandelica bark provide gum.

Schinopsis lorentzii and bark of *Lannea coromandelica* are used in tanning industry.

4. Ink:

Insect galls on the branches and leaves of various species of *Rhus*, *Pistacia* are used in manufacture of ink.

Semecarpus anacardium (Dhobis-nut) fruits provide black ink used for dyeing textiles and marking cotton clothes.

5. Skin irritants:

Rhus toxicodendron, *R. quercifolia* etc. are skin irritants.

6. Ornamentals:

Continus coggyria, *Rhus typhina* and *Spondias pinnata* are ornamental plants.

Systematic and economic importance of Myrtaceae:

Leaves aromatic, gland dotted, exstipulate, entire margin; flower hermaphrodite, actinomorphic, epigynous; calyx 4-5, gamosepalous, sometimes thrown off as a lid; corolla 4-5, free or united; stamens indefinite; carpels 2-5 syncarpous, ovary inferior, placentation axile; style and stigma simple; fruit a berry or drupe.

A. Vegetative characters:

Habit:

The members of this family are mostly trees (*Eucalyptus*, *Syzygium*, *Psidium*) or shrub (*Carreya*) very rarely herbs. Some of the species of *Eucalyptus* may attain a height of 300 ft.

Root:

Tap root and branched.

Stem:

Erect woody, branched, bark very shining, smooth and goes off in old trees (*Eucalyptus*); vascular bundle bicollateral.

Leaves:

Simple, opposite, alternate (Eucalyptus), or whorled, shortly petiolate, exstipulate or with minute stipule, gland dotted, coriaceous, evergreen. Leaves of Eucalyptus show adaptation to dry climatic and intense sunlight conditions and may become needle like and take up vertical position.

Inflorescence:

Usually of cyme type, sometimes panicle cyme or corymbose cyme, proliferous drooping spike in Callistemon; axillary in Psidium; solitary axillary (Myrtus communis); trichotomous cyme (Syzygium); paniculate cyme (Eucalyptus).

Flower:

Pedicellate (Eucalyptus) or sessile (Callistemon), bracteate usually with two bracteoles (Callistemon), ebracteate (Eucalyptus) actinomorphic, hermaphrodite, epigynous sometimes perigynous; complete.

Calyx:

Sepals 4-5, polysepalous or united, rarely reduced or thrown off like a lid as the flower opens (Eucalyptus) or entirely absent in some of Eucalyptus spp; quincuncial aestivation.

Corolla:

Petals 4-5 more or less circular in form, polypetalous sometimes gamopetalous and forming cap (Eucalyptus), quincuncial aestivation.

Androecium:

Stamens indefinite, arranged in several whorls at the edge of the receptacle, polyandrous rarely monadelphous (Callistemon); 5 and antipetalous in Melaleuca. In Melaleuca leucadendron the stamens are numerous but in five bundles opposite to petals, anthers dorsifixed or versatile, ditheous, small, introrse, connectives of anthers are usually gland dotted. In the bud condition the stamens are bent.

Gynoecium:

Carpels 2 to indefinite, syncarpous; perigynous to fully epigynous; inferior, two to many locular, axile placentation rarely parietal (Rhodamnia), 2 to indefinite anatropous or campylotropous ovules per locus; style simple, long, stigma capitate.

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Fruit:

A berry (Psidium), capsule (Eucalyptus, Callistemon)-, drupe (Eugenia).

Seed:

Non-endospermic

Pollination:

Entomophilous. Insects are attracted by coloured stamens and floral parts.

Distribution of Myrtaceae:

The family contains 100 genera and 300 species out of which India contributes 116 species. The chief centres of distribution are Australia and America.

Economic Importance of Myrtaceae:

1. Fruits:

Some members of the family produce edible fruits e.g. *Syzygium cumini* (syn. *Eugenia jambolana*) (H. Jamun), *Psidium guajava* (Amrood) with edible fruits.

2. Oil:

The essential oils are obtained by the steam distillation of leaves and branches of *Eucalyptus* species.

3. Spice:

Syzygium caryophyllata (syn. *Eugenia caryophyllata*) yields the cloves of commerce. Clove oil (H. Laung ka tel) is extracted out of them.

4. Medicine:

Eucalyptus oil is used in influenza. It is mixed with clove oil and used in rheumatism. The roots of *Eucalyptus* are purgative. Clove oil is antipyretic and largely used in gum troubles. The leaves of *S. cumini* are used in indigenous medicine for dysentery.

The fruits of *Myrtus communis* are carminative and given in dysentery, diarrhoea, and rheumatism.

5. Wood:

The wood of *Eucalyptus* and *Psidium* is used in engraving and making handles. In Australia the wood of *Eucalyptus* is used for railway sleepers, bridges and plywood industries.

6. Ornamental:

Many plants viz., *Callistemon*, *Myrtus*, *Melaleuca leucadendron*, *Tristania*, *Eucalyptus* are cultivated for their showy nature in the gardens.

Systematic and economic importance of Cucurbitaceae

Characters of Cucurbitaceae:

Prostrate herb bearing tendrils; leaves palmately lobed, surface hispid; flowers pentamerous, unisexual, monoecious or less commonly dioecious; stamens five, usually less, anthers free or connate, ovary inferior, trilobular, parietal placentation, fruit fleshy, pepo. Vascular bundles bicollateral and in two alternating rows.

A. Vegetative characters:

Habit:

Mostly annual or perennial herbs, rarely shrubs (*Acanthosicyos*) or small trees (*Dendrosicyos*), usually trailing, climbing by means of tendrils.

Root:

Tap root, branched may be thickened due to storage of food and water

Stem:

Herbaceous, climbing, angular, fistular, branched.

Leaves:

Alternate, petiolate- petiole long and hollow; simple, lobed, exstipulate, palmately veined; tendrils present in the axil of leaf or opposite to the leaf. In *Acanthosicyos* the leaves are but thorns are present.

B. Floral characters:

Inflorescence:

There is great variation in the inflorescence. Flowers are solitary, or racemose or cymose panicles (Actinostemma).

Flower:

Regular, mostly unisexual rarely bisexual (Schizopepon), incomplete, epigynous, small or large, mostly white or yellow, pentamerous.

Male flower:

Produced in large numbers.

Calyx:

Sepals 5, gamosepalous, sepals pointed, rarely petaloid, campanulate, aestivation imbricate.

Corolla:

Petals 5, gamopetalous united at the base (Momordica) or through out (Cucurbita, Coccinea), polypetalous (Luffa, Lagenaria), may be campanulate, rotate, imbricate or valvate aestivation.

Androecium:

Stamens 5, sometimes free or combined to form a central column, anthers dithecous extrorse, dehiscence longitudinal or in curves; androecium may be modified in one of the following ways:

1. In Thaldiantha two pairs of stamens are closely approximated in the lower part of their filaments and the fifth stands apart.
2. In Sincydium the pairs of stamens are united below; in Momordica, Citrullus, the union of pairs of stamens is complete and apparently only three stamens are present.
3. In Sicyos and Sechium the filaments unite to form a central column and the anthers are very much curved.
4. In Cyclantliera the stamens are united into a central column with two ring like pollen chambers running round the top. (Compare with the condition found in Phyllanthus cyclanthera of the Euphorbiaceae).

5. In *Fevillea* a polyandrous condition is found with all the five stamens free and alternating to the five free petals. This is a primitive genus.

Genoecium:

Reduced or rudimentary or absent.

Female flower:

They are fewer in number than the male flowers.

Calyx:

Sepals 5, gamosepalous, calyx tube adnate to the ovary wall; imbricate aestivation, superior.

Corolla:

Petals 5, gamopetalous, inserted on calyx tube; imbricate aestivation, superior.

Androecium:

Staminodes 0, 3, 5.

Gynoecium:

Tricarpellary, syncarpous, ovary inferior, unilocular with parietal placentation, the intruding placentae make the ovary to appear trilocular.

In *Luffa* the ovary is narrow and ultimately 3-4 celled and apparently of the axile type. In *Sechium* the ovary is unilocular with only a single ovule; ovule bitegmic. Style stout and columnar and bears a forked stigma for each carpel.

The stigmas are commissural i.e. stand above the dividing lines between the carpels. This is explained by assuming that each is a joint structure and composed of a branch of the stigmas of two adjacent carpels.

Fruit:

Soft, fleshy, indehiscent and either a berry or pepo. Fruits sometimes very large in size (*Citrullus* sp. *Benincasa* sp., *Cucurbita* sp.). In *Ecballium* the fruit is highly turgid when ripe and dispersal is by explosion.

Seed:

Exalbuminous, flattened, numerous, embryo straight, cotyledons large and oily.

Pollination:

Entomophilous.

Distribution of Cucurbitaceae:

It is commonly called gourd family. The family has 110 genera and 850 species out of which 86 species are found in India. The members are chiefly inhabitants of tropical regions; a few in temperate regions. The members are wanting in the colder regions.

Economic Importance of Cucurbitaceae:

This family is particularly important economically because its fruits are edible.

I. Vegetables and fruits:

1. Cucumis melo (Hindi – Kharbuza):

The fruits are edible and a number of varieties are known. *C. melo* var. *momordica* is Phut and *C. melo* var. *utilissimus* is Kakri. *Cucumis sativus* is Khira.

2. Citrullus vulgaris (Hindi – Tarbuz):

The fruits are large and ripen during summers; it is cultivated on the sandy beds of rivers. *C. vulgaris* var. *fistulosus* is Tinda which is used as vegetable.

3. Cucurbita maxima is Kaddu:

Cucurbita maxima is Kaddu while *C. pepo* is Safed Kaddu; both are used as vegetable.

4. Benincasa heipida is Petha:

Benincasa heipida is Petha. It is used as vegetable; PETHE-KI-MITHAI is also prepared from the fruits.

5. Lagenaria vulgaris is Lauki:

Lagenaria vulgaris is Lauki; the fruit is commonly used as a vegetable. From ripe fruit-shells sitar is made.

6. Trichosanthes dioica is Parwal:

Trichosanthes dioica is Parwal whose fruits are also used in vegetable preparations. *T. anguina* is Chachinga which is also used as vegetable.

7. Luffa acutangula is Torai:

Luffa acutangula is Torai. This is also a popular vegetable.

8. *Momordica charantia* is Karela:

Momordica charantia is Karela. The fruits are bitter but used in vegetable preparations. It is said to be useful in gout and rheumatism.

II. Medicine:

There are a few plants also important medicinally.

9. *Citrullus colocynthis* – produces the alkaloid colocynthin from its fruits. The fruits and roots are used against snake bite. The alkaloid is also used in other diseases.

10. *Ecballium elatarium* fruits produce elaterium of medicine which has narcotic effect and useful in hydrophobia.

III. Ornamental:

Some plants viz., *Ecballium*, *Sechium*, *Sicyos* are grown in gardens.

Systematic and economic importance of Apiaceae:

Stem fistular, leaves alternate, much dissected mostly decompose, sheathing leaf base; inflorescence umbel or compound umbel occasionally simple; flowers epigynous, pentamerous, regular rarely zygomorphic, hermaphrodite; calyx superior, pentafid or 0; corolla five, polypetalous, often inflexed; stamens 5; carpels 2; syncarpous, bicarpellary with 2 pendulous ovules; honey-disc surrounding the stigmas – stylopodium is present; fruit cremocarp; seeds endospermic and oily.

A. Vegetative characters:

Habit:

Plants are mostly herbs which may be annual, biennial or perennial, the herbs may be large (*Bupleurum*, *Heracleum*, *Agelica*) rarely shrubs with aromatic odour due to the presence of oil ducts. *Pseudocaryum* climbs by means of its petioles which are very sensitive to contact.

Root:

Tap, branched sometimes swollen for the storage of food material e.g., Carrot (*Daucus carota*)

Stem:

Erect or prostrate; climbing in *Pseudocarus*; swollen nodes, sometimes ridged, usually fistular, glaucous or glabrous.

Leaf:

Cauline and ramal; radical in young plants of *Daucus*, usually exstipulate, stipulate in *Centella*; alternate, opposite in some species or *Apiastrum*; simple or much dissected, often decomposed; petiolate, petiole usually sheathing at the base, venation reticulate uncostate (*Centella*), multicostate (*Astrantia*), parallel in *Eryngium* and *Aciphylla*. Palmately lobed leaves in *Sanicula*.

B. Floral characters:

Inflorescence:

Simple or compound umbel surrounded by thin leafy bracts called involucre; in some reduced to single flower e.g., in some species of *Centella* and *Azorella*; and to a compact head in *Eryngium*.

Flower:

Pedicellate, bracteate (*Centella*) or ebracteate (*Foeniculum*), perfect, complete, actinomorphic and in some zygomorphic due to the enlargement of the outer petals of the marginal flowers of the umbel (*Coriandrum*); hermaphrodite, pentamerous, epigynous, discus present.

In *Echinophora* each umbel has a central female flower surrounded by male flowers. In *Arctopus* and *Aciphylla* the flowers are fully dioecious. In *Astrantia* an intermediate condition is found.

Calyx:

Sepals 5, gamosepalous, small teeth or scales or absent (*Foeniculum*), adnate to the ovary, valvate, green.

Corolla:

Petals 5, polypetalous, epigynous often emarginate, tips inflexed, valvate (*Foeniculum*) imbricate, coloured.

Androecium:

Stamens 5, polyandrous, inserted under the disc, anthers dithecous, versatile, introrse, filament long, equal in length, bent in the bud but ultimately spreading out.

Gynoecium:

Bicarpellary, syncarpous, inferior, bilocular with a single pendulous ovule in each loculus, antero-posteriorly placed, axile placentation, style two; stigmas two; on the top of the ovary an epigynous glandular-stylopodium is present.

Fruit:

Schizocarpic cremocarp which splits into two one seeded mericarps, which remain attached to a slender often forked axis – the carpophore; mericarps are longitudinally ridged, in between the ridges are the furrows having oil ducts or vittae.

Seed:

Endospermic, embryo small.

Pollination:

Entomophilous due to nectar, scent and protandrous nature of flowers.

Distribution of Apiaceae:

The family is commonly called carrot family. It was also named as Umbelliferae. It includes 295 genera and 2,850 species according to Willis. In India the family is represented by 180 species and 30 genera. The plants are distributed almost throughout the world except the arctic regions. The chief centres of the distribution are north temperate and sub-tropical regions.

Economic Importance of Apiaceae:

This family is of considerable importance from economic point of view chiefly because the plants have essential oil from which condiments or medicine are prepared.

Food:

Carrot (*Daucus carota*), celery (*Apium graveolens*), parsnip (*Pastinaca sativa*) and sowa (*Peucedanum graveolens*) are chiefly used as pot herbs.

Condiments:

Hing (*Ferula foetida*), Ajwain (*Carum copticum*), Zira (*Cuminum cyminum*), Saunf (*Foeniculum vulgare*), Dhania (*Coriandrum sativum*), are used as condiments or carminatives. Hing is a oleogum resin obtained from the roots. *Ferula sumbul* and *F. galbaniflua* also produce hing. *Dorema* also produces oleogum resin.

