B.Sc. Semester-II

PAPER – II

PALAEOBOTANY & MORPHOLOGY OF ANGIOSPERMS

Topic:

- ***Inflorescence***
- ***Flower***
- ***Calyx & Corolla***

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The following points highlight the five major types of Inflorescence.

The types are:

1. **Solitary Flowers**
2. **Racemose Inflorescence**
3. **Cymose Inflorescence**
4. **Mixed Inflorescence**
5. **Special Inflorescence.**

Type # 1. Solitary Flowers:

Flowers occur singly or are separated from other flowers of the same plant by vegetative regions. Solitary flowers are formed by direct transformation of shoot tips into flowers.

They are of two types:

(i) Solitary Terminal:

Single flowers occur at the tips of the main stem and its branches, e.g., Poppy,

(ii) Solitary Axillary:

Single flowers occur in the axils of ordinary green or foliage leaves, e.g., Petunia, Garden Nasturtium, and Shoe Flower.

Type # 2. Racemose Inflorescence:

Racemose inflorescence is an indeterminate inflorescence which shows indefinite growth and bears a number of flowers due to the presence of active growing point. The arrangement of flowers is either acropetal (older towards base and younger towards apex) or centripetal (older towards periphery and younger towards centre). Racemose inflorescence is of two types, simple and compound.

Simple Racemose Inflorescence:

Simple racemose inflorescence is that indefinite inflorescence in which the peduncle is un-branched.

Simple Racemose Inflorescence types:

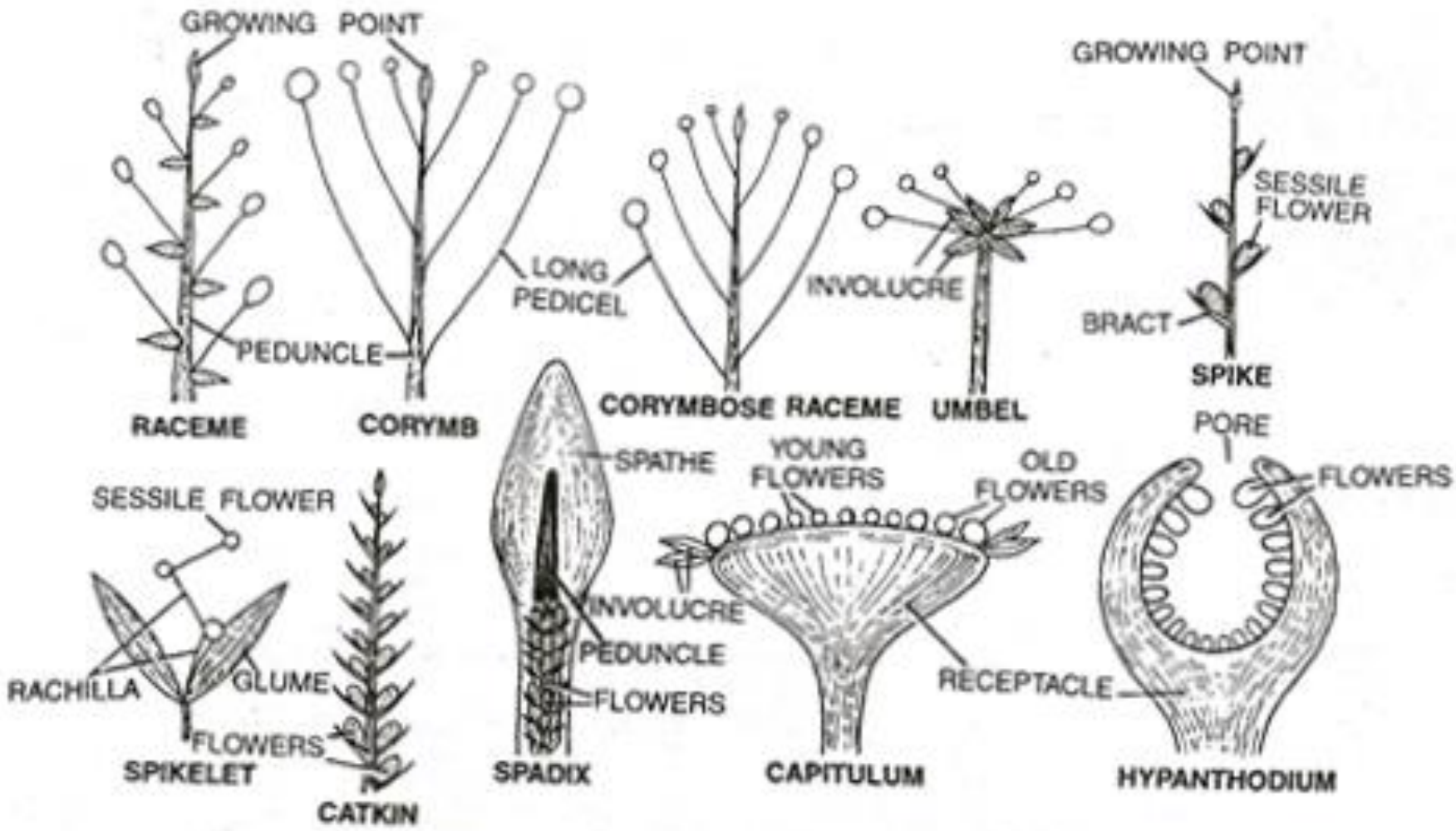


Fig. 5.68. Diagrammatic representation of various types of simple racemose inflorescence.

1. Typical Raceme:

An un-branched elongated peduncle bears stalked or pedicellate flowers in an acropetal fashion, e.g., Larkspur (Delphinium, Lupin (Lupinus), Radish (Raphanus), Linaria.

2. Corymb:

An un-branched peduncle bears pedicellate flowers in an acropetal fashion (like a typical raceme) but the pedicels of the lower flowers are longer. In this way, all the flowers come to lie at the same level, e.g., Candytuft (Iberis amara).

3. Corymbose Raceme: The young flowers appear to be arranged like a corymb but in mature state the longer pedicels of the lower flowers do not bring them to the level of upper ones, e.g., Mustard.

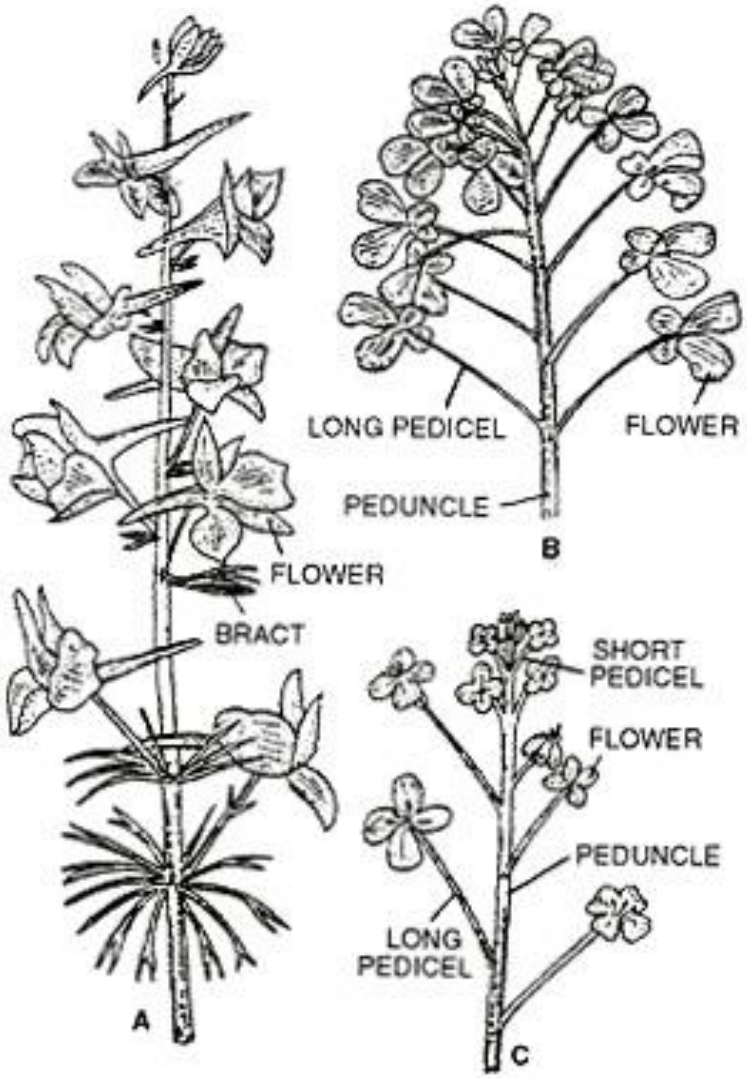


Fig. 5.69. A, typical raceme of Larkspur; B, corymb of young Candytuft; C, corymbose raceme of Mustard.

4. Umbel: All the pedicellate flowers arise from a single point in a centripetal fashion because the peduncle is reduced. An involucres or a whorl of bracts is often present at the base of flowers, e.g., Androsace, Centella asiatica (= Hydrocotyle asiatica, vern. Brahmi). Umbel is also a unit of inflorescence in family Apiaceae (=Umbelliferae).

5. Spike: An elongated peduncle bears sessile flowers in an acropetal fashion, e.g., Chaff Flower (Achyranthes), Bottle Brush (Callistemon), Adhatoda vasica Amaranth.

6. Spikelet : Spikelets are small and few flowered spikes which are surrounded at the base by two scales or glumes. They occur in family Gramineae (e.g., Wheat Oat, Grass, etc.).

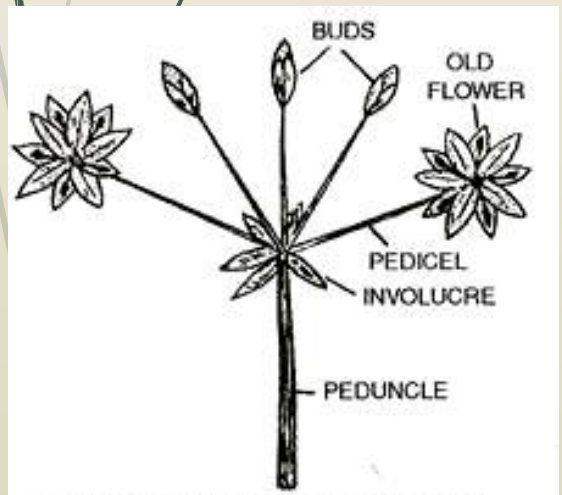


Fig. 5.70. Simple umbel of *Androsace*.

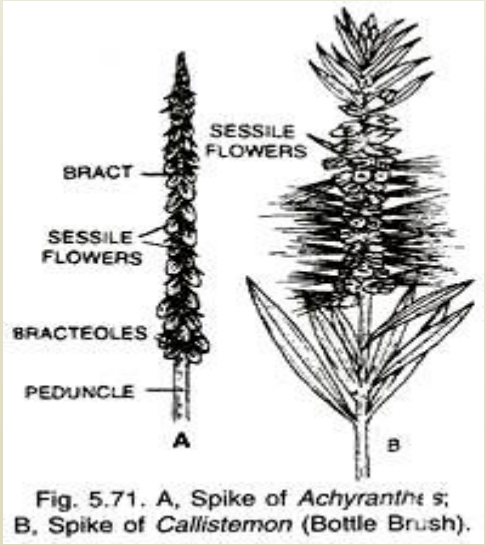
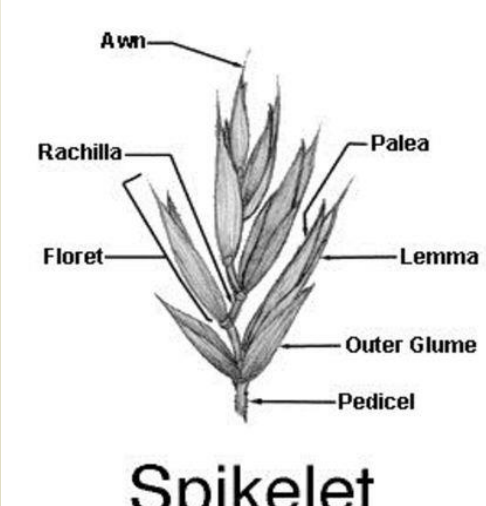


Fig. 5.71. A, Spike of *Achyranthes*; B, Spike of *Callistemon* (Bottle Brush).



7. Catkin :

The inflorescence is a compact unisexual, often hanging, spike which matures and falls down as a single unit, e.g., Mulberry (Morns, vern. Shahtoot), Poplar (Populus), Willow (Salix), Red Hot Cattail (Acalypha hispidd), Betula, Quercus.

8. Spadix :

It is a special type of spike which possesses a fleshy peduncle and a large green or coloured bract called spathe. The peduncle bears an upper coloured and sterile appendix. The lower part of the peduncle possesses sessile unisexual flowers, upper male and lower female.

The two types of flowers are separated by downwardly directed sterile hair or neuter flower, e.g., Colocasia, Arum. In a spadix the appendix of the peduncle and the spathe are coloured to attract insects for pollination. The spathe is tubular in the basal region to protect the flowers.

Fig. 5.72. Female catkin of Mulberry.

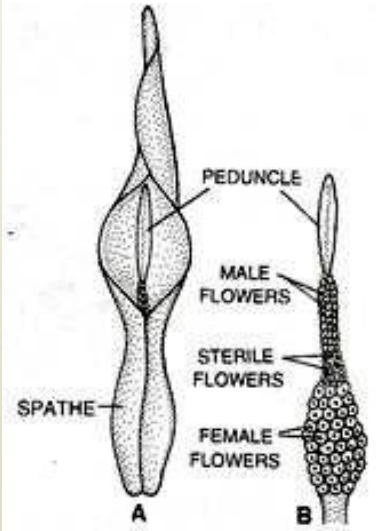


Fig. 5.73. A, external view of spadix of *Colocasia* (Kachaalu); B, structure of spadix of *Colocasia* after removing its spathe.

9. Capitulum or Racemose Head :

The peduncle is somewhat flattened to form a receptacle that bears small sessile flowers called florets. The latter are of two types, tubular and ligulate. The florets are arranged in a centripetal fashion, e.g., younger towards the cenre and older towards the periphery.

The inflorescence is surrounded by one or more whorls of bracts called involucre. Capitulum inflorescence is found in family compositae, e.g., Tagetes, Zinnia, Sunflower (Helianthus annuus), Cosmos, Chrysanthe mum, Sonchus.

It may be tubular homogamous (e.g., Ageratum), ligulate homogamous (e.g., Sonchus) or heterogamous (e.g., Sunflower). In Sunflower, the central disc florets are bisexual and tubular while the peripheral ray florets are sterile or female and ligulate.

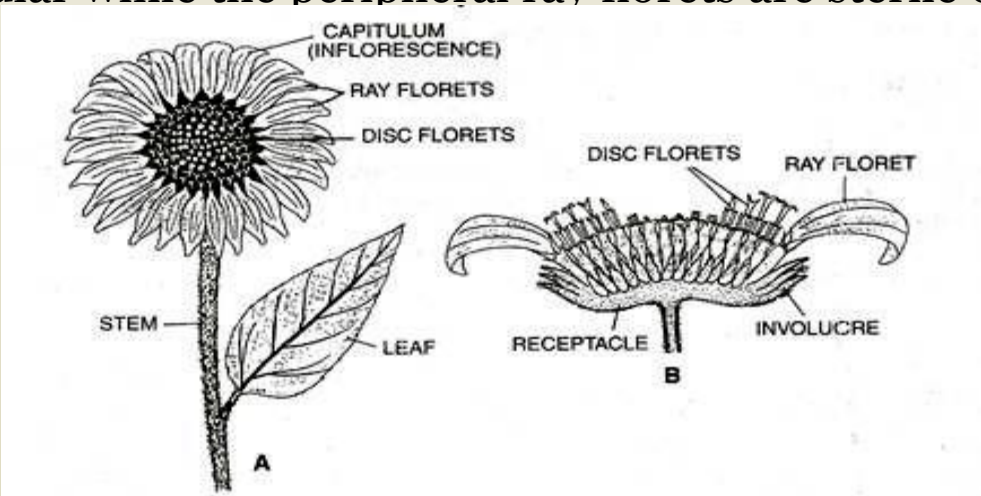


Fig. 5.74. Capitulum of Sunflower. A, entire capitulum; B, vertical section of capitulum.

Compound Racemose:

It is an indefinite or indeterminate inflorescence in which the peduncle is branched in a racemose fashion with each branch bearing flowers in acropetal or centripetal fashion.

1. Panicle (Raceme of Racemes or Compound Raceme), e.g., Gold Mohur (Delonix), Cassia fistula, Asphodelus, Yucca, Neem (Azadirachta indica).

2. Compound Corymb (Corymb of Corymbs), e.g., Pyrus, Cauliflower, Candytuft. In Cauliflower (Brassica oleracea vern. hotrytis, vern. Gobhi), the flowers remain undeveloped.

3. Compound Umbel (Umbel of Umbels). Several small or daughter umbels called umbellules arise from a common point in an umbellate fashion. A whorl of bracts, called involucre, is present at the base of the parent umbel.

Similar whorls of bracts found at the bases of umbellule's are called involucels. Compound umbel is characteristic of family umbelliferae e.g., Carrot (Daucos carota), Fennel (Foenlculum vulgare, vern. Saunf), Coriander (Coriandrum sativum, vern. Dhania).

4. Spike of Spikes, e.g., Amaranthus.

5. Compound Spadix (Spadix of Spadices), e.g., Date, Coconut.

6. Compound Capitulum (Capitulum of Capitulum) e.g., Echinops.

Type # 3. Cymose Inflorescence:

Cymose inflorescence is the name of determinate or definite inflorescence in which the tip of the main axis terminates in a flower and further growth continues by one or more lateral branches which also behave like the main axis (Fig.). The arrangement of flowers is either basipetal or centrifugal.

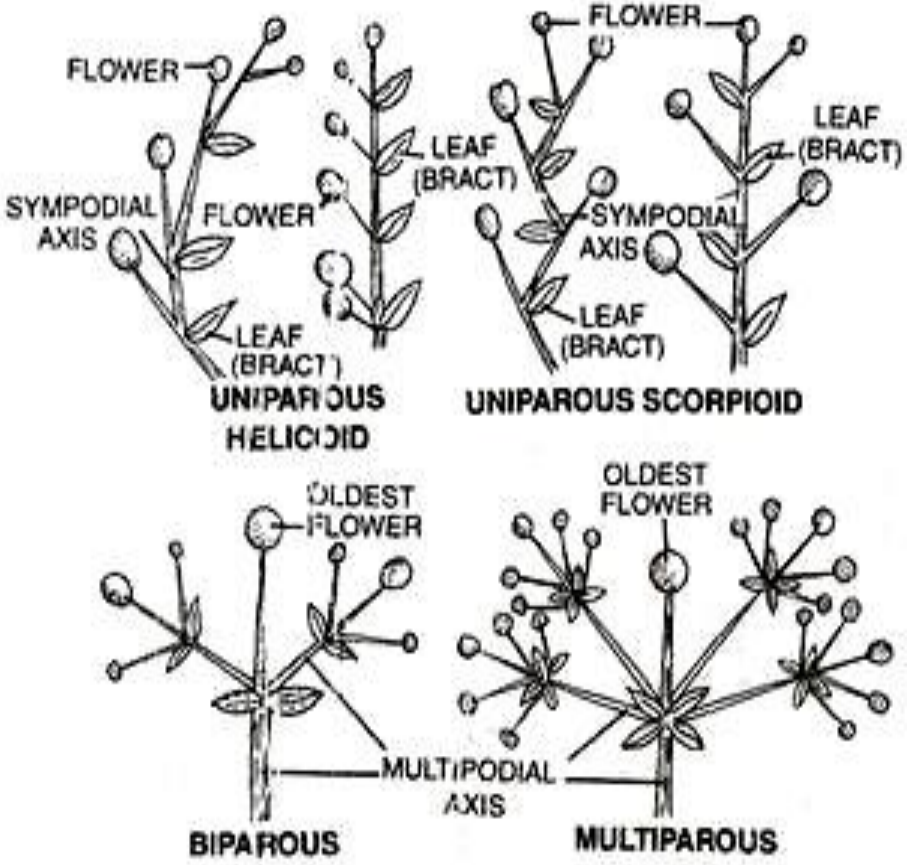


Fig. 5.75. Diagrammatic representation of various types of cymose inflorescence.

a. Uniparoas or Monochasial Cyme.

The terminal bud of main axis ends in flower. A single lateral branch pushes it to one side but also itself ends in a flower. The process is repeated. The peduncle is formed by the fusion of bases of axillary branches and the main axis. It is, therefore, sympodial.

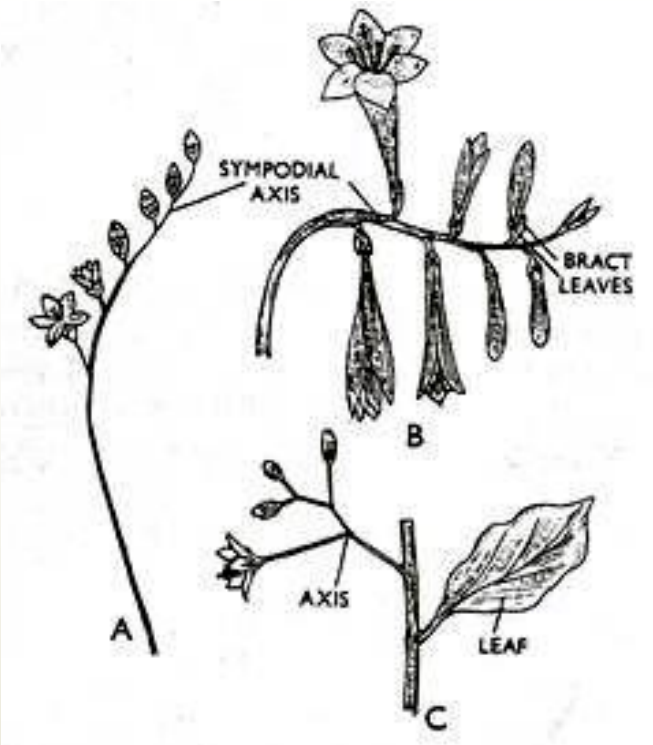


Fig. 5.76. Uniparous cyme. A, helicoid (bostryx) of *Drosera*; B, scorpioid (cincinnus) of *Freesia*; C, rhipidium of *Solanum nigrum*.

Uniparous cyme inflorescence is of two types:

(i) Helicoid (Bostryx): All the flowers are borne on the same side forming a sort of helix, e.g., Drosera, Begonia,

(ii) Scorpioid (Cincinnus): Flowers are alternately borne on both the sides, e.g., Freesia, Tecoma, Heliotropium, Ranunculus bulbosus. A modification of scorpioid cyme is rhipidium. Here all the flowers are borne in one plane, e.g., Solanum nigrum.

b. Biparous or Dichasial Cyme :

A terminal flower is subtended by two lateral bram.hes which also end in flowers. The process is repeated. Inflorescence axis is multipodial. e.g., Pink (Dianthus), Nyctanthes (vern. Har Singar), Spergula, Silene, Jasmine (Jasminum), Clerodendron (Clerodendrum), Bougainvillea, Teak.

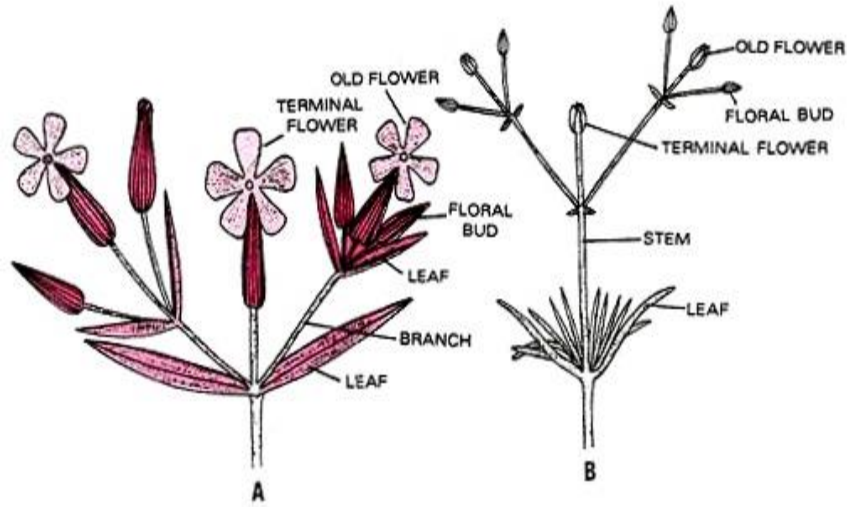


Fig. 5.77. Biparous or dichasial cyme. A, *Silene conoidea*; B, *Spergula pentandra*.

c. Multiparous or Polychasial Cyme :

More than two lateral branches continue the growth of the inflorescence when the parent axis ends in a flower. Polychasial cyme generally occurs in the primary divisions. The later divisions often become dichasial followed by monochasial ones. As in biparous cyme, the inflorescence axis is multipodial, e.g., Hamelia patens, Calotropis (vern. Ak, Madar), Asclepias.

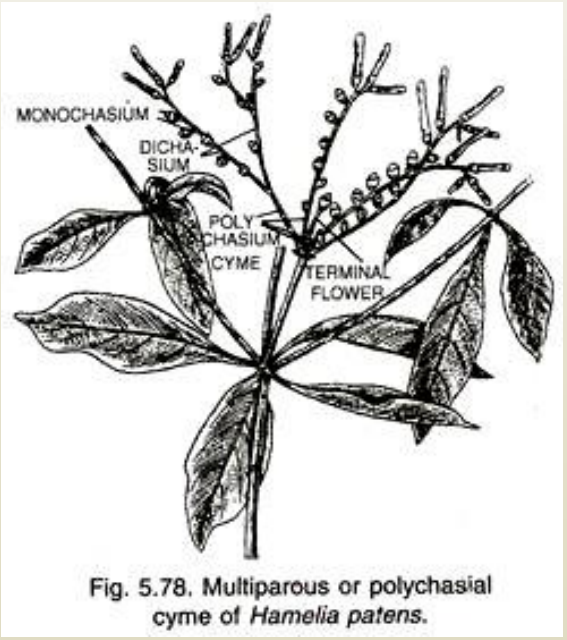


Fig. 5.78. Multiparous or polychasial cyme of *Hamelia patens*.

d. Cymose Head (Glomerule):

Sessile or subsessile flowers are borne centrifugally around a receptacle, e.g., Anthocephalus cadamba (vern. Kadam), Albizia (= Albizzia), Acacia (Fig. 5.79).

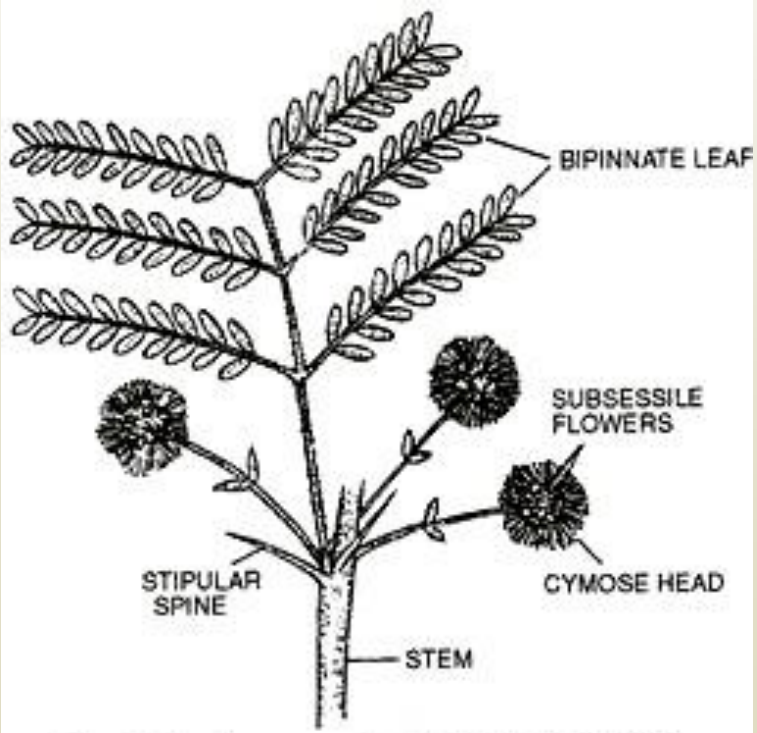


Fig. 5.79. A cymose head of *Acacia* (Kikar).

Type # 4. Mixed Inflorescence:

In this case two or more types of inflorescence get mixed up to form a mixed inflorescence, e.g., panicle of spikelets (e.g., Oat, Rice), spike of spikelet's (e.g., Wheat), corymb of capitula (e.g., Ageratum conyzoides), umbel of capitula, raceme of capitula, mixed spadix (spadices with cymose inflorescence arranged acropetally on a fleshy axis having coloured spathes, e.g., banana), thyrsus (thyrse, cymose clusters borne acrotepally on an axis, e.g., Grape Vine, male Cannabis).

Type # 5. Special Inflorescence:

a. Hypanthodium :

Hypanthodium has a flask-shaped fleshy receptacle which possesses a narrow canal and a terminal pore at one end. The pore is surrounded by a few scales while the canal is lined by downwardly pointed hairs. Internally the receptacle bears male flowers towards the pore and female flowers towards the base.

Sterile, neuter or gall flowers occur in between the two groups. The inflorescence is formed by the condensation of three types of flower- bearing axes (cymose groups). Hypanthodium is found in the genus Ficus of the family Moraceae, e.g., Peepal (Ficus religiosa), Banyan (Ficus bengalensis), and Fig (Ficus carica).

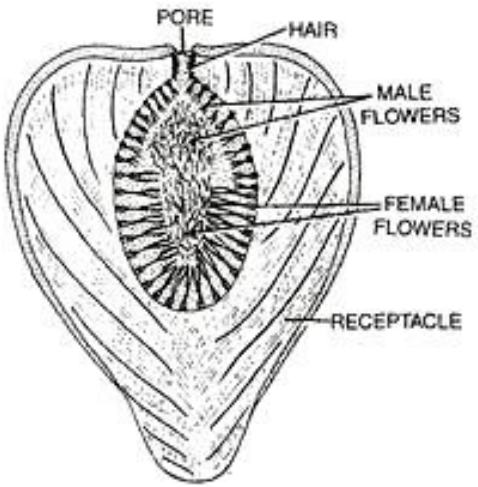


Fig. 5.80. Longitudinal section of hypanthodium of Fig (Anjir).

b. Verticillaster :

Two clusters, each having 3-9 flowers, develop on a node in the axils of opposite leaves. Each cluster consists of a dichasial cyme with monochasial branches. The axis of the cyme is shortened so that all the flowers arise from a single point.

The two opposite clusters often give the appearance of whorl or verticil due to overcrowding. The verticils are further arranged in a racemose fashion. Verticillaster inflorescence occurs in family Lamiaceae or Labiatae where stems are generally quadrangular, e.g., Ocimum sanctum (Sacred Basil, vern. Tulsi), Ocimum basilicum (Sweet Basil, vern. Niazbo), Salvia, Coleus.

Fig. 5.81. Verticillaster of *Salvia*.

c. Cyathium :

It occurs in Poinsettia (= Euphorbia pulcherrima) and Euphorbia species. The inflorescence looks like a flower. It has a small conical receptacle surrounded by an involucre of generally five green or coloured bracts having nectariferous glands.

Internally, the inflorescence contains pedicellate achlamydeous and unisexual flowers of both the types, male and female. The female flower is single and centrally placed. Male flowers are numerous and are arranged centrifugally.

Each male flower has a pedicel and a single stamen. The joint between the two represents the thalamus. It is usually naked but in Anthostemma a whorl of small tepals or perianth occurs in this region. The female flower has similarly a pedicel and a tricarpellary pistil with lobed stigmas.

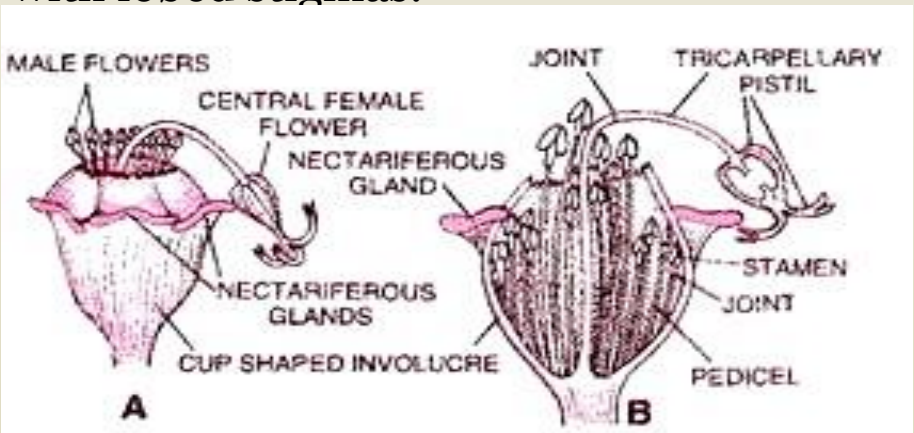


Fig. 5.82. Cyathium. A, unopened cyathium; B, cyathium cut open.

Flower:

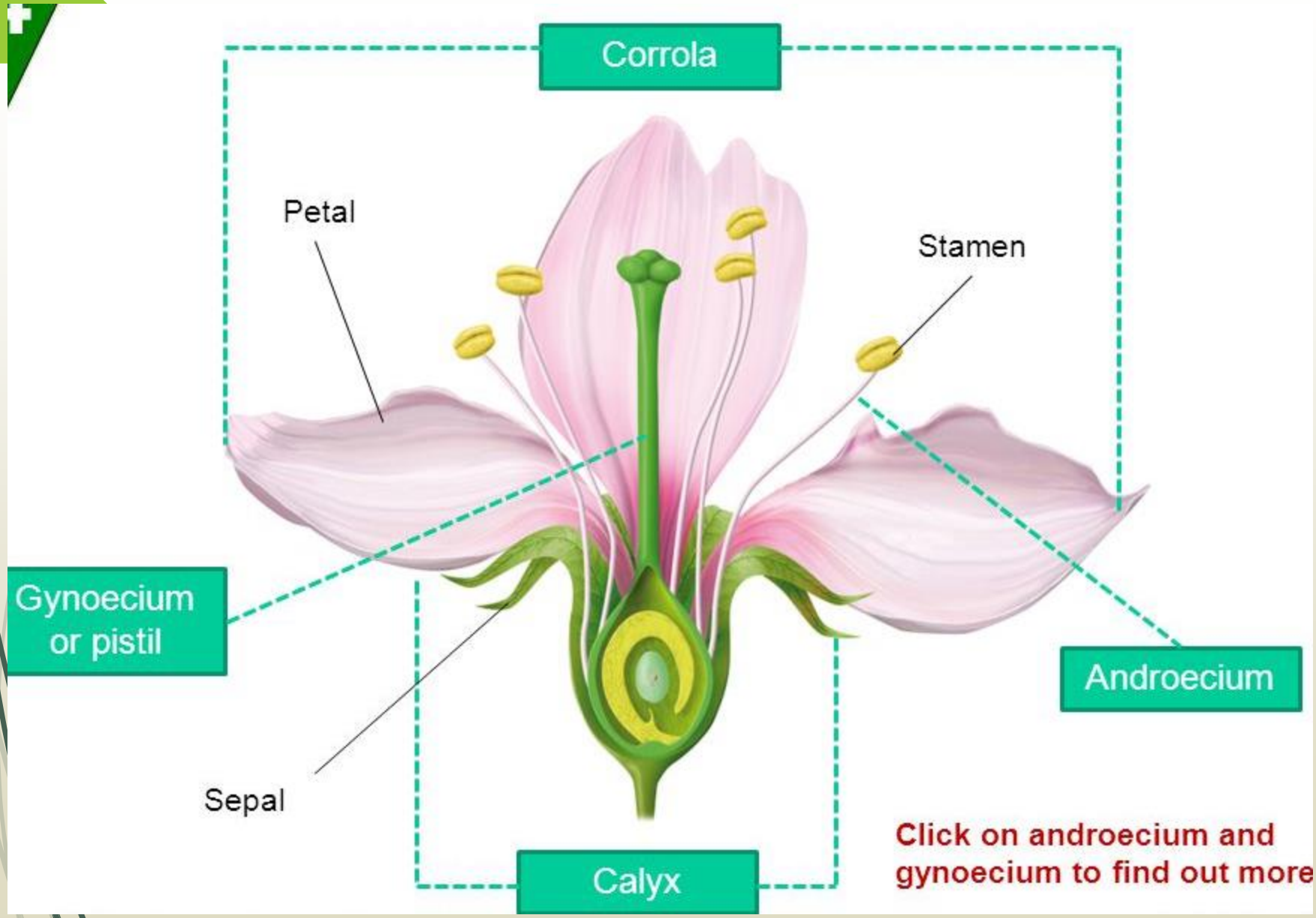
Parts of a Typical Flower:

A typical flower consists four whorls of floral appendages, attached on the receptacle, i.e., calyx, corolla, androecium and gynoecium. Of these, the two lower whorls, i.e., calyx and corolla are sterile and considered as non-essential/accessory/helping whorls and the two upper whorls, i.e., androecium and gynoecium are fertile and are considered as essential or reproductive whorls.

Different whorls of a flower are given below:

(i) Calyx:

It is the outermost whorl of floral leaves. An individual leaf segment is called sepal. The sepal are essentially green, but in some cases they are coloured like petals, is called petaloid. They are protective in function. They may fall immediately after the flower opens or may remain persistent and protect the developing fruits.


Corrola
Petal
Stamen
Gynoecium or pistil
Androecium
Sepal
Calyx
Click on androecium and gynoecium to find out more

(ii) Corolla:

This is a second whorl of floral leaves that arise inner to calyx. Individual leaf of corolla is called petal. Petals are brightly coloured and fragrant, which make the flower attractive. They attract insect pollinators and help in pollination. Petals and sepals together form the floral envelope. The floral envelope including both calyx and corolla is called perianth. An individual member of perianth, when sepals and petals are not clearly differentiated is called tepal.

(iii) Androecium:

It is the third whorl of floral appendages that arise inner to corolla. The individual apparatus is the stamen, which represents the male reproductive organ.

Each stamen consists of an anther and a filament, usually anthers are bilobed and contain four microsporangia, but sometimes they have only one lobe and two microsporangia.

The point of stamen, which connects the anther and the filament is called connective. Its main function is the production of microspores, i.e., pollen grains containing male gametes within the anther lobe.

(iv) Gynoecium/Pistil:

It is the fourth and the last whorl of floral appendages, which represents the female reproductive organ and consists of three parts, i.e., ovary, stigma and style.

(a) Ovary is the basal swollen part of the carpel, which bears one or several ovules.

(b) Stigma is the receptive spot, which lodges the pollen grains.

(c) Style is the connection between the stigma and the ovary.

It helps body part in production of megaspores, fruits and seeds.

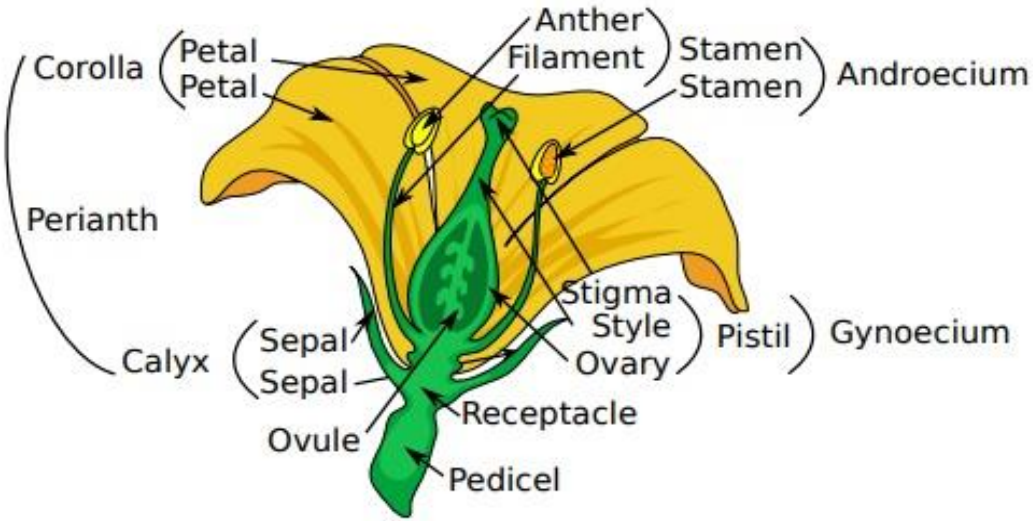


Figure 8.7. Most important parts of the flower.

Functions of a Flower:

Following are the functions of flower:

(a) Flowers are the modifications of shoot that perform the function of sexual reproduction.

(b) The fertile leaves become microsporophyll's and megasporophylls, which bear anthers and ovules respectively. The anthers produce pollen grains and ovules possess eggs.

(c) Flowers are variously shaped to help diverse mode of pollination.

(d) They provide seed for germination of pollen, development of pollen tube, formation of gametes and fertilisation.

(e) Floral parts get transformed into fruits and seeds after fertilisation.

(f) Flowers also help in dispersal of seeds and fruits.

The thalamus of a flower.

The thalamus is the short abbreviated axis bearing the four sets of floral leaves. It is the swollen end of the peduncle or pedicel with four nodes and very much compressed internodes. The floral leaves remain inserted on the nodes in whorls or spirally. The axis nature of the thalamus becomes quite evident in some flowers in which it (thalamus) is considerably long and the internodes are distinct.

The internode between the calyx and corolla is known as anthophore, that between corolla and androecium is androphore, and the one between androecium and gynoecium is gynophore. Androphore is distinct in passion-flower and gynophore in Pterospermum (B. Kanak champa). In Gynandropsis (B. Hurhure) both androphore and gynophore develop to form what is known as gynandrophore .

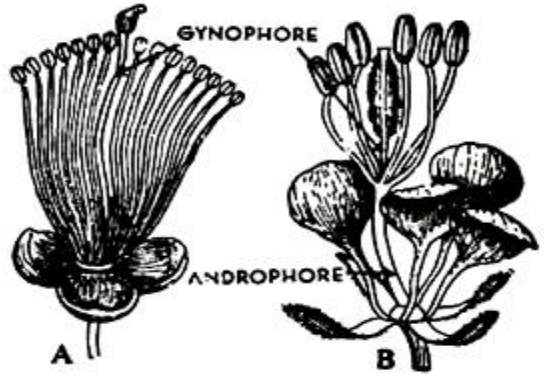
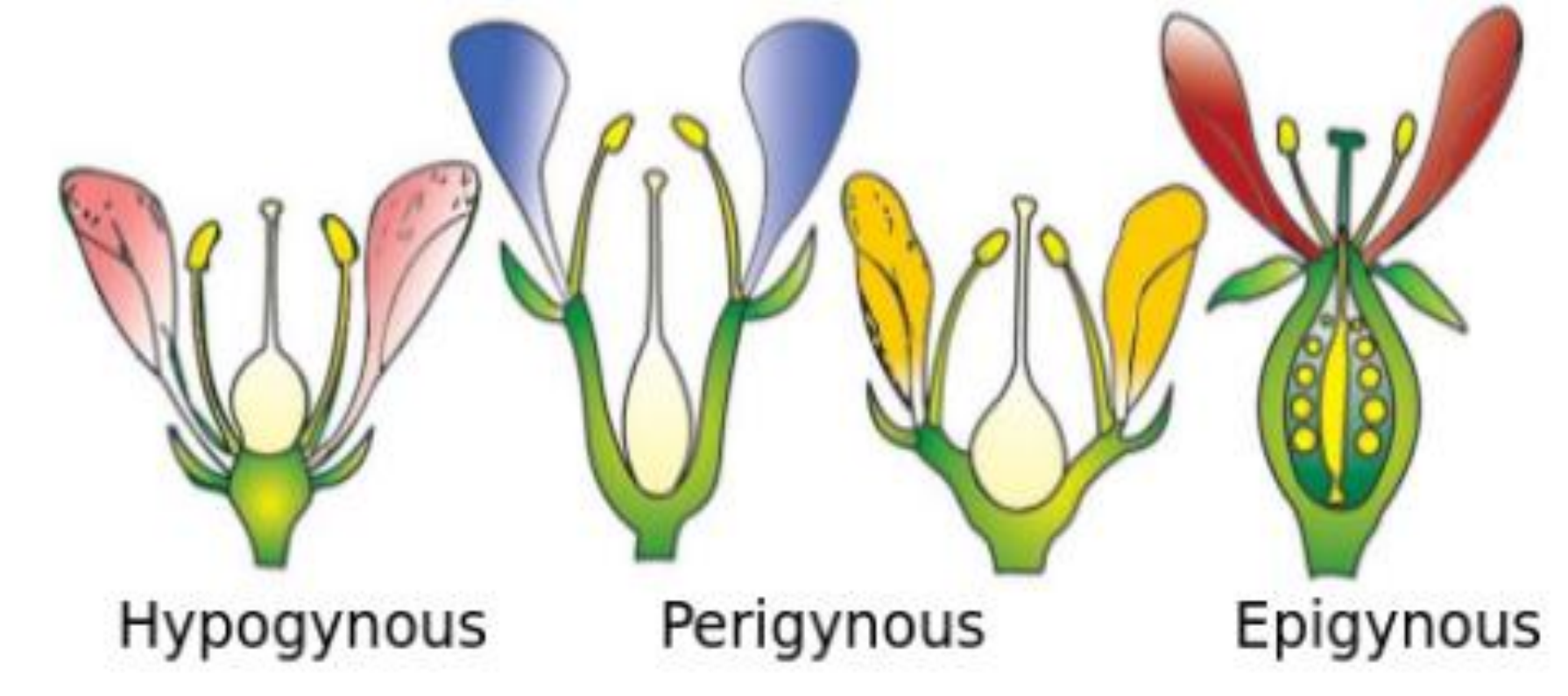


Fig. 85. A—flower of *Capparis* showing gynophore; B—flower of *Gynandropsis* showing androphore and gynophore.

The thalamus may be a bit elongated, as in Michelia (B. Champaka), convex in flowers like China-rose, Datura, cup-shaped in roses, and it may have spongy flat top, as in lotus. According to the nature of the thalamus and mode of insertion of the first three floral sets with respect to the gynoecium, flowers may be hypogynous, perigynous and epigynous.



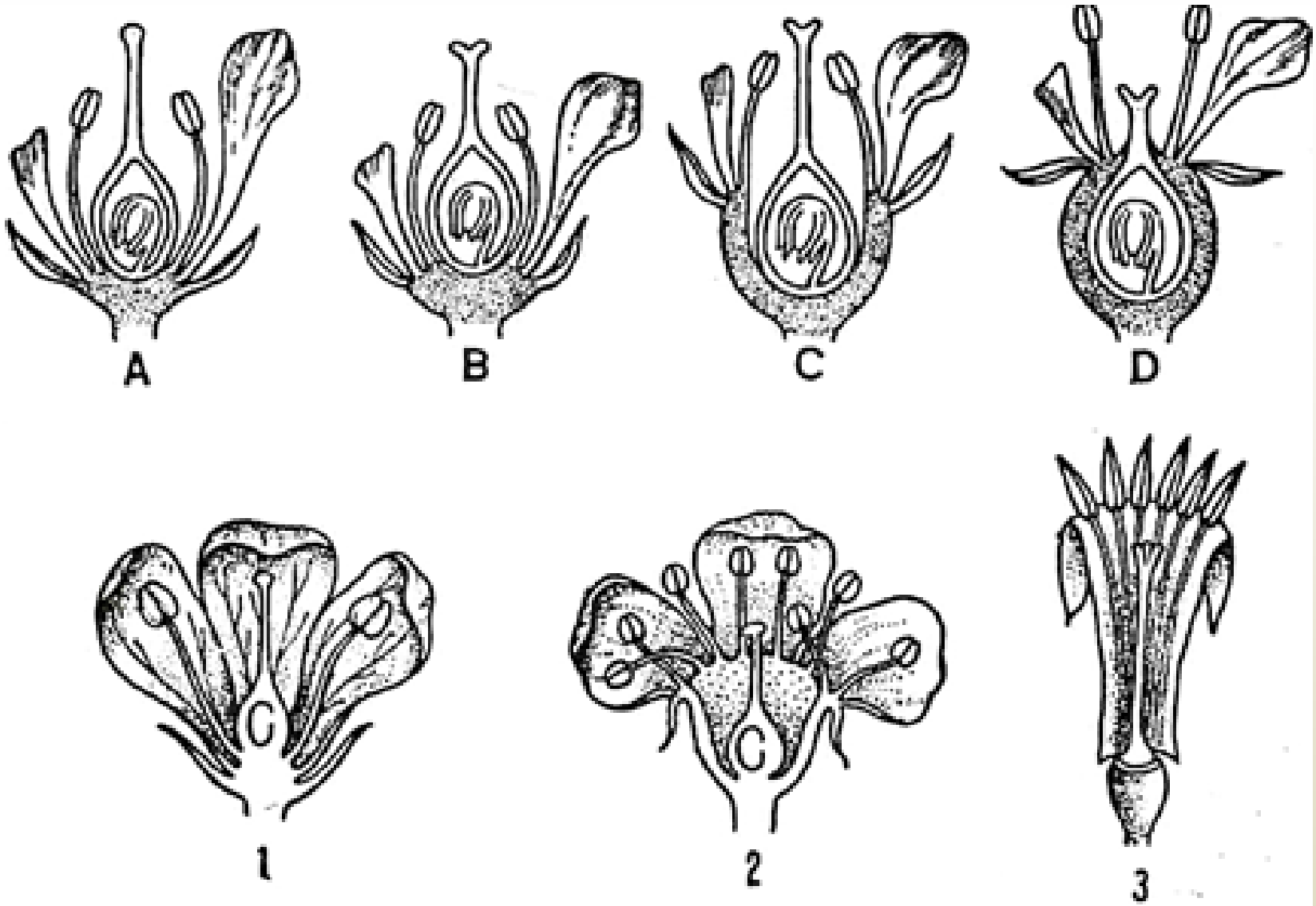


Fig. 86. Insertion of floral leaves on the thalamus. A, B & 1—hypogynous; C & 2—perigynous; D & 3—epigynous.

Hypogynous flower is that in which the thalamus is convex and dome-shaped, and the pistil occupies the top position of the thalamus, other whorls remaining inserted below the pistil one after another in normal order. The ovary here is called superior. Examples—China-rose, Datura.

Perigynous flower has concave or cup-shaped thalamus forming rims or flanges, on which stamens, petals and sepals other whorls are placed around it. The ovary is said to be inferior.

Examples—pea, roses. Epigynous flower is that in which the thalamus is hollow and cup-shaped, and completely fuses with the lower part of the pistil (ovary). The stamens, petals and sepals are placed above the pistil. The ovary in epigynous flower is inferior. Examples— Sunflower, Cucurbita (B. Gourd), tube-rose.

Calyx & Corolla: - Cohesion, Forms of corolla and Aestivation.

Meaning of Calyx:

The outer whorl of perianth consisting of sepals is called calyx.

1. Polysepalous:

When calyx lobes or sepals are free, e.g., Cassia.

2. Gamosepalous:

When calyx lobes or sepals are fused or united, e.g., Datura.

3. Caducous:

When sepals wither or drop off very soon, e.g., poppy.

4. Persistent:

When sepals persist even in the fruit, e.g., Solanum nigrum.

5. Petalloid:

When sepals are coloured, e.g., Delphinium.

Forms of Calyx:

Calyx may be of following types:

1. **Tabular:** Like a tube, e.g., Nicotiana.
2. **Urceolate:** Un-shaped, e.g., Hyoscyamus.
3. **Cupulate:** Cup-like, e.g., Gossypium.
4. **Infundibuliform:** Funnel-shaped, e.g., Atropa belladona.
5. **Campanulate:** Bell-shaped, e.g., Lathyrus odoratus.
6. **Bilabiate:** Consisting of two lips, e.g., Ocimum.
7. **Spurred:** When one or more sepals are produced into spur, e.g., Delphinium.
8. **Pappus:** Reduced and hairy, as in Asteraceae.

Fig. 81. Forms of calyx. A, Free; B, Tubular; C, Urceolate; D, Cupulate; E, Campanulate; F, Bilabiate; G, Spurred.

Modifications:

The calyx may sometimes be modified or have some appendages. The sepals may be petaloid, i.e., petal-like as seen in Sterculia roxburghii with a scarlet calyx and also in Saraca asoca and Caesalpinia pulcherrima of Caesalpinieae, etc.

In Mussaenda, while four sepals are normal the fifth one is large and petaloid although showing vein marks. In the family Compositae and the allied families Dipsaceae and Valerianaceae, the calyx is modified into two or more hairy, scaly or feathery structures forming the pappus .

In Trapa bispinosa (water chestnut) the calyx is spinous in the fruit. In Impatiens balsamina, Tropoeolum majus, Delphinium (larkspur), etc., the sepal is prolonged downwards into a tubular process called spur and the calyx is said to be spurred.

In Aconitum (monkshood of Ranunculaceae) one sepal is enlarged forming a hood over the flower.

Fig. 318

Fig. 319

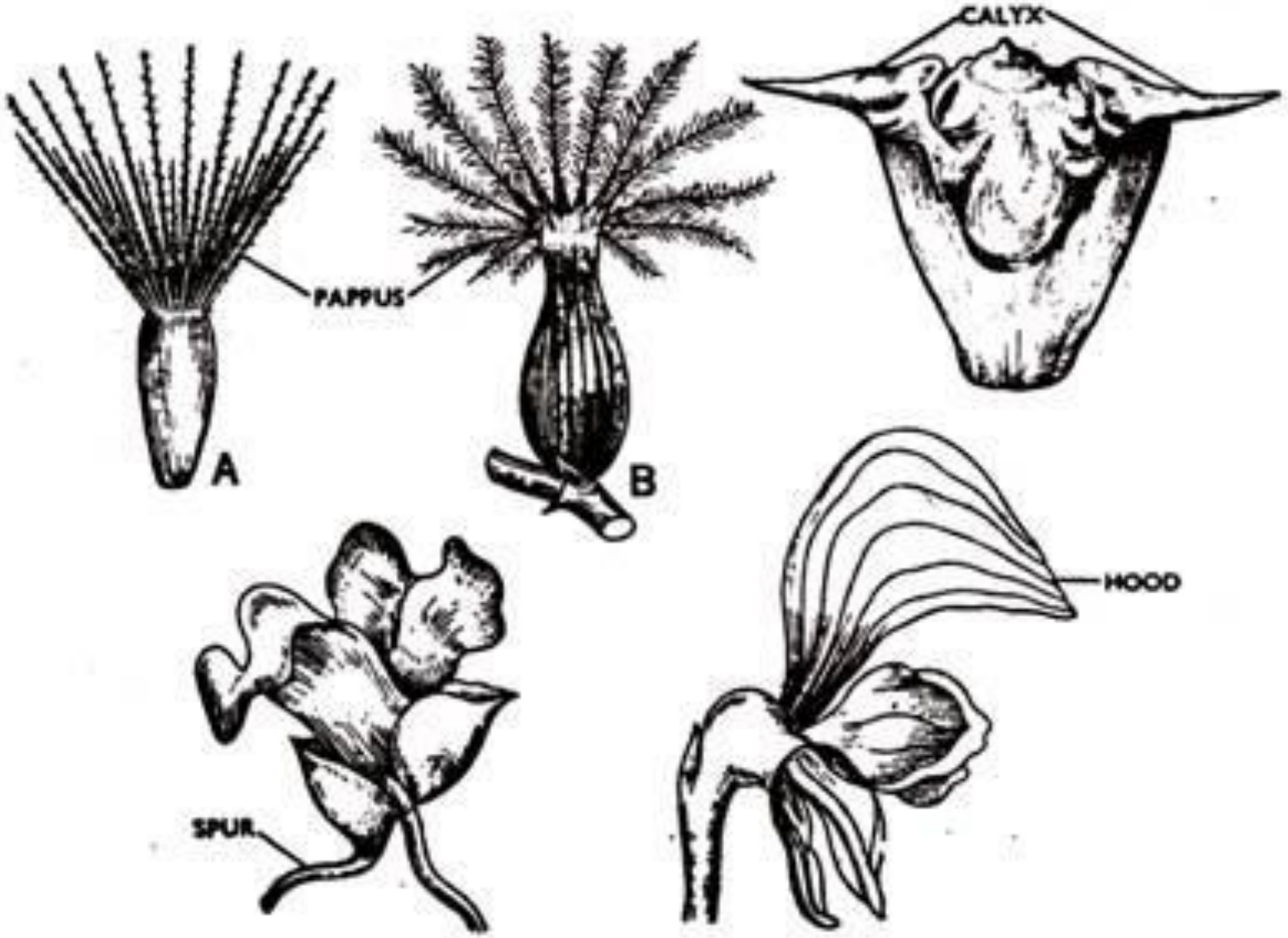


Fig. 320

Fig. 321

Fig. 318. Pappus in A. *Mikania scandens* (Compositae); B. *Valeriana* (Valerianaceae). Fig. 319. Spinous calyx in *Trapa bispinosa*. Fig. 320. Spurred calyx of *Impatiens balsamina*. Fig. 321. Hooded calyx of monkshood (*Aconitum napellus*).

Corolla:

Corolla is the second axillary whorl composed of petals. Like the calyx, the corolla also protects the more essential stamens and carpels within.

The petals are usually brightly coloured because of the presence of water-soluble anthocyanin (red, orange, violet, blue, etc.) and anthoxanthin (yellow to ivory white) pigments or the carotenoids contained in the chromoplasts.

The bright colour of the petals combined with the scent of essential oils present in some flowers and the nectar secretion of special glands make the flowers highly attractive to insects which act as agents for pollination.

Petals may sometimes be green or have some dull colour like the sepals when they are termed sepaloid as in Annona, Polyalthia, Artabotrys, etc., of Annonaceae or in the green rose.

Petals are usually smooth but sometimes the surface may be hairy. Though usually thin, sometimes they may be thick fleshy structures. In a petal the lower part is usually

narrow like the stalk of a leaf and is called the claw or unguis.

When a claw is present the petal is called clawed or unguisculate. The expanded portion of the petal is the limb . A clawless petal is sessile. A petal resembles the lamina not only in this but also in other characteristics.

It may be shaped linear, oblong, etc., and its margin may be entire, dentate, serrate, etc., just as in the leaf lamina. In some flower petals, as in Dianthus , the margin is deeply slashed or divided giving it a frilled appearance when it is called fimbriated or fringed.

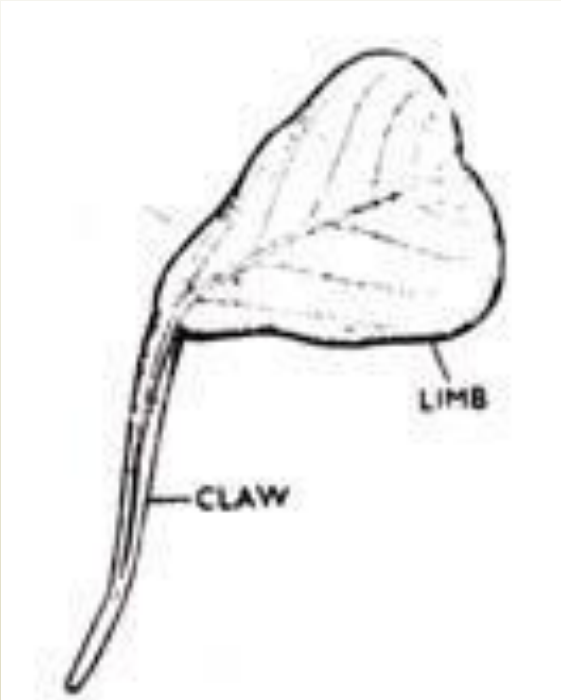


FIG. 325. A petal showing limb and claw.

The corolla may be regular or irregular. It is **polypetalous** or dialypetalous if the petals are free from one another and gamopetalous or sympetalous if there is any degree of cohesion. When united, the united portion is the corplla tube and the free portion above shows the corolla lobes. The junction of the tube and the lobe is called the throat.

Considering its duration, the corolla is caducous (e.g., grape vine) or, more commonly, deciduous. Very rarely it is persistent, as in heather, where it remains in a dry and shrivelled up marcescent form.

Like the calyx, the corolla also may have appendages. In Antirrhinum (snapdragon) the tube of the corolla is slightly dilated on one side forming a pouch. This condition is termed, saccate or gibbous. In some cases one or more petals, or the tube itself is prolonged downwards, forming a spur which usually stores nectar. Such a flower is called spurred.

There may be only one spur as in pansy or there may be several spurs as in Aquilegia vulgaris where each petal is spurred. Sometimes appendages of different kinds, such as scales, hairs, etc., develop from the inner wall of the throat.

This gives rise to what is known as the corona. Beautiful coronas are seen in passion flower, oleander etc. The corona of daffodil is a united tubular structure.

Fig. 326 Fig. 327 Fig. 328

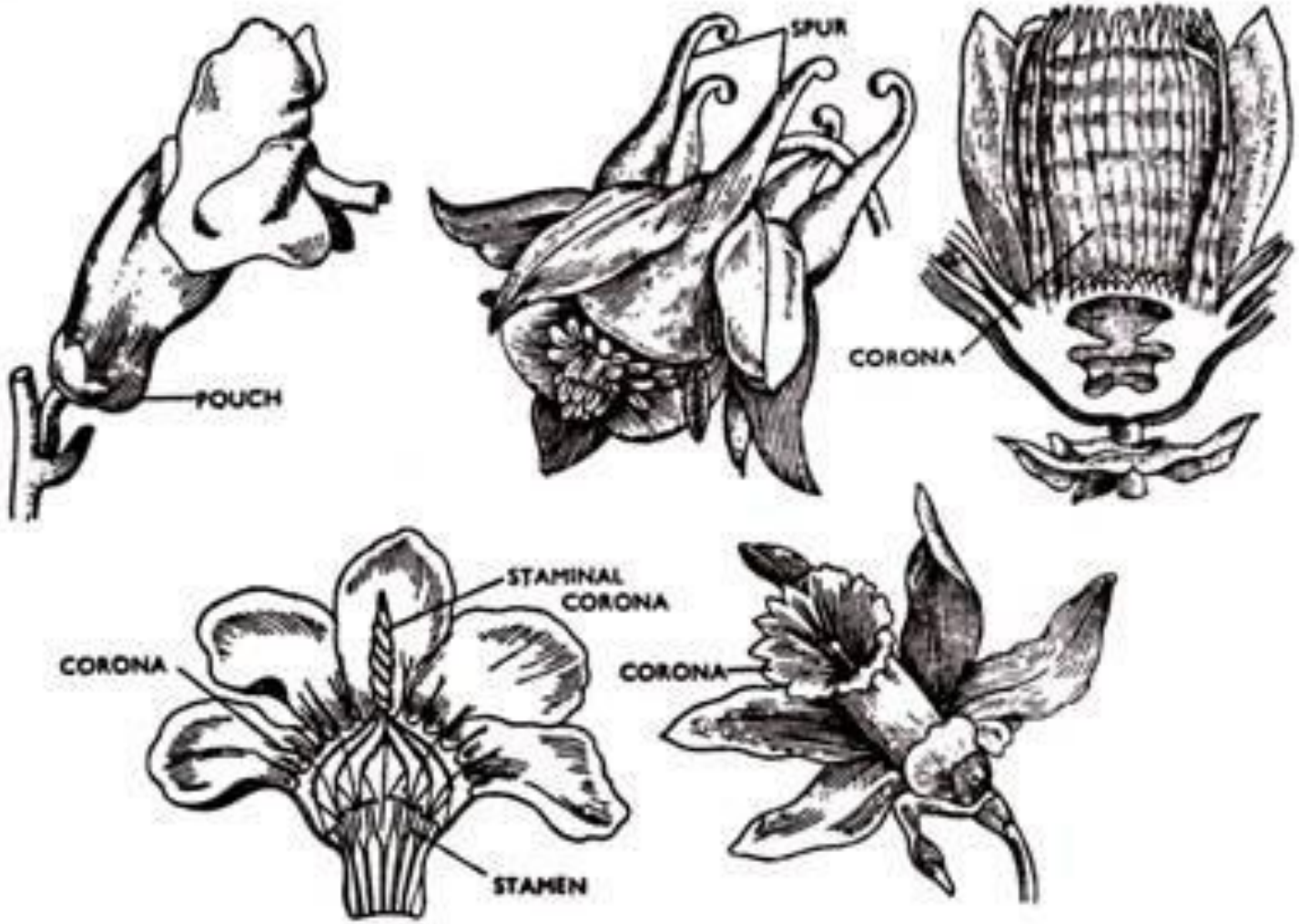


Fig. 329 Fig. 330

Fig. 326. Saccate corolla of *Antirrhinum*. Fig. 327. Spurred petals in *Aquilegia vulgaris*. Fig. 328. Corona developed on corolla of *Passiflora*. Fig. 329. *Nerium odorum* showing corona developed on corolla as well as staminal corona developed by staminal appendages. Fig. 330. Tubular corona developed on corolla of daffodil (*Narcissus pseudonarcissus*).

Forms of Corolla:

According to the nature of cohesion, shape, etc., corollas of the following types are usually met with:

A. Polypetalous or Dialypetalous:

(a) Regular forms:

1. Cruciform:

Four free clawed petals are arranged in the form of a cross as in the Cruciferae family, e.g., mustard .

2. Caryophyllaceous:

This is formed by five free clawed petals with limbs at right angles to the claws as in the family Caryophyllaceae, e.g., the pink flower (Dianthus).

3. Rosaceous:

There are five sessile (or with very short claws) petals with the limbs spreading outwards. The odd petal is anterior. This is found in the family Rosaceae (e.g., wild rose) and also in tea (Thea chinensis). Most cultivated roses however show more petals because of reasons explained .

(b) Irregular forms:

4. Papilionaceous:

Here five free petals resemble a butterfly (papilion=butterfly). The posterior superior petal is larger than the others and is termed the vexillum or standard; two anterior inferior ones are usually more or less united forming a boat-shaped structure and are called the carina or keel.

Two lateral petals called alae or wings overlap the carina and are themselves overlapped by the vexillum. This is a characteristic of the subfamily Papilionaceae, e.g., the pea flower.

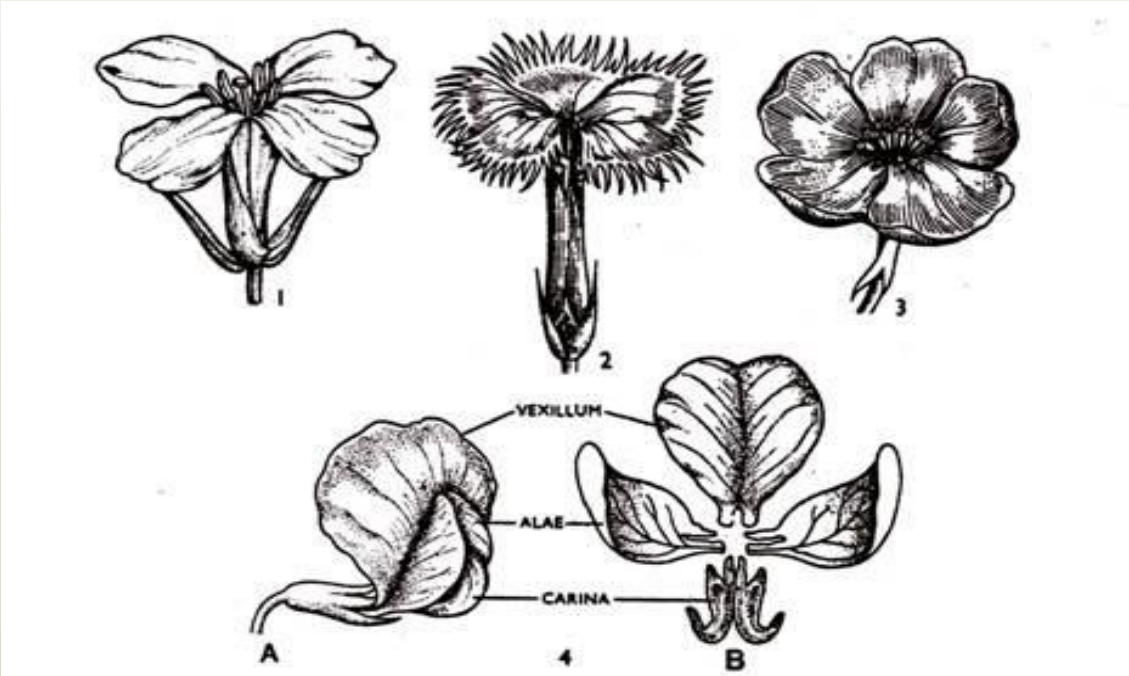


FIG. 331. POLYPETALOUS COROLLA FORMS. 1. Cruciform in mustard (*Brassica nigra*). 2. Caryophyllaceous in pink (*Dianthus chinensis*). 3. Rosaceous in wild rose. 4. Papilionaceous in pea. A, Complete flower. B, Corolla dissected to show arrangement and forms of petals

B. Gamopetalous or Sympetalous:

(a) Regular forms:

1. Tabular:

The corolla tube is nearly cylindrical throughout and the limbs are not spreading. The central florets of most Composite are tubular, e.g., sunflower disc florets.

2. Campanulate or bell-shaped:

Corolla tubes are rounded at base gradually widening upwards like a bell. This may be seen in the family Campanulaceae and in many cucurbits , in Physalis, etc.

3. Infurdibuliform or funnel-shaped:

The corolla resembles an inverted cone like a funnel as seen in Datura or many plants of the family Convolvulaceae like Ipomoea pulchella .

4. Hypocrateriform or salver-shaped:

The corolla tube is long and narrow with the limb placed at right angles to it as seen' in Vinca rosea of Apocynaceac.

5. Rotate or wheel-shaped: Here the tube is shorter than in hypocrateriform while the limb is at right angles to it as seen-in brinjal (Solarium melongena), Nyctanthes arbor-tristis of Oleaceae , etc.

6. Urceolate or urn-shaped: Corolla tube is swollen in the middle tapering towards both base and apex as in Kalanchoe pinnata of Crassulaccae.

(b) Irregular forms:

7. Ligulate or strap-shaped: Five petals unite to form a short tube at base which splits on one side and becomes flattened like a strap above as seen in many Compositae, e.g., the ray florets of marigold where one can see that the strap is formed by the union of five petals.

8. Bilabiate or labiate or two-lipped: This irregular corolla is united in such a way that the limb is divided into an upper posterior part (usually formed by the union of two petal lobes) and an unequal lower anterior part (usually formed by the union of three petal lobes) with the mouth gaping wide open.

This is characteristic of the family Labiatae (e.g., Leucas) and is also seen in some allied families (e.g., Hygrophila and Adhatoda of Aearithaceae).

9. Personate or masked:

It resembles the bilabiate but the two lips are placed so close together that the mouth is closed. The projection of the lower lip closing the mouth is called the palate. This type of corolla may be seen in snapdragon (Antirrhinum) or Lindenbergia.

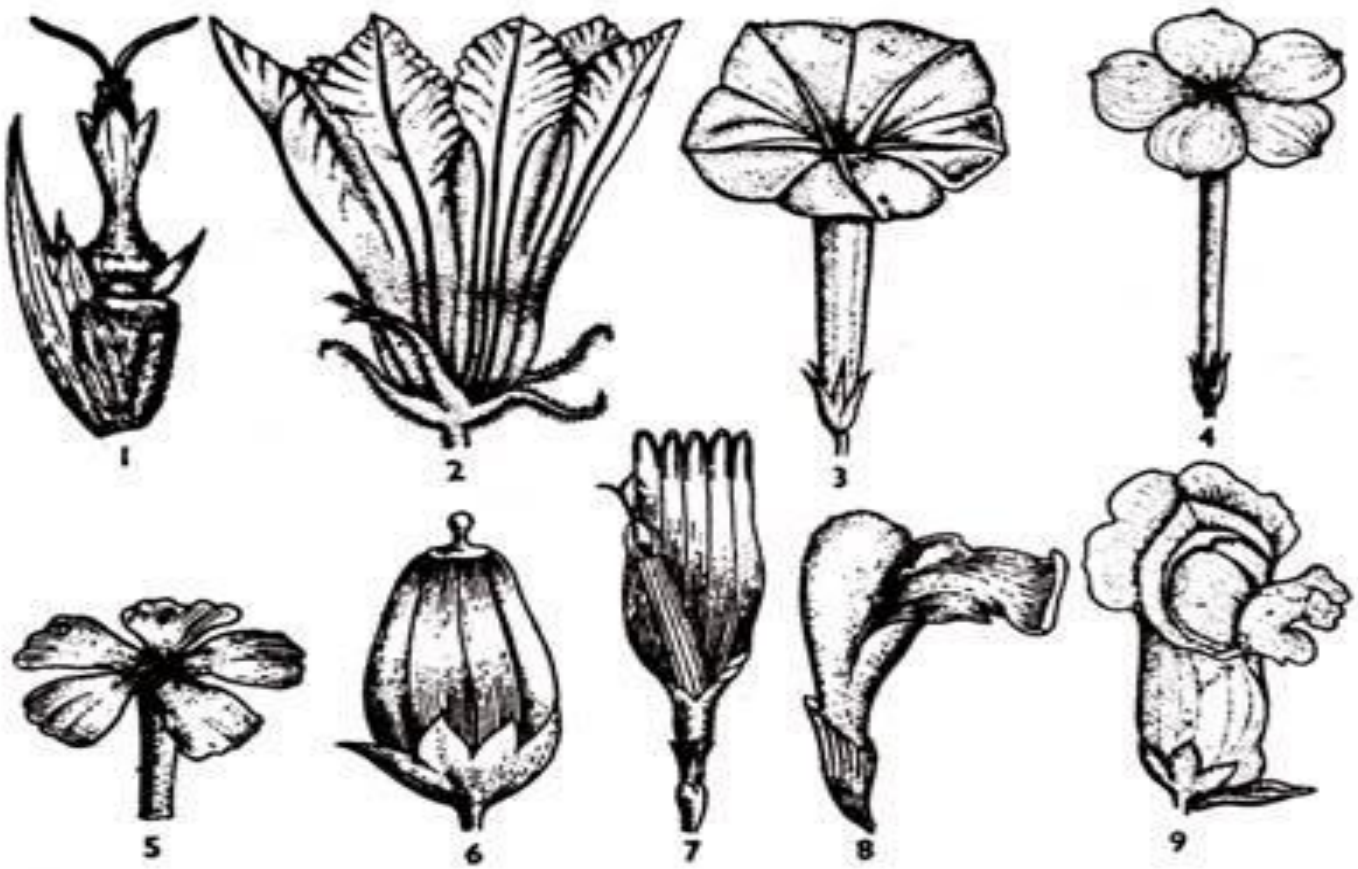


FIG. 332. GAMOPETALOUS COROLLA FORMS. 1. Tubular in sunflower disc floret. 2. Campanulate in *Cucurbita*. 3. Infundibuliform in *Ipomoea*. 4. Hypocrateriform in *Vinca*. 5. Rotate in *Nyctanthes*. 6. Urceolate in *Kalanchoe* . 7. Ligulate in marigold ray floret. Note 5 lobes signifying 5 petals. 8. Bilabiate in *Leucas*. 9. Personate in snapdragon.

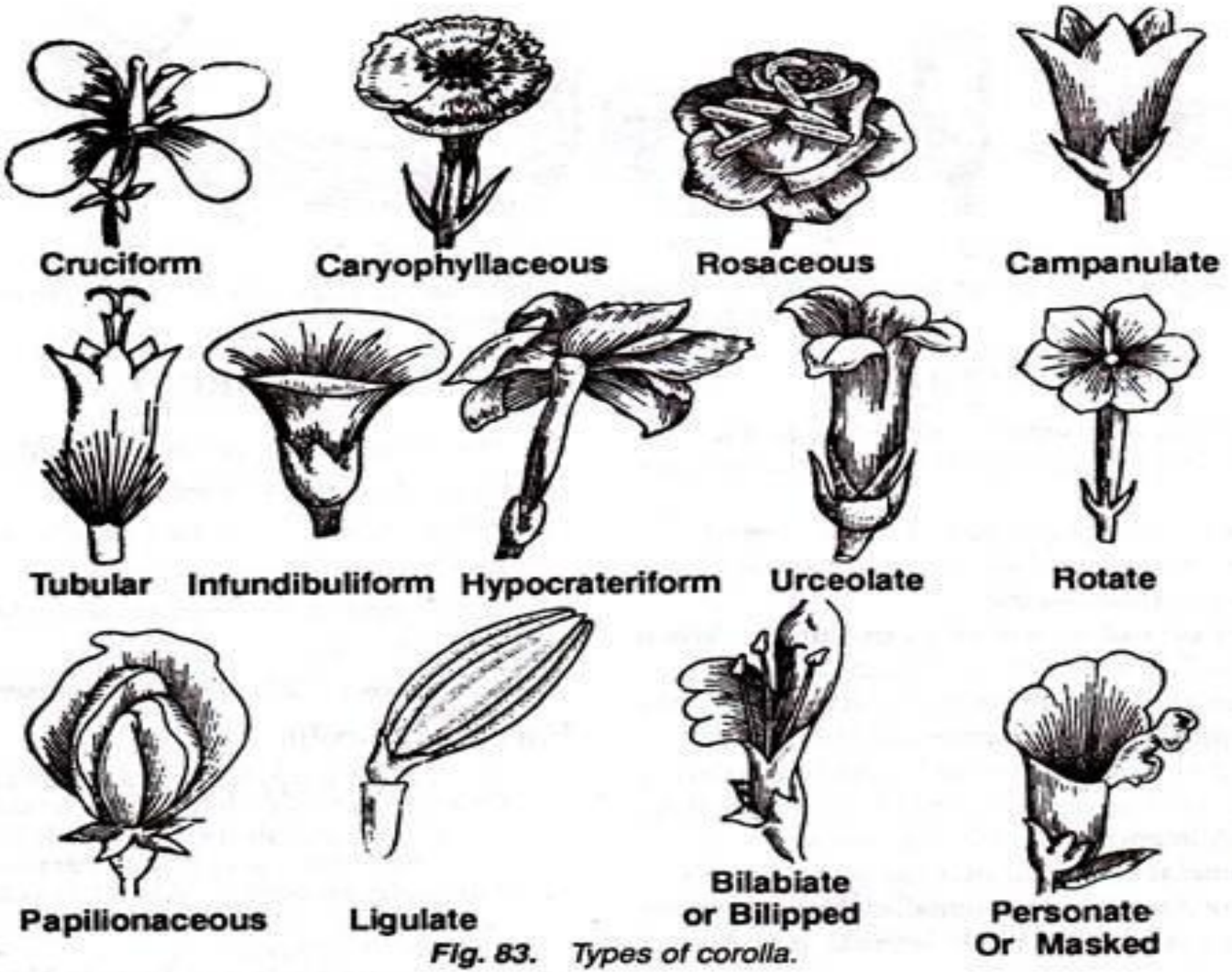


Fig. 83. Types of corolla.

Aestivation:

Aestivation is the arrangement of either the sepals or the petals in a flower bud with relation to one another as vernation proper is the arrangement of young leaves in the vegetative bud.

Aestivation is of considerable importance in the classification of plants. This may be of the following types :

(a)Floral Leaves in One Whorl:

1. Valvate:

Floral leaves in a whorl may just touch one another at the margins without overlapping as seen in the family Anonaceae or the subfamily Mimoseae.

2. Contorted or twisted:

When overlapping is regular in one direction so that one margin overlaps the next member on one side while its other margin is overlapped by the one before, giving a twisted appearance to the bud.

This is seen in Malvaceae (china-rose, cotton, etc.) and Apocynaceae (Nerivm, Thevetia, etc.).

(b) Floral Leaves Not in One Whorl:

3. Imbricate:

When the margins overlap one another but not in any particular order as in the subfamily Caesalpinieae. In imbricate flowers the petals do not actually lie in a single whorl.

4. Quincuncial:

The floral leaves are not in a whorl but spirally arranged . Leaves 1 and 2 are external, 3 partly external, 4 and 5 internal. This is seen in guava (Psidium guyava of Myrtaceae), etc.

5. Vexillary:

This is the typical aestivation of the papilionaceous corolla. The posterior vexillum overlaps the two alae which again overlap the paired anterior carina.

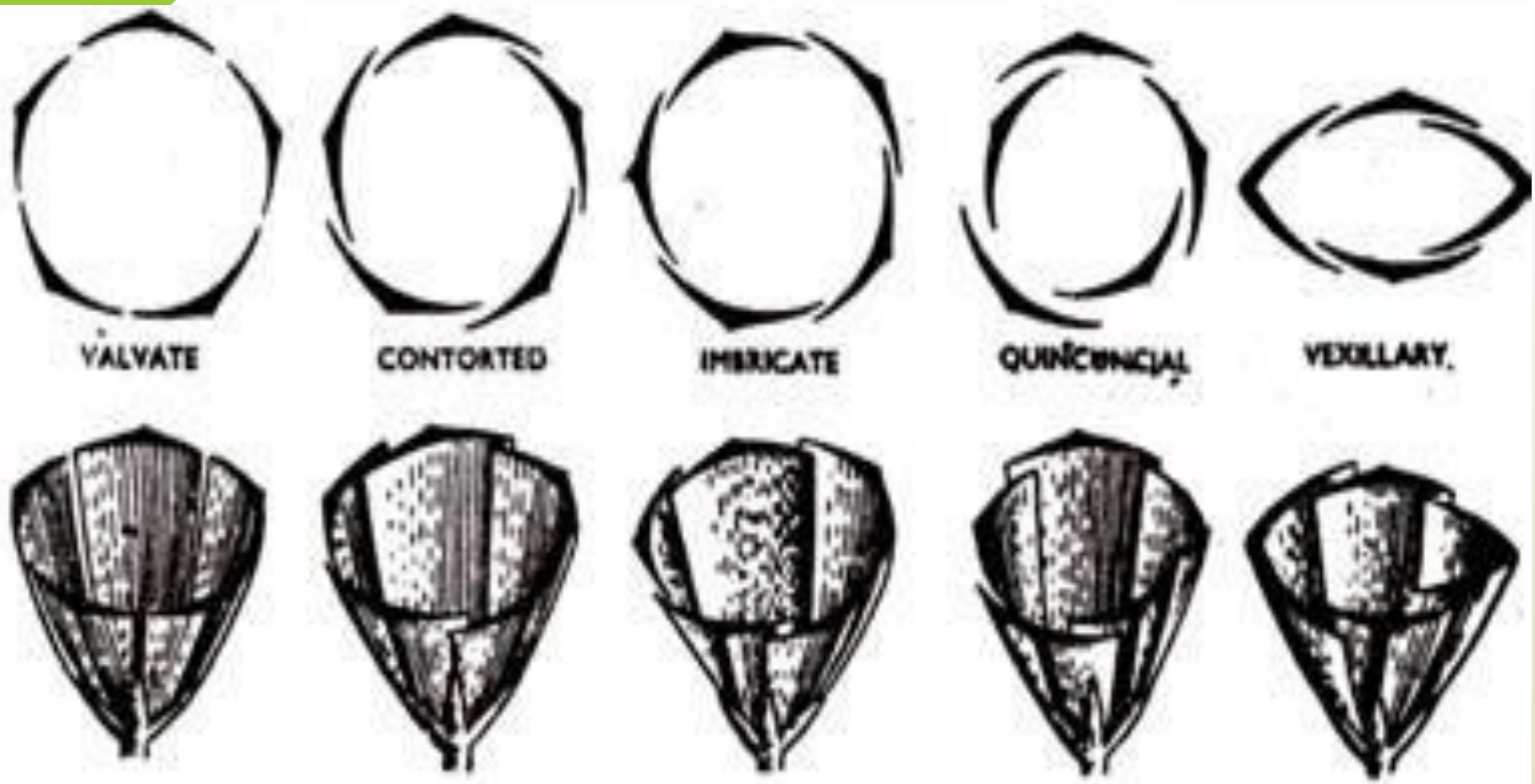


FIG. 333. Aestivation types. T.s. on top and lower half of flower bud below.

Perianth:

In most monocotyledons the calyx and the corolla are not differentiated and the general accessory whorls form the perianth as seen in Polyanthes, Crinum, etc. The perianth is often brightly coloured or petaloid as in Gloriosa superba (Liliaceae), Crinum asiaticum (Amaryllidaceae), etc. The perianth in some members of Amarantaceae is membranous and persistent. In Graminaceae the perianth is represented by two lodicules as seen in Festuca.

If the perianth members are free from one another as in Gloriosa superba , the perianth is termed polyphyllous. When the perianth members are united as in Polyanthes tuberosa , the perianth is gamophyllous.

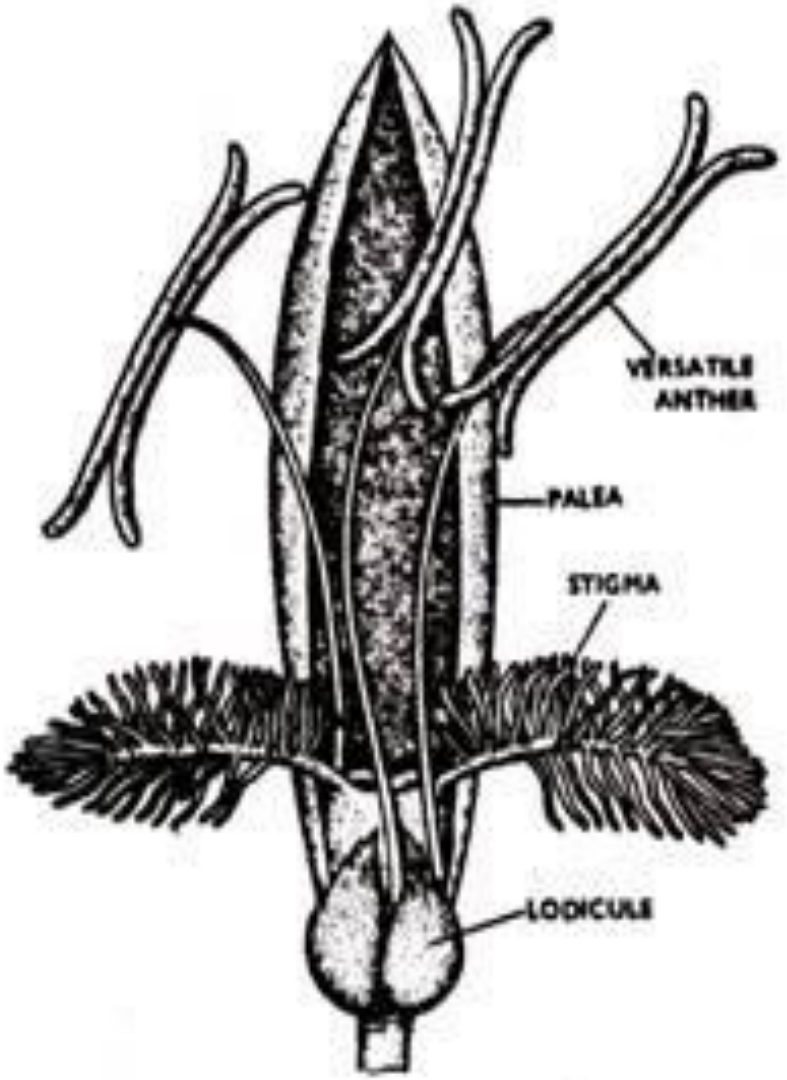


FIG. 334. Flower of *Festuca pratensis* with lemma removed showing lodicules, feathery stigmas and versatile anthers. (After Strasburger).

FIG. 335. Polyphyllous petaloid perianth in *Gloriosa superba* flower. Also note extrorse anthers and style placed at right angles to the ovary.

Thank You….!