INFLORESCENCE

Arrangement of flower on floral axis is called inflorescence.

Racemose – In this type of inflorescence the main axis continues to grow and does not terminate in a flower and give off flowers laterally in acropetal manner (Where old flowers are arranged lower side and young flowers are upper side).

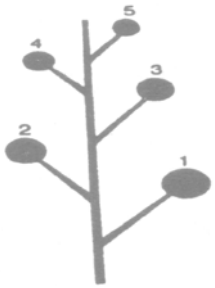
This is of foll. diff. types :

1. **Raceme -** When peduncle or (main axis) is elongated and flowers are pedicellate.

   Eg. **Radish.**

   When peduncle is branched and each branch bear pedicelated flowers like racemose and are arranged in acropetal manner known as compound raceme or panicle

   Eg. Gulmohar, Neem.



Raceme


Panicle

2. **Spike –** In it peduncle is elongated but flowers are sessile.

   Eg. Achyranthes.

   When peduncle is branched and each branch bear spike, like inflorescence then the small branch having flower is called spikelet

   and this arrangement is called as spike of spike of spikelet. Eg. In the members of grass family (Gramineae) wheat



Spike

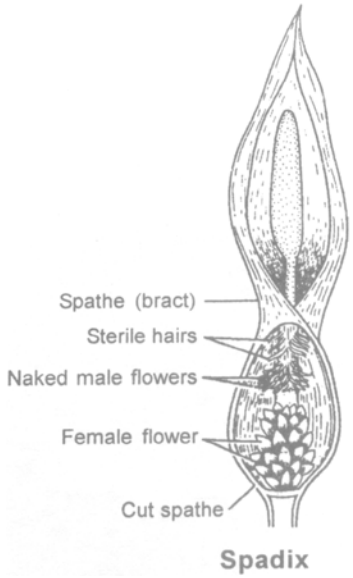
3. **Catkin –** In it peduncle is thin, long and weak, and flowers **are sessile and unisexual**

   Eg. Mulberry, Betula, Oak.



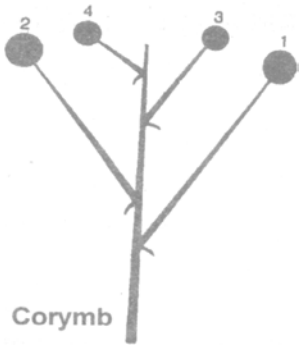
Catkin

4. **Spadix -** In it peduncle is thick, long and fleshy and **have small sessile and unisexual flowers covered with one** or more green or colourfull bracts. Eg. **Colocasia**, Maize, Aroids, Palms, Grain of maize is fruit long filamentous threads protruding at the end of a young cob of maize are styles.



Spadix

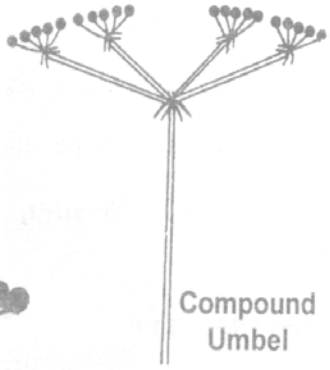
5. **Corymb –** In it peduncle is short and all flowers are present at same level because the lower flower has much long pedicel than the upper one. eg. Candytuft (*Iberis amara)* It in this type of inflorescence peduncle is branched, then each branch has flower cluster then this type of inflores- cence is called compound Corymb.



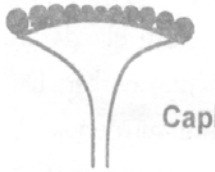
6. **Umbel –** An inflorescence in which the flower stalks of more or less equal length, arise from the same point, At the base of flowers stalk, there is whorl of bracts forming the involucre. eg. ***Cantella.***



If in this type of inflorescence, peduncle is branched then each branch has flower cluster then this type of inflorescence is called compound umbel. eg. ***Coriander,***
Foeniculum , cuminum.



7. **Capitulum/Racemose head –** In it the growth of peduncle
is retarded and it become broad, flattened concave or convex.
On it small flowers are found. These flowers are called floret.
If all the flower of Capitulum are same, then it is called monogamous. If the younger flower are present towards centre and older towards the periphery, than it is known centripetal order. The flowers which are present in centre called disc floret and flowers at periphery are called as ray floret and arrangement of this type is called heterogamous. In this type of inflorescence florets may be unisexual, bisexual and sterile. This inflorescence is surrounded by one or more involucre. It is most advanced type of inflorescence, because all flowers are pollinated at same time. Eg. Sunflower, Zinnia, Marigold.

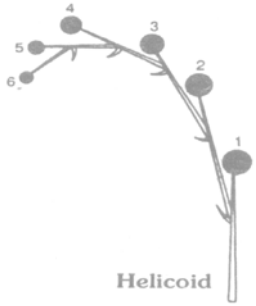


CYMOSE

In this type of inflorescence, the peduncle terminate in a flower. In it the older flowers are present at upper portion and young buds are arragned towards base. This arrangement is called basipetal succession. It is of following types –

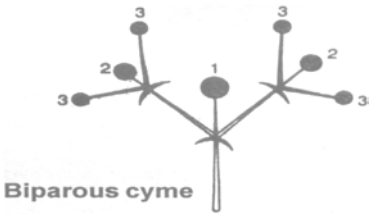
1. **Uniparous cyme/Monochasial cyme –** The peduncle ending in a flower producing lateral branch at a time ending in a flower. It is two types –



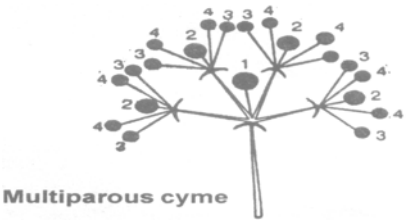


(a) **Helicoid cyme –** When all lateral branches developed on the same side on peduncle then it is called helical cyme. Eg. Heliotropism
(b) **Scorpioid cyme -** In it the lateral branch is develop on one side and the other branch will develop opposite to first one, i.e. they lie alternate to each other. Eg. Begonia

2. Dichasial **or biparous cyme –** In it peduncle ends in a flower from the basal part of peduncle two lateral branches arise which also end in a flower now this same arrangement occur on these lateral branches.
Eg. Bougainvillea, Jasmine, Teak



3. **Multiparous cyme/Polychasial –** In it peduncle ends in a flower and from the base of it many lateral branches arise, which also terminated in flower, this arrangement now also occur on these lateral branches Eg. **Calotropis** (madar) , ***Nerium, Asclepias***

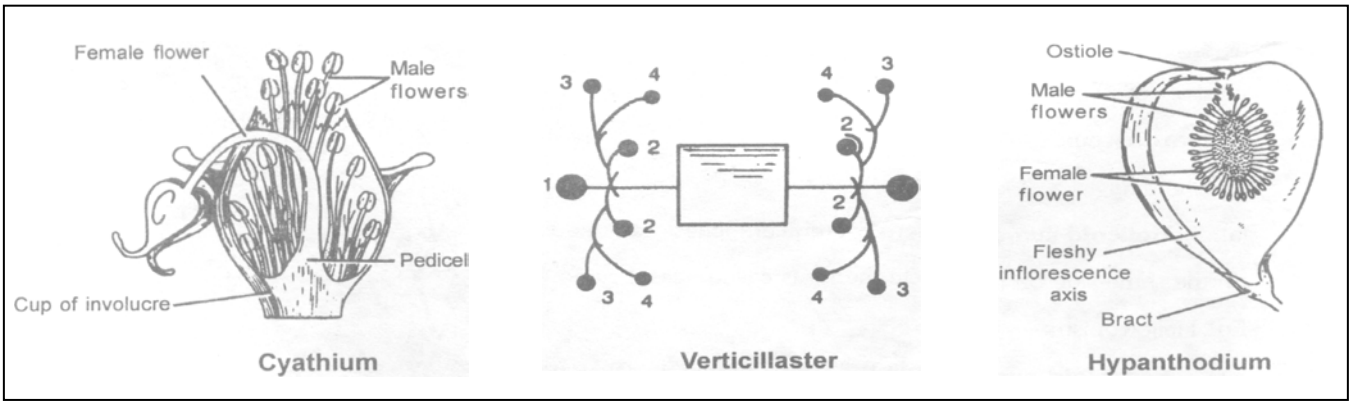


SPECIAL TYPE OF INFLORESCENCE –

1. **Cyathium –** The bracts or the involucre become fused to form a cup shaped structure on the margin of it secretory glands are found. In the central part of cup shaped structure a female flowers is found, which mature earlier. Due to the growth of pedicel this come out from the cup shaped structure. Female flowers are surrounded by small male flowers. These are also found on Pedicel. The male flower, which lie toward centre mature earlier than the flowers which are towards periphery.
This inflorescence is found in Euphorbiaceae family like **Euphorbia, Poinsetia, Pedilanthus.**

2. **Verticillaster –** This type inflorescence is found in Labiatae/Lamiaceae family. In this type of inflorescence leaves are arranged in opposite manner on stem. Form the axil of each leaf inflorescence develops. From the main axil, lateral axil arises, on which flowers are found. Now from these branches lateral branches developed also. On these branches flowers are found also. In this inflorescence each dichasial chyme changes into Monochasial (Scorpioid) cyme. Eg. **Salvia, Ocimum, Coleus**

3. **Hypanthodium –** In the peduncle is modified in narrow cup like structure. At the base of cup female flowers develop while towards mouth male flowers develops. All three types of flowers are present in this inflorescence. Eg. Banyan, Peepal, Syconus, Ficus species



4. **Mixed inflorescence –** Some times flowers are arranged in both racemose and cymose manner on same peduncle called mixed inflorescence.

(i) **Mixed spadix –**Banana

(ii) **Cymose raceme or thyrsus –** Grapes.

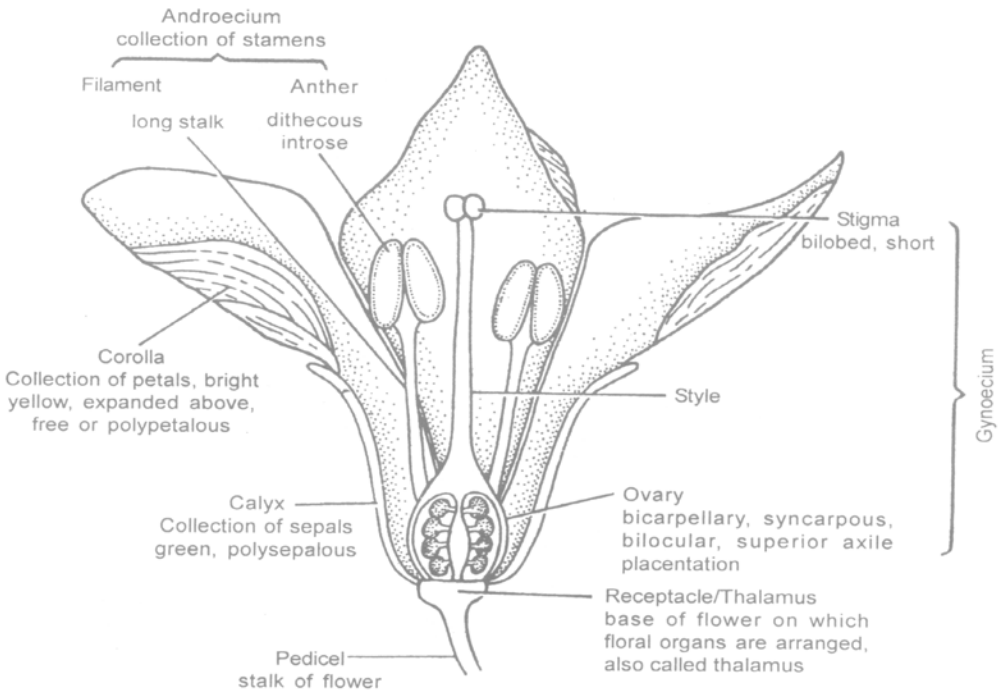
(iii) **Corymbose raceme –** The yound flowers appear to be arranged like corymb but in mature state the longer pedicels of the lower flowers do not bring them to the level of upper ones. Eg. **Mustard**

FLOWER

The part from where flower arise is called bract. Flower is short or long on flower stalk which is called pedicel. The upper part of pedicel is swollen, spherical shaped or conical which is called thalamus/Receptacle. Floral leaves are present on it.

In a flower there are 4 type floral leaves are found.

(1) Sepal (2) Petal (3) Stamen (4) Carpel



Parts of a flower

Symmetry of flower

If the floral leaves are cyclic arranged in a flower, then it is called cyclic flower.

If floral leaves are spirally arranged then it is called spiral or acyclic flower.

Actinomorphic/Radial – When flower is divided by any vertical plane into two equal halves, then it is called actinomorphic flower eg. Mustard, China rose, Datura, Chilli

2. **Zygomorphic/Bilateral –** When the flower is divided into two equal halves only by one vertical plane. then it is called zygomorphic flower. eg. Pea, bean, Gulmohur, Cassia

If from median plane, it divided into two equal halves, then it is called medianly zygomorphic, Eg. **Ocimum** (Tulsi).

But if by lateral plane it is divided into two equal halves, then it is called laterally zygomorphic.

3. **Asymmetrical/Irregular** – When the flower cannot be divided into two equal halves from any plane. then it is called asymmetrical flower. eg. canna.

NOTE –

(1) **Anthophore –** Internode between calyx and corolla is called anthopore. Eg. Silene

(2) **Androphore -** Internode between corolla and androecium is called androphore. Eg. Passiflora.

(3) **Gynophore -** Internode between androecium and gynoecium is called gynophore. Eg. Capparis.

(4) **Gynandrophore or Androgynophore –** When both androphore and gynophore both conditions are found in same flower then this condition is called gynandrophore or androgynophore Eg. **Cleome gynandra.**

NOTE –

The part of flower which lies near to mother axis is posterior part while the part which is far from mother axis is anterior part of flower.

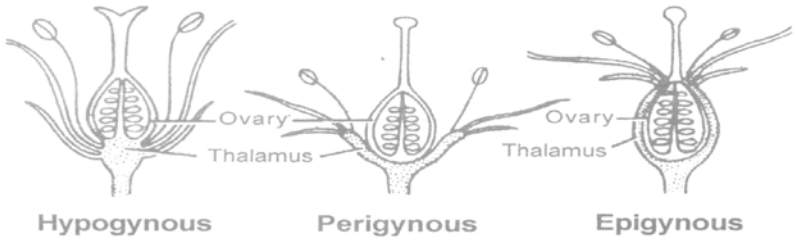
NSERTION OF FLORAL LEAVES

The relative position of gynoecium changes will respect to floral parts and on this basis it is divided into three parts.

(1) **Hypogynous condition –** When petals, sepals and stamens are situated below the ovary, the flower is called Hypogynous and in this condition ovary will be superior. eg. mustard, Chinarose, Brinjal.

(2) **Perigynous condition –** In it thalamus grow upwardly and form a cup shaped structure. On the margin of thalamus floral parts are attached except gynoecium which lie at the basal part. So in this condition gynoecium situated below floral part. But ovary in this condition is said to be half inferior. Eg. Rose, Plum, Peach.

(3) **Perigynous condition –** When petal, sepals & stamen are situated above the ovary, then the ovary is said to be inferior and rest of the floral parts are superior. Eg. Guava, Apple, Cucumber and the rayflorets of sunflower.



Bracteate – The flower which arises from the axil of bract is called bracteate flower.

Involucre – The whorl of bract surrounding peduncle is called involucre.

Involucel – Group of bracteole is called involucel.

Spathe – In flowers when large bract completely encloses whole inflorescence, then it is called spathe – Eg. Banana, Maize

Petaloid bract – When the size of bract of flower is greater than size of flowers and these are of various coloured then it is called Petaloid bract. Eg. Bougainvillea

Glumes – Small, dry, scaly bracts are called Glumes. Eg. Wheat, Grass

CALYX –

The Outermost whorl of flower is called calyx. Each member of this whorl is called sepal when all the sepals are free from each other, then it is called poly-sepalous condition eg. Mustard, Radish. When the sepals are fused each other then it is called gamosepalous condition. Eg. Cotton, Datura, Brinjal.

(1) In calyx of Mussaenda, one of the sepal enlarge and form a leaf like structure. It may be white or brightly coloured. It attracts the insects and thus act as advertisement flag.

(2) In **Trapa,** calyx is modified into spines and helps in protection of fruit.

(3) In Argemone spines are present on the surface of sepal which protect the flower bud.

(4) In Larkspur and Balsum, the posterior part of sepal is modified into a narrow tube. This structure is called sepal spur. For attraction of insects in it, nectar is stored.

(5) In the family of sunflower, sepals are modified into hairy structure. It is called pappus. The pappus is a modified calyx and helps in dispersal of fruit.

DURATION OF SEPALS –

(1) Some plants in which sepals fall just at the time of opening of flower bud these are called caducous sepals. Eg. Poppy.

(2) In some plants, sepals fall after pollination then these are called deciduous.

(3) Upto fruit formation, if sepals do not fall and remain attached to fruit, than these are called persistent. Eg. Tomato, Capsicum, Brinjal, Cotton, Datura

Sometime below calyx, a whorl similar to sepals is found which is called epicalyx. Eg. in Malvaceae family (China rose)

COROLLA –

The second whorl of flower is called corolla and each member of it is called petals. corolla lie above calyx. When the shape and size of petals are similar then it is called symmetrical while when they are not similar, then they are asymmetrical. When all the petals are free, then it is called polypetalous while when petals are fused, then called Gamopetalous.

FORMS OF COROLLA –

A Polypetalous

(1) **Cruciform –** In it 4 petals are found. The lower part of petal which is narrow is called claw while outer broad part is called limb. These petals are arranged crosswise. Eg. Radish, Mustard

(2) **Caryophyllaceous – It** consists of 5 petals the claw of petals are short and the limb of petals form right angle to the claw eg. **Dianthus, Gypsophylla**

(3) **Rosaceous –** It consist of 5 or more petals. Claws are absent in it and limbs are spread regularly outwards. Eg. Rose, Coconut.



Cruciform



Caryophyllaceous



Rosaceous

B. Gamopetalous

(i) **Campanulate –** In this type of corolla 5 gamopetalous petals are present. It's shape is similar to bell. Eg. Tobacco, Raspberry, flowers of Campanula.

(ii) **Funnel shaped or infundibuliform** orcoheel shaped – In it also 5 gamopetalous petals are found. It's shape is similar to funnel. Eg. Datura, Railway creeper

(iii) **Tubular –** In it 5 gamopetalous petals are found which form tubular or cylindrical structure. Eg. Disc florets of sunflower. Which are situated in centre

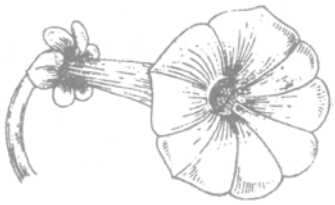
(iv) **Rotate –** In it 5 gamopetalous petals are found and the fused part form above small tube and the petals are arranged in a whorl above tube. Eg. Brinjal.



Campanulate



Tubular



Infundibuliform



Rotate

ZYGOMORPHIC POLYPETALOUS COROLLA –

Papilionaceous – In it five free petals are found. It's posterior part is largest and is known as standard or vexillum. Vexillum covers two lateral petals which are called as wings and the innermost basal parts are united to form a keel or carina. Both lateral parts covers the keel. Eg. Pea, Gram, Arhar



Papilionaceous

ZYGOMORPHIC GAMOPETALOUS COROLLA –

(i) **Bilabiate -** The petal of gamopetalous corolla is divided into two lips. The place between two lips is called corolla mouth Eg. Ocimum

(ii) **Personate –** In this case also the corolla is bilabiate but the two lips are near to each other Eg. Antirrhinum

(iii) **Ligulate –** The upper part of corolla is long, flattened which is attached with short narrow tube Eg. ray florets of sunflower.



Bilabiate



Personate



Ligulate

AESTIVATION:

The mode of arrangement of sepals or petals in floral bud with respect to the other members of the some whorl is known as aestivation. It is of following types:-

(1) **Valuate –** When the petal of a whorl lie adjacent to other petal and just touches it Eg. **Calotropis.** Custard apple.

(2) **Twisted –** In it one part of a petal covers adjacent petals and the other part is covered automatically by posterior petal. One margin of the petal overlaps that of the next one, and the other margin is overlapped by the third one. Eg. Cotton, Ladyfinger, Chinarose.

(3) **Imbricate –** When both margins of the one petal are covered by the other two petals and both margin of another one, covers other, Rest are arranged in twisted manner.

It is of two types:-

(i) **Ascending imbricate: -** The posterior petal is innermost i.e., its both margins are overlapped. e.g. Caesalpinaceae such as Cassia, Bauhinia, Gulmohur etc.

(ii) **Vexillary or Descending imbricate –** The anterior petal is innermost and posterior petal is outermost & largest. In it standard or vexillum covers two lateral petals. These two laterals covers two anterior ones. This vexillary arrangement is present in pea family. Eg. Pea, Bean.

(4) **Quincuncial: -** It is a modification of imbricate type. Out of the five petals, two are completely internal. two completely external and in the remaining petal, one margin is internal and the other margin is external. e.g. Murraya.



ATTACHMENT OF FILAMENT TO ANTHER LOBE

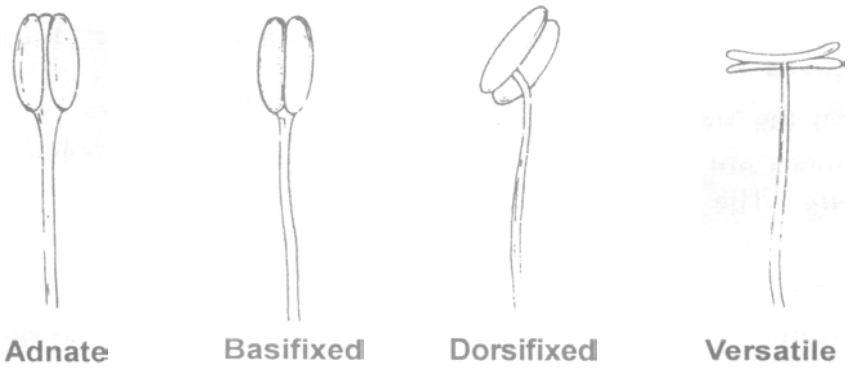
This attachment of filament to another lobe is of 4 type :

(1) **Adnate –** Filament runs the whole length of the anther from the base to the apex.
Michelia (Champa), **Magnolia**

(2) **Basifixerd -** Filament is attached to anther by its base. Eg. Datura, Radish, Mustard

(3) **Dorsifixed –** The filament is attached at the centre to the back of the anther. Eg. passion flower.

(4) **Versatile –** Filament attached to the back of the anther at a point only, so that the anther can swing freely. Eg. wheat grass, maize.



COHESION OF STAMENS :-

When the floral parts of similar whorl are fused, then it is called cohesion.

When the stamens of an androecium are free from one another, it is called polyandrous condition,

(1) When stamens are united by their filament only, it is called adelphy. it is of foll. types-

(a) **Monoadelphous –** When all the filaments are united into a single bundle but anthers are free from each other. In this type of cohesion a tube is formed around the gynoecium which is called staminal tube Eg. Cotton, Hollyhock, Ladyfinger.

(b) **Diadelphous –** When the filaments are united in two bundles but the anther remains free Eg. gram. Pea, bean.

In these plants from 10 stamens, 9 stamens are arranged in bundle while 1 remains free.

(c) Polyadelphous – When filaments are united into more then two bundles. Eg. Castor, Citrus.

(2) **Synandrous -** When anthers as well as filaments of stamens are united through their whole length. Eg. **Colocasia, Alocasia, Momordica,** Cucurbitaceae family.

(3) **Syngenesious –** In it only another are united in bundle but filaments remain free eg. Compositae family



ADHESION OF STAMENS –

When the stamens are attached to other parts of flower, then it is called adhesion of stamens.

(1) **Epipetalous –** When stamens are attached to petals. Eg. Brinjal, Datura, Tobacco, Sunflower, Potato

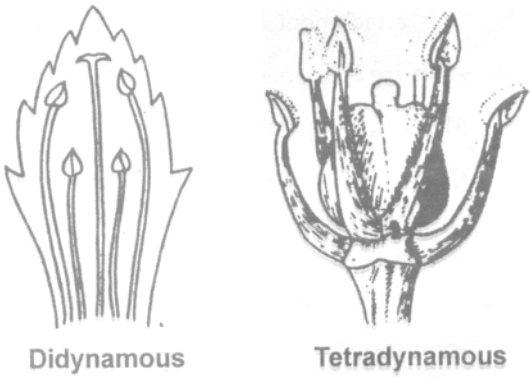
(2) **Epiphyllous –** When stamens are attached to tepals Eg. Onion, Lily.

(3) **Gynandrous –** When stamens are attached to gynoecium or by anthers only. Eg. Calotropis, Aristolochia

LENGTH OF STAMENS –

(1) **Didynamous –** When there four stamens are present out of them two are long and two are short, then it is called Didynamous. Eg. Lamiaceae/Labiateae family

(2) **Tetradynamous –** When there are six stamens and they are arranged in two whorls. In outer whorl, there are two short stamens while in inner whorl, there are four long stamens, this condition is called Tetradynamous.
Eg. Cruciferae family



Some special cases:-

(1) **Inserted –** When the stamens are smaller than corolla. Eg. Datura

(2) **Exserted –** Stamens are longer than corolla and are radially outward. Eg. Gulmohar

(3) **Diplostemonous –** The stamens are double the number of petals and present in two whorls. The outer whorl of stamens is alternating with petals (alternipetalous) **L, while inner whorl is opposite to petals (antipetalous). Eg. Liliaceae family**

(4) **Obdiplostemonous –** It is reverse of diplostemonous. The outer whorl of stamen is opposite to petals, while inner whorl of stamen is alternating with petals. Eg. **Caryophyllaceae.**



(5) **Isostemonous or Haplostemonous –** In such type of condition stamens are present in single whorls. No. of stamens is equal to no. of sepals and petals and generally whorl of stamens is alternating with petals.

Note: In some flowers stamens are without pollengrains and remain sterile throughout life are called staminodes. Eg. **Salvia, Verbascum**