FLOWER

Parts of a typical flower:

- Flower is a modified condensed shoot and helps in sexual reproduction.
- Flower is a modified stem - Described by Linnaeus, Gaspard Bauhin, Goethe and de Candolle.
- Flower consists of nodes and internodes. The modified leaves are present at each node.
- The stalk of the flower is Pedicel
- The apical and broad part of the pedicel Thalamus or Torus
- A typical flower consists of 4 sets of floral leaves. **1)** Calyx, 2) Corolla, 3) Androecium, 4) Gynoecium or pistil
  1) Calyx :- Group of sepals. Outer whorl (First whorl) commonly green and helps in protection.
  2)Corolla :- Group of petals. Second whorl, general coloured and helps in attraction.
  3)Androecium :- Group of stamens. Third whorl, represents male sex organs.
  4)gynoecium :- Group of carpels. Fourth whorl, represents female sex organs.
- Calyx and corolla : Commonly called perianth, Non-essential organs. .
- Androecium and gynoecium : Commonly called essential organs.

Structure of a Flower :-

- Flower has only two sides
- Anterior side:- The side present towards the bract.
- Posterior side :- The side present towards the mother axis. (The main axis bearing the flower).
- Bract:-Specialized leaves produce flowers.
- Bracteoles :- Small leaf like structures present on the pedicel.
- Bracteate (Br):- Bracts present.
- Ebracteate (Ebr):- Bracts are absent.
- Bracteolate(Brl):-Bracteoles present.
- Ebracteolate (Ebrl):- Bracteoles absent.
- Pedicellate:- Flower with pedicel.
- Sessile:- Flower without pedicel.
- Complete flower:- Flower with all floral parts.
- Incomplete flower:- Flower without one or more than one floral parts.
- Bisexual :- Flower with androecium and Gynoecium.
- Unisexual :- Flower with androecium or Gynoecium.
- Staminate flower:- Flower with androecium (with stamens)
- Pistillate flower:- Flower with gynoecium (with carpels) .

Sex Distribution ;-It is of three types:

- **Monoecius** :- Presence of male and female flowers on the same plant.
  Eg: Cocos nucifera, Acalypha.
- **Dioecious**:- Presence of male and female flowers are different plants.
  Eg: Borassus, Vallisnaria.
- **Polygamous** :- Presence of unisexual (Male and female) and bisexual flowers on the same plant. **Eg.** Mangifera, Polygonum.

Symmetry of flower:

I. Symmetry of the flower based on the arrangement. It is of three types

- **Acyclic or spiral** :- All the floral parts are arranged spirally on the thalamus. **Eg.** Magnolia.
- **Hemicyclic** :- Perianth (Calyx and corolla) in whorls and stamens and carpels are arranged spirally on the thalamus. **Eg.** Annona, Polyalthia.

- **Cyclic:-**All floral parts are arranged in circles on the thalamus. Eg. Hibiscus, Datura.

II. Merosity:- Merosity refers to the number of floral parts in each whorl of a flower (often without androecium and gynoecium)

Commonly it is of three types :-

- **Trimerous** :- The floral parts are three in each whorl or multiples of three.
- **Tetramerous '.-** The floral parts are four in each whorl or multiples of four.
- **Pentamerous** :- The floral parts are five in each whorl or multiples of five.

III. Structural symmetry:

It is of three types.

- **Actinomorphic** (Regular) :- A flower can be divided in to two equal halves by vertical section through centre. **Eg.** Hibiscus.
- **Zygomorphic** (Half irregular or Half regular) :-Flower can be divided into two equal halves by one vertical section only. **Eg.** Dolichos, Ocimum.
- **Asymmetric flower**: Flower can not be cut in to two equal halves in any plane: **Eg.** Canna indica.

Position of gynoecium on the thalamus : It is of three types :

- **Hypogynous** (Superior ovary) : Thalamus is conical on convex. Therefore gynoecium is at the upper level than other floral parts. **Ex.** Hibiscus. Datura
- **Perigynous** (Half (semi) inferior ovary): Thalamus is concave or saucer shape. Gynoecium is at the centre and other floral parts are along with the margin. **Ex.** Crotalaria, Tephrosia
- **Epigynous** (Inferior ovary): Thalamuses adeep cup like structure with gynoecium inside. Thalamus and ovary are fused. Other floral parts are above the level of the ovary. **Ex.** Tridax.

Detailed description of flower :

Perianth : Calyx and Corolla constitute perianth. Based on the presence or absence of perianth it is two types.

Achlamydeous flowers : Flowers without perianth (Naked flowers).

Ex. Male and female flowers of cyathium inflorescence (Euphorbia, Poinsettia).

Chlamydeous flowers : Flowers with perianth. Two types.

Monochlamydeous: Flowers'with one whorl of perianth.

Ex. Croton, Amaranthus.

Dichlamydeous : Flowers with two whorls of perianth.

These are two types.

Homochlamydeous: Two whorls are of the same type. These are called tepals. Mainly present in monocot plants.

Ex. Allium

Heterochlamydeous : Two Whorls of different types (as calyx and corolla). Mainly present in dicots.

Ex. Datura, Hibiscus.

Aestivation: The mode (the method) of arrangement of perianth lobes in bud condition. They may be free or united. It is of different types as mentioned below.

- **Valvate**: Perianth lobes art arranged closely side by side without over lapping.

Ex. Calyx of Hibiscus.

- **Twisted** (Contorted or convoluted) : Perianth lobes overlap one another.

Ex. Corolla of Datura and Hibiscus.

- **Ascendingly imbricate**: each perianth overlaps the perianth lobes present posterior to it; overlapping is antero-posterior.

Ex. Corolla of Caesalpiniaceae. 1+1+3

- **Descedingly imbricate** (Vexillum) : each perianth lobes covers the perianth lobes present anterior to it; over lapping is posterio-anterior.

Ex. Corolla of Fabaceae. 1+1+3 or l+2+(2)

- **Quinconcial**: Two are completely inside, two are completely out side, the remaining one is half inside and half out side (2+2+1).

Ex. Calyx of Ipomoea and Catharanthus.

Calyx:

- Outer whorl, commonly green helps in protection. Condition is two types.
- **Polysepalous:** Free condition Ex. Annona.
- **Gamosepalous:** United condition Ex. Hibiscus
- Duration of Calyx is two types.
  - **Ephemeral:** Fall off before fertilization. **Ex.** Argemone.

  Some times after fertilization.
  - **Persistant:** Present **even** in fruit, condition (Pennanent).

  Two types.
  - **Marcescent:** Does not grow after fertilization, **Ex.** Solanum, Capsicum.
  - **Accrescent**:Grows along with the fruit and covers it**. Ex.** Physalis.

Corolla:

It is second whorl of flower consists of petals. Helps in attraction of insects for cross pollination Condition is two types.

a) Polypetalous: Free petals. **Ex.** Cassia

b) Gamopetalous: United petals. **Ex.** Datura **Androecium:**

Androecium:

- Group of stamens It represents third whorl of flower and outer whorl of essential organs:
- Stamens are male reproductive organs. Stamens are also called Microsporophylls.
- Sterile stamens are called Staminodes Ex. Cassia.
- Stamen has two parts, (i) Filament (ii) Anther

i) **Filament:-** Stalk of the stamen.

ii) **Anther:-** Swollen part of the stamen.

Connective : The filament or tissue connects two anther lobes.

Monothecous: Anther with one lobe. Eg. Hibiscus.

Dithecous : Anther with two lobes. Eg. Datura.

Extrorse : Dehiscence of anthers occurs towards outer side of the flower. Ex. Hibiscus.

Introrse : Dehiscence of anthers occurs towards inner side of the flower. Ex. Datura.

Attachment of filament to anther: It is of different types.

Basifixed: Filament attached at the base of the anther Ex. Datura.

Dorsifixed: Filament attached on the dorsal side. Ex. Hibiscus.

Adnate: Filament attached whole length (base to apex) Ex. Nelumbo.

Versatile: Apex of the filament attached at the back and.can spring freely in all directions.

Ex. Oryza sativa. . , -

Length of stamens:

Normally stamens exhibit same length in a flower. Some times stamens are unequal in length in the same flower.

It is of two types.

Didynamous: Out of 4 stamens 2 are long and 2 are short. Ex. Ocimum.

Tetradynamous: Out of 6 stamens 2 outer are shorter and 4 inner are longer. Ex. Brassica (Brassicaceae).

Based on the arrangement it is of two types.

Inserted stamens: Filaments shorter than the petals. So, stamens remain inside theTlower: **Ex.** Datura, Dolichos.

Exerted stamens: Filaments are longer than the petals. So, stamens come out of corolla. **Ex.** Acacia arabica.

Union of stamens:

Commonly stamens are freely arranged in flowers. Some times the stamens are united. It is of two types. 1. Cohesion, 2. Adhesion

Cohesion of stamens:

Cohesion: Fusion among stamens in a flower.

It is of three types: a) Adelphy, b) Syngenesious, c) , Synandry.

A) Adelphy: Filaments of stamens free and anthers united. It is 3 types.

- **Monadelphous:** One bundle of stamens. **Ex.** Hibiscus.
- **Diadelphous:** Two bundles of stamens, where out of 10 stamens 9 form one bundle and remaining one (10th stamen) will form another bundle. **Ex.** Dolichos.
- **Polyadelphous:** More than two bundles. **Ex.** Ceibapentandra

B) Syngenesious: Anther lobes are united and filaments are free. **Ex.** Asteraceae. (Disc florets of Trjdax, Helianthus)

C) Synandry: Filaments and anthers are completely fused. **Ex.** Cucurbitaceae (Cueurbita) x

Adhesion of stamens:

Adhesion: Fusion of stamens with other flower parts, namely calyx, corollaand gynoecium.

It is of 4 types.

Episepalous: Attachment of stamens with sepals. **Ex.** Grevillea (Silver oak)

Epipetalous: Attachment of stamens with petals commonly found in gamopetalous corolla. **Ex.** Datura, Tridax (Disc florets)

Epiphyllous or Epipetalous: Attachment of stamens with perianth lobes. **Ex.** Asparagus.

Gynostegium : Attachment of stamens with the stigmas of gynoecium. **Ex.** Calotropis.

Dehiscence-of Anthers:

Mature anthers dehisce and liberate pollen grains.The dehiscence of anthers is 4 types.

i. **Longitudinal:** Vertical dehiscence. **Ex.** Datura.

ii. **Transverse:** Horizontal dehiscence. **Ex.** Hibiscus.

iii. **Valvular:** Valve like dehiscence. **Ex.** Cassytha

iv. **Porous:** Pores are formed at the apices of anther lobes. **Ex.** Solanum.

Gynoecium:

- Gynoecium or pistil is the fourth and innermost whorl of flower.
- It consists of one or more carpels.
- It is the female reproductive organ of a flower.
- Carpels are otherwise called megasporophylls.
- Carpel consists of 3 parts.

i) ***Ovary:*** Swollen lower part. Consists of ovules.

ii) ***Style:*** Stalk like structure present above the ovary.

iii) ***Stigma:*** The tip of style.

Number of Carpels:

- Gynoecium consists of one to many carpels in angiosperms and so named as mentioned below.
- Monocarpellary - One carpel. ***Ex.*** Dolichos.
- Bicarpellary - Two carpels. ***Ex.*** Solanum.
- Tricarpellary - Three carpels. ***Ex.*** Allium.
- Tetracarpellary - Four carpels. ***Ex.*** Oenothera.
- Pentacarpellary- Five carpels. ***Ex.*** Hibiscus.
- Multicarpellary - Many carpels. ***Ex.*** Annona.

Fusion of Carpels:

- Gynoecium is of two types on the basis of free and fused condition,
- ***Apocarpous:*** Carpels are completely free. ***Ex.*** Nelumbo, Michelia.
- ***Syncarpous: carpels are completely fused or partially fused***

a)Completely fused. ***Ex.*** Datura.

b)Partly fused Ex. Hibiscus

Ovary: the swollen part of the gynoecium and encloses ovules which develops in to seeds after fertilization

- In syncarpous gynoecium, the carpels fuse-and form septa.
- The septa divide the ovary into locules, which are equal to the number of carpels.
- Some times without septa, it may be unilocular.
- Bilocular ovary becomes tetralocular by the formation of false septum. ***Ex.*** Datura.
- Ventral suture: The function of two margins of one or more carpels.

- . Dorsal, suture: The midrib along which each carpel folds.

Number of locules in the ovary:

- The ovaries are of many types based on the number of carpels as mentioned below.

a)Unilocular - One locule- ***Ex.*** Dolichos.
b)Bilocular - Two locules - ***Ex.*** Solanum.
c)Trilocular- Three locules - ***Ex.*** Allium.
d)Tetralocular - Four locules - ***Ex.*** Ipomoea.
e)Pentalocular - Five locules - ***Ex.*** Hibiscus.
f) Multilocular - Many locules - ***Ex.*** Abutilon.

Placentation: part of the ovary that bears ovules is called Placenta

- ***Placentation:*** The mode (method) of arrangement of ovules in the ovary is called 'Placentation'. Placentation is of different types.
- ***Marginal placentation:*** The ovary is unilocular and ovules are on ventral suture. ***Ex.*** Dolichos.
- ***Parietal placentation:*** The ovules are on the inner 'walls of ovary or on intrusions of the wall which form incomplete partitions or false septa. ***Ex.*** Brassica, Cucurbita.
- ***Axile placentation:*** Ovules on central axis in bi to multilocular ovary.***Ex*** Hibiscus. .
- ***Free central placentation:*** Develops from axile, septa degenerate, becomes unilocular, with ovules around the central axis. ***Ex.*** Dianthus.
- ***Basal placentation:*** Ovary unilocular, Ovules few or one at the base of the ovary.***Ex.*** Tridax, Helianthus.
- ***Superficial placentation:*** Ovary is multilocular, ovules develop all round the inner surface of the septa. ***Ex.*** Nymphaea.

Style: Elongated part of the gynoecium and Stalk like structure situated between the ovary and the stigma.

Types of styles: Three types on the basis of position.

Terminal style: arises from the apical part of the ovary Eg: Hibiscuss

Lateral Style: Arises from the lateral side of the ovary eg: Mangifera

Gynobasis style: Arises from the base of the ovary in between four locules Eg: Ocimum.

Stigma: it is the tip of the style and receives pollen at the time of pollination

Pollen germinate on the stigma with the help of sugar like substances secreted by it.