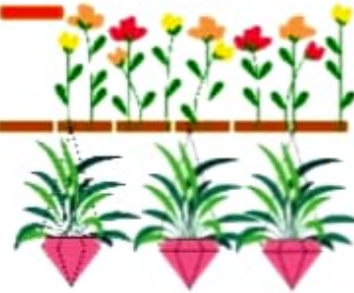


BIOLOGY -



Flowers



Class - 9 ; chapter -3



Chapter Outline

- Structure of a Typical Flower
- Accessory Parts of a Flower
- Classification of Flowers
- Detailed Structure of Floral Parts
- Inflorescence

The flower is the most attractive and beautiful part of the plant. They increase the beauty of nature and bring joy and colour to one's life. A flower is present only in the **angiosperms**, which are therefore known as **flowering plants**.

Flowers are the **reproductive parts** of the plant. They perform the most important function of sexual reproduction in plants. Thereafter, they develop into fruits and seeds, and help in the formation of new offspring by the plants. These new offspring help in the continuation of the species.

STRUCTURE OF A TYPICAL FLOWER

A flower, sometimes known as a **bloom** or **blossom**, is a highly condensed modified shoot in which the leaves form different floral structures.

A typical flower can be subdivided into three main parts – flower stalk or pedicel, thalamus or receptacle, and floral parts.

Flower Stalk or Pedicel

- ❑ The flower stalk or pedicel supports the flower and is the **point of attachment**.
- ❑ Some flowers may be devoid of stalk and are **sessile**.

Thalamus or Receptacle

- ❑ Thalamus is the swollen **upper part** of the flower stalk.
- ❑ It may be expanded to form a **cup-shaped** structure.

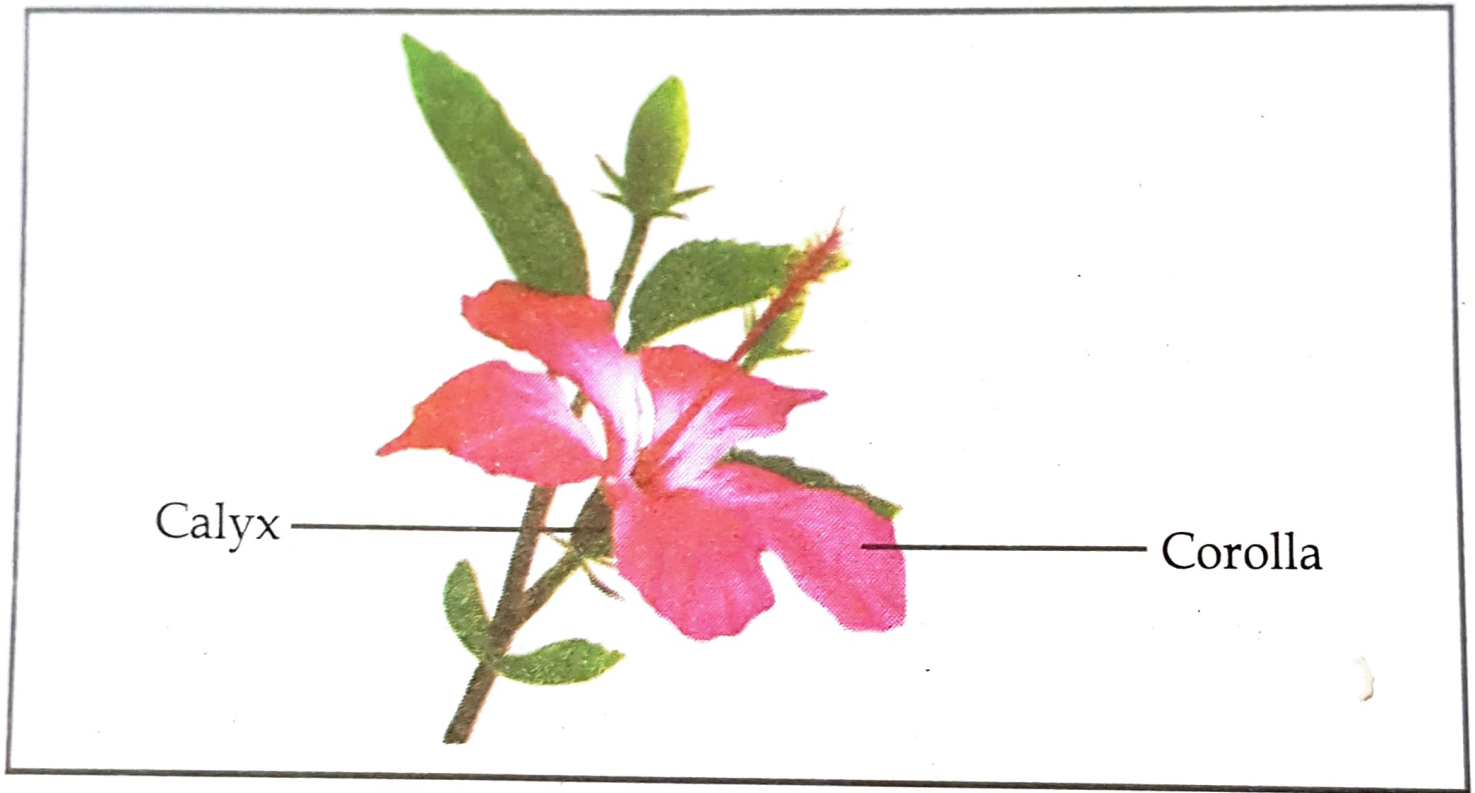


Fig. 3.1: A typical flower

Floral Parts

Floral parts are borne on the *thalamus* in four *whorls*. These are calyx, corolla, androecium and gynoecium.

Calyx

Calyx is the **outermost whorl** of a flower which comprises of many **green sepals**.

Corolla

Corolla, collectively formed of **colourful petals**, forms the **second whorl** of a flower.

Androecium

Androecium forms the **third whorl** of a flower. It is the male reproductive organ, comprising of many thread-like filaments called **stamens**.

Gynoecium

Gynoecium constitutes the **last and central whorl** of a flower and is the **female reproductive organ**. A flower may have single female organ, called **carpel** or **several carpels** fused together to form **gynoecium**.

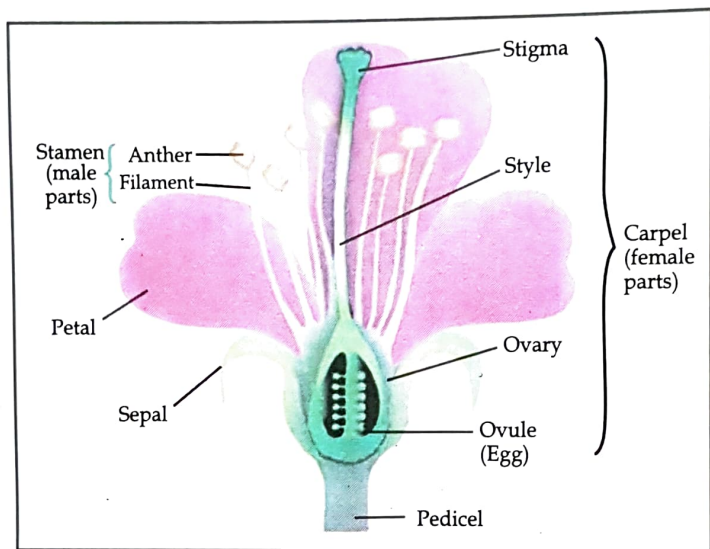


Fig. 3.2: Parts of a typical flower

Non-essential Whorls

- The sepals and petals are non-essential or **accessory whorls** of the flower.
- Their main function is to protect the inner whorls of the flower and help in the **pollination**.
- In a few plants, it is very difficult to distinguish between the sepals and petals. In such cases, they are collectively known as **perianth** and each of the individual units is called **tepal**.

The perianth can be of two types:

- (i) **Petaloid**, if it is non-green like the petals (corolla).
- (ii) **Sepaloid**, if it is green like the sepals (calyx).

Essential Whorls

- The two inner whorls, *i.e.*, androecium and gynoecium, are called **essential** or **necessary whorls** of the flower.

- These whorls carry out the **reproduction** in plants and are essential for the survival and existence of the species.

ACCESSORY PARTS OF A FLOWER

Many flowers also have a few accessory parts other than the four whorls. These are as follows:

Bracts

- In some cases, a flower arises from the axils of specialised leaves or leaf-like structures. These are called **bracts**.
- These may be green in colour as leaves, brightly coloured as petals or scale-like.
- For example, the bracts of *Bougainvillea* are variously coloured like the petals of a flower. In sunflower, the bracts are scale-like. You must have seen the **maize comb** enveloped in several green-coloured, membranous sheaths. These are bracts.
- Flowers which have bracts are called **bracteate flowers**, while the ones which lack them are known as **ebracteate flowers**.

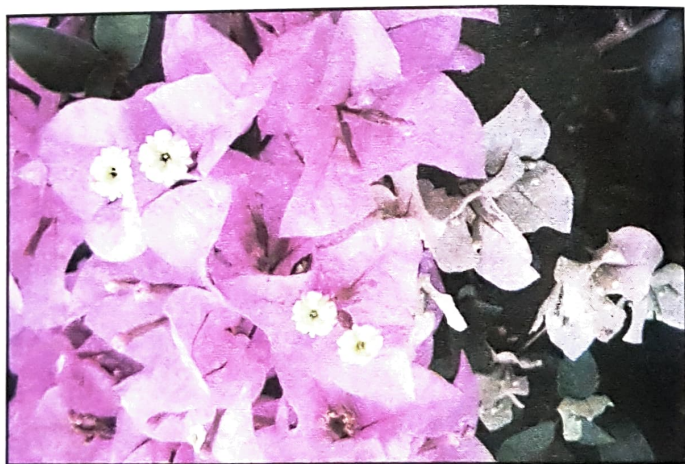


Fig. 3.3: Petaloid bracts in *Bougainvillea*

Bracteoles

Bracteoles are small **leaf-like structures** present on the pedicel of the flower in between the bract and the calyx, as in china rose and strawberry.

Nectaries

- Nectaries are the *nectar-secreting glands* situated at the base of the pistil or petals, as in *Nasturtium*.
- Nectar is a sweet, fragrant liquid that attracts insects. When the insects visit flowers for nectar, the pollen grains stick to their **bodies**. These pollen grains are transferred to the stigma of other flowers when these insects visit them. Thus, they help in cross-pollination.



Fig. 3.4: Flower of *Nasturtium* and the nectar at the base of petals

CLASSIFICATION OF FLOWERS

You must have observed a variety of flowers in your surroundings. How do you identify a flower? They are often identified on the basis of their colour and form. If you observe flowers carefully, you will find that flowers differ from each other in various ways. These differences may be marked on the basis of sexuality, symmetry, inflorescence and placentation or by the presence or absence of floral parts and the accessory structures. Let us study about a few of them in detail.

- ❑ Flowers that grow in the axils of leaves are called **axillary flowers**.
- ❑ Flowers borne at the apex of the stem or branches are called **terminal flowers**.
- ❑ Flowers that occur singly are called **solitary flowers**.

On the Basis of Floral Parts

Based on the presence or absence of the whorls, flowers can be categorised into two types:

Complete Flowers

Most of the flowers have all the four floral whorls and are called **complete flowers**. A few common examples are mustard, *Datura*, china rose and *Petunia*.



Mustard

Datura

Petunia

Fig. 3.5: (a) Complete flowers

Incomplete Flowers

The flowers which lack one or more floral whorls are called **incomplete flowers**, e.g., *Amaranthus*, *Achyranthes* and sunflower.



Amaranthus

Sunflower

Achyranthes

Fig. 3.5: (b) Incomplete flowers

On the Basis of Sexuality

Flowers can be categorised based on the presence and absence of male and female reproductive organs.

Unisexual Flowers

- Flowers which have only one sexual organ, either androecium or gynoecium, are called **unisexual flowers**.
- Flowers with only stamens are called **staminate flowers**, while those with only carpels are called **pistillate flowers**.
- A few examples of unisexual flowers are palm, mulberry, cucurbits and papaya.

Bisexual Flowers

- Flowers which have both stamens and pistils, irrespective of the presence or absence of other floral parts, are called **bisexual** or **hermaphrodite**.
- These are also termed as **perfect flowers**.
- A few examples of bisexual flowers are china rose, pea and cotton.

Neuter Flowers

The flowers which lack both male and female reproductive organs, such as the ray florets of a sunflower, are known as **neuter flowers**.

On the Basis of Symmetry

The flowers exhibit different kinds of symmetry.

Actinomorphic Flowers

These flowers can be divided into **two equal and similar halves**, if cut vertically in any plane through the centre, e.g., china rose, mustard, brinjal, chilli and *Datura*.

Zygomorphic Flowers

These flowers can be divided vertically into two equal halves **only through one plane**, e.g., pea and bean.

Asymmetrical Flowers

These flowers cannot be divided into two equal halves through any vertical plane, e.g., *Canna*.

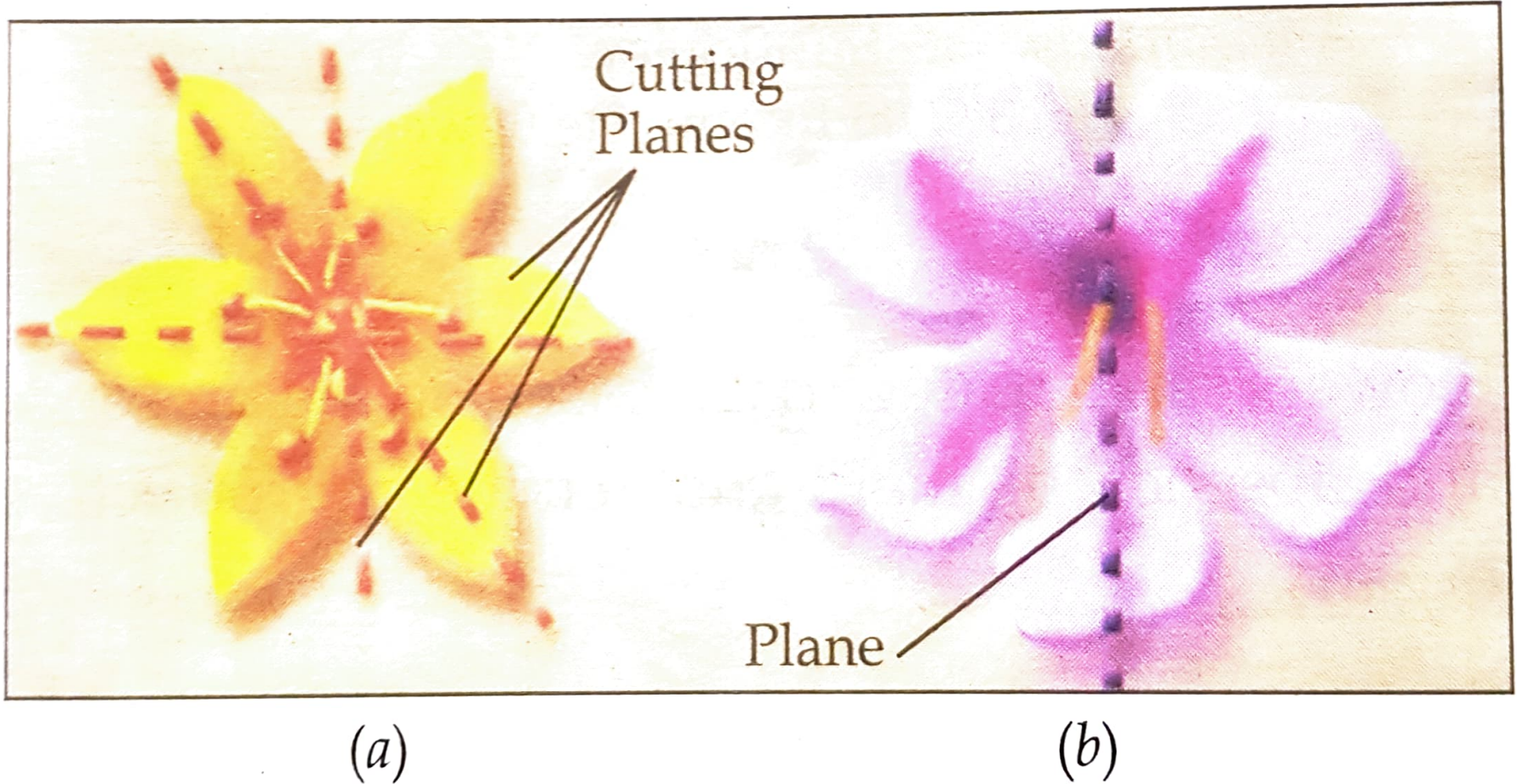


Fig. 3.6: Types of symmetry in flowers: (a) Actinomorphic symmetry (b) Zygomorphic symmetry

DETAILED STRUCTURE OF FLORAL PARTS

Non-essential Whorls

Calyx

- Calyx is the outermost whorl of a flower, made up of leaf-like sepals.
- Often green in colour but in a few flowers like *Cassia*, the **sepals** are coloured and resemble petals. These are called **petaloid sepals**.
- The number of sepals is usually five in dicot flowers and three in monocot flowers.

- In a whorl, the sepals may be free from each other. It is called a **polysepalous condition** as observed in mustard flowers.
- In some plants, such as *Datura*, the sepals are fused or united to each other. This condition is known as **gamosepalous condition**.
- Sometimes, a flower has more than one whorl of sepals. These are smaller in size and are called **episepals**. These collectively form epicalyx, e.g., in strawberry.
- The position of sepals on the thalamus, with respect to other parts, may vary.

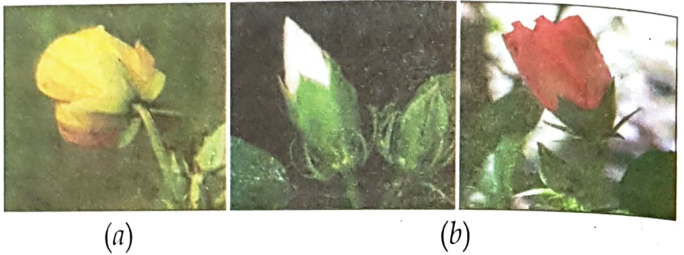


Fig. 3.7: Kinds of calyx: (a) Polysepalous
(b) Gamosepalous

Functions

1. The calyx protects the inner floral whorls in a floral bud.
2. The green sepals contain chlorophyll and carry out photosynthesis to prepare food.

Corolla

- Corolla is the second whorl of a flower and is made up of colourful petals.
- Like sepals, the number of petals in dicot flowers is usually five while it is three in monocot flowers.
- Generally, the petals are arranged in a single whorl. But in some plants, such as poppy, they may be present in two whorls.
- The petals may be present free from each other (**polypetalous**) as in mustard, rose and pea, or as fused forms (**gamopetalous**), as observed in brinjal (wheel-shaped), *Datura* (funnel-like) and the central florets of sunflower (tubular).

Functions

1. Petals add to the beauty and fragrance of the flower.

2. They protect the inner whorls of the flower.
3. Petals attract the insects and help in pollination.

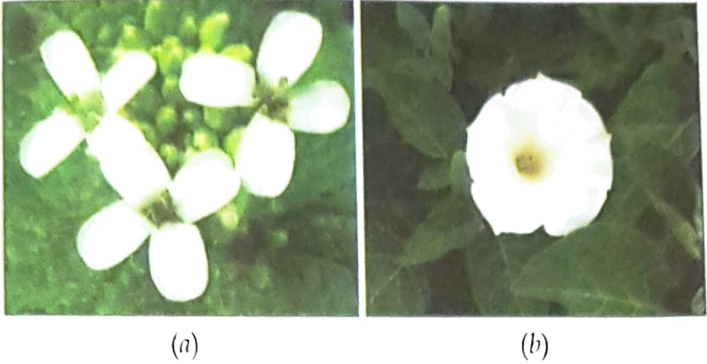


Fig. 3.8: Kinds of corolla: (a) Polypetalous (b) Gamopetalous

Essential Whorls

Androecium

- Androecium is the third and **male reproductive whorl** of the flower, made up of a number of stamens. The number of stamens varies in different flowers.
- Each stamen is composed of the following parts:
 - (i) *Filament*: Filament is the long, **thread-like** part of the stamen through which it attaches to the thalamus.
 - (ii) *Anther*: Anther is the upper, **swollen bilobed** part of the stamen. Each lobe has two chambers called **pollen sacs** which contain powdery particles known as the **pollen grains**. When fully mature, the pollen sacs rupture and release pollen grains which reach the female sexual organs of the same or different flowers through different pollinating agents.
 - (iii) *Connective*: The filament of the stamen is extended between two anther lobes. It is called **connective**.

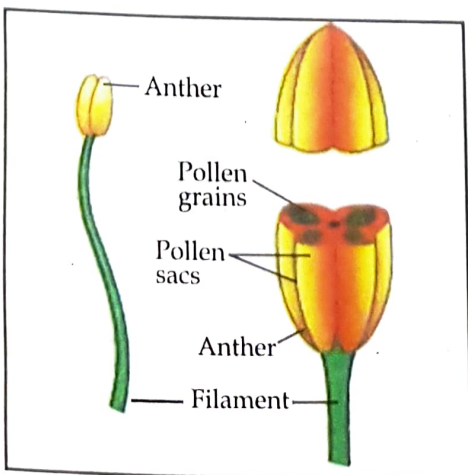


Fig. 3.9: (a) Structure of a stamen

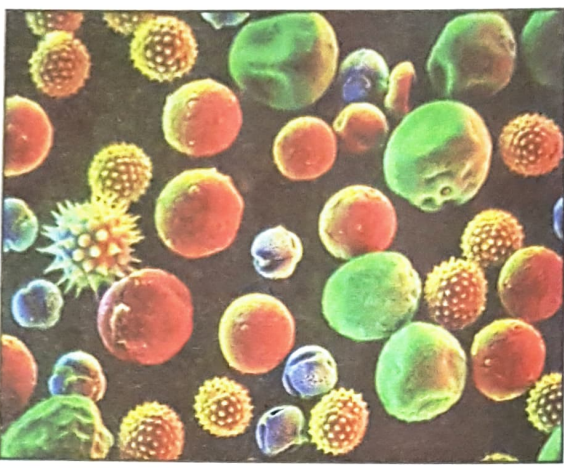


Fig. 3.9: (b) Different kinds of pollen grains

• The stamens may be free from one another or united with each other or with other floral parts in different ways. Based on this, the stamens are of the following types:

- (i) *Polyandrous Stamens*: These stamens are free from each other, as found in *Petunia*.
- (ii) *Monadelphous Stamens*: The stamens are united by their filaments in one bundle but their anthers are free. Examples are: china rose, okra and cotton [Fig. 3.10 (a)].
- (iii) *Diadelphous Stamens*: The filaments of the stamens are united in two bundles and the anthers remain free, as observed in pea, bean and gram [Fig. 3.10 (b)].
- (iv) *Polydelphous Stamens*: In such stamens, the filaments unite to form more than two bundles with free anthers, as found in castor and citrus fruits [Fig. 3.10 (c)].
- (v) *Epipetalous Stamens*: The filaments of these stamens are attached to the petals, as observed in brinjal and sunflower.
- (vi) *Epiphyllous Stamens*: These have filaments attached to the perianth, like in lily.
- (vii) *Gynandrous Stamens*: The filaments of these stamens are attached to the gynoecium, as seen in *Calotropis*.



Fig. 3.10: (a) Monadelphous stamen



Fig. 3.10: (b) Diadelphous stamen



Fig. 3.10: (c) Polydelphous stamen

Functions

1. The stamen has **male gametes** of the flower, *i.e.*, pollen grains.
2. The pollen grains can result into formation of a hybrid plant if fallen on stigma of other species.

Gynoecium

- Gynoecium, also called **pistil**, is the fourth and **female reproductive whorl** of the flower. It consists of one or more carpels.
- A carpel consists of three parts—stigma, style and ovary.

(i) *Stigma*: The stigma is the **knob-like** structure present at the tip of the style. It may consist of two or more lobes. The stigma is the first place where pollen grains reach to enter the ovary.

(ii) *Style*: Style is the elongated, **thread-like** structure which connects the ovary to the stigma.

(iii) *Ovary*: Ovary is the **basal swollen part** of the pistil. It may have only one chamber or it may be divided into several chambers called **locules**. A number of ovules are attached to the inner surface of locules through placenta. *The arrangement of placenta on the ovary wall is called placentation.*

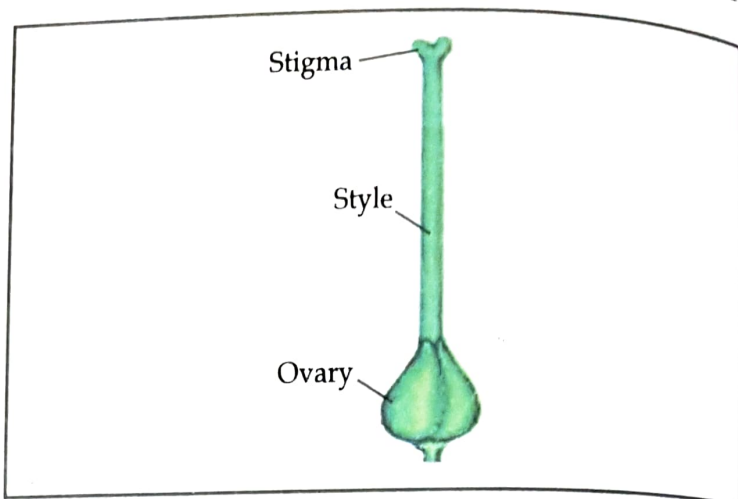


Fig. 3.11: Structure of a gynoecium

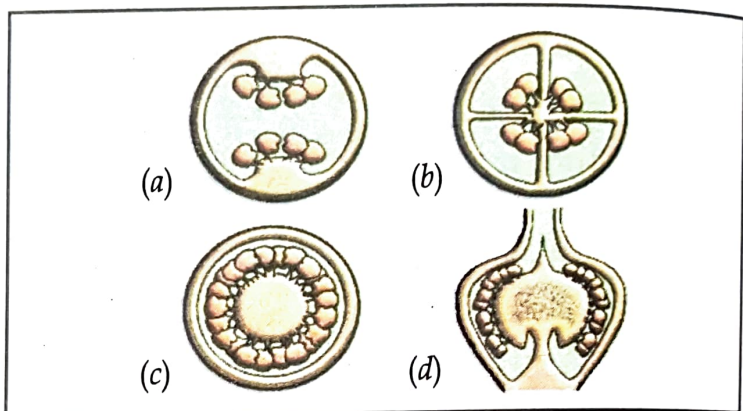


Fig. 3.12: Placentation of ovule in the ovary of plants:
(a) Parietal (b) Axile (c and d) Central

- Like in androecium, the carpels of a gynoecium may be free or united to each other. If the carpels are free from each other, the gynoecium is called **apocarpous**, as seen in lotus and rose. If the carpels are fused with each other, the gynoecium is known as **syncarpous**, as observed in mustard and tomato.

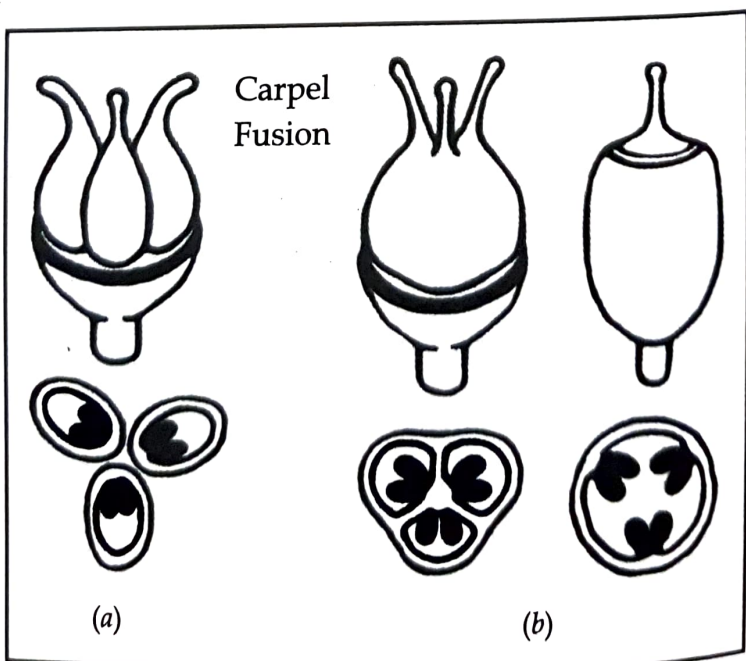


Fig. 3.13: Types of gynoecium: (a) Apocarpous (b) Syncarpous

Functions

1. It is an important part of the flower as it has the female gamete.
2. The ovary develops into a fruit which is economically important.
3. The ovary encloses ovules which are the future seeds.

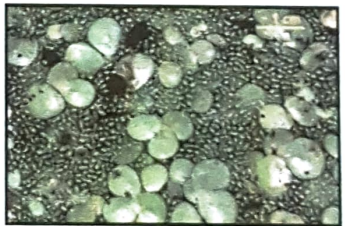
Largest vs Smallest Flower

Rafflesia arnoldii, the largest flower in the world, is also called **corpse flower**. Each bloomed flower can be as wide as 3 feet and can weight up to 24 pounds. It is found in South-East Asia (primarily in Borneo and Sumatra).

The smallest flowering plants belong to the genus *Wolffia*. These are rootless plants that float on the surface of quiet streams and ponds. The entire body of the plant is less than 1 mm long. The plant weighs just about 150 micrograms or approximately the weight of two grains of table salt. A bouquet of one dozen plants in full bloom would fit on the head of a pin.



(a)



(b)

Fig. 3.14: (a) *Rafflesia arnoldii* (b) *Wolffia*

INFLORESCENCE

In most plants, flowers are produced in groups and show definite arrangement. The arrangement of group or cluster of flowers on the stem of a plant is called **inflorescence**. The stem holding the inflorescence is called **peduncle**.

Inflorescences can be described by the arrangement of flowers on peduncle or by the blooming order. A single or solitary flower is not considered as part of inflorescence. It is of various types and has special significance for taxonomical identification of an angiosperm, details of which will be dealt in higher classes.

1. Name:

(i) A condition in which the petals are free.

(ii) A plant with nectaries.

(iii) A monoecious plant.

(iv) The male reproductive part of a flower.

2. Complete the following:

(i) A pistil with many carpels is called _____ .

(ii) Bract is present in _____ .

(iii) A tissue that attaches ovules on the ovary wall is _____ .

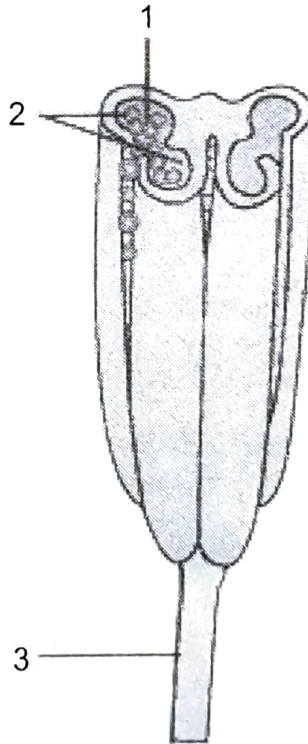
3. Explain:

(i) Pistillate flower

(ii) Nectaries

(iii) Sepaloid perianth.

4. The figure shows a particular structure of a flower.



(i) Identify it.

(ii) State the function of it.

(iii) Label the parts 1–3.

5. Choose the correct option from the brackets

- (i) an incomplete flower (pea, bean, cucumber, *hibiscus*)
- (ii) a pistil with many carpels (monocarpellary, polycarpellary, bicarpellary, pentacarpellary)
- (iii) the floral whorl outside the sepal (calyx, corolla, epicalyx, androecium)
- (iv) the stalk of the flower (pedicel, perianth, placenta, thalamus).

6. State the differences between the following:

- (i) fruit and seed.
- (ii) actinomorphic and zygomorphic flower.
- (iii) gamosepalous and polysepalous.

7. Write the technical term for the following:

- (i) the arrangement of ovules on the wall of the ovary.
- (ii) The condition of free stamens.
- (iii) Collection of carpels.
- (iv) Undifferentiated sepal and petal.

8. State the function of the following:

- (i) placenta
- (ii) style
- (iii) anther
- (iv) sepals

9. State whether the following are true or false.

- (i) Androecium is the male part of the flower.
- (ii) In hypogynous flower, the thalamus encloses the ovary.
- (iii) A complete flower has four or five whorls.
- (iv) Bean is a monoecious plant

10. Give reasons:

- (i) Some plants have nectaries.
- (ii) Petals are brightly coloured.