Exercise 9

Aim: To study the modifications of leaf.

Principle: Leaf is the most important vegetative organ of the plant. It is a lateral appendage borne at nodes of stem and is associated with photosynthesis, gaseous exchange and transpiration. Despite it's wide variety in shapes, sizes and form, leaves of many plant species are also modified to perform some other special functions. These modifications may be with respect to mechanical support, protection, reducing transpirational rate or to trap insects.

Requirement: Specimens of pea/lentil plant with tendrils, Cactus/*Argemone*, Pitcher Plant/*Utricularia*, bulbs of onion/garlic/Crocus.

Procedure

- Observe the external morphology of each specimen.
- Draw diagrams to bring out the differences in each modification.

Observation

(i) **For protection**

Leaves are modified into sharp, pointed structures or spines to act as defensive mechanism against excessive grazing and to check transpiration, e.g., *Cactus, Argemone* (Fig. 9.1).

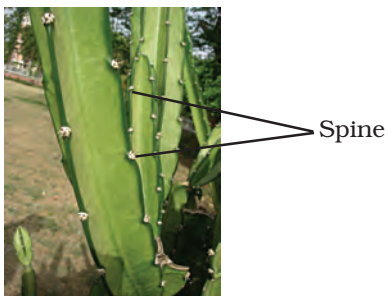

Fig. 9.1 Spines of a cactus

Fig. 9.2 Tendrils of sweet pea

(ii) **For mechanical support**

To provide support and help in climbing, leaves are modified into long, slender, thread like spirally coiled structures called tendrils in plants like sweet pea, lentil etc (Fig. 9.2).

(iii) **For storage of food**

Like stems and roots, leaves are also modified to store reserve food in plants as in the fleshy leaves of garlic, onion (Fig. 9.3).

Fig. 9.3 Onion bulb with scaly leaves

(iv) **For trapping insects**

Leaves are modified as pitcher to capture insects and digest them in **pitcher** plant (*Nepenthes*) and as **bladder** in bladderwort (*Utricularia*) (Fig. 9.4).

Fig. 9.4 Pitcher of *Nepenthes*

Discussion

In all the specimens studied it will be observed that the leaves show modifications in structure and morphology to perform some special functions.

Questions

1. How does a leaf spine differ from stem spine?
2. How does a leaf tendril differ from stem tendril?
3. Is there any significance attributed to insectivorous habit?

Exercise 10

Aim: To study and identify different types of inflorescences.

Principle: In angiosperms the flowers are borne either singly or in clusters. Flowers borne singly are solitary, and those borne in clusters together on a common stalk or peduncle form an **inflorescence**. It is the reproductive shoot composed of a number of shoots of limited growth (dwarf shoots) termed flowers. Pedicel is the stalk of a flower.

Requirement: Inflorescences of locally available plants, hand lens, beaker, water.

Procedure

- Collect inflorescences of locally available plants, keep them in a beaker with water.
- Make yourself familiar with the flow chart of types and characters of inflorescences, given in the Annexure 1 at the end of the exercise.
- Sort out the inflorescences into racemose/cymose and list the plant species in a tabular form as in Table 10.1.
- Identify the type of **raceme/cyme** giving reasons.
- Note the position of the inflorescence in the plant (axillary/terminal).
- Draw labeled diagram of inflorescence (of each plant species collected by you) showing the arrangement of the oldest and youngest flowers on the peduncle.
- Draw a diagram of a flower of each inflorescence, identify and label its parts. Note the position of ovary with respect to arrangement of other floral parts **(epigynous, perigynous, hypogynous)**.

Discussion

- Inflorescences may be of definite or indefinite types classified on the basis of position on the mother axis (axillary/terminal), number of flowers, maturity of flowers, etc.
- Inflorescence and flower characters help us in taxonomic classification and identification of plants.
- Note the type of inflorescence which is more common among the locally available plants.

Table 10.1

Name of plant	Inflorescence		Position of ovary in flower
	Type	Position	
1.			
2.			
3.			

Questions

1. How is a floret different from a flower?
2. Observe a pomegranate fruit and note whether it has developed from a solitary flower or an inflorescence.
3. Cite an importance of studying inflorescences of different plants.

Annexure 1

Types of Infloresence

The inflorescences are classified on the basis of position in the shoot system into the following four types:

1. *Terminal inflorescence:* A strictly terminal inflorescence, terminates the growth of the branch.
2. *Axillary inflorescence:* It is terminal on a short axillary branch, which is reduced to an inflorescence.
3. *Intercalary inflorescence:* These are terminal clusters that have been left behind by continuing apical growth of the main axis, which form alternately fertile and sterile sections.
   Example: Callistemon (Bottle brush)
4. *Cauliflory:* The development of inflorescences on older branches.
   Example: Theobroma cacao (Cocoa plant), *Arctocarpus* (Jackfruit), Cannon ball tree.

On the basis of sequence of development of flowers on the peduncle the inflorescences are of the following kinds:

1. **Racemose** (Indefinite or indeterminate)
2. **Cymose** (definite or determinate)

INFLORESCENCE

Racemose (Indefinite) The main axis grows indefinitely bearing flowers either directly on itself or on its branches. The flowers borne at the lowest are the oldest and the first to mature or open.

Cymose (Definite) The growth of main axis is arrested as it terminates in a flower. Other flowers are produced lower down the main axis or on its branches which also terminate in a flower. The oldest flower is at the top.

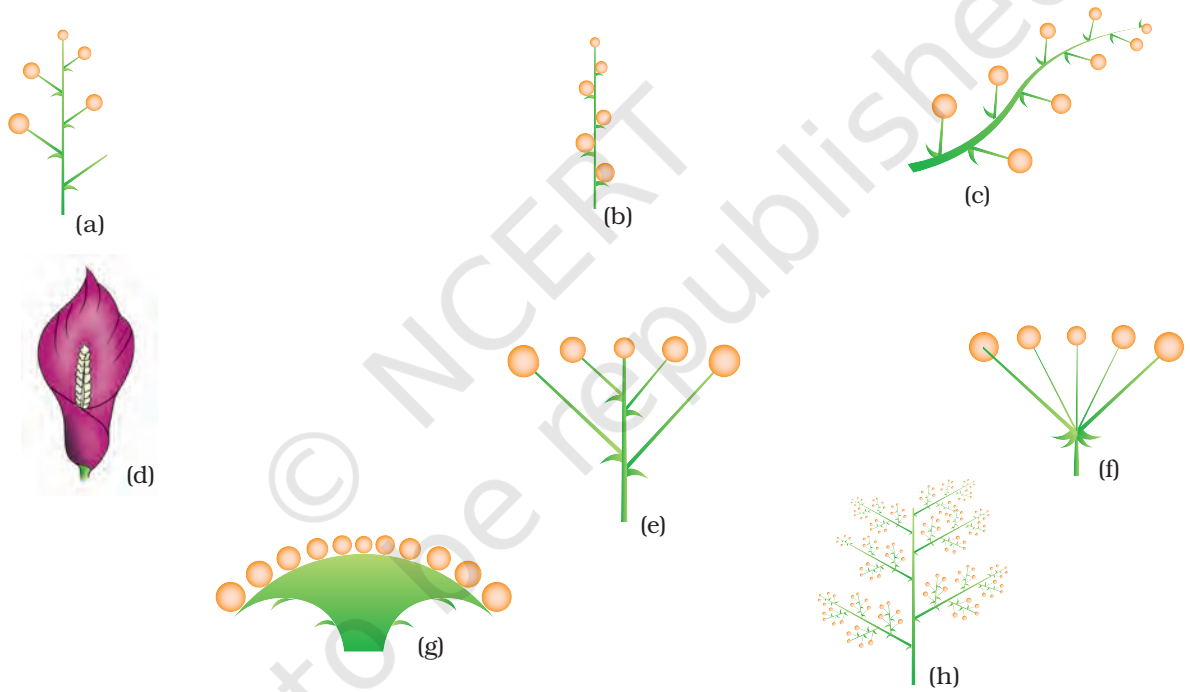

Fig. 10.1 Different types of racemose inflorescence
(a) simple raceme (b) spike (c) catkin (d) spadix
(e) corymb (f) umbel (g) capitulum (h) panicle

Racemose Inflorescence : The unbranched main axis bearing stalked (pedicellate) flowers as in mustard, radish, *Crotalaria* is **simple raceme** (Fig. 10.1 a). Sessile flowers borne on elongated axis as seen in amaranth is referred to as **spike** (Fig. 10.1 b). If the main axis is pendulous and bears stalkless (sessile) unisexual flowers, the inflorescence is **catkin,** e.g., mulberry (Fig. 10.1 c). Fleshy peduncle covered by long showy bract with spike inflorescnce as in banana and *Colocasia* is called **spadix** (Fig 10.1 d). In **corymb** inflorescence, which is a relatively shorter and broder raceme, the pedicel of lower flowers are longer than the upper ones and all the flowers reach the same level (Fig 10.1 e). e.g., *Cassia auriculata, Gynanadropsis,* candy tuft.

An inflorescence with extremely reduced main axis bearing a cluster of pedicellate flowers with more or less equal stalk is referred to as **umbel** (Fig 10.1), e.g., coriander, *Allium cepa* (onion). In **Head or Capitulum** type, sessile flowers are borne in a dense cluster in a common receptacle, which is the flattened main axis (Fig 10.1 g) e.g., sunflower.

If the main axis is branched then the inflorescence is termed as compound. A **panicle** as seen in mango and drumstick is a compound raceme(Fig 10.1 h). Likewise, there can be compound spadix, e.g., palm, compound umbel, e.g., coriander, compound corymb, e.g., candy tuft.

Cymose Inflorescence: There are mainly three types of cymose inflorescence viz. monochasial cyme, dichasial cyme, polychasial cyme.

In **monochasial cyme** a single flower arises in the axil of a leaf of an ordinary shoot or the peduncle ends in a single flower (Fig 10.2 a), e.g. *Hibiscus rosasinensis* (shoe flower).

Dichasial cyme consists of only three flowers, out of which the central one is the oldest and the two lateral ones arising in the axils of bracts below the older flower are youngest (Fig 10.2 b, c), e.g., *Jasminum.*

In **polychasial cyme** the main axis ends in a flower with more than two branches arising from the peduncle below the terminal flower (Fig 10.2 d)., e.g., *Calotropis.*

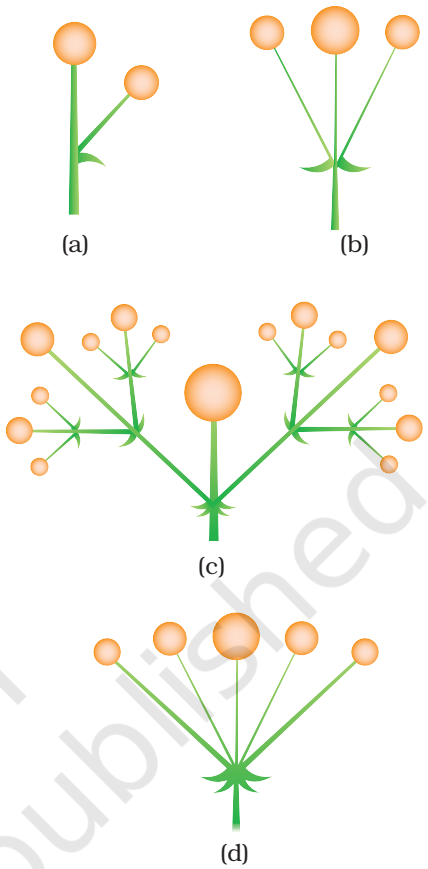

Fig.10.2 Different types of cymose inflorescence (a) monochasial cyme (b) simple dichasial (c) compound dichasial (d) polychasial