Exercise 8

Aim: To study modifications of stem.

Principle: The stem is the central axis that provides support to all the aerial parts of the plant. Besides, in some plants these also help in perennation, vegetative propagation, food storage, photosynthesis etc. through various modifications.

Requirement: Specimens of ginger, potato, onion, arbi *(Arum)*, yam, whole plant of *Oxalis*, mint, water lettuce/*Eichornia*, *Chrysanthemum*, tendrils of *Vitis*/ passion flower, thorns of Pomegranate/Bougainvillea/Acacia, *Opuntia, Ruscus, Asparagus*, or locally available specimens.

Procedure

- Observe the external morphology of each specimen.
- Draw diagrams and bring out the differences in each type of the stem modifications.

Observation

(i) **For storage of food**

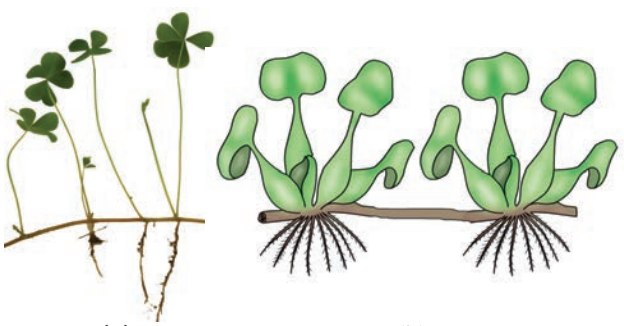
Stems get modified into underground structures for storage of food as seen in potato (tuber) (Fig. 8.1a), ginger (rhizome) (Fig. 8.1b), garlic (bulb), yam (corm). Presence of an eye (node) in potato, distinct nodes with internodes and scaly leaves in ginger/yam, a cluster of roots at the base of the reduced stem in garlic/ onion, all indicate that these underground plant parts are modified stem.

(a) (b)

Fig. 8.1 Stems modified for storage
(a) Potato
(b) Ginger

(ii) **For vegetative propagation**

Plants besides reproducing sexually also propagate through vegetative parts. For this purpose, stems may be modified into **runner** (*Cyanodon dactylon, Oxalis*) (Fig. 8.2a). Runners are a slender prostrate branches arising from axillary buds; **stolon** (e.g., mint, strawberry) which is a slender lateral branch



(a) (b)

Fig. 8.2 (a) Runner of *Oxalis*
(b) Offset of *Eichornia*

arising from the base of stem grows upward and then down to develop new daughter plants; **offset** having a single long horizontal internode growing upto some distance and producing a tuft of leaves above and cluster of roots below at the apex (*Eichornia, Pistia*) (Fig. 8.2b) and **sucker**, which arises from underground part of stem, grows obliquely and gives rise to a new shoot. (*Chrysanthemum*, Banana, Pineapple).

(a)

(b)

Fig. 8.3 Thorns of (a) *Acacia* (b) *Bougainvillea*

(iii) **For protection**

Some modified stem provides protection as thorns which are hard, pointed structures each representing a branch that arises from the axil of leaf. Thorns are found in plants like *Duranta*, Pomegranate, *Acacia*, Ber, *Prosopis*, *Bougainvillea, Citrus*, etc (Fig. 8.3).

Fig. 8.4 Tendrils of Passion flower

(iv) **For support**

Tendrils are modifications of stem to provide support to plants, e.g., *Vitis*, passion flower, *Bignonia* etc (Fig. 8.4).

(v) **For photosynthesis**

Stems are also modified into **Phylloclade**, to facilitate photosynthesis. Phylloclades are flattened/cylindrical stem or branches of unlimited growth (*Cactus*) (Fig. 8.5).

Fig. 8.5 Green stem of *Cactus*

Discussion

In all the examples cited above, the stems are modified to perform the additional function of storage, perennation, vegetative propagation, photosynthesis, etc. Accordingly, their morphology and structure have been modified to suit the function they perform.

Questions

1. Mention any one stem character by which ginger rhizome and onion bulb are recognized as stem.
2. Though potato tuber is non-green and underground, it has plenty of starch. Where does this starch come from?
3. Comment on the feature of photosynthetic stem of *Opuntia*.

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