

Exercise 25

Aim: Study of homologous and analogous organs in plants and animals

Principle: In plants and animals there are several organs or parts thereof, apparently alike in their function and appearance, but markedly different from each other in their origin and anatomical structure. These organs are called **analogous organs**, and the seeming similarity among them is the result of convergence, that is, adaptation to similar habitat and identical ecological niche.

On the other hand, there are organs or parts thereof, which apparently are quite dissimilar to each other in appearance and perform different functions, but have the same origin and anatomy. The differences in their function and also in their appearances are the result of divergence, due to adaptive radiation to different habit, habitat and ecological niche. These organs are called **homologous organs**.

Requirement: Plant specimens showing tendrils, thorns, etc., as given in the text or any other locally available plants, a plant with normal stem, potato and onion bulb, prickly pear, specimens of phylloclade, cladode, wings of bird, cockroach and bat, and cervical, thoracic and lumbar vertebrae of a mammal/lizard

Observations

1. Homologous Organs in Plants

(i) Tendrils of passion flower and thorns of pomegranate

Tendrils of passion fruit and thorns of pomegranate are structurally and functionally different but they have similar origin i.e. they arise from axillary bud (Fig. 25.1a & b).



(a)



(b)

Fig. 25.1(a) Tendrils of passion fruit **(b)** Thorns of pomegranate

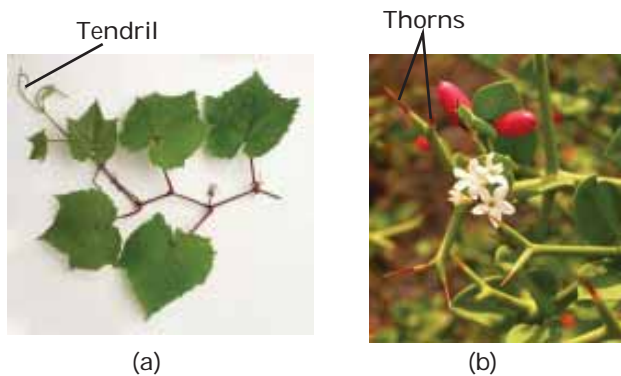


Fig. 25.2 (a) Tendrils of *Vitis* (b) Thorns of *Carissa*



Fig. 25.3 (a) Tendrils of balloon vine (b) Bulbils of *Agave*

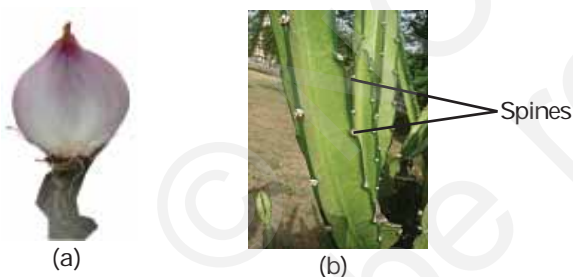


Fig. 25.4 (a) Scale leaves of onion (b) Spines of cactus

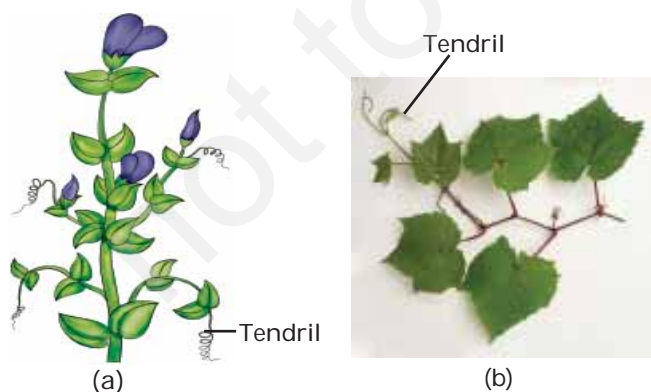


Fig. 25.5 (a) Tendrils of pea (b) Tendrils of *Vitis*

(ii) Tendrils of *Vitis* and thorns of *Carissa*

Tendrils of *Vitis* and thorns of *Carissa* originate from the terminal bud, but they are functionally different (Fig. 25.2 a & b).

(iii) Tendrils of balloon vine (*Cardiospermum*) and bulbils of *Agave*.

Both are modifications of floral bud, but they perform different functions. Tendrils help in climbing but bulbils are meant for reproduction (Fig. 25.3 a & b).

(iv) Scale leaves of onion and spines of prickly pear (*Opuntia*)

Both the scale leaves and spines are modifications of leaves but are structurally and functionally different. Scale leaves of onion are thick and fleshy and store food. On the other hand spines of cactus are defensive organs (Fig. 25.4 a & b).

2. Analogous Organs in Plants

(i) Stem tendrils and leaf tendrils

All tendrils are analogous with one another, being structurally and functionally similar, irrespective of their origin.

Example: Tendrils of pea and tendrils of *Vitis*. Tendrils of pea are modification of leaf and in *Vitis* it is the modification of terminal bud (Fig. 25.5 a & b).

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(ii) Thorns and spines

Thorns and spines are analogous structures being defensive in function. Thorns are modifications of axillary or terminal buds, and spines are modifications of leaves.

e.g: Thorns of pomegranate and spines of prickly pear.

(iii) Modified underground stems and modified roots

Modified stems (rhizome, corm, tuber) are analogous to modified roots (carrot, radish) as they perform similar function of storage of food but their origin is different. Rhizome of ginger, potato tuber, Colocasia are stems and beetroot, radish etc. are roots. (Fig. 25.6 a & b)

(iv) Phylloclade, cladode and leaves

They perform the same function i.e. they photosynthesise but phylloclade and cladode are modifications of stem. Phylloclade of Opuntia, Parkinsonia, Asparagus and leaves of any local plant like mango are analogous organs. (Fig. 25.7 a & b)



Fig. 25.6 (a) Modified root of carrot (b) Rhizome of ginger

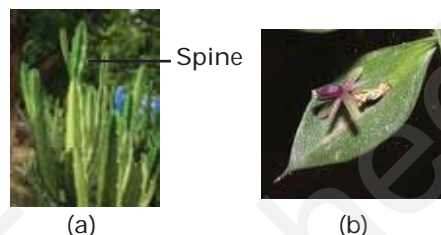


Fig. 25.7 (a) Phylloclade (b) Cladode of ruscus

3. Homologous Organs in Animals

- (i) Wings of birds, and forelimb of mammals/reptiles/frog: All have the same bony elements (humerus, radius, ulna, carpals, metacarpals and phalanges), but perform different (flying in birds, for holding or walking etc. in other) functions. (Fig. 25.8 a & b)

4. Analogous Organs in Animals

- (i) Wings of dragonfly/cockroach/butterfly and of birds. (Fig. 25.9 a & b)
- (ii) Mandible of cockroach and mandible (lower jaw) of a vertebrate. (Fig. 25.10 c & d)

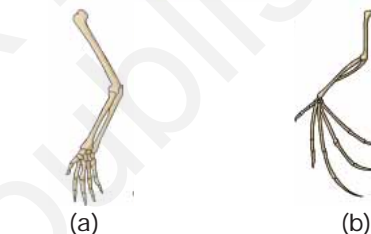


Fig. 25.8 Fore limb of (a) human (b) bat

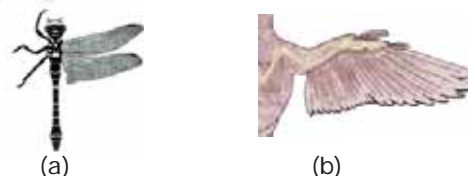


Fig. 25.9 Wing of (a) dragonfly (b) bird



Fig. 25.10 Mandible of (a) cockroach (b) rabbit

Note: Students and teachers are suggested to discuss more examples.

Questions

1. Suggest examples of homologous and analogous organs other than what are given in the manual.
2. Why are stem and leaf tendrils considered as analogous organs?