EXPERIMENT

AIM

To study of homologous and analogous organs in plants and animals.

THEORY

Comparative Anatomical and Morphological Evidences show the similarities and differences among the organisms of today and those that existed years ago. These evidences came from the comparative study of external and internal structures and reveals shared ancestory among organisms. These can be determined by the following types.

Homologous Organs and Homology

The organs which have the same fundamental structures, but are different in functions are called homologous organs.

Homology in organs indicates common ancestry. It is based on divergent evolution, which leads to the formation of homologous organs.

In divergent evolution, a same basic organ gets specialised to perform different functions, in order to adapt to the different environmental conditions prevailing in the habitat.

Analogous Organs and Analogy

In contrast to homologous organs, the analogous organs are different in their basic structure and developmental origin, but appear same and perform similar functions. This relationship between the structures of different groups of animals due to their similar functions is called analogy or convergent evolution.

REQUIREMENTS

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.

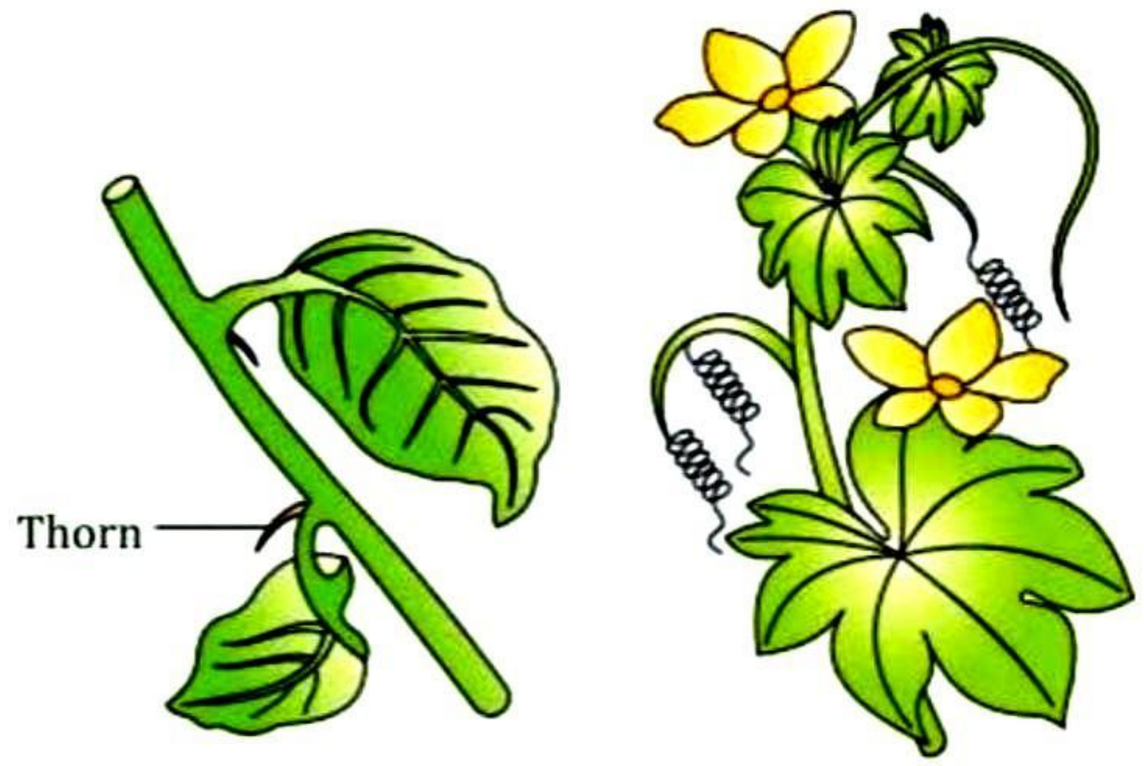
PROCEDURE

1. Study the morphological features of given plants and animals.
2. Write the minute details about the homologous and analogous features of these plants and animals.

OBSERVATIONS

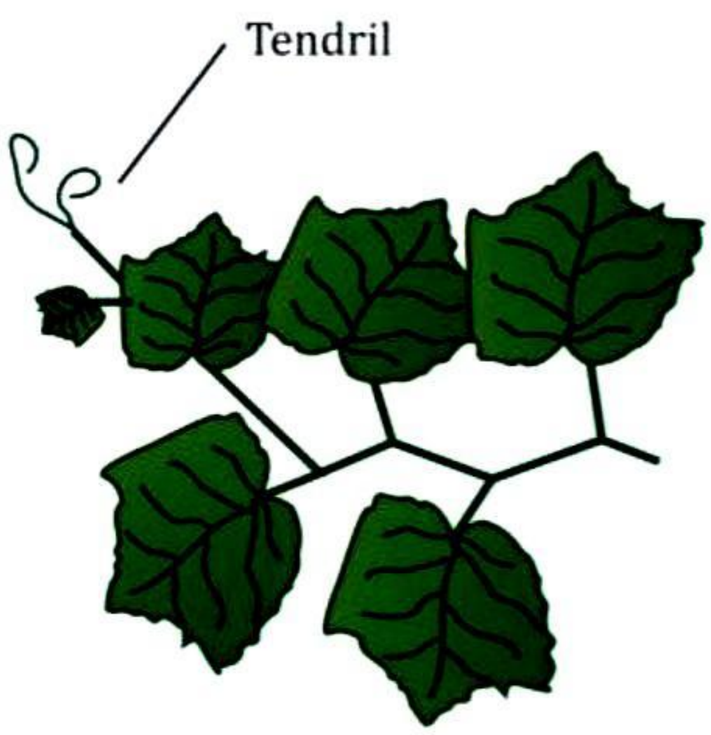
1. Homologous Organs in Plants

   (i) **Thorns of Bougainvillea and tendrils of Cucurbita** Leaves modified as thorns (Bougainvillea) and tendrils (Cucurbita) both arise in axillary positions and are modified branches.



Bougainvillea **Cucurbita**

(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.



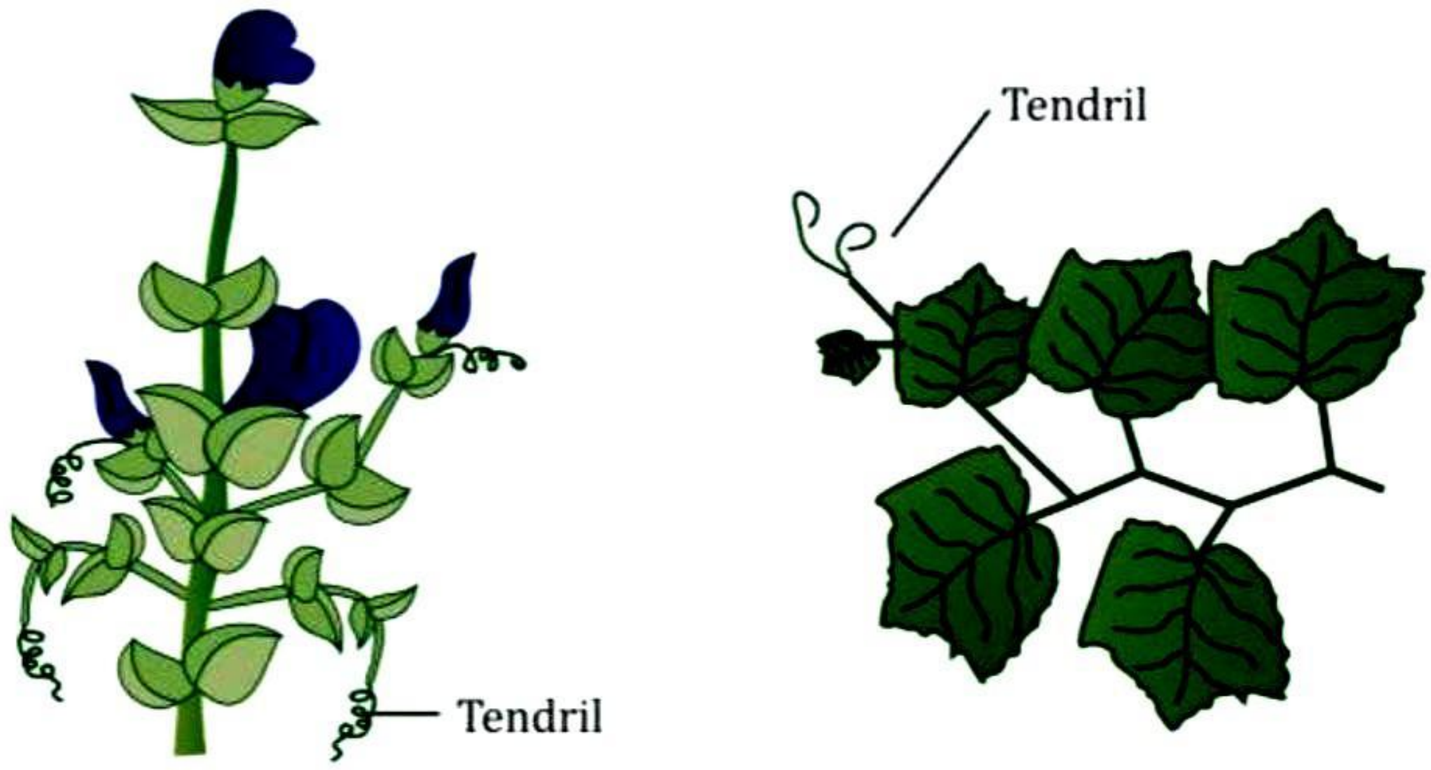
Tendrils of Vitis

Thor of Carissa

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.

(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.



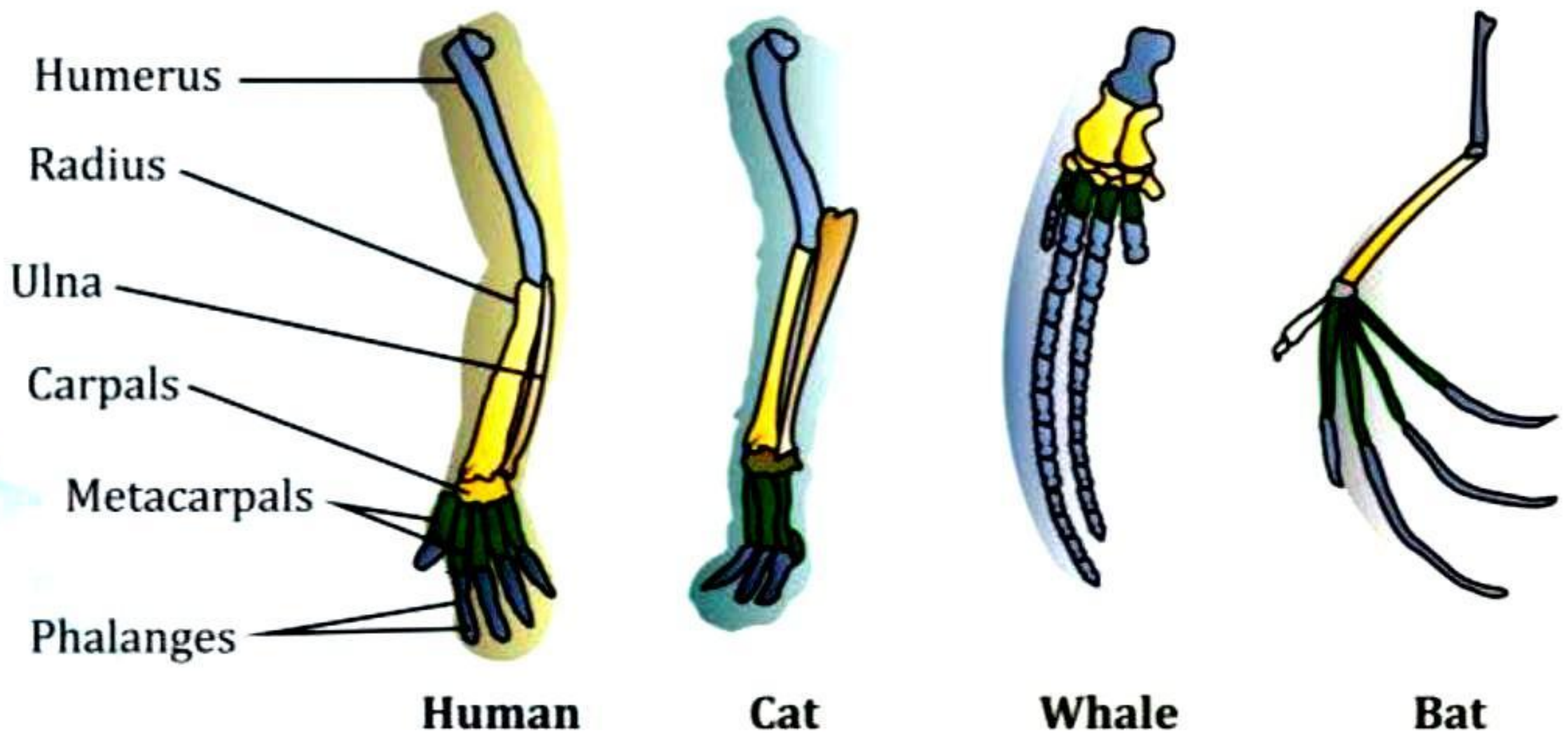
(a) Tendrils of pea, (b) Tendrils of Vitis

3. Homologous Organs in Animals

(i) **Forelimbs of man, cat, whale and bat** All have the same bony elements (humerus, radio-ulna, carpals, metacarpals and phalanges), but perform different (flying in birds, for holding or walking, etc., in other) functions.

(ii) **Brain in vertebrates** From fishes to mammals, brain constitutes the similar parts, i.e. olfactory lobes, cerebral hemispheres, optic lobes, cerebellum, medulla and so on. Thus, it shows homology.

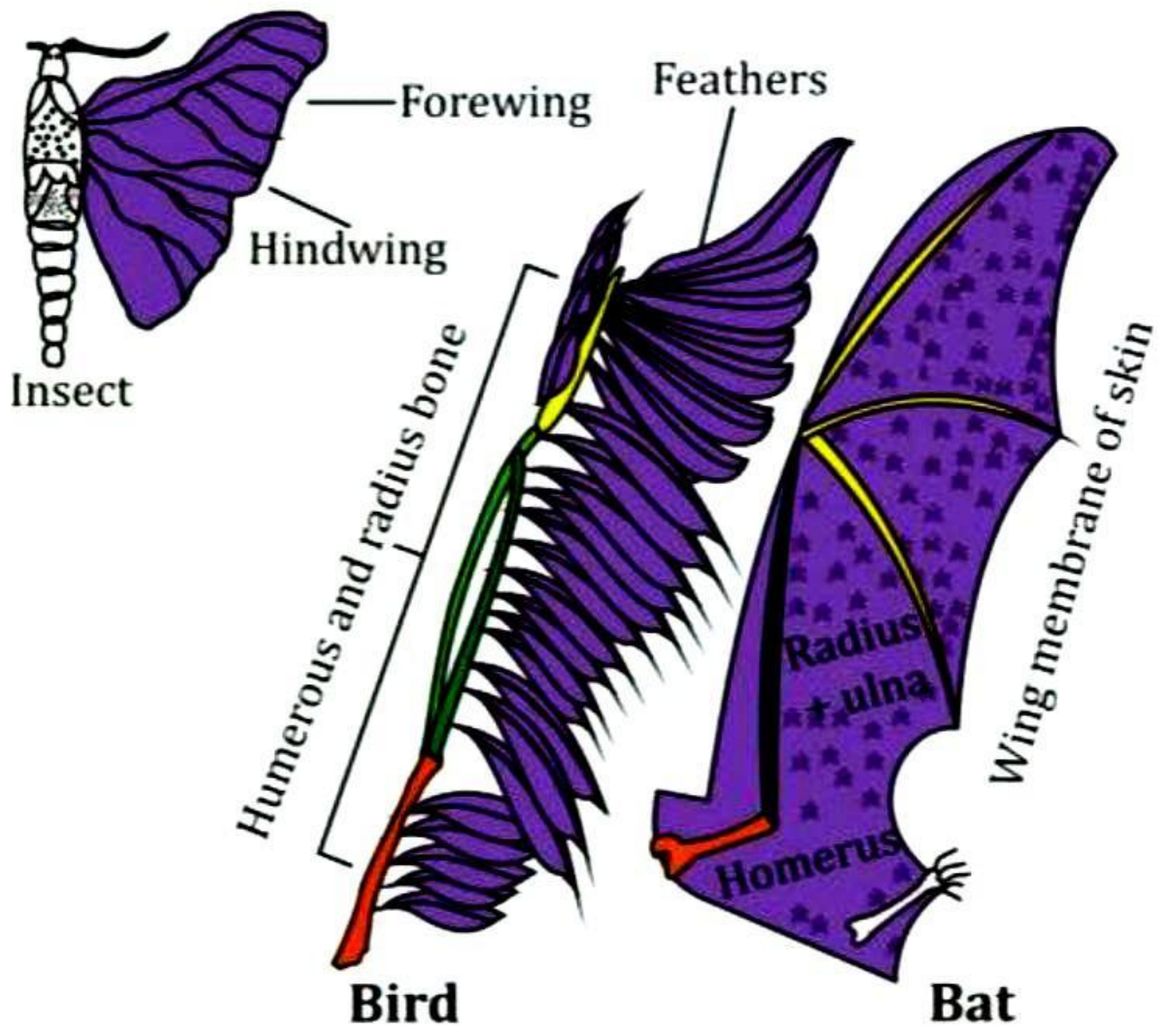
(iii) **All insect legs** consist of five parts, i.e. coxa, trochanter, femur, tibia and tarsus, Even their sequencing in all the insect is same. However, legs of insects may vary functionally.



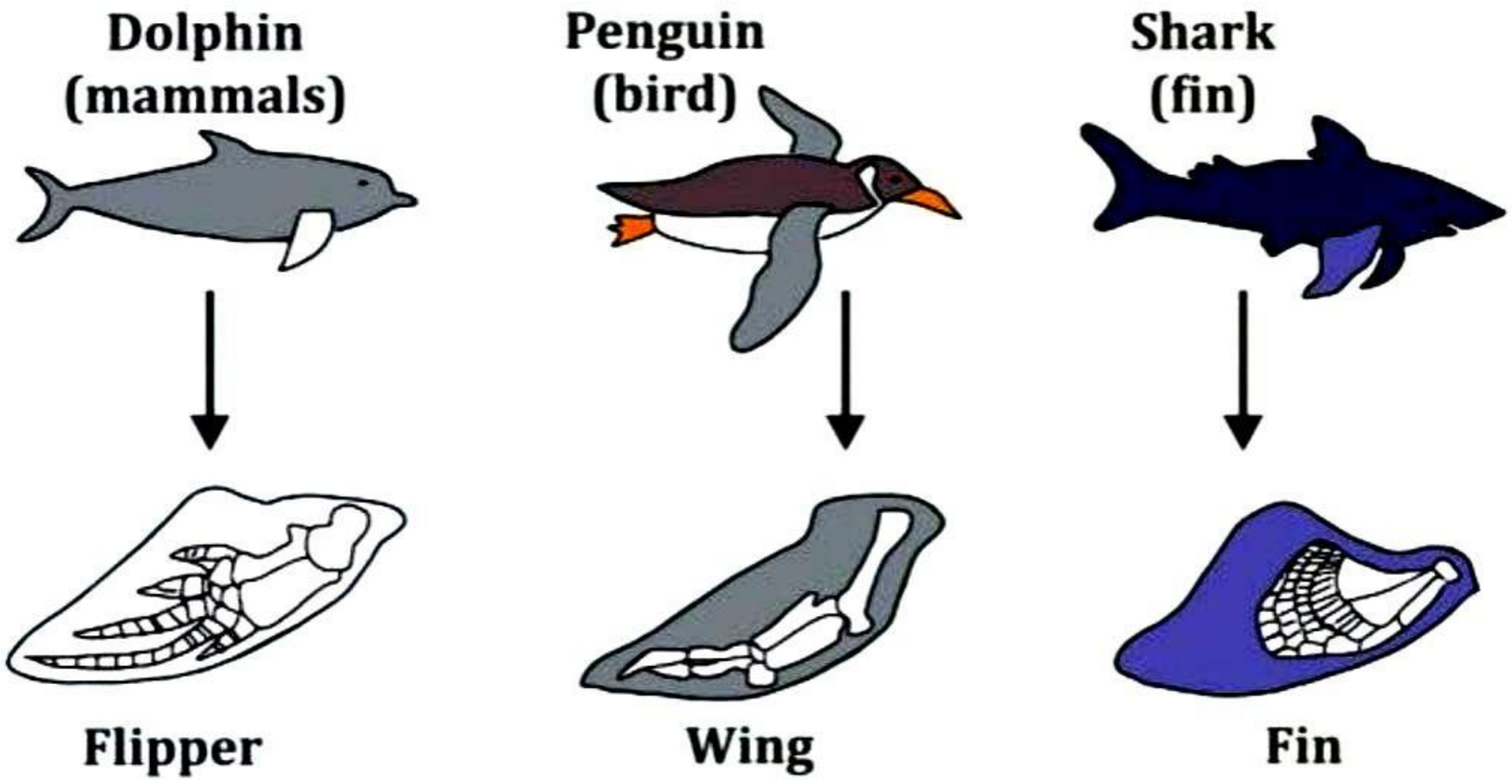
Homology of forelimbs in vertebrates

4. Analogous Organs in Animals

(i) **Wings of insects, bats and birds** show analogy as both are flat structures, well-adapted for flight. However, their basic structure is different as insects wings are formed from their integument (chitin), while the wings of birds and bats are their modified forelimbs (feathers).



(ii) Similar analogy is seen between flippers of dolphin and fins of shark.



PRECAUTION

The plant and animal specimens should be hardled carefully.

Note the homologous organ and structure present in every specimen with respect to another.

VIVA VOCE

Q1. What are homologous organs?

Ans. The organs found in different organisms which have a common origin and same basic structure, but differ in the functions they carry out are called homologous organs.

Q2. What are analogous organs?

Ans. The organs which have similar functions, but are different in anatomical structures are called analogous organs.

Q3. What is the function of tendril?

Ans. Tendril provides support to growing palnt stem.

Q4. Write the analogous organs of cockroach and vertebrate.

Ans. Mandible of cockroach and mandible (lower jaw) of a vertebrate.

Q5. Write one homologous organ in plant.

Ans. Tendrils of flower and thorns of pomegranate.

Q6. Write the analogous organs of insect and bird.

Ans. Wings of insect and wings of bird are analogous organs.

Q7. Name any two vertebrate's body parts that are homologous to human forelimbs (hands).

Ans. Flippers of whales and forelimbs of cheetah.

Q8. Select the homologous structures from the combinations given below:

(a) Forelimbs of whales and bats

(b) Tuber of potato and sweet potato

(c) Eyes of Octopus and mammals

(d) Thorns of Bougainvillea and tendrils of Cucurbita.

Ans. (a) and (d) represents homologous structures. They exhibits divergent evolution.

Q9. Why are analogous structures a result of convergent evolution?

Ans. When organisms of different geographical location converge to a restricted habitat, they develop adaptations to suit that location and develop analogous structures.

Q10. Identify the examples of convergent evolution from the following.

(i) Flippers of penguins and dolphins.

(ii) Eyes of Octopus and mammals.

(iii) Vertebrate's brain.

Ans. **(i)** Flippers of penguins and dolphins.

(ii) Eyes of Octopus and mammals.