and minerals absorbed by the roots to the leaves and also transports the food prepared by leaves to all parts of the plant.

In some plants, roots as well as stem get modified for the following various purposes.

- Storage of food
- Providing support to the plant
- Carrying out photosynthesis and storing water
- Protecting the plant from grazing animals
- Reproduction

Wonderment

Rainforest plants are useful in making medicines. We have studied only 1% rainforest plants for medicinal properties.

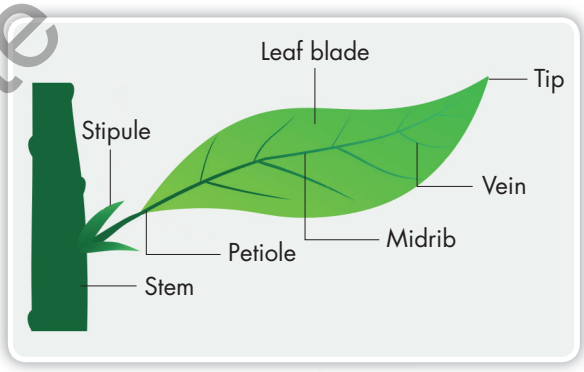
In this chapter, you will learn about leaves, flowers and fruits in detail.

LEAF

Among the various parts of a plant, leaf is the most important part as it prepares food for the whole plant. A leaf is also known as the kitchen of the plant. Let us learn about its external structure, types, arrangement, venation and functions.

The External Structure of a Leaf

A leaf is a green, flattened, thin lateral structure that arises on the stem at a node. A leaf remains attached to the stem by means of a stalk called petiole. The green flattened portion of a leaf is known as lamina or leaf blade. There are several tiny thread-like linings in the lamina. These are known as veins. They transport food, water and minerals. The petiole continues as a thick midrib in the centre of the leaf blade. The veins are the lateral branches of the midrib. The tip of the leaf blade is known as leaf apex. The edge of the leaf blade is called leaf margin (Fig. 1.2). The part that joins the leaf to the stem is called leaf base. Leaves of some plants have small outgrowth at the base known as stipule. There are many leaves that are without a stalk. Such leaves are known as sessile leaves. The leaves with stalk are known as petiolate leaves.



▲ Fig. 1.2 Parts of a leaf

Types of Leaves

There are many types of leaves around us. Plants may have long leaves, short leaves, broad leaves, needle-shaped leaves and even circular-shaped leaves. However, we classify them as simple and compound leaves (Fig. 1.3). Differences between simple and compound leaves are given in Table 1.1.

▲ Table 1.1 Differences between simple and compound leaves

Simple Leaf	Compound Leaf
A leaf with undivided lamina such that the lamina is whole or entire.	A leaf has its lamina divided into several leaflets. The stalk of the compound leaf is called rachis.
The bud present is found in the axil of the leaf.	The bud present is found in the axil of the midrib and not in the leaflets.
For example, mango, papaya, guava and peepal	For example, neem, rose and gulmohar

Simple leaf Compound leaf

▲ Fig. 1.3 Types of leaves

Arrangement of Leaves

The arrangement of leaves on the stem is called phyllotaxy (Fig. 1.4). As the main function of leaf is to photosynthesise, it tries to arrange itself in such a way that it gets maximum sunlight and air. Following are the main types of arrangement of leaves.

Alternate Opposite Whorled

▲ Fig. 1.4 Phyllotaxy

Alternate

- Only one leaf arises at the node.
- No leaf is found just below or above another leaf.
- The leaf arising at the next node is in opposite direction to the previous leaf.
- For example, rose, china rose, etc.

Opposite

- Two leaves grow from each node and are opposite to each other.
- For example, tulsi, jasmine, etc.

Whorled

- A set of leaves grow from each node.
- These leaves are at the same level and form a whorl.
- For example, oleander, asparagus, etc.

Activity 1

Collect leaves of different shapes, sizes and colours. Paste them on a white chart paper and identity the name of the plant they belong to.

Venation

Have you seen fine lines on a leaf? They form various pattern and run within the lamina. Monocotyledonous and dicotyledonous leaves have different pattern of arrangement veins. Veins are responsible for the transport of water, minerals and nutrients into the various parts of the lamina. Veins also provide strength and rigidity to the lamina of a leaf. *Venation* is defined as the arrangement of veins and veinlets in a leaf. There are two types of venation.

1. Reticulate
2. Parallel

Reticulate venation

Reticulate means resembling a network. Veins and veinlets are irregularly distributed over the entire lamina (Fig. 1.5). They look like a network. Dicotyledonous plants show this type of venation. For example, leaves of mango, tulsi and rose.

Enunciation

Venation: ve-na-shun

Parallel venation

This type of arrangement of veins and veinlets show that they run parallel to each other from the base to the tip of the lamina. Monocotyledonous plants show this type of venation. For example, wheat, rice and grass.

Reticulate Parallel

▲ Fig. 1.5 Venation

Wonderment

Dicotyledonous plants have leaves with petiole, whereas monocotyledonous plants have leaves without petiole.

Main Functions of Leaves

1. **Manufacture of food (photosynthesis)**
   - Leaves prepare food for the plant by a process known as **photosynthesis**.
   - The food is prepared in the form of glucose.
   - Excess glucose is converted into starch and stored.
   - During this process of photosynthesis, oxygen is liberated which is the life supporting gas for all living organisms.
   - Photosynthesis takes place in all green parts of plants, which contain the pigment chlorophyll, in presence of sunlight and carbon dioxide.
2. **Exchange of gases (photosynthesis, respiration and transpiration)**
   - Leaves have tiny pores on their surfaces known as stomata. Plants take in oxygen for respiration and carbon dioxide for photosynthesis through stomata.
   - Excess water is given out from the internal tissues of a plant body in the form of vapour through aerial parts is known as transpiration. It also occurs through stomata.

Modified Leaves

In many plants, either whole leaves or parts of leaves get modified to perform special functions. Table 1.2 shows modified functions of leaves.

▲ Table 1.2 Leaf modifications

Leaves Modified for Food Storage	Leaves Modified for Providing Protection and Reduce Loss of Water	Leaves Modified for Support
Some plants have leaves modified as scale leaves to store food and water. They may be thin and dry like in ginger and thick and fleshy like in onion.	A few desert plants show that their leaves get modified and reduced in size and become pointed and spiny. These structures are known as spines. They reduce the loss of water by transpiration and also protect the plant from grazing animals. For example, cactus, prickly pear and Mexican poppy.	Some plants show modified leaves in the form of leaf tendril. It is a thread-like structure that provides support to the weak stem for climbing. For example, pea plant.

▲ Fig. 1.6 Onion

▲ Fig. 1.7 Prickly pear

▲ Fig. 1.8 Pea plant

Modification of leaves in insectivorous plants

Some plants are carnivorous by nature. Let us study one example of the pitcher plant (Fig. 1.9). It is an insectivorous plant. The lamina of leaf gets modified to form a pitcher-like structure and insects get trapped into it. The apex of the leaf forms the lid of the pitcher. Once the insect enters the pitcher, the lid closes and it gets digested with the help of digestive fluid secreted by the inner walls of the pitcher. Some other examples of insectivorous plants are Venus flytrap, Utricularia, etc.

▲ Fig. 1.9 Pitcher plant

Activity 2

Aim: To show that chlorophyll is essential for photosynthesis.

Things required: A variegated leaf and iodine solution

Procedure: Pluck a leaf from a plant that has an unequal distribution of chlorophyll. Pour a few drops of iodine and observe the colour change.

Variegated leaf

Observation: Green part of the leaf will change to blue-black and the non-green part of the leaf will show no change.

Conclusion: Blue-black colour indicates the presence of starch. The non-green part does not turn blue-black, hence, it shows the absence of starch in that part of leaf. This proves that chlorophyll is essential for photosynthesis.

Vegetative Propagation by Leaves

Some plants are able to produce more of their kind through their different parts, such as roots, stem and leaves. This phenomenon is known as **vegetative propagation**. Let us understand this with the help of an example.

Have you noticed the growth of buds on the leaves of a *Bryophyllum* plant? (Fig. 1.10). They develop along the leaf margins and give rise to **adventitious roots**. When these buds fall on moist soil, they grow into new plantlets. *Kalanchoe* is another plant that propagates through its leaves.

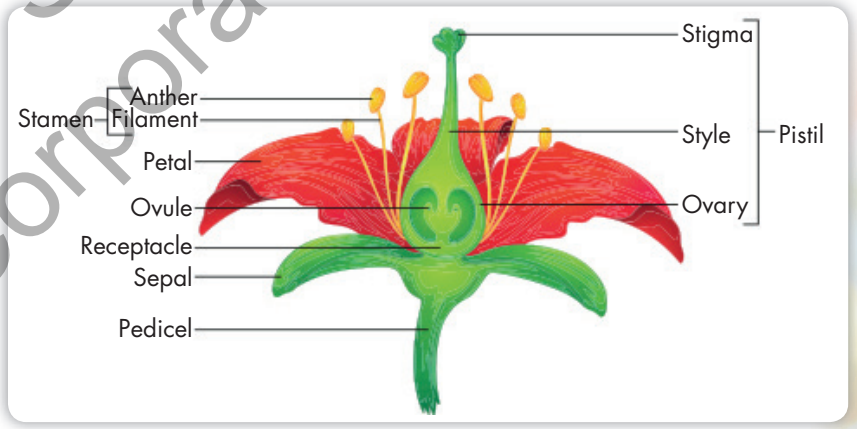
▲ Fig. 1.10 Bryophyllum

Quick check

1. Name the following:
   a. The flat green part of the leaf. _____
   b. The gas used by plants to manufacture food. _____
   c. Arrangement of leaves on the stem at the same node but opposite to each other. _____
   d. Pore present in leaves that help in gaseous exchange. _____
   e. The process by which aerial parts of plants give out water in the form of vapour. _____

FLOWER

A **flower** is a modified and reduced part of shoot for the purpose of reproduction. We see a variety of flowers around us. They vary in size, shape, colour and fragrance. Rose, China rose, mirabilis, jasmine, lily, marigold, etc. are examples of different flowers. Flowers develop from the floral bud present on the stem. They are the reproductive parts of a plant. Figure 1.11 shows the parts of a flower.



▲ Fig. 1.11 Parts of a bisexual flower

Parts of a Flower

- **Pedicel:** The stalk of a flower with which it is attached to the stem.