



### Structure and Function of Plant Cells

Plant cells are made up of several key structures, each with a specific function.

- The cell wall provides strength and support to maintain the cell's shape, while the cell membrane controls the movement of substances in and out of the cell.
- Inside the cell, the cytoplasm is where most chemical reactions occur. The nucleus contains the plant's genetic material and controls its activities.
- Plant cells also contain chloroplasts, which are vital for photosynthesis as they hold chlorophyll, the green pigment that captures light energy.
- Finally, the vacuole stores nutrients and waste and helps maintain pressure inside the cell to keep it firm.

### Differences Between Monocotyledons and Dicotyledons

Flowering plants can be divided into two main groups: monocotyledons (monocots) and dicotyledons (dicots).

- Monocots have only one seed leaf (cotyledon), while dicots have two. Their leaf vein patterns differ too – monocots typically have parallel veins, whereas dicots display a net-like vein pattern. When it comes to flowers, monocots have parts in multiples of three (like 3 or 6 petals)
- Dicots have them in multiples of four or five. Their root systems also vary; monocots usually develop fibrous roots, and dicots form a taproot system.

### The Plant Growth Cycle: From Seed to Seed

The plant life cycle begins with germination, where a seed absorbs water and begins to grow. A small root (radicle) emerges followed by a shoot. This leads to the seedling stage, during which the plant starts to develop leaves and roots. As it continues, it enters the vegetative stage, focusing on the growth of stems, leaves, and root systems. Eventually, the plant flowers, producing reproductive organs. Pollination then occurs when pollen is transferred from the male anther to the female stigma, either by wind or pollinators. This is followed by fertilisation, where the pollen meets the ovule to create a seed. After fertilisation, the ovary develops into a fruit, and the seeds inside can be dispersed to start the cycle again.

### Growing Mediums:

Plants can grow in different growing mediums, each with its own characteristics.

- Soil is the most common medium and is naturally rich in nutrients, but it can contain pests or become compacted.
- Compost, made from decayed organic material, improves soil structure and adds nutrients, but its quality can vary.
- Coco coir, made from coconut husks, is a sustainable option with good water retention but lacks nutrients, so it needs fertilisers.
- Rockwool, a manufactured material, provides a clean and sterile medium ideal for hydroponic systems, though it is not biodegradable.
- Hydroponic systems do not use traditional soil at all; instead, plants grow in nutrient-rich water, leading to faster growth and space efficiency, though these systems are expensive and require careful monitoring.

### Impact of Poor Growing Conditions on Crop Yield

Various environmental conditions can impact crop yield. Insufficient water can cause wilting and reduce growth, while poor drainage can lead to root rot and oxygen deprivation. Without adequate light, photosynthesis is limited, leading to spindly growth and weak plants. A lack of nutrients results in poor development, with symptoms like yellowing leaves and low fruit production. Additionally, pests and diseases can damage crops significantly, reducing the overall harvest and sometimes killing the plants altogether.

### Improving Yields with Fertilisers

To maintain high crop yields, farmers use both natural and artificial fertilisers. Natural options include manure, compost, and green manure (such as cover crops), all of which improve soil health and structure over time. These are environmentally friendly but release nutrients more slowly. In contrast, artificial fertilisers like NPK blends (containing nitrogen, phosphorus, and potassium) are fast-acting and can be tailored to specific crop needs.