

EXPERIMENT NO: 01
STUDY OF PLANT CELL

PRINCIPLE

Plant cells are eukaryotic cells that vary in several fundamental factors from other eukaryotic organisms. Both plant and animal cells contain nucleus along with similar organelles. One of the distinctive aspects of a plant cell is the presence of a cell wall outside the cell membrane. They are rectangular and comparatively larger than animal cells.

Even though plant and animal cells are eukaryotic and share a few cell organelles, plant cells are quite distinct when compared to animal cells as they fulfill different functions. Some of these differences are obvious when the cells are examined under an electron microscope.

Plant cell anatomy

Just like an organ in an animal, plant cells have various components known as cell organelles that perform various tasks and function to sustain itself. These organelles include:

1. The Cell Wall

It is a rigid layer which is composed of cellulose, glycoproteins, lignin, pectin, and hemicelluloses. It is located outside the cell membrane. It comprises proteins, polysaccharides, and cellulose. The primary function of the cell wall is to protect and provide structural support to the cell. The plant cell wall is also involved in protecting the cell against mechanical stress and to provide form and structure to the cell. It also filters the molecules passing into and outside the cell. The formation of the cell wall is guided by microtubules. It consists of three layers i.e., primary cell wall, secondary cell wall, and the middle lamella. The primary cell wall is formed by cellulose laid down by enzymes.

2. Cell membrane

It is the semi-permeable membrane that is present within the cell wall. It is composed of a thin layer of protein and fat. The cell membrane plays an important role in regulating the entry and exit of specific substances within the cell. For instance, cell membrane keeps toxins from entering inside, while nutrients and essential minerals are transported across.

3. Nucleus:

The nucleus is a membrane-bound structure that is present only in eukaryotic cells. The vital function of a nucleus is to store DNA or hereditary information required for cell division, metabolism, and growth.

Nucleolus: It manufactures cell's protein-producing structures and ribosomes.

Nuclear membrane: Nuclear membrane is perforated with holes called nucleopore that allows proteins and nucleic acids

4. Plastids

They are membrane-bound organelles that have their own DNA. They are necessary to store starch, to carry out the process of photosynthesis. It is also used in the synthesis of many molecules which form the cellular building blocks. Some of the vital types of plastids and their functions are stated below:

i. Leucoplasts

They are found in non-photosynthetic tissues of plants. They are used for the storage of protein, lipid, and starch.

ii. Chloroplasts

It is an elongated organelle enclosed by phospholipid membrane. The shape of the chloroplast is disk-shaped and the stroma is the fluid within the chloroplast that comprises a circular DNA. Each chloroplast contains a green colored pigment called chlorophyll required for the process of photosynthesis. The chlorophyll absorbs light energy from the sun and uses it to transform carbon dioxide and water into glucose.

iii. Chromoplasts

They are heterogeneous, colored plastids organelle which is responsible for pigment synthesis and for storage in photosynthetic eukaryotic organisms. Chromoplasts have red, orange and yellow colored pigments which provide color to all ripened fruits and flowers.

5. Central Vacuole

It occupies around thirty per cent of the cell's volume in a mature plant cell. Tonoplast is a membrane that surrounds central vacuole. The vital function of central vacuole apart from storage is to sustain turgid pressure against the cell wall. The central vacuole consists of cell sap. It is a mixture of salts, enzymes, and other substances.

6. Golgi Apparatus

They are found in all eukaryotic cells and are involved in distributing synthesized macromolecules to various parts of the cell.

7. Ribosome's

They are the smallest membrane-bound organelle which comprises RNA and protein. They are the sites for protein synthesis hence they are also referred to as the protein factories of the cell.

8. Mitochondria

They are the double-membrane organelles found in the cytoplasm of all eukaryotic cells. They provide energy by breaking down carbohydrate and sugar molecules hence they are also referred to as the "Powerhouse of the cell."

9. Lysosome

Lysosomes are called as suicidal bags as they hold digestive enzymes in an enclosed membrane. They perform the function of cellular waste disposal by digesting worn-out organelles, food particles and foreign bodies in the cell.