Plant In Envlronment

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Book Author:

Mishaal Ail Mohammed

College member at the College of Environmental Sciences, University of Mosul

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mishaalalanziy@uomosul.edu.iq

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My book is a gift to the soul of my father and mother and my generous family the mother of my sons and my sons (R,Y,D,M)

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INTRODUCTION

The plant is considered the lung from which the world breathes and refreshes the earth on a daily basis by subtracting O2 into the air and ridding the atmosphere of CO2 The presence of the plant in any spot in the earth gives evidence that the environment there is ideal and the ecosystem in it at the highest level and complete with the overlap of living factors, namely the plant and non-living environmental factors such as heat, humidity and ph..... Etc.

The plant in the ecosystem is not only to carry out the process of photosynthesis, but also compete with the rest of the plants on the requirements of continuing life and growth and on the requirements of the process of photosynthesis in the place of the forest, for example, "large trees compete with small trees and shrubs on the light factor and so on the rest of the requirements such as competition for water and nutrients through environmentally adapted root modifications" for that purpose. Plants provide the food chain of plant-eating animals with food, so the plant photosynthesis, which is one of the most important vital process on the globe (which will be highlighted in plant functions in more detail) The product of the process after the inclusion of inorganic CO2 and the presence of light and a complex series of terrestrial processes is complex sugar

compounds when broken down will release the energy that provides the plant with the energy necessary for the continuation of metabolic processes in the plant.

The plant reacts with water as an environmental non-living factor and for the plant to continue to grow (the dry season has been discussed in detail) drought or lack of drought will be in harmony with the tissue root adaptations in desert plants and shade plants.

The movement in the plant compared to the animal is non-existent, but the studies proved that the plant has the ability to carry out physiological movements of phototropism and the movement of the fly sniper plant and this was addressed in the separation of plant movements.

And that the geography of plant distribution had a chapter was addressed plant distribution on various geographical locations according to the nature of the climate, proximity and distance from the equator and the duration of solar radiation and there are short day plants, long day plants, shade plants and sun plants.....etc

The title of this book makes it easier for the specialist in the field of ecology to see the environmental biology of plants and gives an ecological view of the plant as part of the living factors that intervene with non-living environmental factors in the ecosystem..... I hope I have added something to your knowledge in the field of biology.

Mishaal ali Alaniz

Chapter one

INTRODUCTION TO BOTANY

CHAPTER ONE

INTRODUCTION TO BOTANY

The oldest plants identified by ancient man and wheat occupied the first place among grain crops for its superiority in nutritional value has been found wheat grains charred in the excavations of the village (Garmo) eastern Iraq and is the oldest village has been discovered dating back to (6700 BC). It accompanies man in his food as well as in the manufacture of ships, houses, and hunting weapons... For these reasons, botany gained importance.

Botany:

Botany is one of the branches of biology and specializes in the study of plants in terms of structure, properties, classification, diseases, biochemical reactions, and interaction with the environment, and human interest in plants began early for their importance in his life, as it is a major source of food and medicines

Departments of Botany

1. Plant Morphology.

The science of phenomorphology deals with the structure and shape of plants and includes some subdivisions such as cytology, cell study, history, histology, anatomy, the

study of tissue organization in plant organs, the study of life cycles, and the study of evolution and development, as this science describes the shape of the plant in all its parts from roots to leaves, flowers, and seeds.

2. Plant physiology.

is a branch of botany, which includes all the internal chemical and physical activities of plants, and it is also concerned with studying the functions of all the organs of the plant, explaining how these organs perform their functions, and also including ways in which the plant produces and exploits its food, and how to help the different cells of the plant to grow and multiply, and how the plant responds to the surrounding world.

3. Plant taxonomy:

is a science responsible for the classification and naming of plants, taxonomy divides plants based on their relationships with each other, and is also interested in the study of plant remains, and fossils, and this science or modern taxonomy was established thanks to the Swedish science Carlos Linnaeus, and modern classification uses a binary naming system.

4. Plant Genetics:

Genetics is the study of genes, and the function of genes, and many modern plants have been analyzed to use plant DNA and their genomic information, in order to study plants more accurately than before, molecular biology has opened up to taxonomists to classify plant species based on DNA, and plants have been classified into different families, and renamed as a result.

5. Plant pathology: (plant epidemiology)

Is the scientific study of diseases affecting plants caused by pathogens (infectious organisms) and environmental conditions (physiological factors), including organisms that cause infectious diseases, fungi, bacteria, and viruses.

One of the most important botanists in history:

1. Aristotle (384-323 BC)

The summit of the Golden Age of Plant Sciences established the first botanical garden and attributed botany to the proportion of water it contains. So do the longevity of

trees because of their low water content and the short life of herbs due to their large water content.

2. The Greek philosopher Theophrastus (371-285 BC) or an attempt to divide plants divided into trees, shrubs, and herbs and defined the plant parts into roots, stems, and leaves according to their functional characteristics.
3. Descoris (37 BC) was the first to write about the science of plant medicine.
4. The Arabs have a long history of translating the works of the Greeks and added a lot of their own studies.
5. Jabir Ibn Hayyan (700-765 AD) is concerned with the chemical composition of the plant.
6. Ibn Sina (980-1037 AD) was interested in medicinal plants.
7. Ibn al-Bitar (1197-1248 AD) was born in Spain and traveled in search of plants to Tunisia, Egypt, Syria, Hijaz, and Iraq and described 400 plants he saw.

In the seventeenth and eighteenth centuries, the modern scientific renaissance began, and scientific societies and academies appeared, so the discoveries and studies that had a great impact on the prosperity of various scientific researches and the most important scientists for that period

1. Levenhoek (1632-1732 AD)

Made composite lenses and discovered and drew bacteria.

2. Robert Hooke (1632-1702 AD) defined the cell as the unit of structure in plants.

3. Marcello malpighi: (1628 – 1694 AD)

Discovered the stomata in the leaves and knew their usefulness and discovered the plant's breathing and stressed the importance of leaves in making food.

4. Carl Linnaeus

(1707 – 1778 AD A Swedish scientist classified plants according to their structure and similarity with other species, and gave all known plants a two-syllable name, which is known by the binomial nomenclature that is still used today.

And from specialists in the field of botany at the University of Mosul, where I work and learned a lot from them.

From the Department of Biology at the University of Mosul, the department from which I graduated .

The Prof. Dr. Abdul Muttalib Sayed Muhammad Ali Al-Araji (1945-2022).

He has many contributions in the field of plant physiology and plant tissue culture technology and has five patents and books in the field of botany and photosynthesis and providing the library with many master's and doctoral theses in the field of botany.

Plant cell

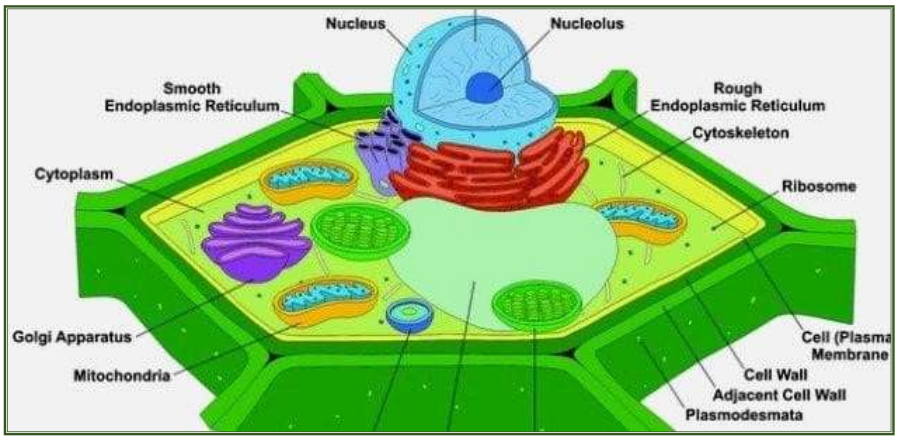


Figure1: Plant cell

The structure of the plant cell varies according to the functions it performs, it generally contains organelles in the animal cell itself, in addition to chloroplasts and a number of large vacuoles.

1. **Plasma membrane:** It is a very thin membrane that surrounds the cell, and plays an important role in the passage of nutrients and waste into and out of the cell. The cell wall in both animal and plant cells and bacteria is made up of protein complexes and phosphorylated lipids. One of its functions.

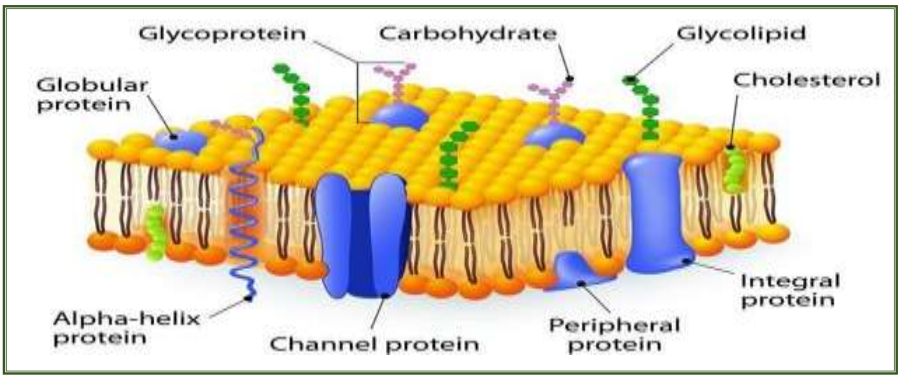


Figure 2: Plasma membrane

a. Cytoplasm preservation

b. Regulating the entry of food and waste into and out of the cell.

c. Cell protection

2. **Cytoplasm:** It is the protoplasmic mass where the organelles of the cell are embedded in it. At present, it is believed that not all essential compounds combine with specific organelles found in the cytoplasm. Most enzymes are found in the cytoplasm.

Organelles are located in the cytoplasm

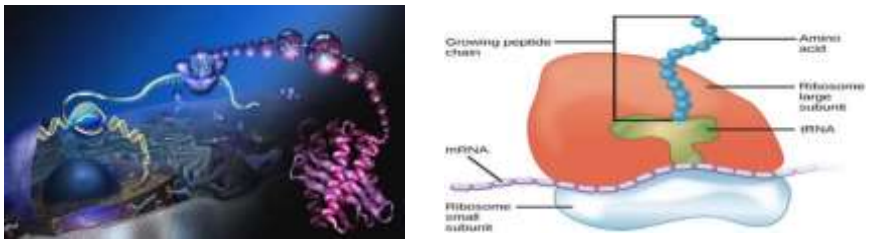
a. Endoplasmic reticulum and ribosomes: The endoplasmic reticulum is a network of closed-branched membrane channels that penetrate the cytoplasm and do not open in it, but connect the plasma membrane in the nuclear envelope (a membrane surrounding the nucleus).

In the cell, there are two types of endoplasmic reticulum, one smooth and the other rough-surfaced, covered with existing granules containing 80% of the RNA in the cell, and these granules are called ribosomes, which are a plant for building proteins on the cell.

Among the functions of the endoplasmic reticulum are: the formation of lipids and the transfer of products of structural processes.

Ribosomes

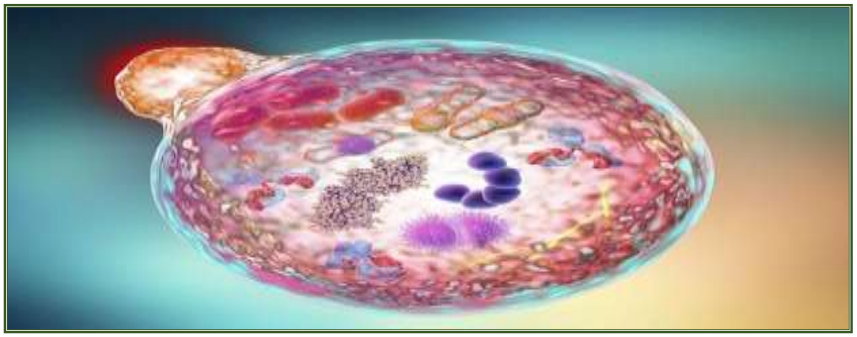
Ribosomes are found in the cell either accompanied by the endoplasmic network or free in the cytoplasm or in the mitochondria or plastids and range in diameter between 0.1 - 0.3 microns and contain 50-60% RNA acid and 40 - 50% protein, meaning that it is a collection of RNA molecules and protein and the common RNA in the construction of the ribosome is called RNA (r- RNA) and ribosomes are usually found in cluster groups or in the form of swimming or polyribosomes, which are the active places for the representation of peptides when they are associated with messenger RNA or(m-RNA).



Figuer3: Ribosomes

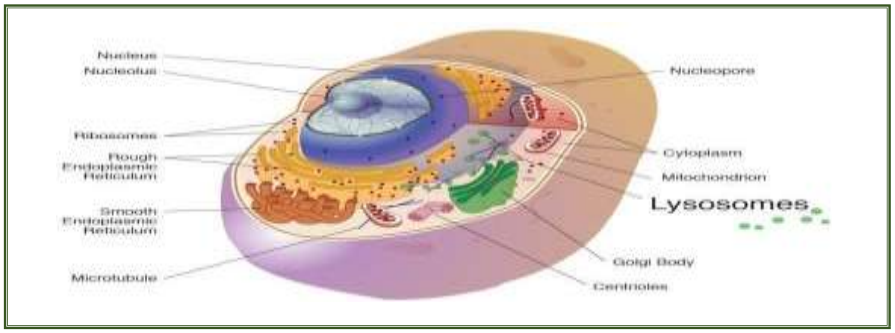
b. Golgi complex: are vesicles stacked in parallel rows with smooth membranes, and often the body of Golgi complex to a channel and acts as a station in the way of transporting materials produced from other organelles, for example, in some cells Golgi bodies work to store proteins formed in the endoplasmic network temporarily in order to transport and secrete out through the cell membrane The Golgi system forms secretory substances, such as the raw materials that make up enzymes.

c. Lysosomes:



Figuer5: Lysosomes

The lysosomes form the digestive system in the cell, as they contain a number of decomposing enzymes that have PH in an acidic range and have the ability to digest organic matter, where the lysosomal bodies merge with various organic substances and enzymes work to digest them and then put the digestion products into the cytosol, where the cell benefits from them as a food source or energy source, and when the cell dies or is harmed and the membrane of the current particle is torn, the decomposing enzymes will be liberated and lead to the analysis (digestion) of the cell contents Auto degradation.



Figuer6: plant cell with Organelles

The body of an adult plant consists of organs such as roots, stems, leaves and reproductive organs represented by flowers in anthophyta and cone cones in gymnosperm. The life of flowering plants begins with the seed and the seed contains an embryo, seed coat shell and stored food, usually stored in either cotyledons or endosperm.

Mitochondria:

The cell needs energy to carry out its various activities and mitochondria are the center of energy generation in the cell, because many chemical reactions that include the oxidation of nutrients and the production of energy from them occur inside the mitochondria under the influence of enzymes contained inside

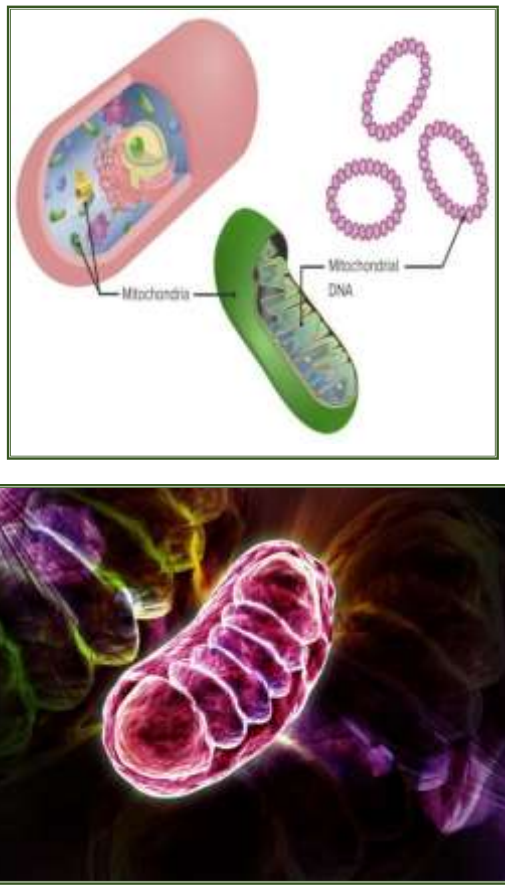


Figure 7: Mitochondria under electron microscopy

d. Plastids: Plastids are found in most plant cells and algae and are divided into three types:

- **Chloroplasts:** They contain the green pigment known as chlorophyll pigment, and these plastids carry out photosynthesis
- **Colored plastids:** They contain colored pigments in addition to chlorophyll pigment, which gives flowers and fruits different colors
- **Colorless plastids:** do not contain dyes and store starch, fat 3.

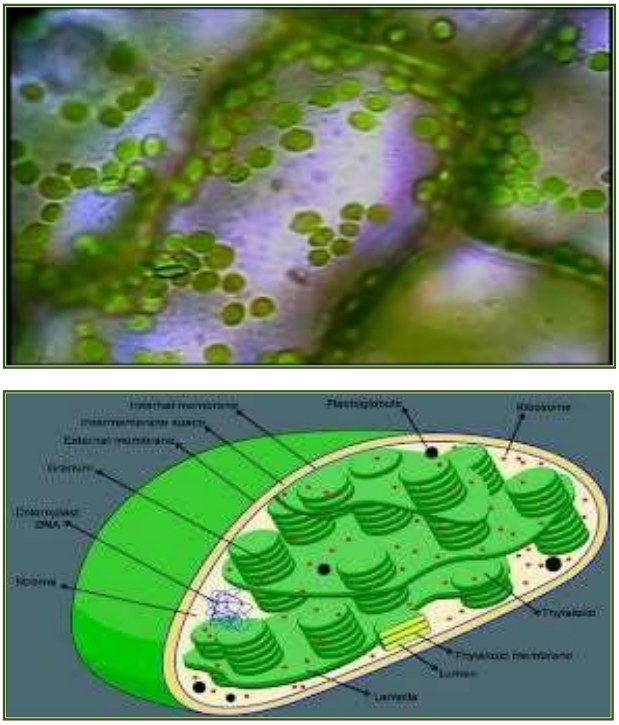


Figure 8: Chloroplast

e. **Gaps:** Membrane bags are found in animal cells in large numbers and small sizes and there are in plant cells gap or two large gaps occupy most of the cell space and contain gaps in plant cells on salts, candies and toxic substances in addition to some dyes that gain flowers different colors, and gaps gain plant cells strength and fullness.

3. **The nucleus:** The most important component of the cell is the nucleus, which is the center of vital activities in the cell and without it the cell dies. It carries genetic traits and transfers them from one cell to another and from one generation to another through division.

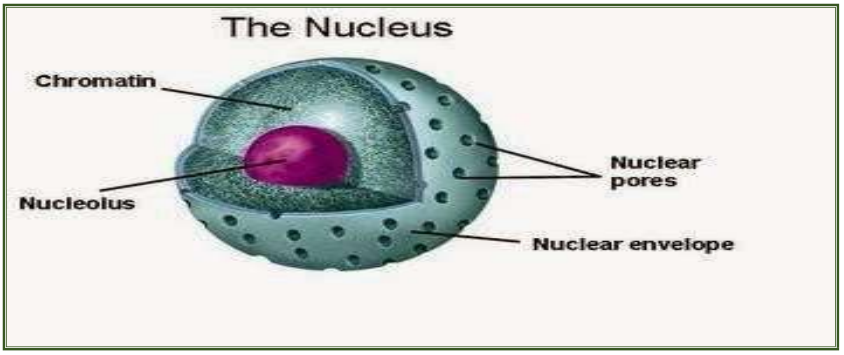


Figure 9: The nucleus

Components of the nucleus:

1. Nuclear envelope: A double shell that surrounds the nucleus and is penetrated by many holes and works to regulate the passage of materials to the cytoplasm.

2. Nuclear fluid: fills the cavity of the nucleus and other components of the nucleus swim in it.
3. The nucleolus is one or more spherical particles and has an important role in the construction of ribosomes.
4. Chromatin: When the cell is not in a state of division, it contains a network of filaments and granules called chromatin (chromatin reticulum) and consists of two substances:

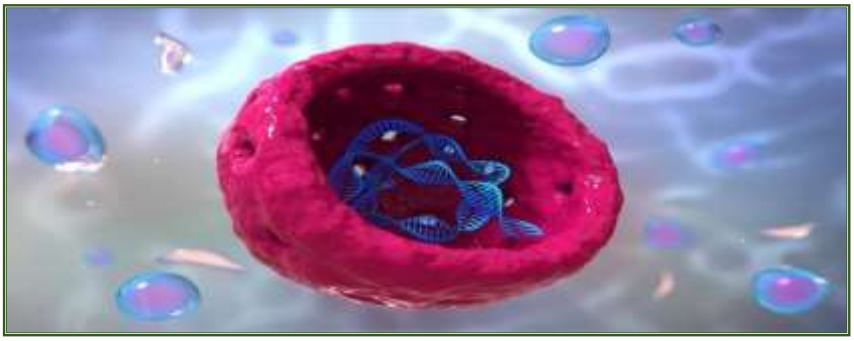


Figure 10: Protein B- DNA

A- Protein B- DNA: DNA, which is the genetic material in the cell appears in the form of filaments called chromosomes, and each chromosome carries thousands of genetic genes consisting of DNA that determine the characteristics of the organism and transfer traits from parents to children. The adult plant body is a group of structural units, which are called cells (single: cell) cells, and the cell is defined as the unit of structure and function in the

body of the organism, and a group of cells is held together to be the so-called tissue, so the tissue can be defined as a group of cells that are synthetically and functionally associated and with a special location.

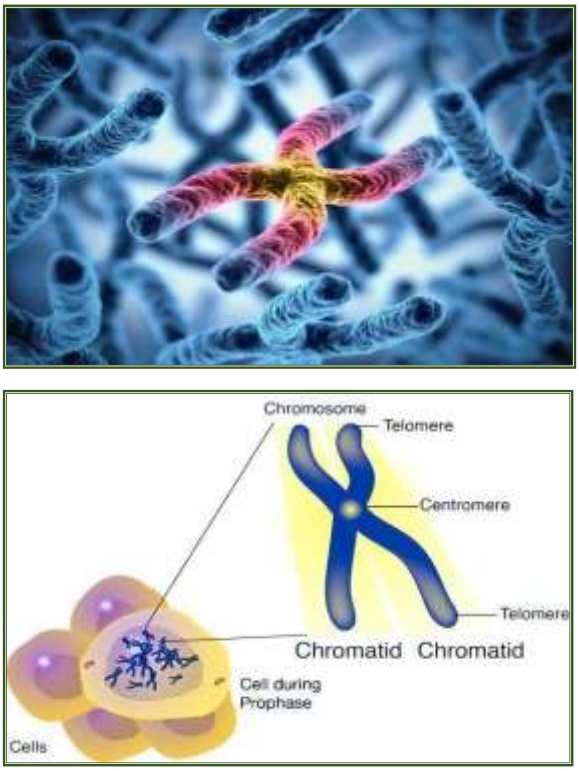


Figure 11: Chromosome

Primary wall: When the middle plate is formed, the cell increases in size and elongates, and this elongation is accompanied by imbibing the middle plate with three types of compounds:

1. Cellulose.

2. Hemicellulose.

3. Glycoprotein.

(Carbohydrate pool protein) and this sedimentation results in a thin layer thickness of 1-3 microns and this layer is called the inner surface of the median plate and the outer surface of the plasma membrane primary or primary wall. Many plant cells contain only the primary wall such as meristem cells, epidermal cells, and cells involved in metabolism. The primary walls are characterized by their elasticity as a result of the flexibility of their installation, but when new components of the walls are deposited on them, they lose part of their elasticity

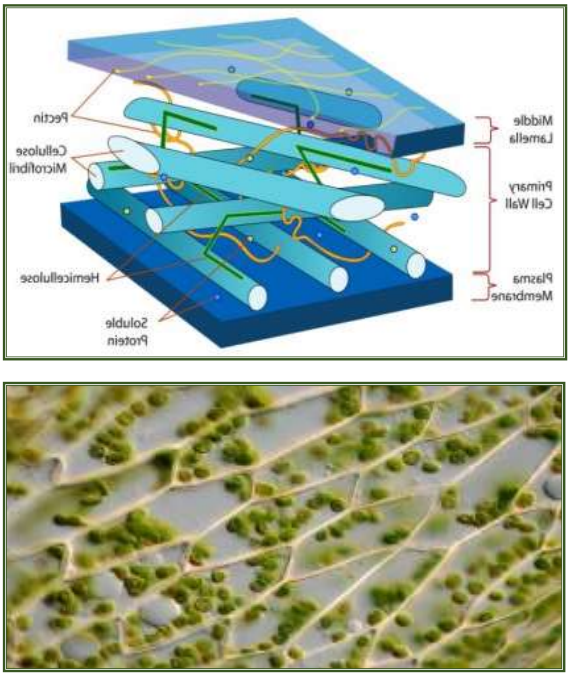


Figure 12: Primary wall

Secondary wall: When the secondary wall is formed in parenchymal cells the cell ceases to elongate. While in other cells, such as bronchioles, the wall continues to thicken after the elongation of the cells stops by depositing layers of cellulose and lignin to form the secondary wall. The thickness of the secondary wall varies between 5-10 microns and by the end of the deposition of the secondary wall, the wall loses a lot of its elasticity and eventually becomes completely non-elastic. The thickening of the secondary wall can lead to the filling of most of the cell volume and this causes the death and decomposition of the protoplasm. Many of the secondary walls contain lignin, a polymerized alcoholic substance derived from phenyl propane compounds, which is found in the wall with hemicellulose and other cellulose-related compounds. Phenyl propane compounds and found in the wall with hemicellulose and other compounds associated with cellulose.

Classification of tissues

Tissues in the plant body can be divided based on the following foundations:

1. Depending on the location.

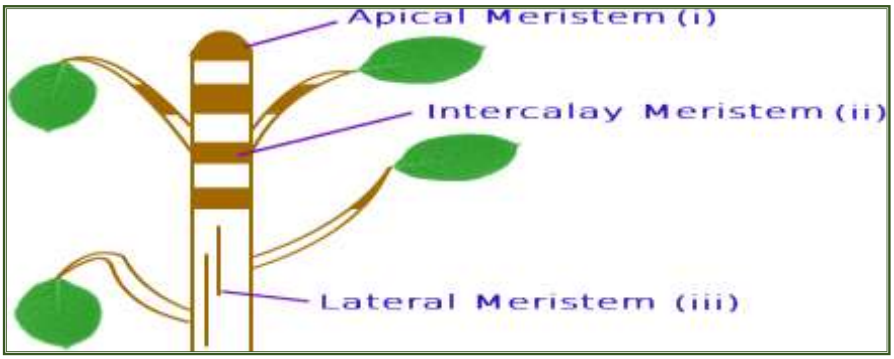


Figure 13: Type of tissues

2. Type of tissues:

Simple tissues: They are tissues made up of a group of cells similar in their characteristics, such as skin tissue, parenchyma tissue and collenchyma tissue.

Compound tissues: They are tissues made up of more than one type of cells that differ in their characteristics, such as wood and phloem.

3. Origin and Development

It is divided based on origin and stage of growth into (meristem tissues and permanent tissues).

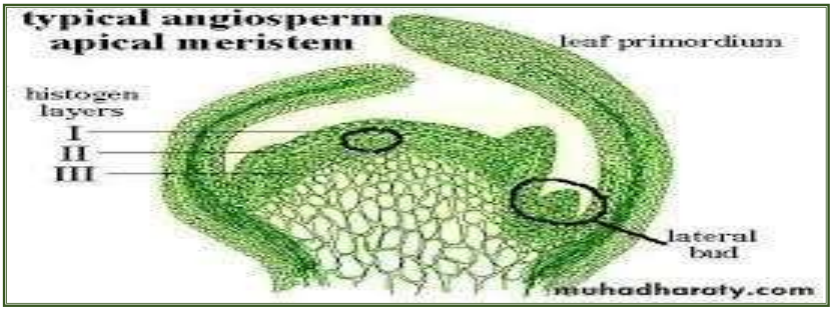


Figure 14: meristem tissues

4. Function

Such as connective, transporter, secretory tissue and others.

Root

One of the most important parts of the plant, which is heading towards the ground away from the light and does not contain nodes and phalanges and surrounds the end of the hood root cap and there is a difference in the tissue between the root and the stem. The root system originates from the radical, which grows into the primary root, which in turn branches into secondary roots and tertiary ... etc.

The root consists of the following zones (starting from the bottom towards the top):

1. **Root cap calyptra:** A group of cells that protect the apical and root meristem.
2. **Apical meristem:** A group of meristem cells whose function is to divide and generate new cells.
3. **Elongation region:** It is the area that includes the primary meristems, which will be the body of the primary plant later, represented by (protoderm-- ground meristem).
4. Maturity zone or root hair region.

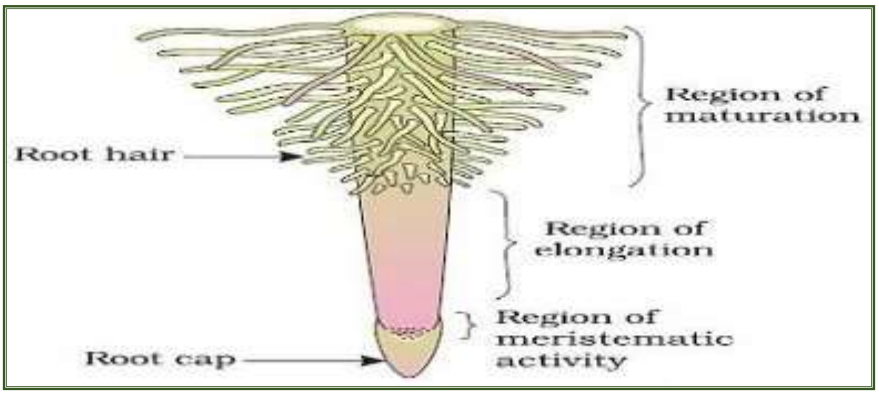


Figure 15: Root

The ripening area at the roots can be distinguished the following layers:

1. Epidermis

The absence of cuticles indicates the presence of a thin layer of cuticles, sometimes, and in the case of permanent skin, cell walls may be formed.

The epidermis consists of a single row of Uninervate and may be multi-seriate, as in the velamen layer in the aerial roots of orchids of the family Orchidaceae, as well as plants of the family Araceae that live on other plants, where it is filled with water in case of wet weather and with air in case of dry weather and are densely walled and densely reticulated, spiral or peaceful.

They are characterized by the presence of root hairs: they arise as protrusions from the walls of epidermal cells,

however, in some plants there are special cells in the epidermis called trichoblasts or piliferous, that is, wild cells that can be root hairs and are characterized by being small, as they arise from uneven divisions of epidermal cells. (Most aquatic plants have roots without root hairs, but they form when they move into the soil). It turns out that there are types of epidermal cells that specialize in the formation of hairs and other types, all their cells have the ability to form hairs in the genus Citrus, sometimes root hairs are observed from a layer located under the epidermis. In the area where the hairs wither, the epidermal cells may turn into exodermises, as in the perennial of the plant, in which secondary thickening does not occur, but most often the cells of the outer shell turn into exodermises.

2. Cortex:

They are characterized by being homogeneous and simple cells, but they contain different types of cells, and the degree of others depends on the period in which they remain. In plants that suffer from secondary growth when the cortex falls off early, the cortex consists mainly of parenchymal cells, while the roots that retain their cortex, as in cotyledons, in addition to parenchyma, sclerenchyma and possibly collenchyma cells are formed.

In the roots that grow characterized by the inner layer of the endodermis inner shell, its diagonal and transverse walls contain the Caesarian strip, which is part of the primary wall.

3. The crust of the roots, as well as the ground stems, is characterized by the thickness of the crust compared to the stems in order to center the wood tissues in the center away from external influences.

4. The Roots are most likely the outer shell layer of exodermises, which is a special layer located under the epidermis or Cork, and it is very similar to the inner shell in terms of structure and function and is found in topless and covered with seeds and is less present in low vascular plants, but it is found in single cotyledons with an almost continuous layer.

5. May contain secretory cells.

6. The cortex at the roots is devoid of cholinergic cells, but it may contain fibers as a supporting tissue.

7. In the area of the root capillaries, the cortex consists of only parenchymal cells.

The roots are divided into the following:

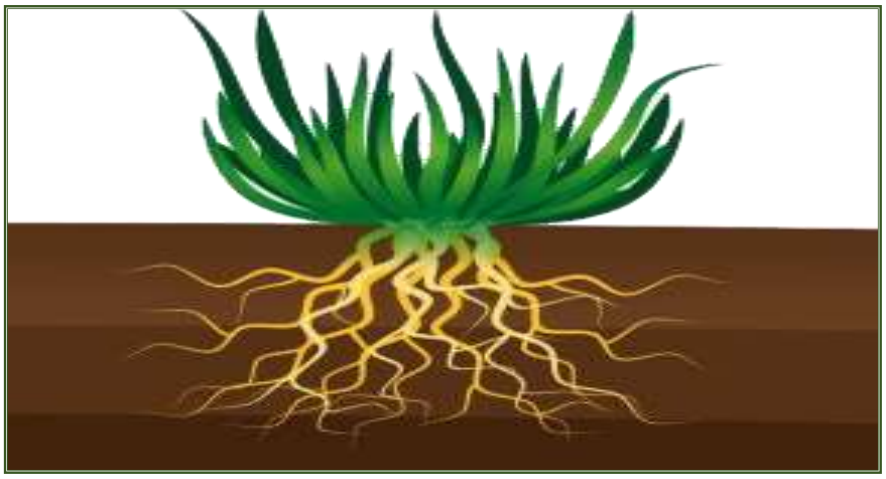
1. Tap root system in this system, the root arises from the root Radical, when the root grows to root primary, which in turn grows in a vertical direction in the soil, forming a root and a valley, and this system is usually found in the two cotyledons. The root in this system takes different forms, including:

a. **Normal:** these are thin roots that are not thickened, as in the Aster, bitter Sonchus, and Vicia beans.

b. **Fleshy root:** which is the roots of fleshy enlarged stored nutrients and be in different forms may be conical in shape as in the carrot and be this type of roots wide at the base and gradually tapering towards the top or be the form of Fusiform as in white radish Raphanus sativus or Lvti (Mtkoor) Nidiform as in Alshalgham (turnip) Brassica rapa or be rounded Globiform and red radish Beta and may be cylindrical as in white radish sometimes

2. Adventitious root: a group of roots originating from any part of the plant except the root and types:

a. Fibrous root, filamentous shape and come out or arise from the base of the stem as a result of the death of the Primary root as in grasses, and may arise from the nodes in thestems as in (strawberry).



Figuer16: Fibrous root

b. **Tuberous root:** t is the roots that store, and these are either grouped, as in the potato sweet potato Ipomoea, Dahlia, and the asphodelous plant, or they are monomorphic, in which the root has bulging parts, as in the asparagus plant, and the root resembles a bean.

c. **Prop root:** these are roots originating from the lower stem nodes, and these roots are not branched until they reach the soil in the Zea mays plant.

d. **Parasitic root:** these are special structures sent by parasitic plants within the tissues of the host plant and are called suckers, as in the dodder plant Cuscuta *europaea*

Figuer17: Parasitic root

e. **Floating root:** Which is called respiratory roots, as in the Shura plant or Avicennia officinalis.

Figure18: Floating root

f. **Aerial root:** comes out of the stem and helps to climb as in the rope of the poor Hedra Helix and sometimes absorbs water and salts directly from the rain as in the case of epiphyte.

Figure 19: Aerial root

g. Contractile root: there are some bulbs and corms, these roots work to pull the plant down, where the percentage of moisture is higher than the areas near the soil surface and these plants prevent the soil from drifting.

Figuer20: Contractile root

Root function

1. Stabilization: It helps the plant to settle in the ground steadily and erect in front of environmental factors.

2. 2.Absorption: One of the most important things that is done by the absorption of water and the nutrients it contains, which is the means of survival and continued growth and completion of the process of photosynthesis that depends on absorbed water.
3. Prevent soil erosion from the movement of water and wind and work to bind the molecules together.
4. Storage: The root stores food as in carrots, radishes and beetroot
5. 5.Reproduction: Although the roots are not a "proliferative" organ, some plants are means of reproduction, such as herbs, jasmine and some creeping plants, and this reproduction is known as vegetative propagation.
6. Environmental importance in the event of soil erosion will provide food and space for many living organisms.

Stem

The part of the plant that is often above the soil surface The stem is characterized by the presence of nodes and internodes, usually bearing leaves at the node area, as well as buds and sometimes scales.

The internal structure of the Stem

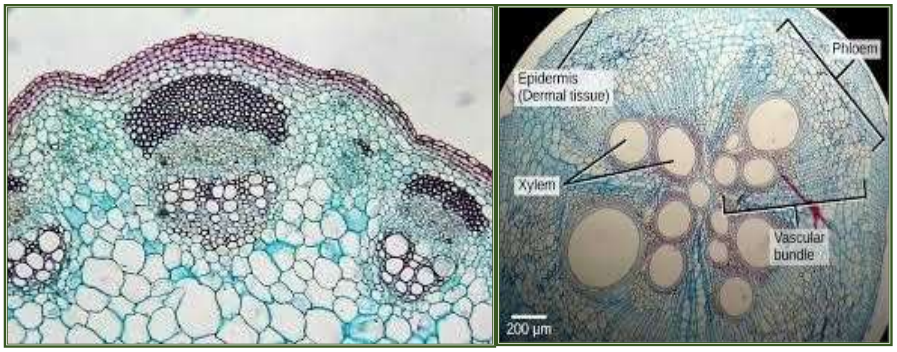
Is considered more complex than the root because the stems carry leaves and branches in addition to reproductive organs, as well as the presence of nodes and phalanges, but they can be considered somewhat similar in terms of the presence of three tissue systems (Dermal tissue system, Ground tissue system, Vascular tissue system), however, there are differences between the two and have been compared

The stem carries the leaves, exposes them to sunlight, delivers water and raw materials from the root to the leaves, and distributes nutrients to the parts of the plant. Photosynthesis when green as well as storing nutrients

Figuer21: Plant stem components

The stems are of different types, they may be airy, or the stems are ground. Some stems are modified know (the

modified stems),Anatomically, when taking a transverse section of the stem, the following layers can be observed (from the outside towards the inside).



Figuer22: The internal structure of the Stem

1. Epidermis:

Epidermis

The absence of cuticles indicates the presence of a thin layer of cuticles, sometimes, and in the case of permanent skin, cell walls may be formed.

The epidermis consists of a single row Uniseriate and may be multi-seriate, as in the velamen layer in the aerial roots of orchids of the family Orchidaceae, as well as plants of the family Araceae that live on other plants, where it is filled with water in the case of wet weather and air in the case of dry weather and are densely walled and densely reticulated, spiral or peaceful.

They are characterized by the presence of root hairs: they arise as protrusions from the walls of epidermal cells, however, in some plants there are special cells in the epidermis called trichoblasts or piliferous, that is, wild cells that can be root hairs and are characterized by being small, as they arise from uneven divisions of epidermal cells. (Most aquatic plants have roots without root hairs, but they form when they move into the soil). It turns out that there are types of epidermal cells that specialize in the formation of hairs and other types, all their cells have the ability to form hairs in the genus Citrus, sometimes root hairs are observed from a layer located under the epidermis. In the area where the hairs wither, the epidermal cells may turn into exodermis, as in the perennial of the plant, where secondary thickening does not occur, but most often the cells of the outer shell turn into exodermis,

2. Cortex:

It is characterized by being homogeneous and simple cells, but it contains different types of cells, and the degree of others depends on the period in which they remain . In plants that suffer from secondary growth, when the cortex falls off early, the cortex consists mainly of parenchymal cells , while the roots that retain their cortex, as in cotyledons, in addition to parenchyma, sclerenchymal and

possibly colenchymal cells.In the roots that grow characterized by the inner layer of the endodermis inner shell, its diagonal and transverse walls contain the Casparian strip, which is part of the primary wall, the crust of the roots, as well as the ground stems, is characterized by the thickness of the crust compared to the stems in order to center the wood tissues in the center away from external influences.

The Roots are most likely an outer shell layer exodermis, which is a special layer located under the epidermis or filamin, which is very similar to the inner shell in terms of structure and function and is found in topless and covered with seeds, and its presence is less in low vascular plants , but it is found in single cotyledons with an almost continuous layer.

Endodermis: the collenchyma and sclerenchyma tissue performs a supporting function.

In the stems, there is difficulty in determining the inner shell layer of the Stele due to the lack of differentiation of the endodermis layer, unlike the root, but in some herbaceous plants it may be distinguished as a store of starch, so it is called Starchsheath. The endoderm cells, if they exist, are characterized by consisting of monolithic cells and are alive, their diagonal and transverse walls contain

Casparian strips and sometimes Suberin lamellae on each inner wall, and a secondary layer of malachite cellulose may sometimes be added on the inner side of the suberin sheets that the inner shell may be visible in some dicotyledonous plants such as Helianthus and Tropaeolum, and the inner shell is also visible in some lowland plants such as Polypodium and equisetum, as well as in some aquatic plants, is sometimes found between the vascular cylinder and the pulp as in

Marsilea and in some ferns, such as Dryopteris, the endoderms are surrounded by single vascular bundles, while in seeds they are clearly visible in the roots. In the ground stems, such as rhizomes, there is a clear inner shell, but in some plants the inner shell is formed when the plant blooms. endodermis inner cortex:

It is the last row of cells of the cortex, followed by the surrounding circle, and is distinguished by its clarity at the roots, unlike in the stem.

Disappear after secondary thickening, most often in the absorption zones, the diagonal and transverse walls are surrounded by the Casparian Strip Strip (which is a component of pectin, Cyrene, or both), and this strip is

considered part of the primary wall because it penetrates into the middle plate and the Protoplast adheres to it.

Kaspar tape is characterized by being impermeable to water, raw materials, or food

Endodermis is divided into two types:

1. Primary Endodermis: characterized by the thinness of its walls, where the Caspar strip extends around the diagonal and transverse walls, this type of inner shell is found in triads and some dicotyledons.
2. Secondary Endodermis: the diamond internal walls and diagonal walls are permeated where cyprene is deposited on the primary walls, including the Caspary tapes, sometimes all the walls are permeated, in the case of the presence of this type of veneer, special cells remain called transit cells or passage cells, which are fine-walled cells found in the outer or inner veneer when cells are thickened with secondary walls and are located opposite the arms of wood and are and the vascular roller. In this type of secondary inner shell, cyprian is added so that it covers all the walls, and thus the Caspar Strip will be separated from the cytoplasm, and then a thick layer of cellulose, there is a cyprin layer and sometimes they stain this wall so the Strip cannot be distinguished and the wall

is described as secondary . This shell is found in monocotyledons and some dicotyledons.

Exodermis outer shell:

One or more layers of the cortex located under the epidermis often distinguish the subepidermal cortical layers at the root into a tissue that protects the plant or an internal tissue that contains the substance cyprian in its walls. Some researchers call this layer hypodermis for both the root and the STEM, but some use the term exodermis for this layer at the root. Exodermis is structurally similar to endodermis, it may contain a Caspar Strip, but it contains a plate of cyprian on the inside of the primary wall, and layers of cellulose are usually deposited on it. The outer shell may consist of one to several layers of cells and may be accompanied by sclerenchyma. The outer shell is either made up of long, probed cells, as in Angelica, flax, and lettuce, or it is made up of short, non-probed cells, as in the onion Allium cepa

Peripheral circuit pericycle

1. It consists of one or two layers and rarely more than two layers, as in *Aloe vera* plant
2. The surrounding circle may be continuous or intermittent in the case of wood arms reaching the endoderms.

3. The cells of the surrounding circle either consist of parenchymal cells with sclerenchyma cells and sometimes some elements of the first wood protoxylem.
4. It may consist of several layers opposite the bark and one layer opposite the arms of the wood.
5. It loses its distinctiveness and turns into meristematic cells (Corky Cambium, lateral roots and part of the vascular cambium).
6. They contain secretory channels, as in the roots of plants of the family Umbelliferae.
7. It may be overgrown with alkene or cyprin – the aged roots of monocotyledons.

Both Xylem and bark tissue are located in the primary root on equal radii, the bark is in the form of strips near the perimeter of the vascular cylinder under the surrounding circle, and the wood is in the form of strips interchanging with bark strips or occupies the center. the xylem may occupy the center or may leave a narrow space for the pulp, separating the parenchyma tissue between the xylem and the bark tissue. As for the single cotyledon atoms, the core is wide. For Wood, the location of the first wood is outside, i.e. Exarch, the number of arms of wood varies according to different plant groups .in dicotyledons, the number of arms

ranges from 2-8 (-11 or -12), But in single-cotyledons, it ranges from 15-20. the number of arms may be constant or variable and the root is called based on the number of arms diarch, Triarch or Tetrarch to polyarch, as in the Bengal fig.

Central cylinder

bordered from the inside by endodermis inner shell. Vascular cylinder Vascular cylinder Namely, the central part of the root

Vascular cylinder= Vascular system + associated parenchyma

They are limited by the layer of the circumferential circle. Both wood and bark are located in the primary root on equal radii, the bark is in the form of strips near the perimeter of the vascular cylinder under the surrounding circle, either the wood is in the form of strips interchanging with the bark strips or occupies the center . The wood may occupy the center or may leave a narrow space for the pulp, separating the parenchyma tissue between the wood and the bark . As for the single cotyledon atoms, the core is wide . For Wood, the location of the first wood is outside, i.e. Exarch, the number of arms of wood varies according to different plant groups .in dicotyledons, the number of arms ranges from 2-8 (-11 or -12), But in single-cotyledons, it ranges from 15-20. the number of arms may be constant or

variable and the root is called based on the number of arms diarch, Triarch or Tetrarch to polyarch polyarch, as in the Bengal fig.

It is worth noting that the number of wooden elements decreases by increasing the number of wooden arms and vice versa . The elements of the first wood protoxylem are located outward, ripens early and the thickening is spiral, ladder or annular, so the tubes or vessels are able to expand and elongate during root growth, while the other wood elements mature late and the thickening is reticular or annular and is less stretchable and the capacity of the tubes increases near the center in dicotyledonous plants.

Stems are divided into:

1. **Ground or dirt stems:** Stems growing below the surface of the soil and can be distinguished as containing

The stems consists of nodes and phalanges, These are divided into:

a. Rhizomes as in The green gospel and reeds.

b. Onions and garlic.

c. Tubers: Potatoes and mezze.

2. **Air stems:** Regular stems grow above the ground
3. **Water stems:** Stems grow in water, either floating or submersible.
4. Types of air stems

a. winged Strems: It has longitudinal growths extending along the stem

With angles and divided into:

1. **Tri-angle:** Saadian family Cyperaceae.
2. **Quadrangular:** Labiatae oral family.

3. **Cylindrical:** as in the family Poaceae and includes hollow :wheat, barley, reeds. And Bamboo.

4. Erect grows vertically above the soil surface as in raspberries.

5. Weak stems are divided into:

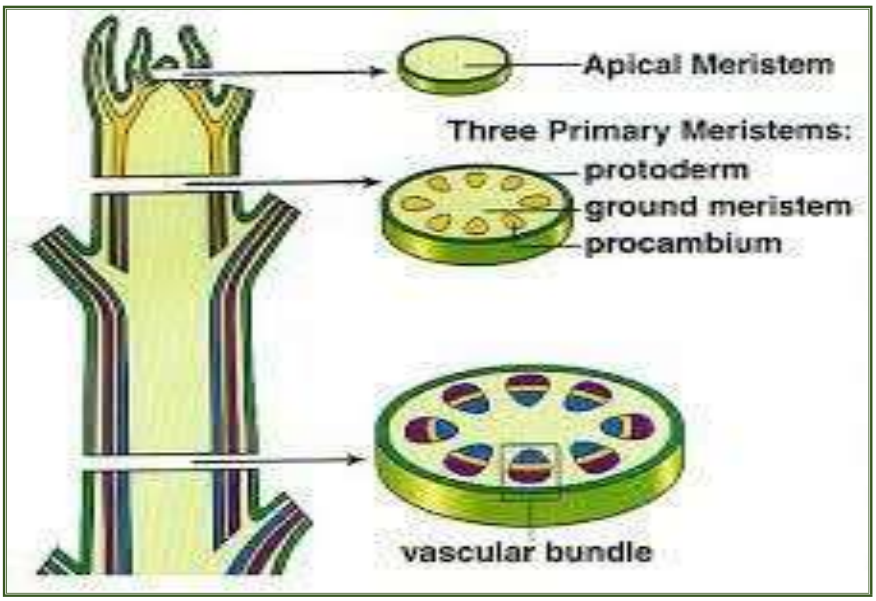
a. Prone and divided into:

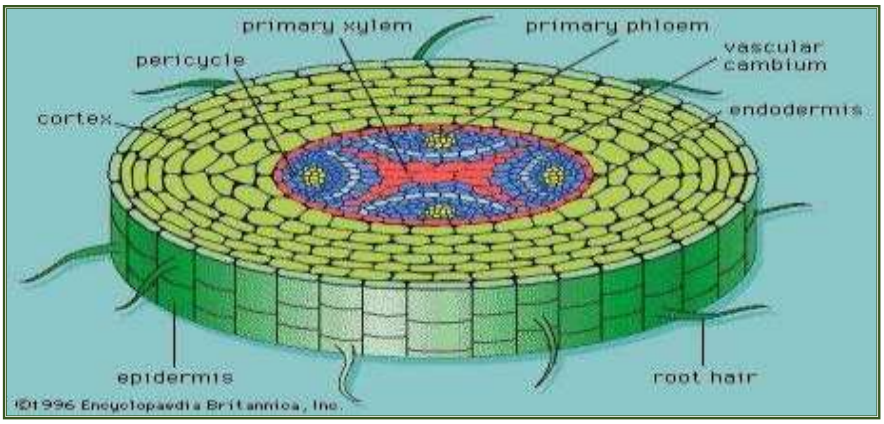
- Procumbed stem raised top
- Creeping: The air stems of the broad tail

b. Wrapped: Telephone rose.

c. Climber: Climbing by claws.

The internal structure has the following layers (from the outside towards the inside)





The most important function of the plant stem is:

1. Support for the aerobic vegetative body .
2. Delivering water and nutrients from the roots to the rest of the plant.

Table2: the difference between Root and stem

	Root	Stem
1	Carries thin-walled unicellular bristles	It carries single-celled multicellular bristles with a cuticle
2	The skin is devoid of cuticles and stomata	Cuticles and stomata are present
	The skin specializes in the absorption process	The skin specializes in Plant Protection
3	The shell is wide	The shell is narrow
4	The outer layer of the cortex exodermis sometimes performs a protective function	The outer layer of the hypodermis cortex may be of a collenchyma or sclerenchyma nature, specialized in Plant Protection

	Root	Stem
5	The inner shell of endodermis is generally distinct with thick diagonal walls where a water-impermeable layer is formed around the cylinder (Stele) of the wooden column	Endodermis have distinct or non-distinct and their cells generally carry a starchy substance known as Starchsheath
6	Possage cell cells exist	Missing
7	The surrounding circle is made up of a single layer whose cells are thin-walled parenchyma	The surrounding circle is multilayered and contains sclerenchyma or consists of sclerenchyma and parenchyma
8	Diagonal vascular bundles mean that the xylem tissues are bark tissues on mutual radii	Vascular bundles of the collateral-obicollateral type are closed or open
9	Side branches of endogenous	Origin side branches of exogenous exogenous origin

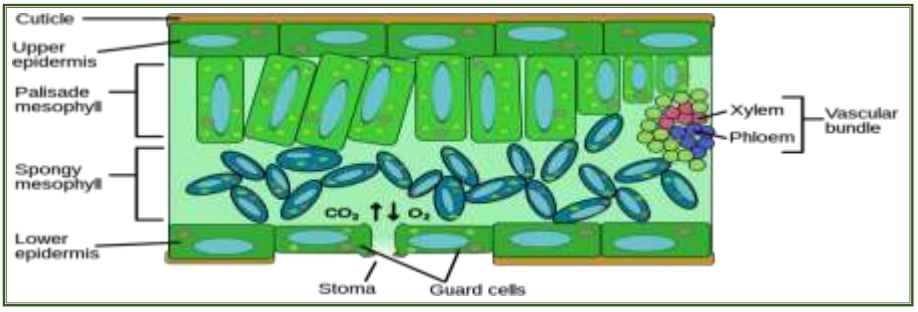
Leaf

The leaf is the most important part of the plant that performs the most important biochemical process in which carbon dioxide is converted into sugar in the plant.

The leaf is the vegetative part that carries the nodes of the stems and is often characterized by being wide and flat and the process of Photosynthesis and Transpiration and respiration and vary in shape according to the type of plant.

The leaves have different characteristics, they may be sitting directly on the Sessile or carried on petiole.

Anatomical characteristics of leaves



Figuer23: Internal structure of the plant leaf

1. Epidermis:

Epidermis usually consists of a single layer of cells and contains stomata stomata, normal epidermal cells typical epidermis cells, idioblasts and various appendages of the trichomes . Its function is plant protection-gas exchange-secretion Its **advantages:**

a. Characterized by the presence of a cuticle layer, which helps it to carry out plant protection.

b. Its cells are alive‹B. they have the ability to restore their ability to divide, and this trait is essential, as the epidermis can keep up with the longitudinal or diagonal increase of the Stem, in this case, it expands tangentially and divides diagonally.

2. Cortex:

The cortex of the Stem is that area confined between the epidermis and the vascular cylinder and is narrow compared to the root it consists of fine-walled parenchymal cells‹ contains chloroplasts‹ they are photosynthetic and are stored. In other cases, in the outer areas of the cortex, we find clusters of cholinergic cells, as in the stem of the anise Pimpinella anisum, or sclerenchyma cells, as in grasses. The inner layer of the cortex is parenchyma. The collenchyma cells or fibers either form a continuous layer, as in

Helianthus Sun roses and zinnia and may be concentrated in the corners, as in ribbed stems, for example, Bacillus Vicia, luffa fiber and pumpkin Cucurbita. Also, the cortex may contain sclerids, secretory cells, and lactiferous Milky ducts. Some stems have an actual columnar layer that performs photosynthesis due to leaf atrophy, as in Casuarinas and statice, the collenchyma and sclerenchyma tissue performs a supporting function.ized by the presence of a cuticle layer, which helps it to carry out plant protection.

Its cells are alive, they have the ability to restore their ability to divide, and this trait is essential, as the skin can keep up with the longitudinal or diagonal increase of the leg, in this case, it expands tangentially and divides diagonally.

3. The inner shell of Endodermis: in the stems there is a difficulty in determining the inner shell layer of the Stele، because the endodermis layer is not distinguished، unlike the root, but in some herbaceous plants it may be distinguished by storing starch, so it is called the starchsheath starchy shell . The endoderm cells, if they exist, are characterized by consisting of monolithic cells and are alive, their diagonal and transverse walls contain caesarian strips, sometimes Suberin lamellae is added on each inner wall, and a secondary layer of malachite cellulose is sometimes added on the inner side of the

Suberin sheets that the inner shell may be visible in some dicotyledonous plants such as Helianthus and Tropaeolum, and the inner shell is also visible in some lowland plants such as Polypodium and equisetum, as well as in some aquatic plants, is sometimes found between the vascular cylinder and the pulp as in the plant phioglossum and the plant Marsilea and in some for ferns such as Dryopteris the endoderms are surrounded by single vascular bundles, but in the seeds they are clearly visible in the roots . In the ground stems, such as rhizomes, there is a clear inner shell.

4. Mesophyll medium tissue: it is defined as the tissue located between the upper and lower epidermis and consists of parenchymal cells usually, but it may contain sclerites, Which is taught in the plant laboratory. Mesophilic cells are usually rich in plastids, there are two types of mesenchymal tissue that are not divided into spongy and columnar cells and segmented tissue.

a. Collecting cells: They are cells located in the spongy tissue attached to the phloem that are met by a group of columnar cells and are believed to collect food and transport it to the phloem. The second type of leaves is the mesophilic tissue is not divided into a columnar and spongy layer: this type of leaves is represented by

dicotyledonous plants in angiosperms and Pinus pine leaves in the latter, the cells are bent inward

5. Vascular tissue of the leaf:

a. Reticulate it is common in dicotyledons.

b. Parallelepiped is a parallel and is common in monocoque units.

Both species either have pinnate or palmate feathers, and the latter is either convergent, as in the case of zizyphus in dicotyledons and wheat Triticum in dicotyledons, or divergent, as in Vitis grapes in the case of dicotyledons and ornamental palms or fan Washingtonian in the case of single-dicotyledons. The reticular vein branches into smaller ones, forming spaces called areoles at the ends of the veins.

Leaf function

1. Carrying out the most important vital process, which is the process of photosynthesis, and will be explained later in detail.

2. Carry out transpiration

3. Gas exchange by guard cells.

Flower

It is an axis branch that carries specialized leaves for the purpose of reproduction or aiding it, which is the reproductive organ in flowering plants Entophyte. A typical flower consists of four rings:

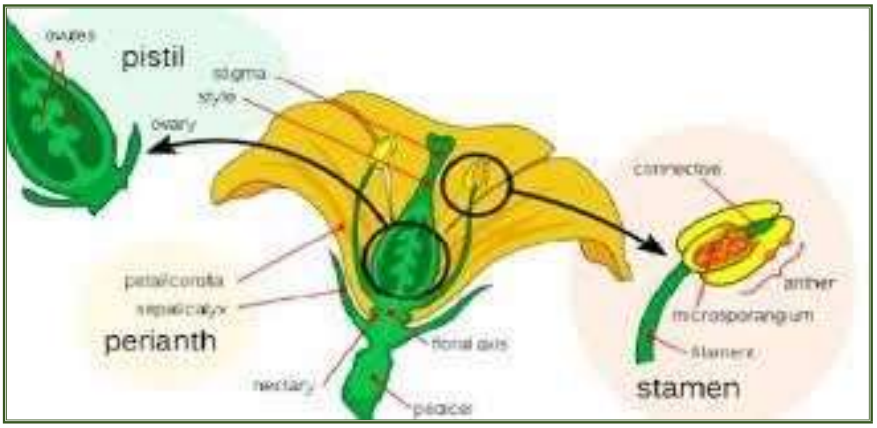


Figure 23: Internal structure of the plant Flower

1. **Calyx:** It is the outer ring of the flower and consists of a number of units called sepals, which is often green in color.

2. Corolla: Which is the second ring after the cup and its basic units are called petals and is often colored and its main function is to attract insects for the purpose of pollination,

3. The rings of the cup and the corolla are called (the flower cover or Perianth or called sterile parts in the flower, and in the case of not distinguishing the flower cover into a cup and corolla called perigon and its basic units are called Tepals.

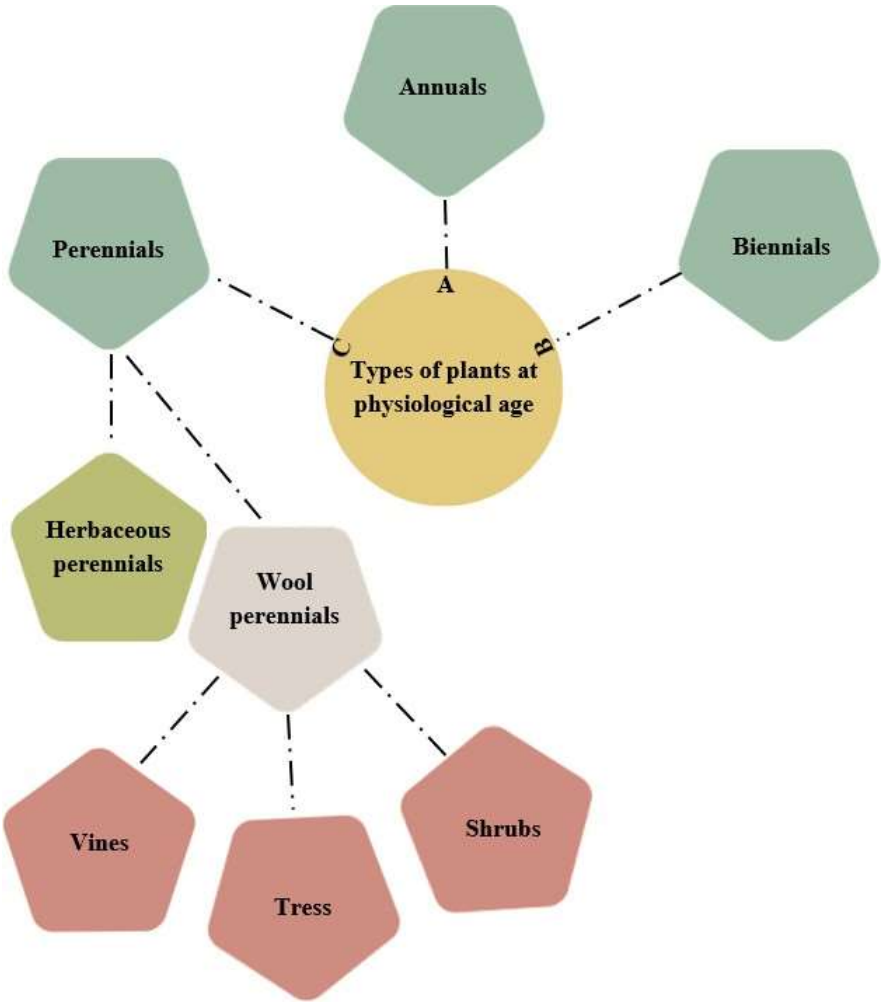


Diagram3: Types of plants at physiological age

Plants in general are divided depending on their physiological age into:

a. **Annals:** They are plants that continue to live for about any year or less, in which the plant is a vegetative total, then the life of the plants ends and reaches the fruiting stage.

b. **Biennuals:** plants with two years These plants continue for two years or two factors, in the first year the seeds are planted and given vegetative growth and in the next year the plants complete their life cycle and are given vegetative growth and productive growth and end their life after that, for example, onions and sugar beets..

c. **Perennials:** It includes plants that can live more than two years and is divided into two parts:

1. **Herbaceous perennials:** These plants have soft, non-woody stems that live for more than two years and are given annual vegetative and productive growth, and their vegetative or aerial parts die due to unsuitable environments or severe emergency conditions such as high temperature, frost, or drought. These plants often have tissues buried underground containing stored nutrients, for example, asperger's.

2. **Woody perennials:** The majority of this section does not end the life of plants fruiting, but renewed fruiting annually are plants that live more than two years and stems solid non-juicy such as trees, shrubs and climbers.

- Tress trees have a permanent main stem, often straight that carries the rest of the vegetative system as well as fruits.
- Shrubs are smaller than trees and may have one stem or several stiff market.
- Vines climbers are characterized by the fact that their market is stiff and can climb trees, buildings, and wires, and if there is no support to help them climb, they crawl on the ground because of the inability of the leg to grow in a vertical straight direction.

Chapter two

Environmental importance of the plant

CHAPTER TWO

ENVIRONMENTAL IMPORTANCE OF THE PLANT

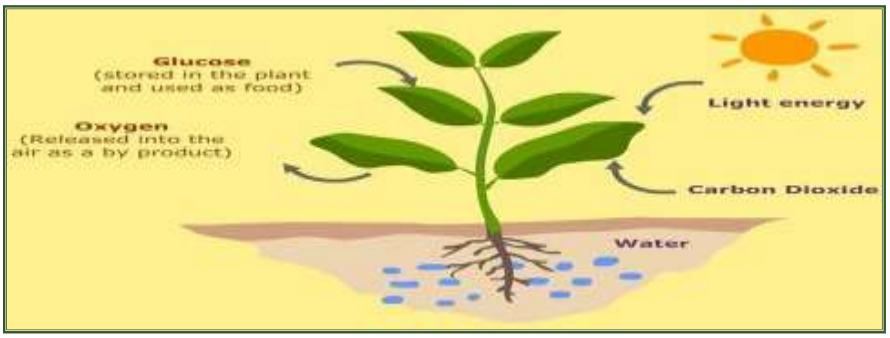
The importance of plants in the environment is not only being part of the food chain, but the physiological role that it plays and their interaction with the environment in which it is located, whether it is desert, mountainous, near a river or sea. Etc.

Its organs of the roots, stems and leaves with its tissue structure helped it to perform the following tasks, according to the Plant organ. Leaf, Photosynthesis installation process, the process of respiration and transpiration, as for the roots, they absorb water and resist drought and lack of food, and the stem performs the function of transporting plant sap.

For this reason, we will highlight the most important of those functions that the plant performs in separation as follows:

1. Photosynthesis installation process

Namely, the process of introducing oxygen as an alternative to removing carbon dioxide from the atmosphere is one of the crucial biological processes for all living things on the Earth's surface, including humans. However, this does not apply to some microorganisms that do not use oxygen and use it instead of CO2.Our light source, which comes from the fusion reactions of the hydrogen atom, is the sun, which shines brightly and illuminates the world. In the fusion reaction, one helium atom (alpha particle) is created from the Union of four hydrogen protons. In the deep central regions of the sun, this difference in mass is transformed into solar energy because the mass of the helium atom is slightly less than the total masses of the four protons from which it is formed. When the Earth is far enough from the sun for the average solar energy to travel perpendicular to a unit of horizontal area for a unit of time out of the atmosphere.



The production of about 50 million tons of sugar within a complex metabolism with sequential steps based on the type of plant and its tag, which is a fundamental source of organic structure on the planet and is food for all living organisms directly or indirectly, is the most significant manifestation of the process of photosynthesis. The plant also removes tons of carbon dioxide cancellation from the atmosphere and releases oxygen at a reviving balance. Additionally, the process of photosynthesis is of "economic importance, as evidenced by the years and eons of time showing that plant tombs have evolved into one of the energy transformations. The process of photosynthesis in short converts light energy into chemical, or is the process in which solar energy is converted into photochemical energy and then into chemical energy by plant chlorophyll. All acquaintances are correct but may not give a full description of the process.

Using the following equation, we may define photosynthesis more broadly as the biological process that takes place in all organisms that contain chlorophyll and involves the conversion of inorganic components (water and CO2) into chemical organic molecules. Chlorophyll

$CO_2 + H_2O$ ---------- $CH_2O + O_2 + ATP$

light Carbohydrate

Or write in another way with the outputs

$6CO_2+12H2O+light+chloroplasts= C6H_{12}O_6+6H_2O+6O_2+Energy$

In this process, in short, oxygen is released, then CO2 is reduced, and sugar formation occurs.

History of photosynthesis with botanists

The Greek Aristotle is the first to say that plants get their food from the soil.

Van Helmond 1640 planted willow plants (plant weight initially 2.5 kg) in a pot containing dry soil weighted (100 kg) and watered the plant with water whenever needed. After five years he noticed that the weight of the plant became 84 kg, but when drying the soil found it incomplete very little, so he inferred wrongly for recent information that the plant grows in water only. However, Wood Ward 1699 noted that the growth of the potato plant in clay water was more than the growth of a plant Potatoes in rain water He thus disagreed with Van HELMONT.

In 1727, Stephen Hales believed that part of the plant nutrition came from the air

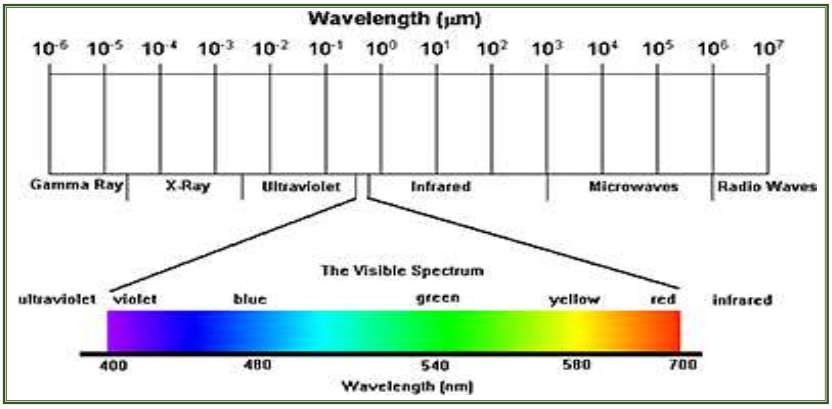
In 1804, De Saussure developed the first equation of photosynthesis, which remains true to this day,

$$CO_2 + H_2O \text{ ---------- } CH_2O + O_2$$

In 1842, Robert Mayer developed the law of energy conservation, under which he solved the problem of energy transfer in the process of photosynthesis, as he pointed out that plants can convert photovoltaic energy.

What is the nature of the sun that gives us light?

The sun has been and continues to be the only source of energy for practically all sorts and forms of life, with the exception of the force produced by the internal processes of the atom's nucleus, which humans have lately harnessed as a source of energy. Prior to the arrival of the scientist Huygens, who proposed that light is electromagnetic waves, it was believed that light was interpreted as a torrent of fine particles that were emitted from the source (the sun) and that these particles were absorbed by opaque objects and reflected by non-opaque objects. This theory was known as the wave theory. This presumption persisted until Einstein arrived and proposed combining the two theories (particle and wave)



Energy produced by the Sun comes from large nuclear reactions that occur within the mass of the Sun with temperatures reaching millions of temperatures, and these reactions are the combination of four molecules of hydrogen H to form one atom of helium He, and the energy difference between the reactants and the products is in the form of photo thermal energy.

The energy absorbed by one mole of water or any compound is called the term "two inches" and is the unit of measurement of energy:

$E = N \times h \times V$

Where: E; energy, N; Avogadro number = 6.023 × 1023

H; Plank's constant =1.58 ×10-34, V; Frequency = C / λ C ; speed wave , λ ; wave length

To calculate the wavelength of orange light energy, for example, which has a wavelength of 650 nm:

$E = N \times h \times V$

$E = 6.023 \times 10^{23} \times 1.58 \times 10^{-34} \times (3 \times 10^{8} / 6.5 \times 10^{-7})$

E= 43.91 K.cal/mole

E = 43.91 Einstein

Photosynthesis pigment: The pigments found in different plants may vary, but the green pigments in chloroplasts are the only ones that carry out photosynthesis, and the rest of the pigments may be secondary pigments that help in the process. Among the most important tinctures in different plants are:

- Chlorophylls: The amount in the plant is equivalent to 10 times the amount of other dyes. They are found in plants in different forms:

a. **Chlorophyll A:** and its chemical code C55H72O5N4Mg and is found in all plants that carry out photosynthesis, and that the highest absorption is located at wavelengths 430 and 660 nm.

b. **Chlorophyll B:** and its chemical code C55H70O6N4Mg and is found in all high-end plants and green algae and that the highest absorption is located at the wavelengths 452 and 642 nm.

c. **Chlorophyll C:** It is found in brown lichens

d. **Chlorophyll D:** found in red lichens

e. **Chlorophyll E:** found in some plants All these chlorophylls are auxiliary pigments and their guest absorbs light energy and delivers it to chlorophyll A, which is the basic pigment.

Chlorophyll A differs from chlorophyll B in the amount inside the plant as it is three times the amount of chlorophyll B. Chlorophyll A is bluish-green while chlorophyll B is light green, as well as differing in absorption spectrum.

Photosynthesis occurs in two phases, the first in Thylakoids membrane which involves light reactions, while dark reactions occur in the stroma. The process occurs within units called photosynthetic units, and the smallest part of this system contains 400 molecules of chlorophyll and is arranged in a regular geometric order called quanta some

Figure 27: Thylakoids membrane

Photosynthesis units work by means of auxiliary dyes to polarize light waves, collect them and then deliver them to the basic chlorophyll molecule A in the center of the system, which in turn splits the water molecule and releases energy from it in the form of an H+ proton. These units receive light energy from the sun and transfer it between them in a process called magnetic resonance for the purpose of raising their energy to a level sufficient to trigger the reaction.

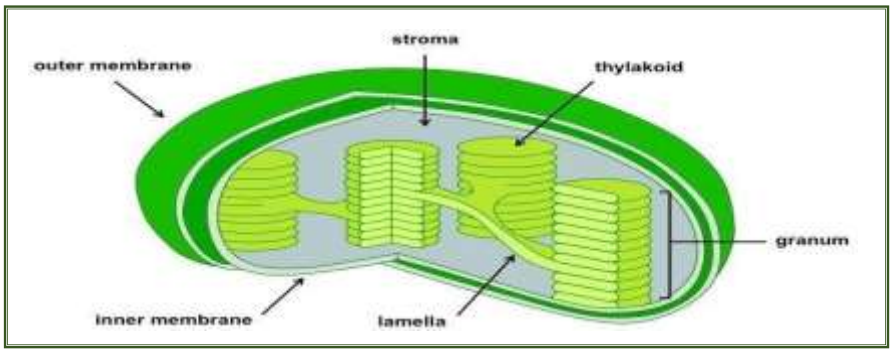


Figure 28: Components of plastid

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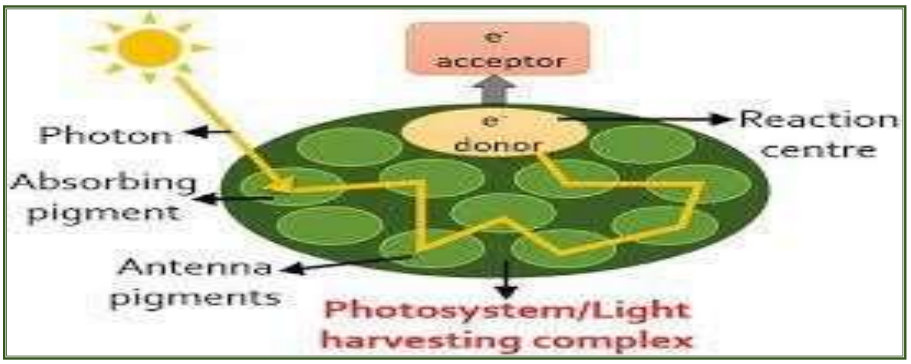
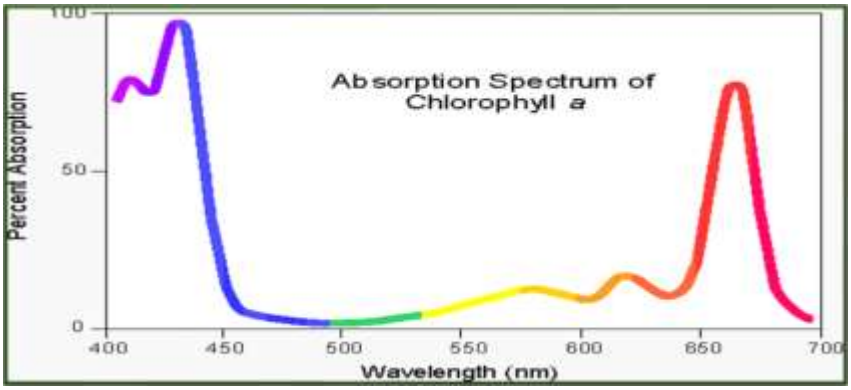


Figuer29: Solar radiation reception

Chlorophyll is affected and excited if exposed to white light (visible light) as white light occupies a very small area ranging from 390nm to 760nm and this area of wavelengths includes blue light (470 430), greenish blue (500 470), green (530 500), greenish yellow (560 530), yellow (600 560), orange (640 600), light red (670 640), deep red (675-760). While wavelengths Larger or smaller

are electromagnetic radiation that the plant does not benefit from.



Figuer30: Light absorption within the colors of the solar spectrum

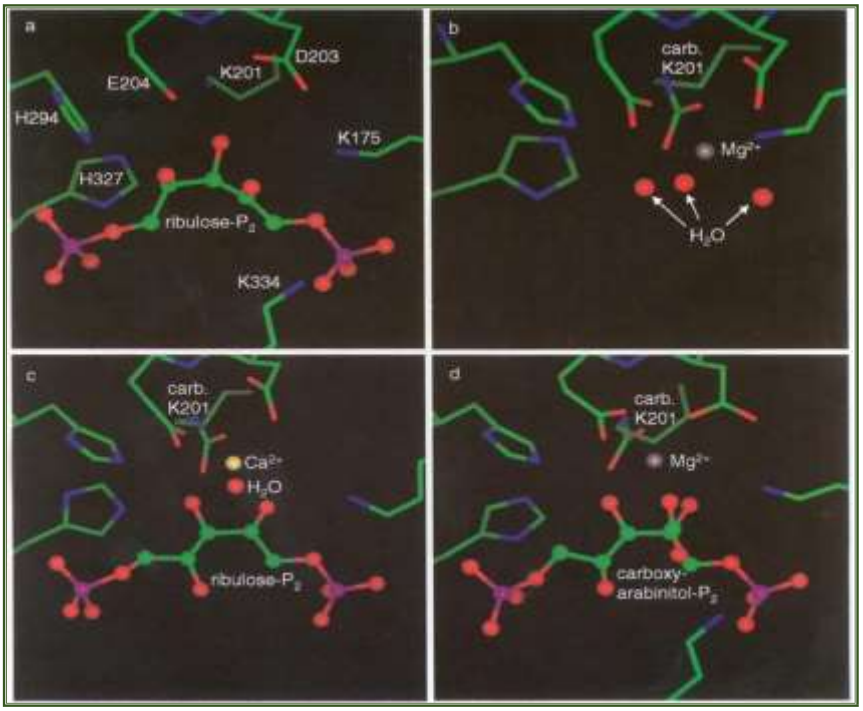


Figure31: Shows the binding groups in the polycarblose-penta-carbon diphosphorus as well as the enzyme catalase and iron bond

When chlorophyll absorbs blue rays with wavelengths (430nm) and red rays with wavelengths (670nm), chlorophyll molecules are excited as a result of the absorption of this light energy. There are three levels of excitation that the excited chlorophyll molecules can reach any of them:

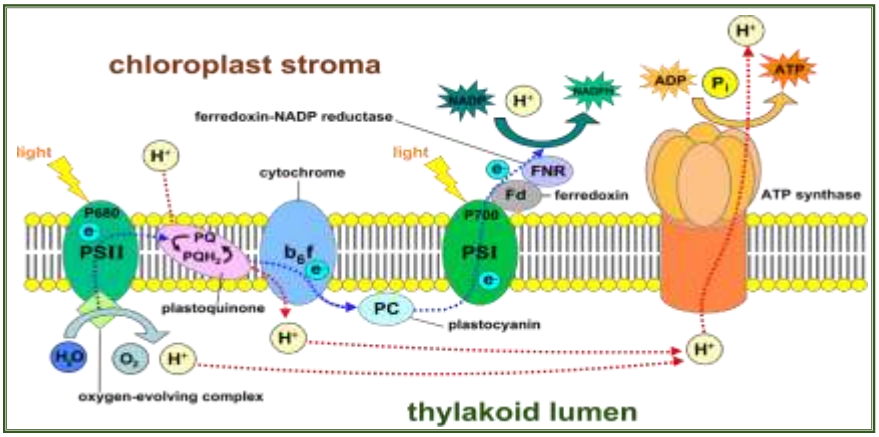


Figure32:chloroplast stroma

Second singlet state

This level reaches chlorophyll when exposed to blue light (430nm (where chlorophyll molecules are raised and absorb a high amount of energy up to Cal.k 65.It is known that this stage is high energy, but it does not last long, as chlorophyll electrons lose a quantity of energy in the form of heat emission and reaches the next level, which is the most stable relative and its energy Cal.k 40.

1st singlet state

Chlorophyll electrons reach this level in their energy content if exposed to red light (670), and as already mentioned, this level is more stable than the previous level, as this stage is able to complete biochemical reactions in the cell. The electron excited at this level is most important as an energy source in completing the photosynthetic reaction. The electron can also reach this level by losing energy in the form of heat from the second singlet stat.

1st triplet state

The energy of this level is about Cal.30K, as the excited chlorophyll electrons reach this level when the electrons in the stale singlet stage lose a quantity of energy in the form of heat emission. An excited electron with an energy of 1st singlet state and 1st singlet state may also return to Ground state, which is the stage of stability, after it loses its acquired energy that it carries and loses it in the form of heat or light emission.

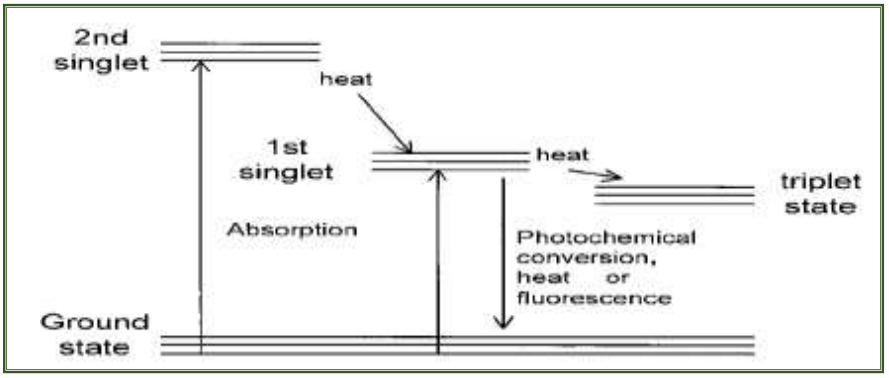


Figure 33: Fluorescence

Light Reactions

The process of photosynthesis is known to occur through two reactions, the light reaction and the dark reaction within chloroplast. The reaction of light takes place in grana plates within chloroplasts and these plates contain photosynthetic pigments. The dark reaction takes place in the estroma plates, which contain dark reaction enzymes. The reaction of light is the one that produces the reduced energy as a source of hydrogen in the form of NADPH2 as well as the energy molecules ATP .

$H_2O+NADP+ADP+Pi$ ==== $O_2+NADPH_2+ATP$ (Light Interaction)

$NADPH_2 + ATP + CO_2$ ==== $(CH_2O)n$. (Dark Reaction(

It has been possible to know that the interaction of light includes two systems, the first photosystem I, which absorbs energy at 700 called P700, and the second

photosystem II absorbs energy at P680 and each system has its own pigments as well as its own electronic carriers.

The dye and electronic holders of the first photovoltaic system include.

Ferredoxin & NADP & F.R.S & P700 Chlorophylls & Carotenoids & Fd-NADR- reductase (nm 700 & 690 & 680 & 670 & 660 A Chlorophylls of all kinds

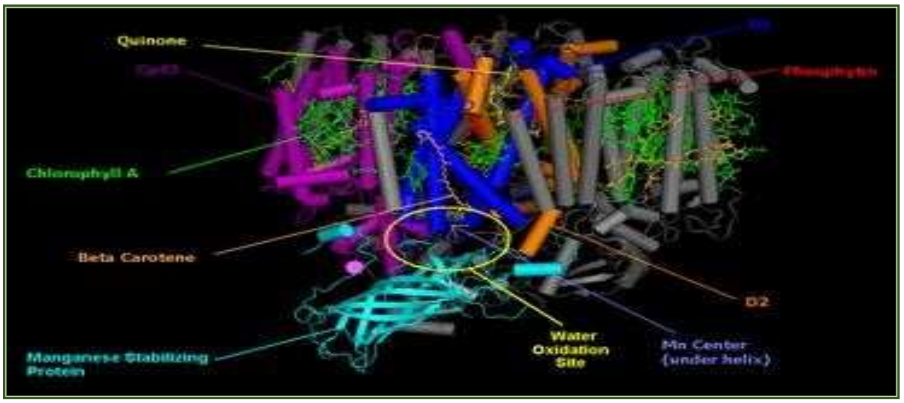
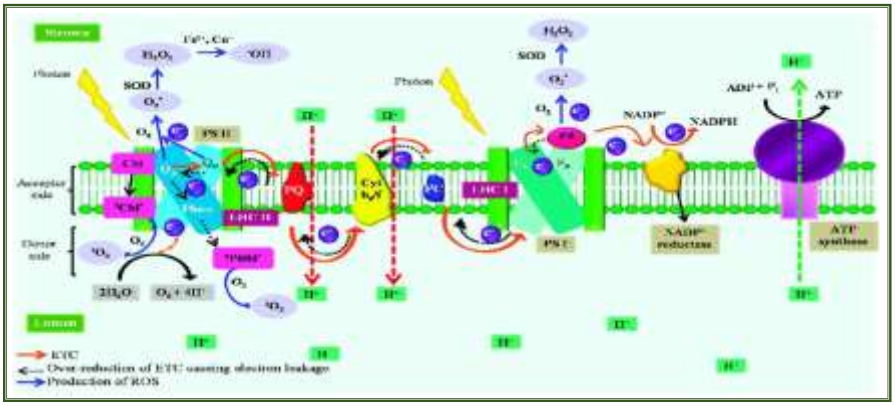


Figure34: Photosystem one and second

The second photovoltaic system also includes: P680 & Q & cytochrome (b) & plastoquenone & cyfochrome (f) & plastocyanine & ChlOrOlhylls include chlorophyll (b) 650 & Chl (A) 660 & Chl (A) 670 nm & Chl (A) 677 & Chl (A) 670.

Movement of electrons

When the light energy reaches the plastids in the second photosystem P680, its molecules are excited, so the water molecule is oxidized in it and electrons are released from it, which is transmitted through a series of electronic carriers by a process of oxidation and reduction (gain and loss of the electron) until it finally reaches the NADP to form the reduced energy molecules. As the hydrogen ion produced from the water molecule is received first by the Q compound, it is reduced and then the energy is delivered by the oxidation process to the cytochrome compound f and then cytochrome b, which in turn delivers energy to the plastocyanin containing copper, and at this stage the energy molecule produces ATP, so the electron energy decreases to a low level and the photosystem I (P700) is delivered. In the first photosystem, a process of absorption of light occurs to raise the energy of the electron again through the decomposition of a water molecule, and the energy produced in this system is received by a strong reducing compound, ferdoxin Fd, which oxidizes the energy to another reducing compound, Fd - NADP- reductase This enzyme consists of flavoprotein contained on FAD, which in turn forms the reducing compound NADPH2, the most important compound in the biological



Figuer35: Movement of electrons

Non-Cyclic photophosphorylation

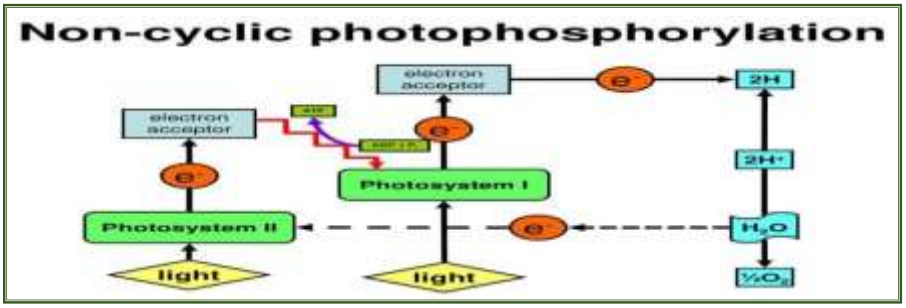


Figure 36: Non-Cyclic photophosphorylation

When the energy produced from the water molecule is released in the second photosystem and travels through a series of electronic vectors through the first photosystem I (P700) until the production of the reduction compound NADPH2, this series is called open photophosphorylation.

Cyclic photophosphorylation

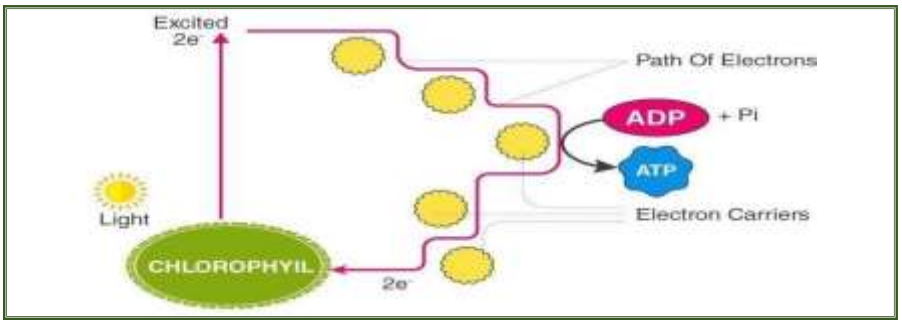


Figure 37: Cyclic photophosphorylation

Open photophosphorylation occurs when the first photosystem (P700) is exposed to wavelengths of more than 680 millimicrons (with weak energy), it is insufficient to analyze the water molecule and raise the electron energy, in this case the system cannot produce the reducing compound NADPH2, but the energy returns to the cytochrome in the second photosystem to produce an ATP molecule and re-react again.

Components of the electron transport chain in the optical reaction systems (II PS & I PS):

a. Ferredoxin is a protein containing iron and sulfur and the reductive oxidation potential of this compound is low. This compound is reduced to the light limit.

b. Plastocyanin Plastocyanin is a protein linked to copper and this substance is found at 0.2% of the amount of total

chlorophyll and can be easily reduced to chloroplast isolate.

c. Cytochrome f, b There is a cytochrome in chloroplasts with 0.25% of the total chlorophyll, which is an iron-containing compound and the ATP starting site is between the release of the electron from the plasticoquinone and cytochrome f. o

d. Wplastoquinon Plasticoquinone is present between the two light reaction systems and is oxidized optically by I PS and its reduction is through the second photosystem PS II and this compound is the only one present in an amount equivalent to 5-10% of the total chlorophyll.

e. Quinon Q or C55O This substance is not known enough and it acts as an electronic receptor in PS II and this compound gives the highest absorption spectrum rate at 550 millimicrons.

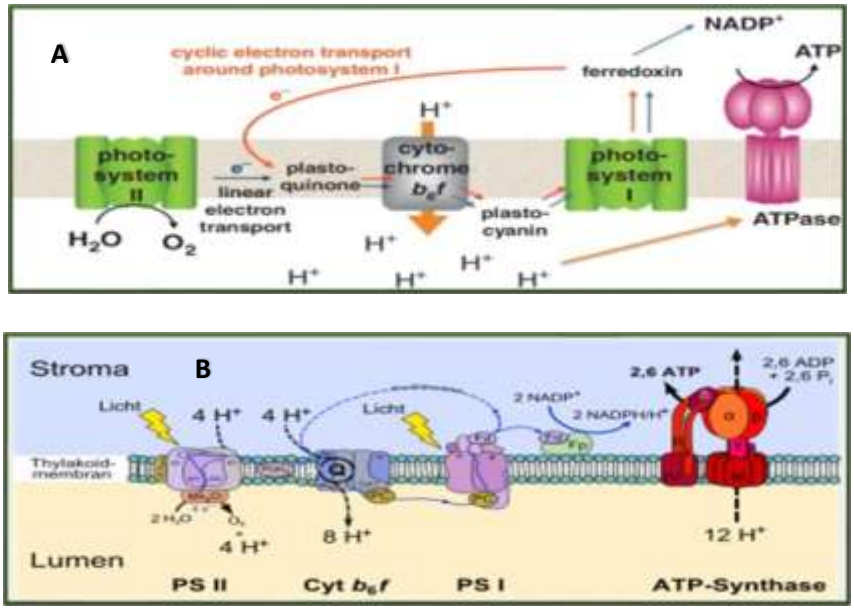


Figure 38: a: cyclic electron. b:ATPsynthase

Dark Reaction

After NADPH2 and ATP are produced from light reactions, they will enter into other reactions called carbon stabilization reactions and convert inorganic CO2 into an organic carbon compound. These reactions were previously described as dark reactions, thinking that researchers did not need light energy, but it was recently shown that the enzymes involved in these reactions are activated in the presence of light and their effectiveness decreases in the dark, so carbon cannot be reduced to darkness even if energy is available from another source.

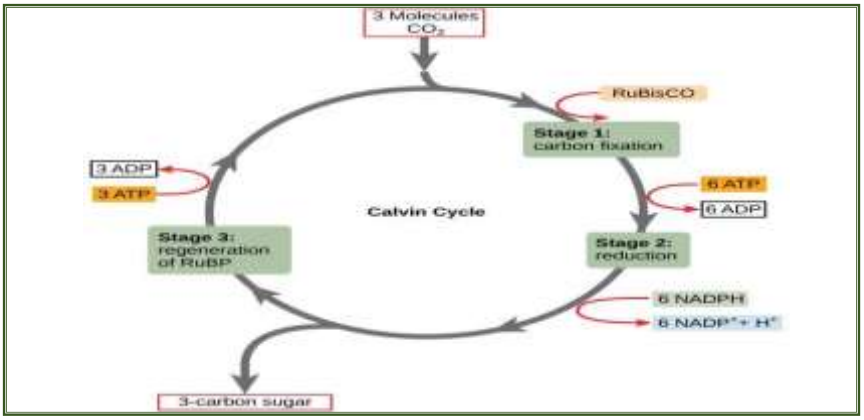
Methods of fixing CO2 in plants

Research has shown that there are three ways to stabilize CO2 according to different plant species, and in light of this, plants were divided into three groups accordingly:

1.C3 plant group: It was named by this name because the first compound formed after installing CO2 is a three-atom carbon compound 3- phosphoglyceric acid (PGA) and CO2 is fixed within a cycle of reactions called the Calvin cycle and this cycle includes the following:

This course includes:

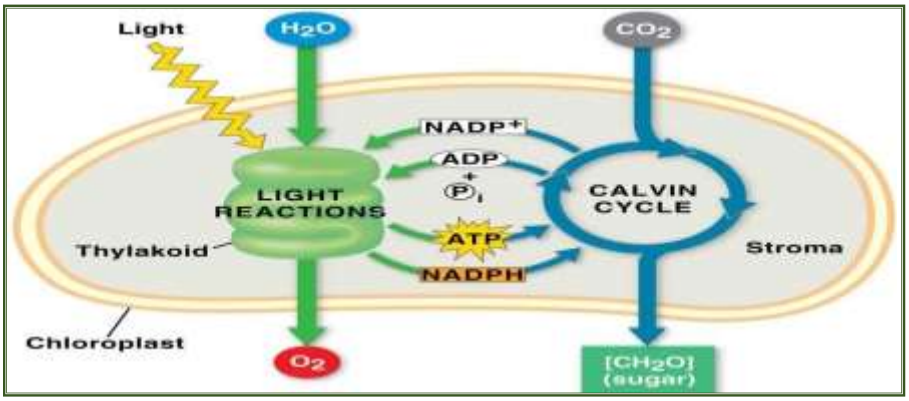
This cycle condenses CO2 with pentacarbon (RuBP) Ribulose-1,5biphosphate into two tricarbonic sugar molecules (PGA) by exploiting the energy of NADPH2 and ATP. To shorten the cycle, six molecules of CO2 enter the Calvin cycle, each molecule producing two molecules of 3-PGA, as shown in the diagram:



Figuer39: Calvin cycle

After producing two 3-PGA molecules, each molecule is reduced to Glyceraldehydes-3-P (G3P) in a reaction that requires ATP energy and NADPH reduction power (two products of light reactions). Some G3P molecules may be transferred to the cytoplasm and combine to form hexose-P sugars such as fructose-P or Glucose-P, which may combine to form phosphorylated sucrose, starch and other carbohydrates. Other molecules may undergo a series of reactions (condensation and reorganization) to form RuBP to receive the CO2 molecule again and to continue cycle reactions. The end result of these reactions is the recirculation of carbon by recycling 5 molecules (out of 6 molecules) of G3P to produce three molecules of RuBP to replace molecules that previously interacted with CO2, thus continuing the Calvin cycle. The sixth molecule is the one

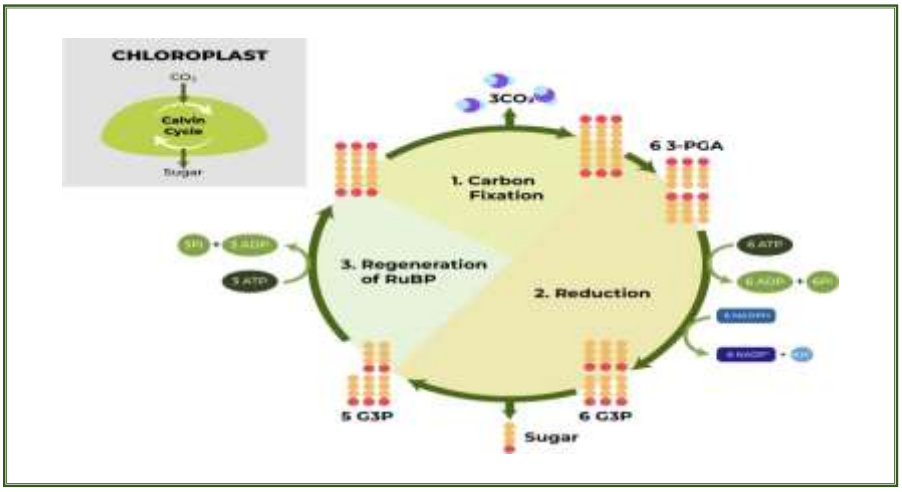
that enters the metabolism in the cytoplasm to form hexose and other carbohydrates.



Figuer40: Embed CO2 in the plant

So, in this cycle each CO2 molecule needs 3ATP and 2NADPH. Since the formation of one molecule of F-6-P requires 6 molecules of CO2 as the final resultant,

$$6\,CO_2 + 11\,H_2O + 12\,NADPH + 18\,ATP \rightarrow \text{Fructose-6-phosphate} + 12\,NADP^+ + 6\,H^+ + 18\,ADP + 17\,P_i$$



Figuer41: Plant C3

Examples of C3 plants are wheat, barley, rice, beans, soybeans, sunflower and othersC4 group of plants (C4-plant tetracarbon plants).

It is so named because the first compound formed after the fixation of CO2 is a quaternary carbon compound, oxaloacetate (OAA).

Its carbon stabilization path is known as the Hatch-slack pathway.

This pathway occurs in some plants – especially tropical or subtropical origin such as white and yellow corn, sugar cane and others, and the first product of the reaction is a carbon tetrachnomic compound. This group includes approximately 1500 species distributed among approximately 18 epicospermophilous plant families (15 dicotyledonous and 3 monocotyledonous)

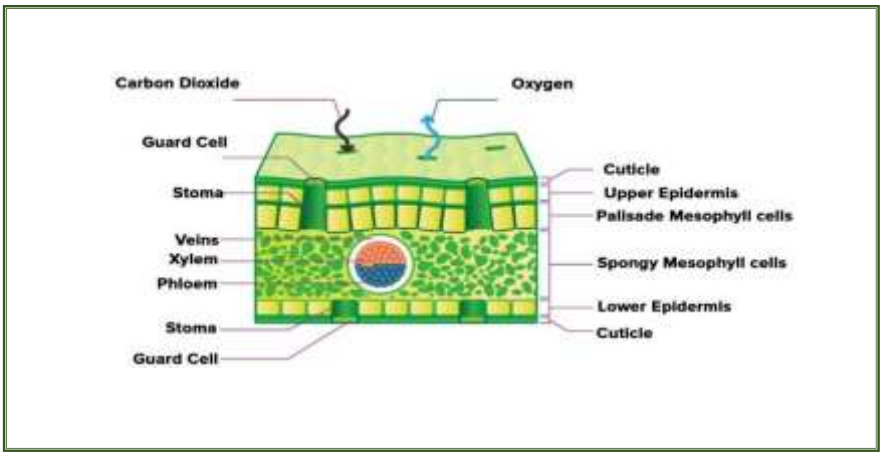
Plants of this group are characterized by:

1. Grows perfectly under high light intensity and high temperature (30-40 degrees Celsius).
2. The rate of photosynthesis is high up to two or three times than in C3 plants under the same conditions
3. High growth speed (produces about 4-5 g dry matter/ cm3/day compared to 0.5-2 g in C3 plants).

4. 4.Its ability to tolerate drought is greater than C3 plants, and it has the ability to continue the process of photosynthesis under conditions of water stress

5. Photorespiration is non-existent or very low due to its ability to increase the concentration of CO2 in the leaf tissues and may be the reason behind its acquisition of the mentioned features

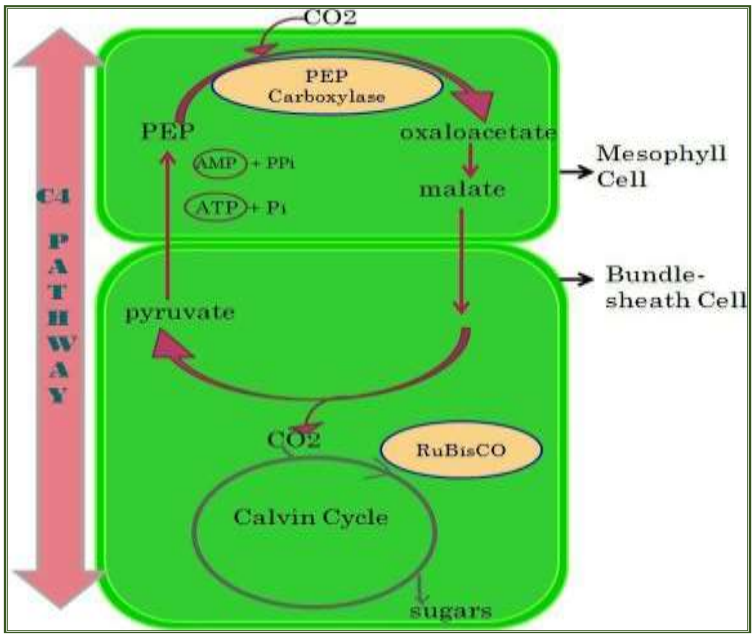
6. They contain green plastids in the cells of the casing of the bundle sheath in addition to the plastids of the cells of the mesophil layer, while C3 plants do not contain plastids in the cells of the envelope of the package, which gives them a greater possibility in exploiting light energy, as in the following figure:



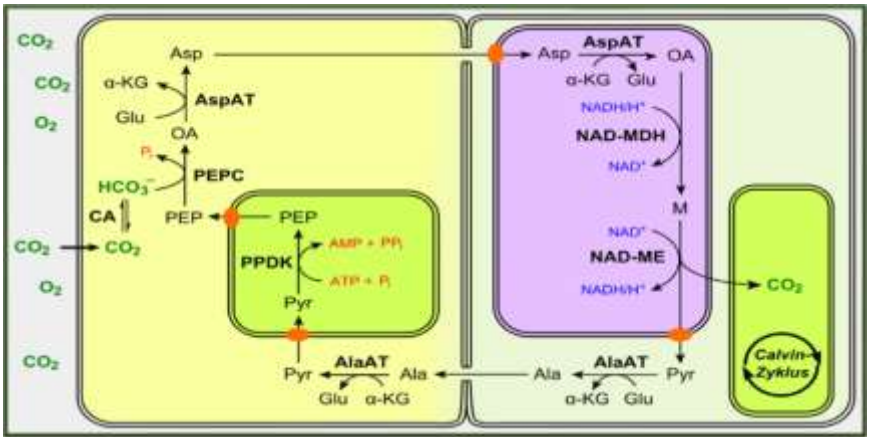
Figuer42: Co2 Entry and O2 Exit from Plant Cell in Photosynthesis

Hatch – Slack Cycle

The reaction occurs first in the mesophyll cells, where the compound Phosphoenol pyruvate (PEP) interacts with CO2 entering the air to the leaf, forming an unstable tetracarbon intermediate acid, and then turns into another stable quaternary compound, Asparatate or Malate, which moves to chloroplast cells of the casing of the adjacent vascular package, and there a molecule of CO2 is removed to enter the Calvin cycle and then reduced to triple sugar (Triose sugar). As for the remaining organic acid triple acid returns (moves) to the mesophilic cells after it turns into a pyruvate and then to PEP to receive a new molecule of CO2 and the cycle returns again, as in the following diagram:



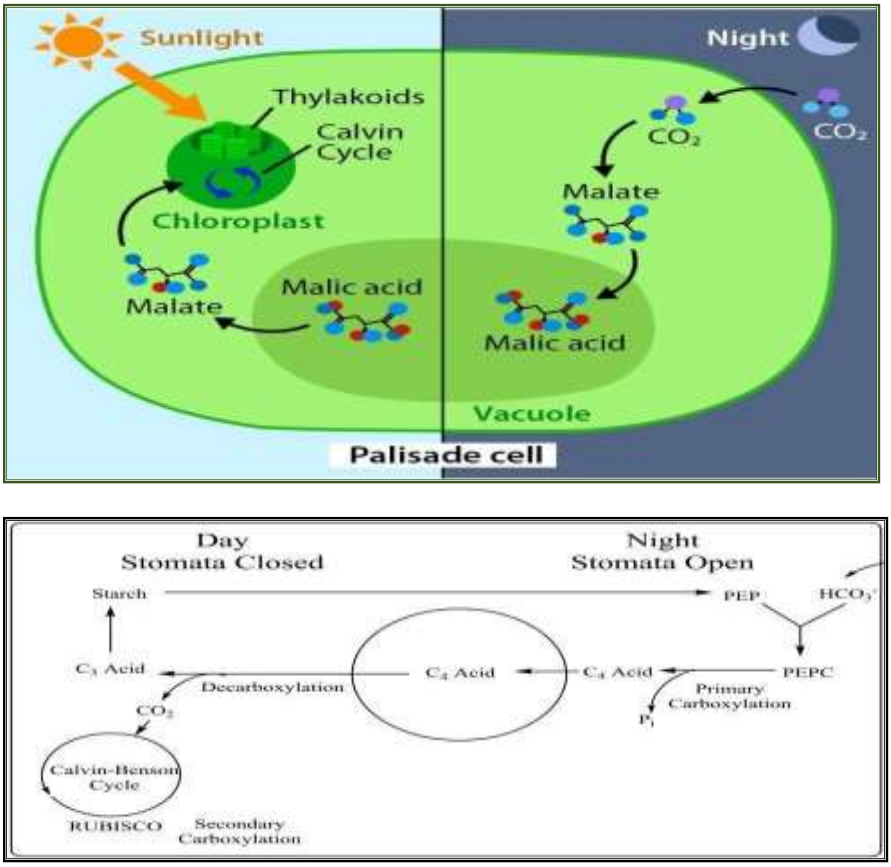
Figuer43 : Hatch – Slack Cycle



Figuer44: Chemical reactions in a cycle Hatch–Slack plant

3. CAM plant group:

The abbreviation is Crassulacean Acid Metabolism and the name given to the plant species in which the process was first discovered, Crassulacean. This type occurs in succulents that do not open their stomata in the daytime to avoid water loss due to high heat. Therefore, CO2 gas penetrates into the leaf tissue at night when the stomata are open and is fixed in combination with PEP to form OAA, which converts into malate and is stored in large quantities in the gaps. In the daytime, malate switches to OAA, which in turn turns into PEP, a CO2 gas editor that is installed again in the Calvin cycle as in the diagram:



Figuer45: Chemical reactionsCO2 plant c4

The process of photosynthesis is, in short,This process, which is characterized by green plants without other living organisms, includes the absorption of light energy by green dye (chlorophyll) and converting it into chemical energy exploited in the construction of carbohydrates, where the plant absorbs water and carbon dioxide and releases oxygen in this process. In higher plants, the majority of photosynthesis takes place in green leaves

This process is one of the most important physiological processes in the formation of carbohydrates, as these carbohydrate substances constitute a large percentage of the plant body 85-90% of the dry weight depending on the type of plant

Methods of estimating the speed of photosynthesis

1. Estimation of the amount of CO2 absorbed
2. Estimation of the amount of escalating CO2
3. Estimation of the resulting carbohydrate substance (dry weight of the plant)

The basic materials necessary to complete the photosynthesis process:

Co2,Water, Light, Chlorophyll.

I: Carbon dioxide:

It is considered an important environmental factor as it is the main source of building carbohydrates for the plant body.

Atmospheric air contains a small percentage of CO2 estimated at about 0.03% (300-3600ppm

The process of photosynthesis consumes Co2, so this process maintains its concentration in plant tissues in small

quantities, and this helps it to quickly absorb it from the atmospheric air surrounding the leaves through the stomata.

Through the stomata, gases are exchanged between the leaf and the surrounding air, where Co2 is absorbed and diffused into the paper tissue while water is lost through the so-called transpiration process.

Increasing the concentration of Co2 to a relatively high degree may lead to a decrease in the speed of photosynthesis, and this varies according to the type of plant and the degree of its growth, and this effect of high concentrations is attributed to its toxic effect in the protoplasm as well as to the fact that it causes closure of the stomata.

Factors affecting the opening and closing of stomata are:

1. Increasing the concentration of salts, especially potassium (k), helps to open stomata.
2. Increasing light helps to open stomata.
3. Increasing the concentration of CO2 inside the paper tissue causes the stomata to close.
4. The high temperature causes the stomata to close.
5. Increasing the concentration of some hormones such as ABA (Abscesic acid) causes the stomata to close.

II: Water (H2O)

In the process of photosynthesis, the plant consumes less than 1% of what it absorbs from water, so it is not likely that the lack of water will be a determining factor, but its indirect effect, where the decrease in water leads to partial or complete closure of the stomata, causes a decrease in the entry of CO2 into the leaf, which causes a decrease in photosynthesis.

III Light:

The leaves of the plant absorb light energy, which comes mainly from the sun, and then convert it into chemical energy, resulting in the formation of carbohydrates.

Visible light is the most important source of light energy that the plant benefits from in the process of photosynthesis.

1m=10-7 cm

This visible light is located at wavelengths of 400-700 mm microns:

- m in the range of electromagnetic waves so this visible light is the field of energy active in the process of photosynthesis.

- Visible light confined between 400-700 mm is usually measured in the following unit Micromol/m2/s: It is the amount of photons of light incident on an area of one square meter in one unit of time.

The light energy reaching the Earth is measured on the basis of:

1. Total incident radiation

2. Net solar radiation.

3. Visible light

4. Photoperiod (hour/day)

Net solar radiation represents the difference between the total incident radiation and that reflected upwards.

The net solar radiation consumption is as follows:

Rn= ET + H + G + Ps

Rn= net solar radiation

ET= Energy used in the evaporation process transpiration (potential energy of evaporation)

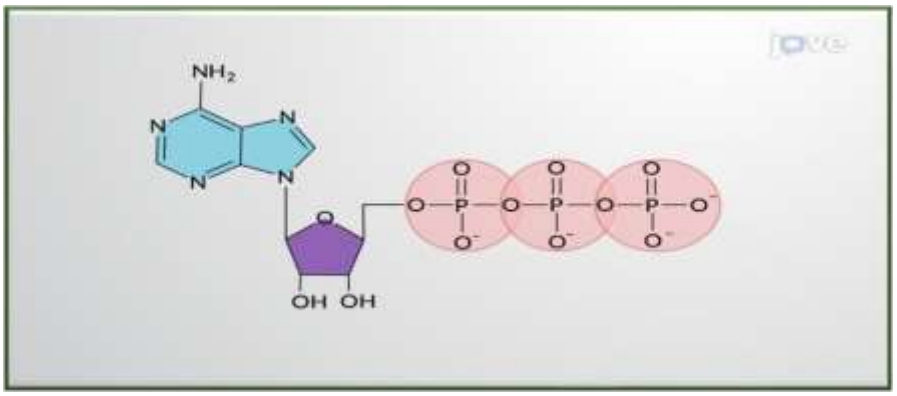
H = Energy used in the heat exchange process between the plant and the surrounding air (loaded currents)

G= energy used in soil heating

PS= energy used in photosynthesis

Coenzymes

1. ATP



2. NADPH dinucledate phosphate

Figeuer47: NADPH

3. Oxygen gas O2 as a by-product

-ATP-NADPH Coenzymes are the necessary substances or oxidizing force in dark reactions

Table3 : Comparison of plants C3, C4 , CAM

Comparison	plants C3	C4 PLANTS	CAM Plants
1. Photorespiration	Yes,	NO,	NO,
2.Favorable temperatures	low temperature	High temperature	Very high temperature"
3.CO2 receptor compound	Ripollose 1,5 diphosphate RUDP	Phosphoenol Pyruvate (PEP)	Phosphoenol Pyruvate (PEP)
4.The first compound produced	OAA	OAA	3-PGA
5.The CO2-fixing enzyme is Ribulose triphosphate carboxylase	Ribulose diphosphate carboxylase	Phospho enol pyruvate carboxylase	Phospho enol pyruvate carboxylase
6. Growing regions	Most of its plants grow in temperate zones	Tropics	Desert
7. O2 Effect	Inhibition is inhibited by oxygen abundance	N0, Inhibition,	N0, Inhibition,
8. Optimum temperature for photosynthesis	**15°-25°**Celsius	**30°-40°**Celsius	**More than 40°**Celsius
9. Light saturation	High	NO	NO
10. Examples	Wheat, rice and soybeans	Corn and sugar cane	Cactus plant and prickly pear plant

Factors affecting photosynthesis

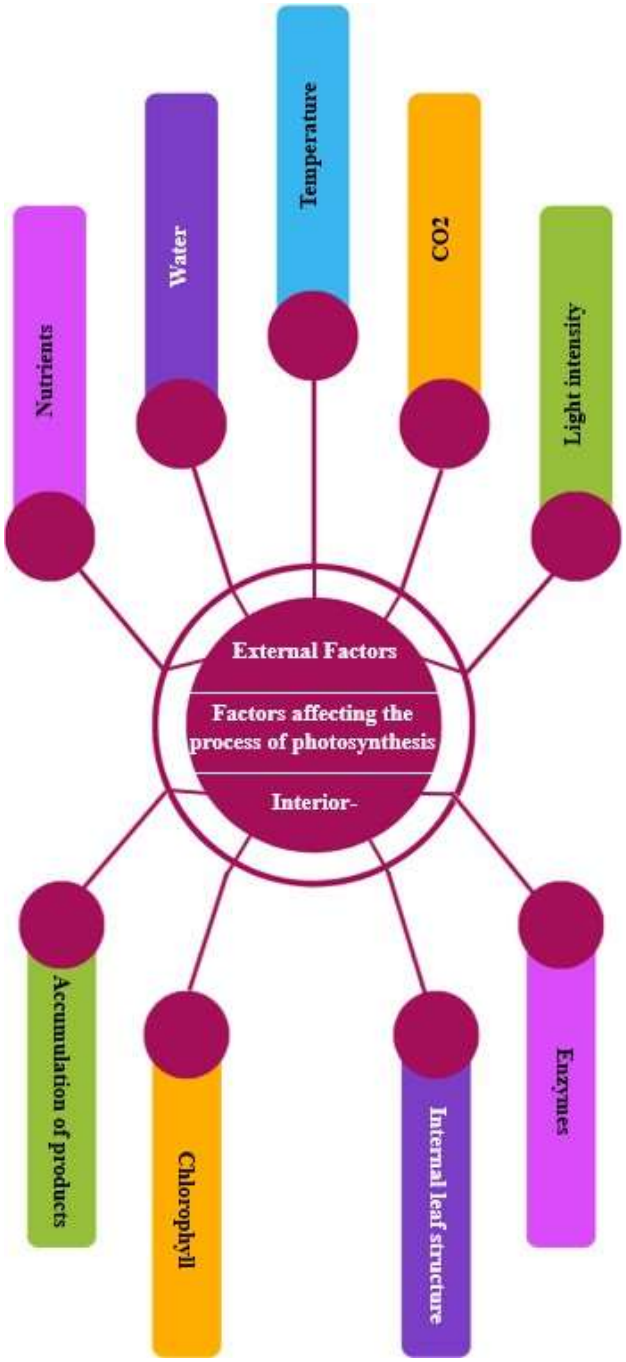


Diagram3: Factors affecting photosynthesis

There are external factors

1. **Light intensity:** The intensity of lighting in the external environment of the plant and the duration of its exposure to light has an impact on the process of photosynthesis and the rate of its occurrence, when the intensity of lighting is low, the speed of photosynthesis is directly proportional to it, as the rate of photosynthesis increases with the high intensity of light.

The process of photosynthesis is directly proportional to the intensity of the lighting until it reaches the degree of saturation after that, any increase from this point may cause a decrease in the process of photosynthesis, as high illumination causes the so-called photooxidation (the phenomenon of solarization) soolarigation

Figure 48: the phenomenon of solarization

As the increase in the intensity of lighting falling on the leaves causes high plant temperature and thus may cause

damage to chlorophyll, as the leaves lose their green color and turn brown.

2. **CO_2 concentration:** Increasing the concentration of carbon dioxide leads to an increase in the speed of photosynthesis and if the concentration of carbon dioxide in the external environment increases to a high degree, the speed of photosynthesis decreases due to its toxic effect on the plant and closing its stomata to protect itself from this effect, and when the stomata are closed, the concentration of carbon dioxide decreases around the cells for photosynthesis, and then the speed of the process decreases.

CO_2 gas is concentrated in (0.1%) which is the optimal limit for photosynthesis, but the high concentration of carbon dioxide to limits higher than (0.2%) reflects negatively and indirectly on the photosynthesis process, as photosynthesis is inhibited and the plant dies, and on the other hand, a decrease in the concentration of this gas below (0.01%) leads to the cessation of photosynthesis.

3. **Temperature:** Enzymes of photosynthesis cycles are affected by increasing and decreasing temperatures, as the rise in temperature accelerates the occurrence of photosynthesis, but with an excessive increase in

temperature, this leads to a decrease in the rate of photosynthesis, and thus the process is affected.

4. **Water:** It was found that the amount of water required to continue the process of photosynthesis is estimated at only about 1% of the total water absorbed by the plant. It has been noted that the rate of photosynthesis rises if a simple drought occurs in the leaves (15% water loss), but this rate decreases completely if there is a severe drought in these leaves (45% water loss) as the loss of water leads to shrinkage in the cells and thus the closure of the stomata, so the rate of representation decreases accordingly and drought also leads to a lack of permeability of plasma membranes and relative dehydration of enzymes and may lead to a lack of rapid formation of carbohydrate materials formed from the construction process, which leads to Their accumulation in the leaves and thus the slow speed of the construction process.

5. **Nutrients:** Deficiency of some elements leads to a decrease in the rate of photosynthesis because they are catalysts for some enzymes for dark reactions or the need for their presence to complete the process of light interaction such as chlorine, which leads to a deficiency to the inability to transfer electrons from water to

chlorophyll and may be a lack of an element affecting the construction of chlorophyll itself as in the case of lack of iron or nitrogen or magnesium and others as it enters as a reaction substance during dark reactions.

Internal factors

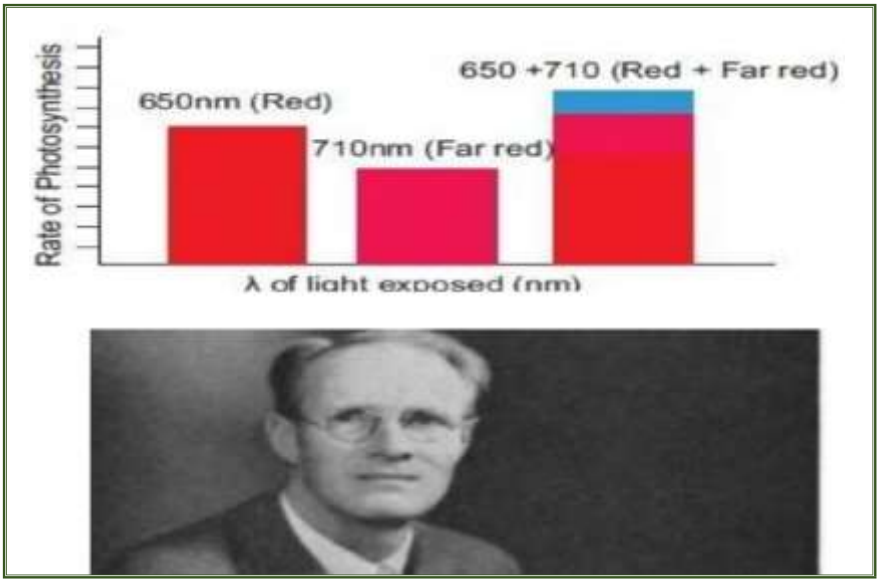
1. **Enzymes:** As we know, enzymes are proteins specialized for a specific metabolic work and any effect on them, the process of photosynthesis will be affected and if a defect occurs in any of the enzymes involved in the process of photosynthesis, there will be a defect in the processes of photosynthesis.
2. **Internal leaf structure:** The composition of the leaf varies according to the type, in some types the leaf is thick dark green as it contains chlorophyll in a higher percentage, such as the shady plant.
3. **Accumulation of products:** The plant in the process of photosynthesis produces sugars as a product of the conversion of CO2 into sugar compounds in the plant that accumulates these products will be negative on the process of photosynthesis, so it will be less efficient and slower.

4. **Chlorophyll:** is an essential factor in photosynthesis, as it absorbs light energy, which pushes living cells to build carbohydrates.

Chlorophyll is found in the cell carried on the bodies of chloroplasts and chlorophyll can be extracted from green leaves with an organic solvent such as Aston or N, N-DIMETHYLFORMAMIDE (CH) 2NCHO because chlorophyll does not dissolve in water and chlorophyll can be extracted from the leaves by boiling them in ethylene alcohol.

Green plastids contain two types of chlorophyll A and B. In a ratio of 1:3, chlorophyll, especially A, is the main light-absorbing material that begins with photosynthesis reactions.

There are two yellow and purple pigments, which are **carotene** and xanthophyll, may have a role, especially the carotene pigment, which has a role in absorbing light and transferring it to chlorine and vail and protecting it from photooxidation



Figuer48: The Emerson Enhancement

There are two sites to receive light energy (photons) has been the scientist Emerson shed a wavelength less than 680 nanometers (mill microns) and light with a wavelength of more than 680 nm (mill micron) separately once and the second time the light was highlighted with a wavelength greater and less than 680 nm (mill micron) was an increase from each previous time and this case was called The Emerson Enhancement effect and thus Emerson concluded that there are two optical systems.

Important definitions in photosynthesis:

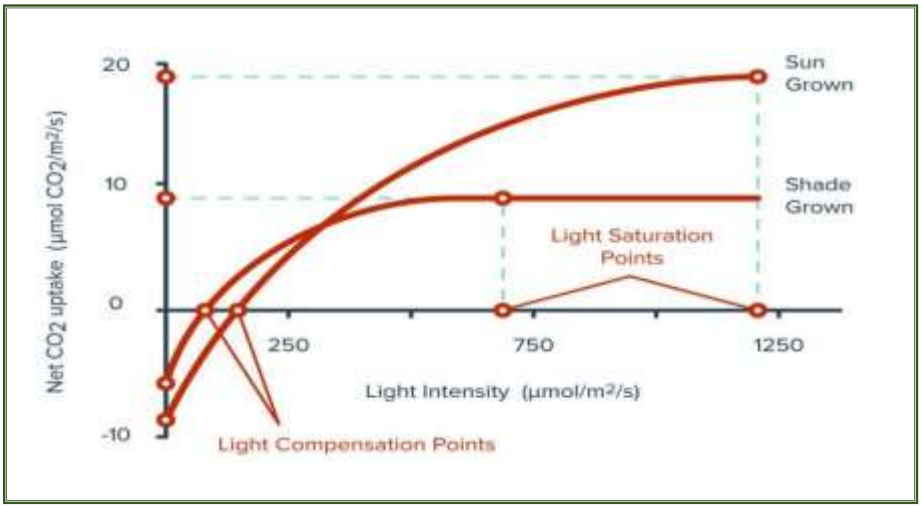
1. Light compensation:

It is the intensity of illumination in which the speed of breathing is equal to the speed of photosynthesis.

2. light saturation:

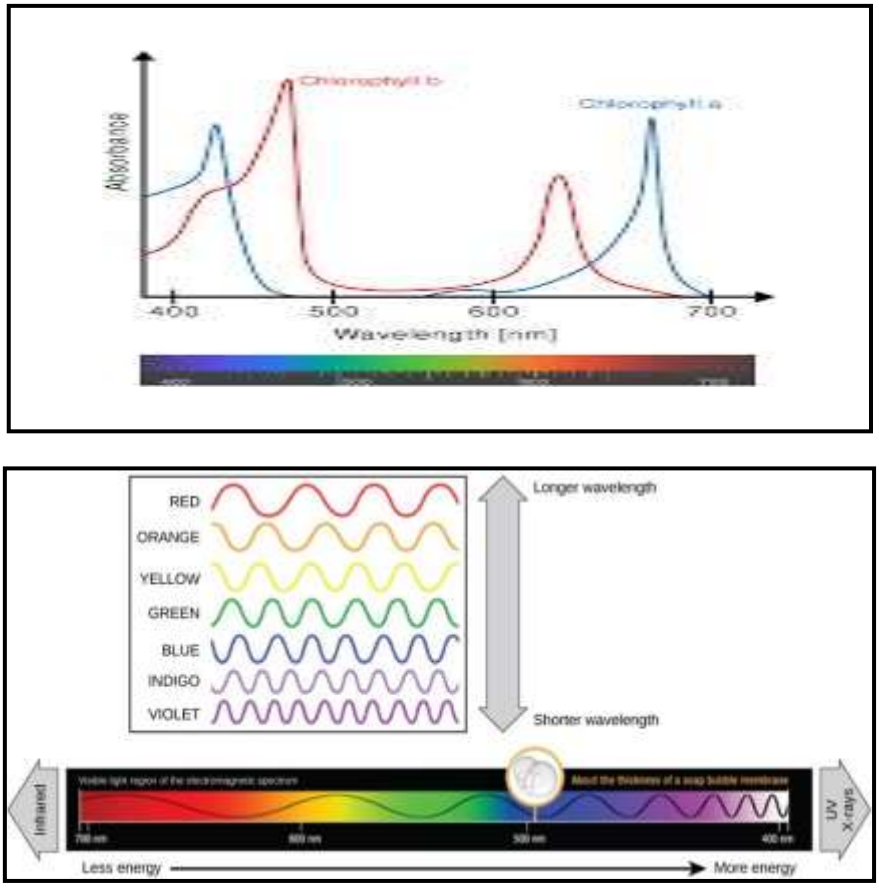
It is the intensity of illumination necessary for the speed of photosynthesis to reach its maximum under certain conditions.

After these points, the efficiency of the paper in converting light energy into chemical energy decreases.



Figuer49: light saturation

3. **Absorption spectrum:** It is the spectrum that is absorbed by the plant as for the active spectrum: It is the spectrum that actually participates in the process of photosynthesis, which is determined in green and blue.



Figuer50: The active spectrum

2. Respiration

It is the set of processes that occur within the cell whereby complex nutrients are converted into less complex compounds into structures with the release of potential energy to those substances in batches.

The nutrients used in breathing are starch, sucrose, glucose and other sugars as well as fatty substances and organic acids.

The energy released part of the energy is converted into thermal energy most of what moves to the surrounding atmosphere radiation or conduction has caused some lighting and raise the temperature of the plant. The other part of the energy that benefits from the plant turns into chemical energy stored in some compounds in the form of phosphate bonds rich in energy and the most important (adenosine triphosphate), which has the ability to receive or receive energy from other reactions and transfer this energy to proceed another interaction and build cellular components.

This process of respiration is the process of oxidation of nutrients and oxygen reduction to form water.

Primary chemical reactions:

Complex sugars are converted into simple sugars (glucose)

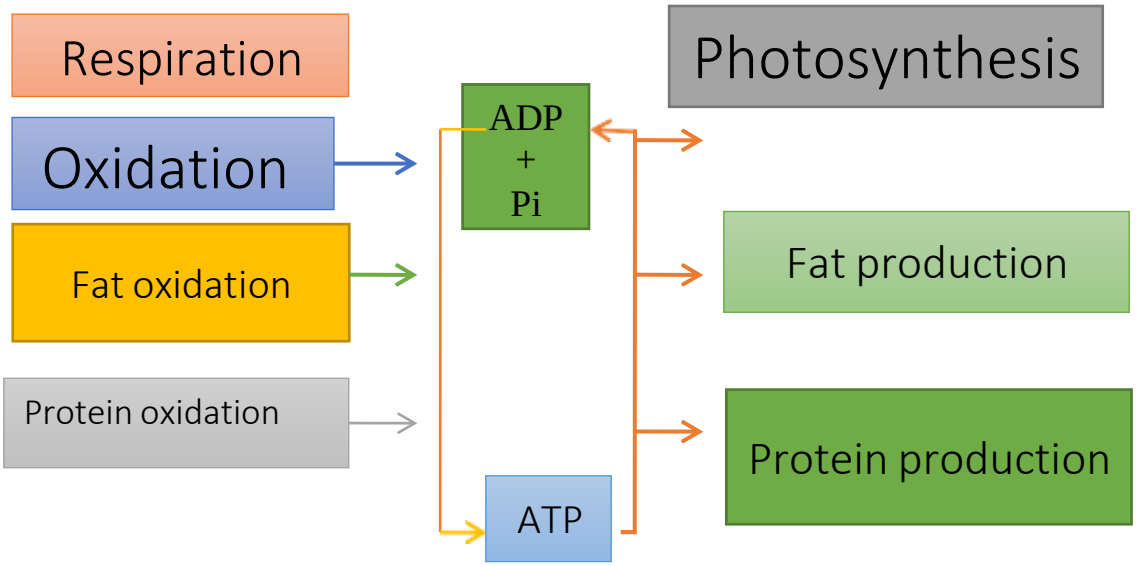
1 - Starch + many H_2O $\xrightarrow{\text{amylase enzyme}}$ many glucose

Starch + Pi $\xrightarrow{\text{phosporylase enzyme}}$ many glucose -1 - P

2 - Fructans + H_2O $\xrightarrow{\text{fructan-exohydrolases}}$ Sereal Frutose + one sucrose

3 - Sucrose + H_2O $\xrightarrow{\text{invertase enzyme}}$ Glucose + fructose

Sugars before glycolysis must go through preliminary reactions through which polysaccharides are converted into simpler sugars into monosaccharaides.



Diaram4: ATP cycle medium energy carrier

adenosine triphosphate=ATP

adenodiphosphate =ADP

Inorganic phosphorus =Pi

$$CH_2O + O_2 + ATP + Pi \rightarrow CO_2 + H_2O + ATP$$

The importance of the process of plant respiration:

1. ATP production.
2. It has many compounds that go into the construction of plant tissues.

In the first stage: glucose sugar turns into **Pyruvic** acids, oxygen is not absorbed and CO2 is released

The second stage: Co2 is released as a result of the dissociation of the bar-acids in you.

All free absolute CO2 comes from the Krebs cycle. In the last stage (electron transfer) energy is produced, where 2/3 of this energy is lost in the form of heat and only 1/3 of this energy is held in the form of ATP (a complete phosphorus complex of energy)

Before entering the sugars in the first stage (glycolysis), it must be many and binary sugars (starch)-sucrose

It has been hydrolyzed by some enzymes that have the property to be converted into monosaccharides to be hydrolyzed.

This stage is called preliminary reactions.

Respiration coefficient.

(RG) The respiratory quotient (RQ)

Respirator, respiratory ratio

$RQ = \frac{CO2}{O_2}$

It is the measure of the ratio of CO2 release to o2 consumption in the process of respiration.

When the glucose sugar is the reaction substance in breathing and oxidizes as a whole, the volume of oxygen consumed in this process is equal to the volume of CO2 released, hence the ratio is equal to the unit ea.=1 This is what is observed when measuring the respiration rate of many seeds grains because their food stock is sugary substances, but in the seeds plants that contain fatty substances, the ratio is a fraction due to the difference in the reaction material for respiration and because the ratio of carbon, hydrogen and oxygen in fats differs from sugars, and here the coefficient of Breathing indicates the type of oxidant or ... Any... Oxidation of the substance entering as a respiration reaction.

If the breathing substance is sugar, the respiration coefficient is equal to 1, but in fats, they require a large amount of oxygen in order to be oxidized to CO2 and water because the percentage of oxygen in the fat molecule is less than the sugar molecule, so the respiration coefficient of fat is less than 1 (sugar)

Factors affecting plant the respiration:

1. Temperature

Temperature affects significantly in the process of respiration, plants respond to the high temperature in the process of respiration, like any other vital process, so the rate of respiration increases with increasing temperature to some extent, as well as the decrease in temperature may cause a decrease in the process of respiration, depending on the type of plant and the environment in which it lives.

2. O_2 concentration

The rate of respiration increases with the increase in the concentration of oxygen, as well as the lack of oxygen causes a decrease in the rate of respiration, and in general, aerobic respiration requires the presence of oxygen, that is, in the absence of oxygen, breathing is anaerobic.

3. CO_2 concentration:

It is believed that increasing the concentration of CO2 produced in the process of respiration may inhibit the 3- CO2 concentration:

It is believed that increasing the concentration of CO2 produced in the process of respiration may inhibit the respiration process, but these concentrations that inhibit

respiration are also high, as mentioned earlier, increasing the concentration of CO2 in plant tissues may cause stomata closure and thus effect gas exchange and thus inhibit respiration. Process, but these concentrations that inhibit respiration are also high, as mentioned earlier, increasing the concentration of CO2 in plant tissues may cause stomata closure and thus effect gas exchange and thus inhibit respiration.

Table5: Comparison of respiration and photosynthesis in plants,

Comparison	photosynthesis	Respiration
1. Phosphorylation	Photophosphorylation uses light energy	Oxidative phosphorylation uses chemical energy
2. Reductionist power	NADPH is formed by photovoltaic energy and used to reduce CO2	NADH is formed by oxidation of O2 reductase
3. CO2	Reaction material	Result
4. O2	Result	Reaction material
5. Organic compounds	product	Reaction material

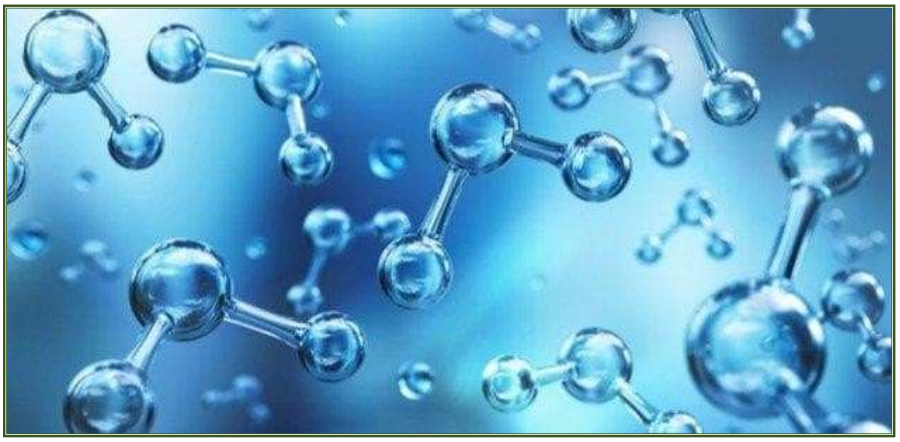
Chapter THREE

Water & Plant

CHAPTER THREE
WATER & PLANT

Water movement in the plant

Water is of great importance in plant life and the concentration of chemical content within the plant plays the largest role in affecting the water potential inside the cell from the ether imbalance on the osmotic voltage.



Properties of water

1. Specific heat is the amount of heat (in calories) needed to raise the temperature of one gram of a substance one degree Celsius without a change in the state of the material. Water is characterized by high quality temperature above any other material, so we find that water has the ability to absorb large amounts of heat with little change in its temperature, and this has a soothing

effect in the case of high temperatures around the plant and the warming effect in the event of its decrease.

2. The volume of water shrinks by thermal decrease up to 4 m and then increases its volume rapidly with the continuous decrease of temperature from 4 m to zero degrees Celsius and this decrease cause's ice to float above the surface of the water so that the plants of the Polar Regions live under the ice in the water.

3. **Hydrogen bonds:** Water molecules are connected to each other by hydrogen bonds, and this is done in partnership between hydrogen and oxygen atoms in neighboring molecules, and this is the reason for the cohesion between molecules so that they play an important role in the cohesion of aqueous solutions when they rise in the vessels of wood

4. Adhesion force between water molecules and materials in contact with them, which facilitates their spread.

5. Transparency this is important in the spread of light radiation necessary for photosynthesis inside the leaves.

6. In plants, water is the main element of plant juices (once any ionized substance dissolves in it, it becomes a conductor of electricity) and this facilitates the transfer of

elements and the creation of the appropriate medium to accomplish vital reactions.

Osmosis: It is the diffusion of water through an optional permeable membrane as a result of the chemical potential difference of water on both sides of the membrane (it is a special type of diffusion).

Aqueous potential: The chemical potential difference between a solution of a water solvent and pure water - measured in units of pressure. Where water diffuses from a high-voltage solution to a low-voltage solution if separated by a bio membrane permeable, Organic and inorganic substances in plants play a large role in influencing the water potential in the cell through their effect on osmotic potential. Inorganic and organic substances in the gap and cytoplasm cause a reduction in the value of the electrolytic potential, which leads to a reduction in the water energy of the plant. These components play a key role in the osmoregulation process in plants.

Osmoregulation: It is the adaptation of the plant cell to the water state of the ocean in which it is located. If the plant is in a medium with a water potential less than the water potential of the plant cell, then the water will come out of the plant.

The movement of water

In the wood, i.e. its transition from the root to the top of the plant, is carried out in several ways, including:

Root pressure

The movement of ions to the wood Xylem leads to a decrease in the value of water potential Ψw in the wood, which leads to the transfer of water into the wood. The transfer of water to the wood generates pressure at the root and this pressure leads to the movement of water to the top of the plant. This phenomenon does not lead to the transfer of water to high distances in plants and does not play a fundamental role in it.

The root pressure causes what is known as the phenomenon of quitting in the plant, which results from pushing water through the plant and taking it out in the form of droplets from the edges of the leaves, which is usually observed in the early morning hours. It is one of the ways in which the plant can get rid of toxic ions that harm the plant, including the element boron B.

Table5: lem sap

Positive ions	K^+	Na^+	Ca^{++}	Mg^{++}	Total
Meq/L	17.3	0.3	10.8	3.9	32.3
Negative ions	NO_3^-	SO_4^-	$H_2PO_4^-$	Cl^-	Total
Meq/L	26.1	3.1	0.4	1.7	31.3

In the phloem transport

The materials manufactured in the vegetative parts are transported from the places of manufacture in the plant to the places of consumption sink.

Phloem composition

The bark consists of:

1. .Sieve Elements.
2. Companion cells, which are cells near the sieve tubes and are connected to them by plasmadsmata.
3. .Fiber gives strength to bark.
4. Parenchyma cells, which are the cells in which the material made by the leaf is stored.

Composition of phloem sap

1. Organic components: the main form of them are carbohydrates and are in the form of sucrose.
2. Inorganic components: H2PO4, K, Ca, Mg, Cl, Type 3, H2CO3, Na, NH4.
3. .Bio hormones: IAA, GA, CYTOKININ, ATP, A.A. amino acids.

Guttation

Figuer51: Guttation in plant

It is the loss of water in the form of liquid solutions that can be seen in the early morning as juicy drops at the end ends of the leaves, such as tomatoes and cabbage, and the reason for this phenomenon is that the root pressure is affected, and here the speed of absorption exceeds the speed of transpiration, which is slow in the evening to close a large percentage of large stomata, and tear water contains some sugary substances, amino acids and mineral salts.

Transpiration

Figuer52: Transpiration in plant

Played the main role in the transfer of water from the root to the top of plants in high plants, which may sometimes reach a height of 100 meters. The transfer of water through the stem in the plant is by pulling the water molecules up as a result of the evaporation of water molecules from the plant to the atmosphere in order to compensate for the lost water because the water molecules are connected to each other from the root to the top of the plant in the leaves. The movement of water in this method is called cohesion theory.

Transpiration is the exit of water in the form of steam from the plant parts exposed to the surrounding atmosphere, pure water free of other substances and pictures of transpiration:

Stomata transpiration

It is the most common form of transpiration in plants, constituting about 50-97% of total transpiration.

Cuticular transpiration

Also known as epidermal transpiration, water vapor seeps through the outer walls of epidermal cells and accounts for 3-10% of total transpiration .

Transpiration Lenticular

It is the exit of water through the lenticels in the bark of the plant and the percentage of 0.1%.

Movement in the phloem transport

The materials manufactured in the vegetative parts are transported from the places of manufacture in the plant to the places of consumption sink .

Phloem composition

The bark consists of:

1. Sieve Elements.
2. Companion cells, which are cells near the sieve tubes and are connected to them by plasmadsmata.
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Composition of phloem sap:

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3. Bio hormones: IAA, GA, CYTOKININ, ATP, AMINO ACIDS.

Factors affecting transpiration

1. **Vegetative factors include**

a. The ratio of the vegetative root total to the increase of the transpiration process to increase the proportion of the vegetative root total

b. The surface area of the paper the area of the paper determines the amount of water lost, as the amount of water lost from leaves with a large area is greater than the amount of water lost from leaves with a small surface area, but the transpiration speed (the speed of space loss) g/cm is in the opposite case, so the explanation of the surface area of

c. The size and shape of the paper.. The amount of ambient air increases and this leads to an increase in the resistance of the surface of the sheet to prevent water vapor from escaping into the outside air

d. The surface of the paper

e. IF the surface of the paper contains live hairs, it will lead to an increase in the transpiration rate, as for the leaves containing dead hairs, it reduces transpiration, because it hinders the movement of air and increases the thickness of the saturated air layer around the leaves, so the glossy Sicilian leaves reflect a high percentage of the light falling on them, and therefore their temperature does not rise, unlike.

2. External factors Environmental or external factor, namely the state of humidity of the air surrounding the leaves, light and dark, temperature and wind.

The drought:

The lack of rain falling and the rise in temperatures, which accelerate the drought, and in general, the drought cannot be determined depending on one climatic factor, but the overlap of more than one factor of them, drought is a natural phenomenon associated with the season of lack of

rain and high temperatures, which may also affect the lack of groundwater.

Attempts have been made to define drought on the basis of the amount of rain falling and the first map of the equal rain lines of the world had a great impact on the choice of this element has been chosen line rain equal 250 mm line separating between semi-dry and humid areas and 127 mm between semi-dry and dry areas, but this division has a major deficiency to neglect temperatures in areas where rain falls as neglected seasonal rainfall because high temperatures increase the need for rain. In areas where there is no clear rainfall season, the rain line of equal 120 mm is a dividing line between dry and semi-dry areas with an average temperature of 5 ° C and 170 mm for areas with average temperatures of 10 ° C and 320 mm for areas with an average of 25 ° C, but if rainfall is in winter, the rain line of 50 mm is the boundary between dry and semi-dry with an average temperature of 5 m and 100 mm for areas with an annual average temperature of 10 m and 250 mm for areas with average temperature Annual 25 °C, but if the rainfall is summer, it needs 190 mm at an average of 5 ° C and 240 mm for areas with an average temperature of 10 ° C and 390 mm for areas with an average annual temperature of 25 ° C.

The definition of drought for the plant does not differ from the climatic definition because of the plant's complete dependence on the climate, the plant depends on the rain that is affected and affects the amount of evaporation, so the areas that depend on rain in their cultivation are completely without the help of irrigation as wet areas, and the greater the dependence on irrigation and the less rain necessary for agriculture indicates drought.

Dehydration means the lack of affordable soil water, which leads to a decrease in the amount of internal water of the plant to a degree that reduces its growth. Although the damage of drought is mainly caused by the lack of soil water, the damage is increased by various weather factors such as high temperature, low humidity and wind, which increases the speed of transpiration, which in turn accelerates the occurrence of internal water shortage.

Another type of drought is physiological drought, in which the lack of plant water resulting from cold soil or high osmotic pressure of the solution or the occurrence of drowning and lack of oxygen absorption necessary for breathing and absorption decreases water absorption despite the availability in the soil where the plant suffers from drought because of its inability to absorb it.

What does the plant do in and drought?

Figure 53: drought in plant

The speed of water loss in these plant species is low due to the lack of water lost by transpiration, but this opinion was criticized as many drought-tolerant plants carry out the process of transpiration quickly if provided with water, and thus it seems that the low speed of water loss in those species is mainly due to the lack of water that already exists and is affordable for the plant.

The opinion tended to be that the main factor in drought resistance is the ability of the protoplasm to withstand drought and not the structural qualities that reduce water loss and there is a tendency to accept the opinion that the reason for drought resistance is due to several factors, including those factors that postpone the dryness of the

protoplasm in addition to those factors that increase its ability to withstand drought.

Drought occurs in all cases of climate, causing a short non-rainy period in humid areas The effect of a long period in a semi-arid climate and drought does not cause only lack of rain, as high heat may cause the climate to dry out due to the plant's need to a large degree for water, so the statistical methods used for the efficiency of rain in different types of climate work as a basis for measuring air dryness.

Types of plants and drought resistance can be divided into the following:

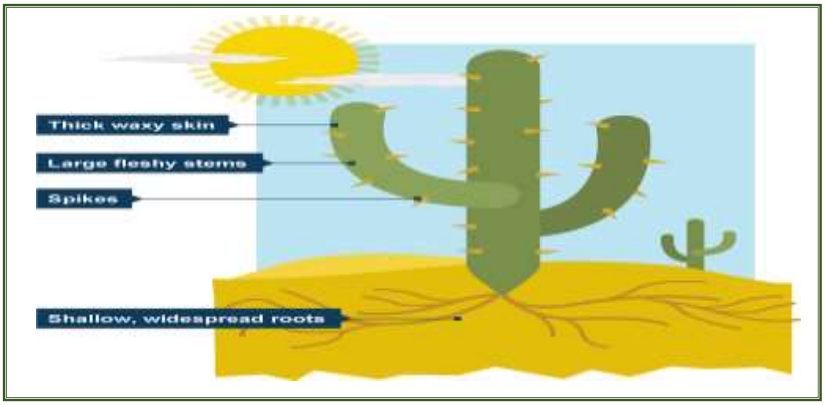
1. Some plants do not tolerate drought and are affected quickly or die as soon as water is lacking, because they are fast drying like shade plants.
2. Plants such as cacti and other succulent plants store large amounts of water and at the same time lose water slowly because of their small surface to size, the thickness of the **cutin** and the lack of stomata, so their resistance to drought is high.
3. Drought tolerant plants because the protoplasm of their cells can be dried without permanent damage, such as mosses and some seed plants.

4. Plants with a moderate or limited ability to resist drought accompanied by structural features that reduce the speed of water loss, as they increase the absorbed water, thus postponing the occurrence of a critical shortage in internal water, and this group includes most crops.

The ratio between the absorption of water by the roots and its loss through the vegetative system (water balance of the plant) and there are external and other internal manifestations of the water balance plant and external manifestations is the amount of water available to the organs that absorb water and factors that help increase transpiration and water content decreases to a degree that may reach 40% of the wet weight.

The composition of plants is affected by the conditions of water balance during their growth more than the impact of any other factor for the environment and characterized plants growing under conditions inappropriate for water balance characteristics of the following:

A. Synthetic manifestations



1. Reduction of the size of the vegetative total.
2. Increase the size of the root system
3. The small size of the leaf cells, the small area of the blade, the small size of the stomata and the increase in the number of hairs per unit area.

Figuer53: Desert plants

4. Thickening of the dermis and cell walls and increasing the amount of lipids on surfaces.

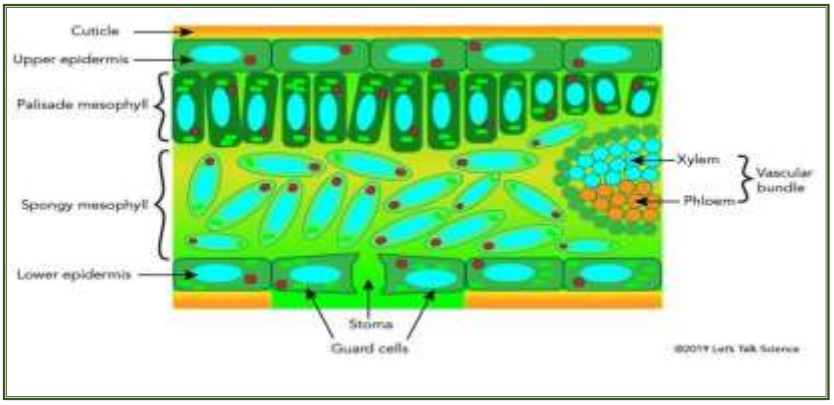
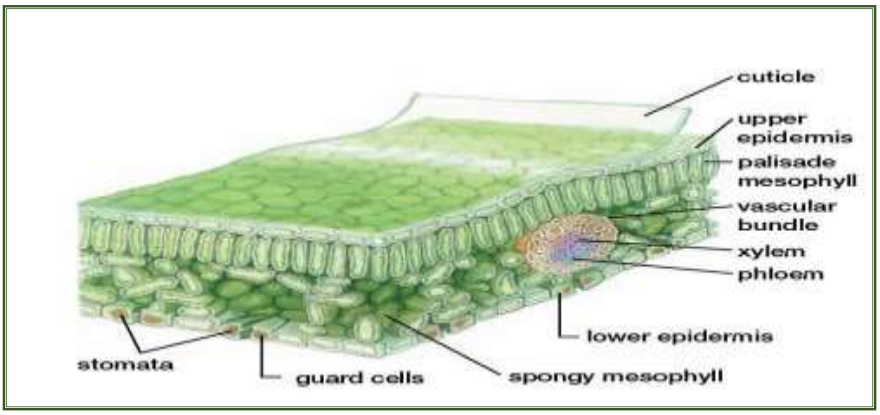


Figure 54: Thickening of the dermis

5. Be good for the intentional tissue and weak formation of spongy tissue.
6. Small distances between them.
7. Smallness of wood tissue.

B. Synthetic manifestations:



1. Reduction of vegetative total size.

2. Increase the size of the root system.

3. Small size of leaf cells, small blade area, small size of stomata, increase in the number of hairs per unit area, thickness of the dermis and cell walls, and increase in the amount of lipids on surfaces.

4. Good for intentional tissue and poor spongy tissue formation.

5. Small intervals, small xylem and increased proportion of lignified tissues.

C. Functional manifestations

1. Rapid rate of transpiration per unit area despite the lack of transpiration.

2. Fast rate of photosynthesis per unit area.

3. A small percentage of starch: sugar
4. High pressure and Low viscosity of protoplasm
5. High protoplasm permeability
6. Increase the proportion of water in the dry weight unit of tissues
7. Flowers and early fruiting.

Drought resistance from plant

Parker has pointed out. 1968 to the various factors that work on plant resistance to drought, including:

A. **Tolerance of protoplasm to drying:** as is the case in many algae, lichens and even some seed plants, the protoplasm in them can remain alive when dehydration and can be easily observed in many herbs and shrubs that grow in dry areas. It is noted that for these plants that the qualities of plant resistance occupy the first place, are more important than the amount of the crop. One of the examples of plants is considered one of the best examples in this regard is olives. Where it can grow where the drought is most severe and the environment is not suitable for any other type of tree. It has been found that one of its characteristics is that its leaves resist the removal of water from them strongly, and that its leaves

are covered with a thick layer of capotin as well as covered with a layer of fluff as it is leathery and small. This plant is considered one of the most capable plants to live in drought conditions.

B. Avoiding drought or delaying its occurrence: Therefore, less importance in tolerating drought, and this is found in most plants Mesophytes and this may be due to some morphological and physiological qualities, which result in avoiding the occurrence of water stress deficiency and that is in many ways, including.

C. Modification of the growing season: As in the case of many annuals that grow and bloom within a few weeks, after the rain descends on the surface of the soil, the plant soon grows and completes its growth and blooms and completes its life before the severe shortage of water Stress occurs, and thus the plant could resist drought, but by avoiding the period in which drought occurs as the period of its life is short and grows within specific weeks, as well as it was noted that in some white sea herbs it occurs It has dormancy during the dry season and during high temperatures.

D. Diffuse root system: The diffuse root system is one of the most influential factors in protecting plants against

drought damage. The depth, wide spread and discharge of the roots a lot and works to protect the plant from drought because its roots in this case are able to absorb water from the soil layers and so the plant avoids drought damage, for example, it is noted that plants with scattered and diverse roots that do not extend much, such as potatoes and lettuce, they suffer from a lack of water more than those plants with deep and dense roots such as tomatoes, which are able to absorb water more than different soil layers.

E. Control the rate of transpiration: One of the ways that the plant tolerates to postpone the occurrence of water deficiency in the plant Water Stress, where the plant interacts with the surrounding conditions in order to reduce the rate of transpiration, such as the Larrea plant, where the wrapping of its leaves works, reducing the rate of transpiration. Many plants react to Water Stress by closing their stomata. That group of plants seems to be more tolerant. And more able to live under drought conditions. And the response of plants to Water Stress in this case and close to the stomata is once the start of the occurrence of water shortage Water Stress and the presence of a layer of cutin on the leaves, results in severe control of the rate of transpiration and thus the plant can

resist or avoid the occurrence of drought, has described Tal 1966 mutation of tomato, which is weak to grow even conditions of an atmosphere saturated with moisture or under the conditions of glass stoves because the stomata can not close on Launch. This illustrates the importance of closing the stomata to reduce the rate of water loss in the plant. Waggones & Simmonds 1966 described a similar mutation of potatoes.

The environmental importance of the plant in the dry period lies in the structural and histological adaptations in the changing environment towards the lack of available water for the purpose of completing metabolic processes that can only occur in the presence of water.

The internal structure of the plant and its relationship to the environment-xerophytes drought plants

The main factor affecting dry plants is the lack of water, and not all plants that grow in desert and semi-desert areas are drought plants because they live for a short time in the rainy season and have means of terrestrial reconstruction such as bulbs, vines, and tubers. True drought plants are those plants that have special mutations in their internal and external structure that make them in extreme drought conditions. Some plants form a good root group that

penetrates into the soil, that is, their transformation is not significant, but only by roots.

Mutations in drought flora

1. Strengthening the skin, increasing the thickness of the cuticle in addition to impregnating the walls with cuticle Cutinization, as there may be two accents, and sometimes the skin is covered with a waxy layer.
2. Sclerenchyma tissue is available in dry plants, especially leaves, where one or two layers of the epidermis and intermediate tissue form or between the Hypodermis and the columnar layer, or sometimes sclerenchyma tissue extends in the form of strips or plates under the epidermis. These serve to prevent water loss and as mechanical support. Such leaves are called hard leaves xerophytes.
3. Abundance of hairs, and these are often on the lower surfaces or on the stomata, which reduces wind movement and thus non-evaporation, and these plants that use hairs to resist drought are called drought plants trichophyllous xerophytes.
4. Folding of the leaves and these are usually found in angiosperms due to the presence of motor or bubble cells,

when the Leaf is folded, the stomata are isolated from the external atmosphere and from air currents.

5. structure and number of stomata: this is due to the small number of stomata and the fact that they are sunken under a special cavity called the external air chambers, and there are some modifications that help to reduce transpiration, as in Oleander cavities or on the sides of special cracks in the surface of the leg or the external chamber is divided by inflamed protrusions into upper and lower chambers, as sphincter Ruscus.
6. ***reducing*** the surface of the paper leads to a reduction in the production process, these plants are called dry small-leaf Microphyllous plants such as horsetail, Pine, Casuarina, and approx.

Fleshy xerophytes drought plants

These plants are distinguished by their fleshy leaves and stems, as they contain a water-storing tissue in addition to gels, and this water is useful during the drought period, and the storage cells are living parenchyma cells characterized by their pristine size and the cytoplasm is surrounded by a large gap.

The storage tissue takes different external or internal positions, as in rubber figs and begonias in the first case and cacti and flags in the second case.

As for the thickened lubricated leaves, the vascular bundles are columnar and pubescent, and the medium tissue is normal and cohesive.

Aquatic plants Hydrophytes

The changes that are found in aquatic plants include temperature, ventilation, and osmotic concentration, and the changes occur by reducing the protective, supporting, and conductive tissues, as well as increasing the distances between them. The changes can be summarized as follows.

1. Epidermis.

a. It loses its protective function

b. P. It absorbs water, gases, and salts.

c. The thinness of the cuticle layer.

d. Stomata are found in the floating parts and disappear in the submerged parts. And. The opening of the stomata occurs as a result of the divergence and convergence of the protrusions of the affected lacunae instead of at their lined walls.

2. The general shape of the leaves of the plant:

Submerged leaves are usually serrated in order to increase the absorption surface and resistance to water current. Some plants are characterized by heterophyllously differentiated leaves: the leaves formed under water are in one form and the leaves formed outside the water are in another form, as in some species of Ranunculus. Sometimes there are three species, as in *Sagittaria* plant. Those that live in shallow water possess three types of leaves, submerged linear-striped, floating-Lance, and aerial-arrow, while those that live in deep water have striped leaves. The floating leaves are full-edged and the representative tissue surrounds the leaf because the light does not reach the submerged blade from all sides.

Air chambers: the leaves of aquatic plants are characterized by containing wide clear spaces used to store air to benefit from it in respiration and photosynthesis, and the parenchymal tissue is of the type aerenchyma tissue.

Chapter four

Plant Geography

CHAPTER FOUR
PLANT GEOGRAPHY

Geography of plant distribution in the globe

Plants differ in their distribution on the ground geographically in the south, north, east and west, and thus several factors affect the vegetation cover, including:

1. Climate:

The difference in terrain from mountains to plains and valleys will have an impact on climate change according to the height above sea level and the elements of climate have a great role and affect the growth and type of natural plant and the most prominent of these climatic Elements are the following:

a. Sun light

We also noted in explaining the process of photosynthesis the importance of sunlight and how it pushes energy towards plants to make food and the source of energy, which is sugars.

Sunlight is a very important climatic factor in the life and growth of plants and food industry, as well as the green matter (chlorophyll) does not grow and does not live except in the presence of sunlight and whenever the plant gets enough light, it is rich in leaves and flowering together

This depends on the following:

Light in density

Light duration

Wave length

b. Temperature degree

Heat is one of the environmental factors determining for all organisms, not only the plant, and it affects the vital processes of the plant, including respiration, photosynthesis, absorption and growth, especially with high temperatures within certain limits, and the opposite occurs when temperatures drop, so metabolic activity decreases and damage to the plant is shaved, especially when extreme temperature (extreme drop and sharp rise in temperature).

How plants resist extremes at lower and upper temperatures?

This is based on several factors, including:

The phases that the plant goes through from the stage of dormancy and growth and the stage of growth of leafy buds or the formation of flowering, because these phases are affected by temperatures.

The duration of low or high temperatures, when the period of rise or fall of temperature increases, it is negatively affected.

- The maturation of the plant wood of the stem (plant stem) when it is mature will resist low and high temperatures better than the soft stem.
- The ability of the plant to adapt in the event of low or high temperatures, and this differs in characteristics between one plant and another from the morphological and biological side.
- Plant age Large and mature plants are more resistant in the event of low or high temperature than plants with young ages.
- The health status of the plant, especially those infected with diseases, is more affected by low or high temperatures than a healthy plant.

c. Rain

Abundance of rain or lack of rain and drought will play an important role in plant life .

Without water, the seeds do not germinate, as well as the process of photosynthesis, which is an important element in the composition of plant cells and tissues, which is a large

proportion of the plant body, and water works to mitigate the impact of high temperatures on the natural plant through the process of transpiration, the amounts of rain falling are what determine the type of natural plants, abundant rains lead to the growth of natural plants such as forests, and when the amounts of rain decrease, then weeds grow, but if the rain is less than the level Growing weeds, they grow desert plants.

d. Relative humidity

In the case of high relative humidity, it reduces the amount of transpiration evaporation, and therefore it maintains soil moisture, and in the event that it reaches the saturation level, it leads to the process of condensation, and with the high percentage of moisture in the atmosphere, it means that there are chances of rain and thus leads to the growth of natural plants, including forests, and vice versa when the relative humidity decreases, it has many effects that make the plant infected with the scorching sun and thus lead to a decrease in plant productivity.

e. Wind

The movement of the wind has a positive and negative effect on the natural plant.

- **The positive effect of winds:**

The wind works on a thermal balance, including the transfer of energy between the lower and upper offers, and this serves the natural plant in the cold offers, as the wind transfers water vapor from water bodies towards land, and thus contributes to rainfall, and the wind reduces high temperatures in summer if it is coming from the northern regions cold, as well as mitigating the intensity of solar radiation because of the particles and particles of dust, impurities, water vapor and some gases, so it works to absorb some of solar radiation, as the wind transfers moisture from wet areas to dry areas In order to serve the natural plant, as the wind has an important role in conducting the process of natural pollination of some natural plants, as well as its role

in rainfall, as it works to renew the air of the soil surrounding the roots and continuously by displacing it to the old air and replacing it with new air loaded with oxygen and as the wind provides many gases important for the growth of natural plants, including carbon dioxide, which is necessary in the process of photosynthesis as well as nitrogen, Wind plays an important role in the natural growth of vegetation on the slopes of mountain slopes due to the phenomenon of mountain and valley breezes.

- **The negative impact of winds:**

Here, the higher its speed, it was able to carry atoms of dust and dust, so it works to tear the leaves of the natural plant and break its branches, especially the soft, as well as uprooting some trees and transferring salts to the lands where the natural plant grows, as well as transferring low or high temperatures, both of which affect the growth of the natural plant, as the wind transfers insect pests from the sick plant to the healthy plant, as well as the role of the wind in the process of erosion of the soil.

2. Soil:

The soil is the medium in which the natural plant grows and derives from it its food, water and air, and in which its roots extend and as a result of the different types

of soils and the variation of their characteristics and components, the natural plant has varied in its growth in those soils, forests grow in soils that have natural characteristics and in climatic conditions that differ from the rest of the other plants, so the soil plays a key role in the difference and diversity of plants within the same climatic region, forests may exist in grass growth areas if the soil is clay capable Water retention is necessary for the growth of trees, as weeds grow in the forest region if the soil is sandy or calcareous porous with a low water retention capacity.

3. Relief

The terrain has an important and influential role in the variation of natural vegetation and the height above sea level, as well as the slope and its direction, it has the effect

of climate Elements that vary from one place to another according to the terrain as follows:

a. Low temperatures with an altitude of about 64 m for humid air and one degree Celsius for dry air per 100 m.

b. The amount of rainfall increases by rising to the level of 4000 feet, as in the Zagros mountain range in northern Iraq, and then begins to decrease.

c. Slopes and direction: The northern slopes in the northern hemisphere reach less energy from solar radiation than the southern slopes and vice versa in the southern half

d. Atmospheric pressure is contradicted by the rise above sea level to an altitude of 2000 feet at a rate of 4% per 1000 feet and from 2000-5000 feet atmospheric pressure decreases at a rate of 3% per 1000 feet.

e. Snowfall and thickness increase with height.

f. The northern slopes in the northern hemisphere receive more snow than the southern slopes, while the southern slopes receive more snow than the northern slopes of the southern hemisphere.

g. The slopes facing the humid winds receive more rain than the slopes located in the shadow of the rain, and in light of this, the mountainous areas have certain vegetative

characteristics that vary according to the levels of altitude, the location of the mountains and the direction of slope of the slopes.

Natural plants

1. Natural plant concept

It means the vegetation cover that distinguishes each geographical area from the other, and plants that grow without human interference in their germination influenced by the natural environment in which they grow and by order of God.

Types of plant communities

Depending on the nature that provides certain conditions, plants can be divided into three types Main:

Saltwater plants (seas and oceans)

Freshwater plants (rivers and lakes)

Plants of the surface of the earth and land

Patterns of plant communities

Patterns of plant communities

Natural plants gather together in groups that take different patterns in terms of the space they occupy or their composition and the extent to which they are affected by the

environment in which they are located and followed, and special terms have been used to describe the pattern of their collection, which is

Major plant groups

Plant subgroups

Local plant groups

Plant Communities

The major plant groups are represented in the main sections of the vegetation covers, which are four, forests, tall grasses, short grasses, desert plants that this division is based on differences in the physical characteristics of plants that represent the pattern of plant response to the climate of the globe represented in temperature, humidity and wind, and each of these four groups consists of different plants in their shape and response pattern.

Forests grow in all areas where the annual average temperature exceeds 50 F and the annual total rainfall is not less than 200 mm, but they vary among themselves, there are coniferous forests in the cold region and deciduous forests in the temperate zone and forests of the hot rainy region, while weeds grow in the regions that are characterized by aspects that are not suitable for trees or plants with wooden stems due to its dryness or lack of rain, which is sufficient for the

growth of plants for a long period of the year and densely and from the pattern of weeds.

Each major plant group, whether forests or grasses or desert plants includes different types of plants vary in the pattern of their response to their environment and therefore divided into subgroups and this division is based on the difference in the shape of the plant and its qualities and not for the difference in climatic elements, the forest group is divided, for example, into coniferous forests or deciduous or tropical, and there are differences in the type of plants growing within the subgroups and these differences arise from a difference in the surface manifestations in a particular spot, which leads to differences Local in the environment causes a difference in the natural plant pattern, so the sub-plant groups are divided into local plant groups or clans and each clan or plant community whose plants are homogeneous in their type and qualities, and plant groups or plant clans are divided into smaller sections called plant groups, which are similar plants among themselves and differ from others in accurate organic qualities that help them adapt to their developing local environment and these organic qualities may change and grow over time to help plants resist the variables occurring in Environment.

Factors affecting normal plant growth

The natural plant cover varies in its qualities a lot due to the difference in its vital environment and these differences may be on the scale of the globe, and there are local differences these differences led to the division of natural plants into major and subgroups, local communities and groups.

The most important elements of the biotic environment that affect the growth of vegetation.

First: Climate

The shape of the earth's surface

Soil

Vital factors

Climate: one of the most important elements of climate

Humidity

Humidity is one of the main elements of climate affecting the growth of the natural plant, it needs water absorbed from the soil by its roots to make its waste in its leaves by photosynthesis, as it enters the composition of plant cells and the plant can by water to transfer the nutrients that it makes in its leaves to the rest of the members of the plant body, In addition, the water works to adjust the

temperature of the plant body in the process of transpiration and the needs of plants vary from water, the areas of abundant rainfall are rich in natural forests grow huge trees with broad leaves while weeds grow in the regions of little rain, and grow desert plants in dry areas .

Natural plants have been classified according to their physiological need for water into three types.

A. Plants adapted to the dry environment:

They are plants that have adapted to the dry environment where the soil moisture is low and characterized by the following adaptations:

- The leaves are gummy or waxy to reduce the amount of water lost in the process of transpiration.
- The leaves and stems contain water sap that stores them in the rainy season.
- The stomata are on the lower surface of the leaf and in the shade area to reduce the amount of water lost.
- The roots are long, penetrating deep into the lower soil or spreading over a large area to get the largest amount of water.

B. Aquatic environment plants: which need large amounts of water for their growth and grow in marshes and swamps and on the banks of rivers and lakes.

C. Plants of the temperate environment, which grow in areas characterized by abundant rainfall with deep soil with good drainage retains water and helps the growth of dense plants spread throughout the region.

D. Changing plants: which change from season to season as seasonal plants whose climate is characterized by a dry season, so the plants shake off their leaves during it and stop growing to return in the rainy season to grow again.

Second: Sunlight

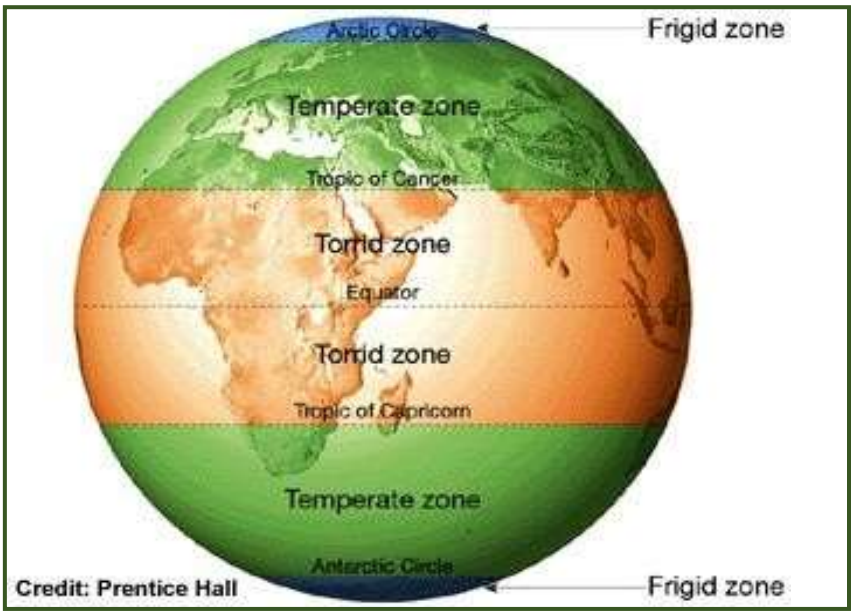
Sunlight is a climatic element affecting the biological environment of the natural plant, it is an auxiliary factor that the plant benefits from in making its food by photosynthesis, through which the plant can build its tissues and thus continue to grow and live, so plant growth is weak in areas where solar radiation decreases, if the natural plant of the type that grows in the shade is adapted to little solar radiation. But the effect of sunlight on the natural plant growth is specific and its impact is more on the grasses and small shrubs and low trees and their distribution and does not affect the distribution of large plant groups because the

branches of tall trees and their leaves receive large amounts of solar radiation and reduce the amount of radiation received by the branches of low trees.

Solar radiation affects the air temperature in the areas of the upper latitudes fall sunlight oblique and its temperature is lower than in the orbital displays where the sun's rays fall vertically so tropical forests are more dense than the forests of the temperate zone, but which modifies the difference in the amount of solar radiation resulting from the difference in the angle of incidence of sunlight is the difference in the length of night and day, and solar radiation affects plant activity and growth in the different stages of its life cycle, represented in The budding period, blooming flowers, fruit ripening and leaf growth in the upper latitude areas, where the length of the day increases in summer and the period of solar radiation increases to reach.

Its peak in the polar regions, where the sun shines for a long period of the day, leads to the acceleration of the growth process to complete the plant growth cycle during the very short summer, but in the range of deciduous forests in the middle widths, where the length of night and day varies during the seasons of the year, it is noted that the growth stage of the plant varies from one place to another.

What are the latitudes?



Figuer55: Globe regions

- Minimum latitudes between latitudes 30°N and 30° South Also called orbital latitudes.
- The middle widths between latitudes 30 and 60 degrees north and 30 and 60 degrees south and these widths are characterized by the occurrence of varying weather fluctuations during the months of the year
- Upper latitudes between latitudes of 60 and 90 degrees north and 60 and 90 degrees south are also called polar latitudes.

Plants are classified into three groups according to their response to the photoperiod, and these groups are:

- Long day plants, which are plants that prepare for flowering if a long light period of more than 14 hours is available, such as winter crops such as alfalfa, wheat and barley.
- Short day plants, which are plants that prepare for flowering if the light period is less than ten hours, such as summer crops such as corn.
- Neutral plants, which are plants that have no relationship between their flowering and the length of the photoperiod, as they bloom under any light period after they pass a sufficient period to form the vegetative group and sunflower.

Third: Temperature

Heat is a climatic element affecting the biological environment of the plant, it is the source of energy for the plant and affects the physiological processes carried out by the plant, each type of plant needs a certain temperature to complete its growth cycle and functions such as photosynthesis and flower formation ... etc.

In addition, each plant has a suitable temperature for its growth, so if the temperature drops, it will lead to the cessation of plant growth and may die if temperatures remain

low for a long time, and its activities are affected if the temperature exceeds its maximum limit.

Forests grow when the average temperature is more than 10 °C and during the summer months, while weeds grow in cold temperate regions when the daily average temperature becomes (5-10) ° C and weeds grow in warm temperate regions when the daily average degree Temperature (15-20) C.

The minimum temperature required for normal plant growth (zero qualitative growth of the plant) of 5.5 m per month is called if the temperature drops below that, it will lead to the cessation of the growth process, but the high temperatures and exceeding the maximum does not lead to the death of the plant as most plants bear high temperatures, but if the high temperatures are accompanied by a lack of water, it will lead to the wilting of the plant and the drying of its tissues and then its death, that temperatures indirectly affect the elements Other climates where high temperatures cause increased water loss by evaporation/transpiration, so the temperature and the amount of rainfall really cause a modification of vegetation in an area.

The high temperatures caused the multiplicity and diversity of plant varieties growing in a particular area in the

tropics, where high temperatures helped the growth of countless types of plants, where two trees of one species cannot be found in a small area of land, while the number of varieties of trees growing in cold temperate areas does not exceed two or three varieties.

The drop in temperatures below freezing leads to freezing of the soil and the inability of the plant to obtain nutrients, and the water freezes in the tissues of the plant and its organs causing its death unless it can adapt itself to the conditions of low temperatures and plants have been classified according to the amount of tolerance to temperatures to the following varieties:

A. Plants growing under high temperatures: These are areas where temperatures rise above 18 °C.

B. Plants growing at medium temperatures: They are the areas where the temperature of the coldest months is 6-18 ° C.

C. Plants growing under low temperatures: They are the areas where the temperature of the coldest months is more than 6 °C

D. Plants growing at minimum temperatures: These are the areas where the warmest temperature of the months is less than 10 ° C

Fourth: Wind

The effect of wind is limited to changing the physical characteristics of the natural plant and on a narrow local scale, it does not affect the distribution of major plant ranges or plant subgroups that the effect of wind on the natural plant may be direct or indirect, The direct impact of the wind on the natural plant appears in the regions where the wind speed intensifies, where the extreme speed makes the branches and trunks of plants bend to the level to the horizontal instead of vertical growth, and severe hurricanes contribute to the destruction of trees and breaking them and also affect the scope of trees on the heights, so the trees area on the slopes of the wind shadow is higher than its borders on the slopes facing the wind and the wind helps to spread the natural plant as it transfers seeds from one place to another as It may help spread fire, causing the burning of vegetation covers, especially if the wind is strong and dry.

The indirect effect of wind is to accelerate the evaporation process and increase water loss by the process of Evaporation/transpiration, which negatively affects the plant, especially if the wind is strong and dry, causing wilting and death of plants if there are not enough sources of water.

2. Topography

The elements of the shape of the earth's surface affect the natural plant pattern and are mainly bored in the degree of slope of the earth's surface, its direction and the amount of its height, and the degree of slope of the earth's surface affects the speed of water discharge, on the steep slopes of the water runs quickly, so a large part of it filters into the ground and the plant benefits from it in its growth, or on the contrary, on the slopes of the few slopes of the slope, where a large proportion of rainwater seeps into the ground and the plant benefits from it for a long time, and causes the severity of The slope of the surface of the earth to the soil shovel and erosion and become a little thick helps the growth of short weeds or drought-tolerant plants, while on flat surfaces or low slope the soil is thicker and the level of underground water is high, so the area turns into swamps that help the growth of aquatic plants.

The direction of slope of the earth's surface affects the amount of solar radiation, temperature, the amount of rain falling and the direction of wind gust, and thus leads to a difference in climate on the different sides of the highlands, causing natural plant variation.

The slopes facing the sun are hotter and drier than the slopes located in the shade, this is especially represented in the highlands of the central latitudes in the northern hemisphere, where the natural plants growing on the northern slopes of the pole differ from the plants growing on the southern slopes facing the equator, and the same applies to areas protected from cold winds, basins and mountain valleys where forests grow, while weeds grow on the adjacent and less hot generational slopes.

The height above sea level leads to the difference in natural vegetation due to the decrease in temperature with the height of the earth's surface, the climatic changes that accompany the rise above sea level and by 1000 m are equivalent to the climate changes associated with the horizontal transition on the surface of the earth north and south of the equator and a distance of 480 km.

3. Soil

There is a close relationship between soil and natural vegetation as they affect each other.

The natural plant affects a lot in the composition and development of soil properties, it affects the amount of organic matter in the soil and affects when decomposed in the amount of acids and types in the soil and leads to the

difference in mineral components in it ... On the other hand, plants (except aerobic plants) cannot grow in the soil where they get water and air and to stabilize their roots as well as provide nutrients.

The soil rich in nutrients with limited permeability grows deciduous forests with broad leaves, while the Taika forests grow in the soil of acidic sandy seeds well-drained, and the soil of tropical rainforest regions is characterized as heavy clay rich in iron oxides, aluminum and clay minerals, and in natural grass areas consist of soils that are much different from the soil of forest areas, they contain many organic matter from the remains of weeds that decompose quickly, but due to the large number of weeds, the process of decomposition takes a long time, so the soil is rich With organic humic materials and at different depths in addition to singing them with dissolved mineral materials, and this is why the areas of the middle width weeds have become one of the most fertile agricultural lands after removing the vegetation, while the intense heat and heavy rain in the tropics cause the rapid decomposition and oxidation of the organic materials left over from the savannah weeds to the lack of organic matter in the soil, and in any case, the properties of the soil affect the natural plant as follows.

A. Soil texture and construction:

The texture of the soil determines its porosity and permeability and thus affects the drainage system in it, sandy soil with high permeability enlarges its pores and leads to water filtration quickly into the ground compared to clay soils in which the percentage of surface water increases, so the sandy soil is suitable for the growth of long trees whose long roots extend to the soil to obtain water, while clay soil with soft texture becomes suitable for the growth of short weeds.

B. Depth of soil and amount of nutrients in it.

Plants need nutrients and water when they grow that they get from the soil, so the soil rich in nutrients helps to grow dense vegetation, and the thickness and depth of the soil affects the growth of vegetation, plants in general grow in deep soil that provides trees with what they need from water and nutrients as well as working to install them on the surface of the earth, unlike shallow soil with little thickness lacking nutrients and water and suitable for the growth of weeds and short weeds.

Natural flora in Asia and its regions

Climate and soil factors affect the diversity of natural plants spread in the continent as well as in its density and distribution, so the following plant regions emerge:

1. Tropical forest region: Intense heat interacts with heavy rain in the work on dense forest plants of multiple species of high trees intertwined branches do not allow sunlight to penetrate into the forest only a little, and evergreen trees are of the steel type, the most important of which are ebony, mahogany, bananas, cocoa and rubber, and spread in the Indochina Peninsula, the Malay Peninsula, the island of Ceylon and the southern tip of the peninsula of India.
2. Seasonal forest region: Here the forests range from dense evergreen to deciduous forests, and the trees are less high, and spread in India, Indochina and southern China.
3. Warm temperate forest region (Chinese region): Most of its trees have wide leaves evergreen, especially in southern China, including coniferous trees and bamboo trees, and deciduous trees prevail in southern Japan and Korea.
4. North China and Manchuria plant region: The most important trees are Manchurian pine, oak and beech trees.

5. Mediterranean Plants Region: Its trees have the ability to withstand the drought, which are olive, orange and vine trees, and are spread in Western Asia overlooking the Mediterranean Sea.

6. The region of hot and temperate deserts plant: They are small trees such as cactus, and the majority of species take advantage of the little rainfall to grow, bloom and die, leaving their seeds buried in the soil.

7. The region (middle-width grasses): Steppes grasses grow in Western Siberia as well as on the margins of the desert region, and are characterized by their shortness, softness and greenery, which provides food for cattle and sheep.

8. Coniferous forest region: It forms a long range above the ground Siberia in North Asia, and its trees are characterized by their height and moderation of their stems and conical shape and the most important types of sherbin and pine.

9. Tundra Region: This extends to the north of the coniferous forest region in Asia, and the warm season does not exceed two or three months, where poor short-rooted plants grow.

Natural plant in South America

First: the tropical forest region.

This range of forests appears on the continent within the characteristics of the humid tropical climate, which leads to the growth of dense vegetation cover known in the continent locally as the Salvas forests, which are hot tropical forests with dense and evergreen trees, their trees are long intertwined in their upper layers, spread in their swampy lands and short trees disappear, because plants race to reach the sun, which makes the forest floor dark, and accordingly the forest The tropical forest is one of the largest forests in the world in the Amazon basin, and these tropical rainforests include more than four thousand varieties of trees ranging from rubber, cocoa, bananas, tea, ivory and palms.

Figuer56: South American Flora

Second: Seasonal Forest Region:

This type of forest appears in the humid tropics, which are characterized by the presence of a clear dry season because they depend on the rainy season, especially the eastern regions of Brazil and the eastern parts of Paraguay, and those trees that grow in them are short and less high than tropical forests and with rough trunks and thick bark with a large number of upper branches of trees, as they appear from afar in the form of umbrellas, and are also characterized by the presence of short grass in the forest floor for the arrival of sunlight To the surface of the earth, located between the latitudes (10-20) north and south of the continent, and

distributed geographically within the eastern region of Brazil and the eastern parts of Paraguay, as well as north of the equatorial region in the western region overlooking the coast of the Pacific Ocean.

 .

Third: The region of long tropical grasses (Savannah)

The prevailing natural plant in this region is sometimes called savannah grass, a label adopted by the American Indians, which means a grass area that is not covered with forests, these weeds grow in areas characterized by a dry tropical climate or humid tropical characterized by fluctuations in rain, humidity and temperature, and the savannah is spread on the continent in large areas of the Brazilian plateau, the Orinoco River basin as well as in the southwestern headwaters of the Amazon River.

Figuer56: (Savannah)

These weeds are divided into two types: The first is tropical grass in the northwest in the Orinoco River, called Lanus weeds and the second is located in the south and southeast of Brazil and is called compos grass that occupies most of the amazon basin.

Fourth: Mediterranean Flora Region

This plant region appears between two latitudes (30-37 south) west of the continent, the trees here are characterized as evergreen depending on the characteristics of the Mediterranean climate, which is characterized by winter rains ranging between (380-1000 mm) and the plants are far apart, which gives way to the growth of short plants, and the most important Mediterranean plants here: - Oak, cedar, Olive tree and the trees are characterized by wide leaves as they are evergreen.

Figuer57: Cedar trees in the Mediterranean

Fifth: Steppe Grass Region

This region includes the areas located in the Patagonia Plateau and northwestern Argentina, where the semi-arid climate prevails in which the dry steppes grass known as the Mont plant grows, a type in which the plants are in the form of short single grasses.

Sixth: Desert plants

Desert plants are concentrated in the driest areas, especially in southern Peru, and northern Chile (Atacama Desert) under the characteristics of the dry climate, and short trees appear in the region adapted to the long dry period in which there is no rain or completely interrupted for a period of up to (10 or 20 years), so these plants have adapted to these conditions by modifying their leaves, stems and roots with the prevailing high rates of recorded temperatures and the lack and fluctuation of the amount of rainfall. Fallen.

Chapter FIVE

The Movement of Plants

CHAPTER FIVE
THE MOVEMENT OF PLANTS

The movement of plants

The movement of plants is often neglected by botanists due to its slowness, but what has emerged from modern techniques in photography and modern digital video cameras that take an image every few seconds and record it inside the camera to be transferred to the computer to be displayed at speeds that show the movement of the plant well to stand on the movement of plant organs accurately and show the reality of the self-movements of the leaves and the market. In this way, it can be seen that the smoke leaves seem to rise and fall like the wings of a bird during flight, and the leg can be seen moving regular spiral movements, and the movements that occur during the blooming of buds, whether leaf or floral buds, can be shown. Physiologist also

interested in studying the rhythm of the indoor plant and searching for how the plant implements its program in the development and its sense of night and day and measuring the temperature and conditions of the plant from its neighborhood to another and launching a bayonet to defend itself if it is attacked by bacterial or viral or hit by an insect or even if it falls under the weight of environmental stress from heat or cold or exposure to salinity or drought ... Etc.

Physiological plant movements

Growth movements:

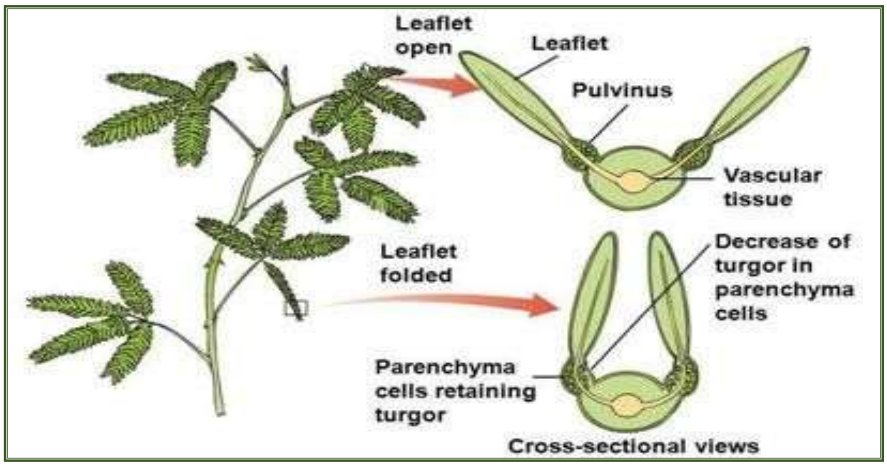


Figure 59: Growth movements

It is the changes in the position of the organs as a result of increasing the size of cells and increasing their numbers and curvature, and curvature occurs as a result of increasing the number and size of unequal cells in the parts that occur

to them growth and curvature, the tropic movement is the movements that occur under the influence of environmental factors such as bending to the light falling on the market and roots (phototropism) and tropism by the effect of gravity (geotropism) or taking kinetic positions by the effect of differences in the water content of the soil (hydrotropism) and tropism as a result of physical contact or chemical contact (tropism). Contact or (chemical tropism). The movement is positive when the member bends in the direction of the effect and negatively when the member bends in the opposite direction.

Tropic movements:

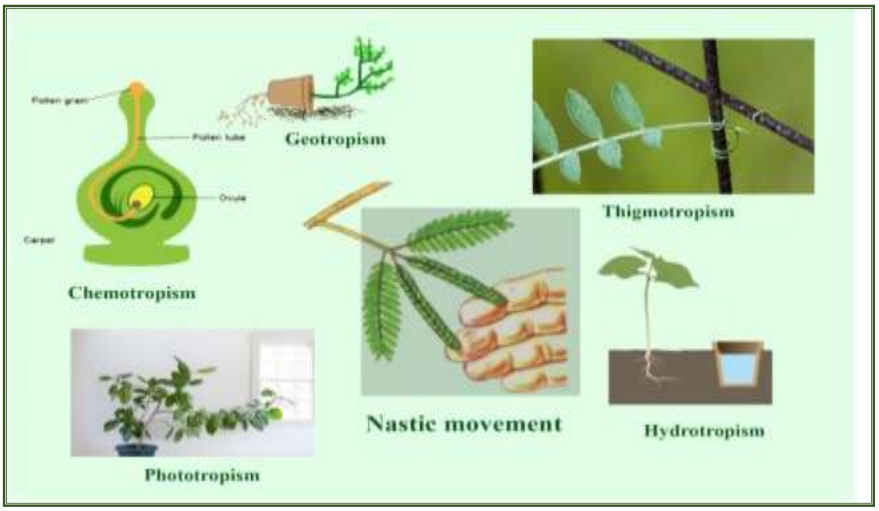


Figure 60 : Types of Tropic Movements

It is the movement that occurs in the member as a result of the equal factor affecting the member from all directions equally, the movement of modern leaves during growth and the movement of the scales of buds and flower petals when blooming are examples of tropic movements and result from the growth of the lower surface of the member faster than the upper surface, making them bend up, for example, to encapsulate the top of the stem or the occurrence of increased growth in the upper surface is greater, so the buds bloom, As for the top of the stem, it grows spirally, although it seems that it grows vertically and results from unequal growth rates in the different vertical parts around the axis of the stem Some tropic movements are stimulated by environmental factors such as heat and light, so the leaves sag at night in some species and adjust their positions during the day and these movements are usually associated with the distribution of Auxins in the affected tissues.

Fullness movements

It is produced as a result of changes and reverse changes in the filling of cells with water and usually the organs affected by those movements of fullness with thin-walled cells called members of the movement or pillows

such as the movement of sleep of plant Mimosa Boudica,,which is one of the legumes, as well as the opening and closing of stomata and the movement of leaves resulting from wilting and healing from it, and usually occur movements of fullness that lead to wrapping of leaves from the presence of large cells in size called balloon cells are located on the upper surface of the leaf at the bases of two grooves in alignment Middle race.

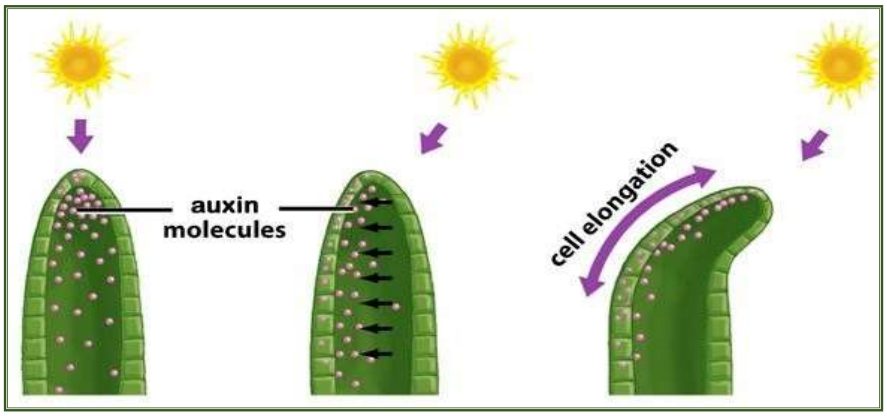
When the fullness is large, the leaves are flat, and when the pressure of fullness decreases, the walls of those balloon cells relax, so the leaf applies (as in the sand grass) plant, and when the loose cells refill the leaf relaxes again, and the leaves take between 8-20 minutes to refill and thus relax.

As for the mechanisms that explain the movement of fullness, they are all due to the secretion of substances with high osmotic activity that allow water to enter or exit the spaces between them through the cytoplasmic membranes, which are opposite changes, some of which are biochemical and others are physical, such as exposure to gases, electric shock, concussion, and the transition from light to dark and vice versa.

It also appears the movement of fullness when erection of leaves or leaves after irrigation of plants and when the leaves relax and sagging when the soil dries, as well as show that movement on the leaves clearly in the early morning where the cells are in complete difference and then decreases pressure wall Cell slot for the exit of water to the spaces between them, especially in the lower cells of the leaf petiole, resulting in the movement of relaxation as shown in the picture. Fullness in all cells results in erection of leaves, And relaxation and when the swelling of the lower cells is lost more than the upper cells result in loosening it is known that the change of fullness in the cells of the petioles is what causes the movements of the leaves that follow the path of the sun during the day.

It is the movement that occurs in the non-living tissues of the plant as a result of watering or drying of the cell walls, which causes the splitting of the corneas and the opening of the canned fruits and the rapid movements of mature germ portfolios in ferns.

Phototropism:



Figuer61: Plant movement across Phototropism

Phototropism results as a result of exposure to uneven lighting on both sides of the plant member, and usually the market bends in the direction of the strongest light and the leaves take a certain position in relation to the light source and often take the leaves of some plants such as lettuce positions so that their blades face the east and west so that the blades of the leaves do not face the full intensity of the midday sun only the edges of the leaves, then these plants are known as compass plants, Those movements that put the leaves and the market in certain positions relative to the light are due to different growth rates in the illuminated parts from the shaded parts in the market and members. These experiments indicated that the tops of the paper cover of oats provide the prodrome with auxin and as a result of its uneven distribution as a result of exposure of the opposite part to

light, which negatively affects the auxin, as it leads to its oxidation of photosynthesis, so its concentration decreases in the part opposite the light compared to the shaded part or far from light. Another view is that light has an effect on the migration of auxin from the exposed side to the shaded side due to the high concentrations of oxen's in the part that is not opposite the light.

Figuer62: phototropic movements

The mechanism of phototropic movements (Figuer62) was known from the study of the behavior of the paper cover of the oat plant because of the sensitivity and simplicity of the composition, it was known that the area that is affected by light if presented unilaterally is the next area of the growing top of the oat seedlings with evidence when removing the top, the bending is little, but when placing the top or a piece of gelatin containing oxen caused bending severely, Elongation occurs for those cells at a higher rate

than the cells corresponding to light and less concentrated for Auxins, which causes their curvature towards the light, and experiments have shown that there is a limit of lighting intensity in order for the plant to respond to phototropism, once the plant is exposed to the minimum value of the intensity of lighting for oat seedlings, they step down towards the light source and the degree of curvature is proportional to the amount of lighting within a narrow field of lighting intensity, However, if the amount of light increases on that, this relationship changes, so the degree of curvature decreases until a negative curvature occurs, and if the intensity of lighting increases more, another wave of curvature begins.

Table7 : Different ratios of auxin distribution on both sides of oat seedlings

Plant curvature		Bright Side	Shaded side
Amount of lighting	Degree of curvature		
0	0	49,9	50.1
20	) o 10 (+	41	59
100	++	26	74
1000	) o 48 (++	32	68
10000	0	49	51

As a result of exposure to light from one side and affected by curvature depending on the intensity of the lighting, If a plant is placed in a horizontal position for a few days, the market begins to grab upwards away from gravity, while the tops of the primary roots change their position in the opposite direction, i.e. to the center of the earth.

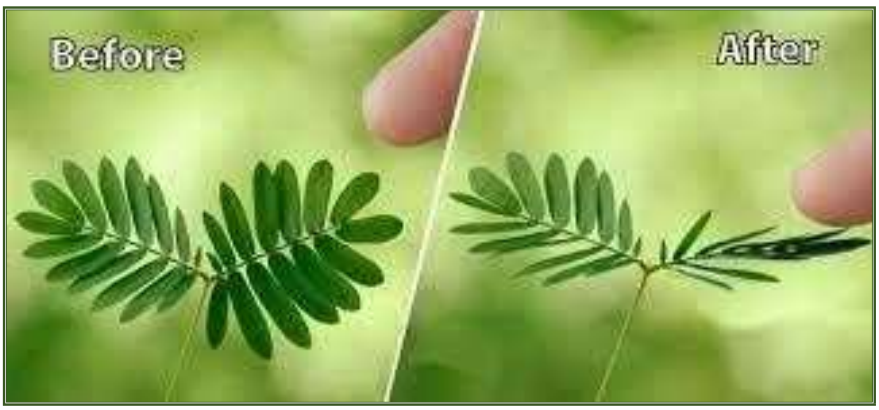
The behavior of the roots can be seen more easily in germinating seeds and the roots fail to tropism if the seeds are fixed on the edge of a wheel rotating in a horizontal plane to cancel the force of gravity. The direction of the roots to the center of the earth is called positive tropism Positive Geotropism and if the opposite is called negative geotropism either if the growth of the roots tilted without perpendicular to gravity is known as geotropism as in secondary roots, but if they are developing horizontally known as horizontal tropism Diageo tropic.

It seems that gravity resembles light in its effect on the distribution of auxin, so the tropism occurs upward by the effect of gravity, but it results from the increase in hormone concentrations on the lower side of the horizontal paper envelope. This effect disappears after only 40 minutes, but the effect of light on the distribution of auxin disappears after 6 hours (after excluding light.).

Contact tropism in plants:

They are the growth movements performed by plants as a result of contact with objects with the effects of contact tropism, such as the movement of the growth of tendrils, which are thin cylindrical organs representing a market and mutated leaflets, such as what is found in grapes and peas, where the tops of modern tendrils are bent as a result of the different growth rates on the side in contact with the hard body from the opposite part, which grows at a higher rate, which leads to wrapping tendrils around the support, and as a result of the speed of turning, it is difficult to explain the curvature, and it is believed that it is related to the pressure of fullness and then After wrapping the walls begin to thicken and the shape of the cells after the formation of secondary walls, the barber turns into a solid support body.

Plant resistance to touch:



Figuer63: Plant movement by touch

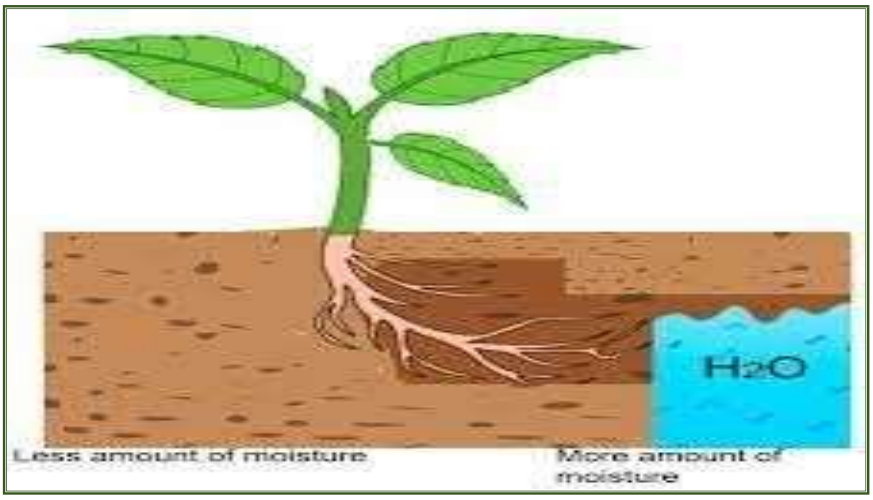
Plants are affected by touch and the degree of sensitivity varies depending on the type of plant, as the sensitivity may be high in the plant insect hunter, where the leaves become traps or the corolla in the flower may be the trap. In the case of contact with rain and repeated wind attacks of trees, we find that their sides are not asymmetrical as a result of exposure to touching air or water, so contact leads to the expansion of the stem and the inflation of its radius and becomes more solid in the part exposed to touch.

The reaction at contact represents the emission of electrical waves through the cell membrane and flow internal and external ions to modify the fluidity and permeability of the membrane, similar to what happens in neurons in humans, increasing the entry of calcium ions into the cells and activating some genes, it has found five genes affected and active from the exposure of the plant to the wind or cold or environmental stress or disease or insect injury. Darkness also causes closure of the leaves, as in sorrel and mustache plant.

Figuer64: mustache plant

As well as some flowers such as the night alum flower, which blooms before sunset and after, and the plant may feel warm, even to one degree, Alienate petals as in the tulip. The saffron is affected by the high degree or tambourine of the atmosphere and a very small degree up to 0.2 ° C for the same purpose has been found that plants tolerant of high temperature produces special proteins called thermal shock proteins to protect them from the toxic effects of high temperature.

Hydrotropism:



Figuer65: Hydrotropism in plant

It is the tropism of the tops of the growing roots to places with high water content. The roots appear as a water-seeker, which is the property followed by the skilled gardener in raising a strong root total for his plants by spacing in every several irrigations between irrigation periods, which exposes the sucking roots to a little dryness, which pushes them to search for water in the farthest soil layers, which still retain ground moisture above the level of depletion.

Movements in insectivorous plants:

Figuer66: Dionaea muscipula

It is the movements used by plants eaters insects in the acquisition of insects in the plant croup flies (Dionia mosquibula) apply the surfaces of the leaf as jaws trap if touched hairs Zanari (similar to the trigger) located on the surface of the paper to touch lightly and may take the process of closure less than a second. This is due to the existence of tensions as a result of differences in the growth of the upper and lower surfaces of the paper blade, but the sudden release of tensions is not known precisely.

Plant resistance to touch

Plants are affected by touch and the degree of sensitivity varies depending on the type of plant, as the sensitivity may be high in the plant insect hunter, where the leaves become traps or the corolla in the flower may be the trap. In the case of contact with rain and repeated wind

attacks of trees, we find that their sides are not asymmetrical as a result of exposure to touching air or water, so contact leads to the expansion of the stem and the inflation of its radius and becomes more solid in the part exposed to touch. Darkness also causes closure of the leaves, as in sorrel plant, as well as some flowers such as the night alum flower, which blooms before sunset and after, and the plant may feel warm, even to one degree, Vtnfrh petals as in the tulip. The saffron is affected by the high degree or tambourine of the atmosphere and a very small degree up to 0.2 ° C for the same purpose has been found that plants tolerant of high temperature produces special proteins called thermal shock proteins to protect them from the toxic effects of high temperature.

One of the most important things that plants give to the environment are medicinal and aromatic plants

What are medicinal plants: It is a plant that contains in one or more of its various members or mutations on one or more chemicals in low or high concentration and has the physiological ability to treat a particular disease and reduce the symptoms of infection if given to the patient in its pure form after extracting it from the plant organ or when used as a fresh or dry plant herb or known as everything of plant origin used medicinally is a medicinal plant.

The aromatic plant is also defined as a plant that contains in one or more of its various organs or mutations one or more chemicals in low or high concentration that have an acceptable aromatic smell used in its pure form after extracting it from the plant organ in the perfume and cosmetics industry

The active substances found in medicinal and aromatic plants protect the plant and act as repellent substances for insects, animals and birds that feed on the plant, as well as as substances regulating plant growth and a storehouse of some nutrients such as nitrogen and used when deficient.

Its importance for humans and animals

Used as a treatment for many diseases, Perfumery, soap and cosmetics industry, Used as insect repellent and

some of them are used as an insecticide, It is added to the pharmaceutical industry to give it an acceptable taste and smell especially in children's medicines.

Chemical components of medicinal and aromatic plants

The components of food metabolism that take place naturally in the cells and tissues of medicinal and aromatic plants, which are called primary secretions or natural products, are the following:

1. Carbohydrates, protein and fatty substances.

2. Volatile oils.

Which is distinguished from fixed oils in that if subjected to evaporation, they volatilize without decomposing. They represent the main substances responsible for the distinct smell of plants. They are easily separated from their bearing plant organs by various distillation and extraction methods. These oils are known as aromatic oils or essential oils, and they are found either in all parts of the plant or in some of them, such as leaves (such as mint), tree bark (such as cinnamon), fruits (such as star anise) and petals (jasmine); they may be found in more than one part and vary in proportion in each part. The quality of these oils can be known through several characteristics, the most important of which are color, as most of them are

colorless, fragrant smell, volatilization, solubility, as the majority of oils do not dissolve in water and dissolve in alcohol by 95%, in addition to the specific density that Specific density that varies depending on the type of plant and most essential oils have a lower density than the specific density of water. It gives the distinctive smell of flowering and plants in general and is found in a liquid state, but some of them are found in a solid form, such as camphor and most of these compounds have an aromatic smell and are extracted mainly for this purpose and many of them have medical benefits such as regulating bowel movement and removing intestinal cramps that occur colic as it has an effect on the uterus and the treatment of menstrual disorders, and some of these compounds are absorbed by the membranes of the respiratory system and are useful in the treatment of coughs and colds as used to increase urine excretion.

1. Fixed Oils:

Most of them are edible and used as a base for medical ointments, but some of them are composed of unsaturated mental acids and are indigestible or absorbable, and some are used as a medical laxative such as castor oil.

2. Glucosides:

The glycosides group is an important part of the active substances in medicinal plants and in fact may cover plants that contain glycosides most of the various types of physiological effects known and glycosides are found in abundance in most high-end plants and rarely found in the vile ones. The availability of glycosides in the cytosol is concentrated in the vacuoles of plant cells

Glycosides:

They are organic compounds that are decomposed by acids and by the action of special enzymes and result in their decomposition:

1. One or more types of sugars: at least one of which is reducing sugar
2. One or more non-sugary substances: The glycated part is called glycan and the non-diabetic part is called Aglycon

General qualities of glycosides

Glycosides are crystalline or amorphous solid compounds that are colorless

Glycosides generally dissolve in water and alcohol and do not dissolve in ether, although some of them dissolve

in some other organic solvents such as acetone and chloroform, which are non-volatile.

Most solutions of these compounds in water or alcohol taste bitter and their photosynthesis is negative.

Glycosides are decomposed in the plant by special enzymes and there is an enzyme and glycoside that affects it in the same plant but in cells separate from each other and when the plant grinds in the presence of water the enzyme mixes with glycoside and their interaction results in glycoside decomposition

3. Alkaloids:

They are bases that turn into salts in combination with acids and contain nitrogen, including morphine and papaverine and have a narcotic effect and substance

Plant insect killers:

It was found that some plants consist of lethal or repellent substances for harmful insects, and if they are deadly, they are poisonous, and if they are repellent, they are alone or excluded. Among the plants that contain insecticidal substances are the roots of the monastery, pyrethrum flowers, seeds of Arizona, and insect repellent plants tansy - basil. Therefore, plants that contain these substances are used in the manufacture of pesticides such as pyrethrum

extract, derris root powder or pyrethrum flowers. A slanting substance such as talcum powder is added to it. To be used in fogging as well as scented materials such as rose oil are added if used as liquid materials. Where the pyrethrum was used in 1800 AD in Iran to combat (bed bugs - human lice, as well as birth) and the United States became the largest producer of it in the world after Egypt. It has been widely used as a source of pesticides. The percentage of active substance in the flowers of the pyrethrum plant ranges about 0.5: 1.5% and extracts the active compounds from the flower powder by adding one of the organic solvents to it such as (methyl alcohol - acetic acid - ethylene - acetone). and other solvents .

Plant tinctures

They are colored substances found in the plant parts and in the leaves in particular and have a medical value where carotene is used in the estimation of vitamin A as well as these materials are used in coloring food products such as jam, pies, syrup and some medicines Examples of dyes (flavonoids)

Resins, balsams and tannins.

Resin: It is a term that refers to a group of solid and semi-solid materials of nature and complex chemical

composition, which is fragile secretions or oozing or leaching and be sticky secreted through plant tissues and that either naturally "or secreted as a result of pathological conditions or secreted to protect against these pathological conditions.

Tannins: They are called astringents and are found abundantly in the plant kingdom and even that each plant family contains at least one

Plants used in folk medicine for the Arab countries and did not know their exact composition.

So what are the volatile oils

They are oils that evaporate or volatilize at the normal temperature without decomposing and are called essential oils for their aromatic smell or ethereal oils for their solubility in the effect or essential oils Their importance to humans as a gas repellent – Relieves the pain of colic and bloating – Used in the manufacture of perfumes, soaps and cosmetics – As an appetizing spice – Added to some medicines to give them an acceptable taste Their importance for plants is repellent to some insects such as mosquitoes and mosquitoes – It works to attract insects and increase the productivity of mixed crops Pollination – Plant protection from animal lethality and know Alkaloids as basic organic

compounds whose molecule contains one or more atoms of nitrogen are usually found linked in heterogeneous rings Their importance to humans as a narcotic - as a stimulant - enter into the manufacture of many medicines Their importance to the plant affects the life of the plant as growth regulators - a store of some elements such as nitrogen - protecting the plant from some animals and diseases that kill it While glycosides are defined as organic compounds that are decomposed by acids and by enzymes and result in their decomposition of one or more types of sugars and is called the glycan slit Non-diabetic lynx

At the end of the book:

I put in your hands my simple book and I am very happy to read its pages, and do not forget me sincerely pray... And thank God

Mishaal Ali Alnzi

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Glossary

1. Absorption zone الجذرو منطقة الشعيرات الجذرية

2. ATP: مركب خازن للطاقة

3. Anatomy:

دراسة الايلي داخلا للنرات ئير مرا إلاآ ولت مدوات مطي مشةتار

ألخذ نموذآ ودراسه تلت المجار

4. Anomalous secondary growth :

عدم اكون هناك طرقات مددعدة وقصيرة العمر من كامريوم

5. Apical meristems: RAM (see) and SAM (see)

6. apogamy apomixis:

عندما يتطور الجنين من جاميت ئير مخصب ، الوالد العذري

7. apomixes: انا آ ف النرات الذكور بدون وخصاب

8. Botany: دراسة علم النرات

9. buds: براعم جنينية

10. Cleistogamous: إقصد باذا المصلح الزهور ذاتية التلقيح الى ا ال تفتح

11. Collenchyma: النسيج الكولنكيما من ألنسجة الداعمة الليفية

12. Companion cells المساعدين " لنواة خالإا منروب الغربال نواة:

13. Complex tissues:

األنسجة الى I نلىوي علت مكطر من نوع واحد من الخالإا

14. Compound leaves: I موراق مركرة بأكطر من طرقة بىسلسي هرم

15.cortex: الطرقة الخارجية من الساق او الجذر

16. Dichotomous: الررعم النااال عندما ينقسم الت اثنان

17.double fertilization:

اخصاب اثنان من االمشاأ الذكرية الثان الريضات االنطوية

18. The enzyme: مركرات برونينة مخصصة لوظيفة معينة

19. Endosperm: محادإة الصيغة من النرات المشيج I األنطوي

20.fibers: I اللنف الجذر الضيقة والطويلة I النسيج اإلسللرنكيم خالإا الزهرة

shoot system: برعم النوالد **21.**Flower:

22.generative

23. ground meristem:

المرسيم األساسا الذي ينشأ منه القشرة واللب

24. hemiparasites

نباتات المتطفلة الضوئية ، تتغذى متطفلة جزئيا على النباتات الأخرى

حالة غير متجانسة عندما إلتوي نبات واحد على مكظر من نوع

25. Homoiohydric: نبات يوفر كمية الماء الذي بداخله

26.lateral meristem: إظار فا الجوانب الكامريوم، المرسيم الورقة

27.leaf: حيث القيام بعملية البناء الضوا الالافظة

28. Megasporangia: السرورية االنطوية االبواغ

29. Megaspore: االنطوية

30. Nodes: ملان اتصال الورقة بالساق

31.opposite leaf arrangement: two leaves per node

organ: مجموعة انسجة لاا وظيفة معينة

32.phloem: اللاء

33. Pistil: كابسولة حول المريضة وضافية

34.pit:

35.pith: النقر الطرقة المركزية للساق

والجذر

36. Plagiotropic: growth: horizontal

37.pneumatophores: جذور هوايية

38. poikilohydric: نرانات التخزين المياه

39.pollination:

عملية انتقال الطلع الذكرية وهي حبوب اللقاح التي الروئضات

40.PGA: اول مركب بعملية تمضئين ثلاث كاربون

41.PEP: اول مركب يدخل مع CO_2 ثلاث كاربون

42.Photosynthesis: عملية البناء الضوئي

43.prickles modified, prickly stem surface growths

44.primary meristems: المرستيم البدائي

45. primary root: جذور من الجنة

46. primary stem: ساق بأنسجة ابدائية

47. primary tissues: النسجة البدائية

48.center: الجزء الأساسا من المرستيم القمي الجذر

49.rays stem: خلايا برنكيمية مرتبة بشكل افقي للساق

50. Rhizodermi: الجذور الشعرية والجذور من الرشرة

51. ring porous wood: with large vessel elements mostly in early wood

52. root: الجذور

53.root cap: حمااإة الطرقة المرسيمية فالجذر

54.root nodules: العقد الجذرية

55.root pressure: الضرغط الجذري

56.RUDP: اول مركب يلد مع CO_2 فا رات كالفن

57.sciophytes: plants adapted to shade

58.sclerenchyma: انس دعم يدة

59. sclerophytes:

رات إمع فقدان الماء ويكون من انسجة سلمية

60. secondary (lateral) roots:

جذور جانبية تنشأ من الجذور االبداايية

61.secondary vascular tissues انسجة الخشب واللاء الوعاائية الرذور

62.seed:

63.seed scales: megasporophylls (see) of conifers seta mosses: stalk of the sporogon (see)

64.sheath: جزء من الورقة حول الساقة

65.shoot plant body:

جسم مجادي القطب: ال يوجد نظام جذر ، إطلق النار فقط

66.sieve tube cells: الخلايا الحية التي تنقل السكر

67. Aspermatism: aflagellate, non-motile sperm cell (plural: spermatia)

68. Spines reduced, prickly leaves

69. spiral leaf arrangement, or alternate leaf arrangement: one leaf per node

70.stomata: فتحات تغلق بالخلايا الحارسة

71. Succulents: ماء إقوم بتجميع الماء

72. Thallus: جسم نباتي غير متخصص

73. Tissue: انسجة تتكون من خلايا

74.tuber: جزء متضخم من الجذور

75. vascular bundles "chords" made of xylem (inner) and phloem (outer) layers

76. vascular plants: Pteridophyta Spermatophyta

77.vascular tissues: االنسجة الناقلة

78.xylem: الخشب الناقلي