





The eukaryotic cell includes:

- human
- animal
- plant
- Fungi
- Algae
- Protozoa
- Nematodes

Division of soil microorganisms based on energy and carbon source:

It is divided into two main groups:

1 –Autotrophic: They are the organisms that can make their own food using The sun or chemical energy is divided into two groups:

- a- Photoautotrophic: They are the organisms that are the source energy is the sun, and the source of its carbon is  $CO_2$ .like,
  - Algae
  - Plants
  - Some types of bacteria such as green bacteria
  - Popular Bacteria
  - Blue-green algae

b- Chemoautotrophic: They are the organisms whose carbon is the source of atmospheric carbon dioxide  $CO_2$  and the source of their energy is chemical compounds

In the soil, as these organisms oxidize them to obtain energy. This group includes organisms of great importance in the soil, such as nitrification bacteria.

Q / What is meant by nitrification?

- It is a biological oxidation process of ammonia and its conversion into Nitrate by chemical autotrophic regeneration, which is carried out in two stages:

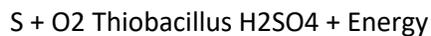
1- The transformation or oxidation of ammonium (NH<sub>4</sub>)<sup>-</sup> (to nitrite) NO<sub>2</sub><sup>+</sup> (By bacteria Nitrosomonas) and according to the equation:



2- Conversion of nitrite (NO<sub>2</sub>)<sup>-</sup> (to nitrate) NO<sub>3</sub><sup>-</sup> -According to the equation:



Among the other types of sulfur-oxidizing bacteria are (Thiobacillus), according to the equation:



2-Heterotrophic: They are living organisms that cannot manufacture their own carbon and depend on organic compounds Living and dead for energy and carbon. The source of carbon and energy is organic compounds, and this group is important in the decomposition of the organic matter present in the soil and the additive and recycling Nutrients (nutrient cycle).like,

1 Most bacteria

2 - All fungi

3 - All actinomycetes (filamentous bacteria) which include (protozoa, nematodes, worms Earth).

The division of soil biology on the basis of the need for oxygen:

1- هوائية اجبارية. - Stricerebes: They are organisms that cannot survive and carry out their biological activity without oxygen

Oxygen is the ultimate acceptor of electrons for the purpose of oxidation. The members of this group grow by growth. Its percentage in the air, i.e. when Normal when the oxygen level in the soil air is close

The partial pressure of oxygen is close to 21.0, and most soil biota is considered to be By air Pressure

Pneumatic. Most bacteria, fungi, algae, earthworms, and so on belong to this group Examples of aerobic bacteria are

Nitrosomonas , Nitrobacter , Thiobacillus , Rhizobium و Azotobacter .

2- هوائية اجبارية – Anaerobes: They are the microorganisms that cannot live in the presence of oxygen and grow only in the absence of oxygen or when the molecule is low, and most of this group is affiliated with the pathogenic bacterias.

(Which make up the blackboards) Examples of anaerobic bacteria are:

a- – Clostridium: Under this genus there are several types of it fix

Atmospheric nitrogen, and harmful ones that cause diseases (cancaria), some types of soil bacteria

Waterlogging (aerobic) conditions that have a role in biological transformations are dependent on

(NO<sub>3</sub>), sulfates (SO<sub>4</sub>) and (Ca), chemical compounds containing an example of nitrates . NO<sub>3</sub> NH<sub>3</sub> or N<sub>2</sub>: for final electrons as acceptor

b-Pseudomonas : It is a bacteria that reduces NO<sub>3</sub> to NH<sub>3</sub> or N<sub>2</sub>.

c-Fibrio Desulfo (H<sub>2</sub>S): As for CO<sub>2</sub>, it reduces the action of anaerobic bacteria co<sub>2</sub> to ch<sub>4</sub>

3- الاختيارية – anaerobes Facultative: They are organisms that are able to grow with or without oxygen, but they grow steadily Better in aerobic conditions, and below this group are bacteria and some protozoa And a number of fungi. Examples of this type are:

Species of the genus Bacillus and Pseudomonas.

To be divided based on the formation of the "Formation Spore".

All fungi are spores, and it is one of the asexual reproduction methods. For fungi only there are two sexes They are (Clostridium, Bacillus) and they are spores. The blackboards are not for reproduction but for preservation On the type when exposed to extreme conditions

Organisms are divided according to thermal requirements: Heat is a major factor controlling all the biological processes of bacteria in every type of organism Microstructure is an optimum temperature for growth. It also has a specific heat field so that vital activity stops Outside this field, therefore, microorganisms can be placed in three main sections, depending on the degree The optimum temperature for it and the heat field in which it can grow:

1-mesophiles: It grows at a temperature of 25-35 ° C.

2-psychrophiles: It grows at a temperature of 10-15 ° C.

3-thermophiles: It grows at temperatures over 40 degrees Up to 80.

Living organisms are divided according to their role in the environment into three components: -

1- producer organisms: These organisms are called autotrophic and include organisms A snake that can make its own food such as plants, algae and some species Bacteria such as Nitrosomonans,

Nitrobacter, and atmospheric carbon dioxide is a source. Of carbon for this group, which converts it from the organic form to The organic form turns into glucose, depending on the energy of the sun and water in a process Photosynthesis  $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

And there are some organisms that can chemoautotrophic construction Some genera of bacteria use certain chemical compounds to make their food without the need To light, for example, Nitrosomonans oxidize ammonia into nitrite and sex Another oxidation of nitrite into nitrobacter in the second step of the nitrification process is in the soil . other types oxidize ferrous ions to ferric and this results from these reactions Oxidative stress is an energy that these organisms use for various activities.

**Lec:10**

**soil microbiology**

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2- Consumer organisms : They are organisms that are not autotrophic or heterotrophic organisms

These organisms depend, directly or indirectly, for their nutrition on living organisms Producers are therefore called dependent organisms, and these organisms are represented by animals The different nutrition, size and number, and these organisms may be called phagocytes phagotrophs, which are organisms that devour and digest food inside their bodies, and divide this up Objects to: -

- A- Primary consumers: they are living organisms that feed on plants and herbs, such as Livestock, birds and insects.
- B- Secondary consumers: they are living organisms that feed on meat or animals The other is called carnivores, such as lions and eagles.
- C- Mixed-nutrition consumers: they are organisms that feed on herbs Animals and thus can be primary, second, or even third consumers Fourth in the food chain as humans and fish

in the soil environment, the primary consumers are rodents, earthworms, and some Insects such as locusts and stalk borers, and secondary consumables such as microorganisms protozoa prey on Bacteria and Trichoderma fungi Nematoda eggs.

3- decomposer Organisms: They are organisms that are not autotrophic (dependent on feeding) throw or parasite, and this one Organisms are not able to devour and digest food, but rather absorb food after excretion Digestive enzymes to break down food components into simple substances. These types of organisms generally include microorganisms such as bacteria Bacteria and Fungi are called parasitic organisms when Saprophytic organisms depend for their food for food They get their food from dead materials. Decomposers are characterized by their ability to analyze materials Complex organic matter and converting it into simple organic components, and these biology are important in The cycle of elements within the ecosystem, such as the carbon, nitrogen and phosphorous cycle And other elements that green plants can absorb as nutrients for them, This completes the life cycle.

Living organisms can be divided according to the surrounding environmental conditions or the media you live in it to the following: -

- 1- The classification Ecological division of this biology Soil by the scientist Winogradsky and added to it by Waksman 1957 This division includes three groups: - A- Indigenous neighborhoods in soil or endemic -: organisms They are the neighborhoods whose numbers remain fairly constant and are not affected much by different parameters Soils whose original and permanent habitat is soil and which has an essential role in The changes that occur inside the soil (chemical and biological), and they grow and multiply in it It carries out all its activities, and these neighborhoods may exist in silent stages as blackboards that become It is effective when the appropriate conditions are available and it can reactivate again and it may be present on The body of vegetative cells in the soil, and this group is characterized by the stability of its numbers somewhat Resistance to adverse environmental conditions such as bacteria, pseudomonas, and Bacillus . Aurthobacteria
- 2- - Exotic neighborhoods - Zymogenous organisms, which are affected Its preparation with or without some energy and food sources is affected With different soil treatments, such as adding organic fertilizer or green plant residues Soil is also contaminated with sewage, such as Salmonella sp. and then the mold decreases when its food sources are depleted) it remains in the soil For a little while, then it dies when the additive is removed (as well as restored) To the soil with the aim of exploiting its vital activity to increase Useful substances that are intentionally added to readiness or absorption of an element, such as organisms that are added with biological fertilizers Biofertilizer such as Rhizobium to supply an ingredient Nitrogen with Leguminous Plants or Biocontrol such as Fungus Trichoderma to kill some agricultural pests and these organisms may be They are present in the soil but are ineffective, so effective and competitive strains are added For the original revival.