4. Nutrition in Living Organisms

Nutrition

- It is the process of obtaining nutrients from the environment.
- It is an important source of energy for growth and development of body.

Modes of nutrition

- Autotrophic nutrition – Organisms synthesize their own food with the help of raw materials. Example – all green plants
- **Autotrophic nutrition** is of two types- Phototropic and chemotropic nutrition.
- Heterotrophic nutrition – Organisms derive energy (nutrition) from the food prepared by plants. Example – All animals, bacteria, and fungi
- Heterotrophic nutrition is of three types – holozoic nutrition, saprophytic nutrition, and parasitic nutrition.
- Holozoic nutrition is typical of most animals. It means consuming the food as a whole and then digesting it into simpler substances, saprophytic nutrition means obtaining the nutrients from dead and decaying matter and in parasitic mode organisms derive nutrition by living on or inside the bodies of other animals.

Steps involved in holozoic nutrition:

- Ingestion
- Digestion
- Absorption
- Assimilation
- Egestion

- **Autotrophic nutrition**
  - Synthesis of food by green plants through the process of photosynthesis.
  - Photosynthesis equation- $6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$
  - Events of photosynthesis
    - In the grana region of chloroplast:
      - Absorption of light energy
      - Splitting of water in hydrogen and oxygen
      - Synthesis of ATP and $NADPH_2$
    - In the stroma region of chloroplast:
      - Reduction of carbon dioxide to carbohydrates

Plants carry out photosynthesis with the help of structures called stomata.

- Minute pore like structures surrounded by two guard cells
- Help in exchange of CO_2 and O_2

Photosynthesis is affected by factors like:

- CO_2 concentration
- light
- temperature

- **Transportation** is a life process where substances synthesized or absorbed in one part of the body are carried to other parts of the body**.**

- **Transportation in plants**
    - The transportation system in plants moves the energy stored in leaves to different parts. It also helps in moving raw materials absorbed from the roots to various organs of the plant.
    - **Xylem** conducts water and minerals obtained from soil (via roots) to the rest of the plant.
    - Transport of water occurs due to transpiration pull, root pressure and difference in pressure gradient.
    - **Phloem** transports food materials from the leaves to different parts of the plant body.
    - Transport of food (translocation) through phloem requires energy.

- ***Cuscuta* (*Amarbel*)** is a parasite that obtains food from host plant.
- **Pitcher plant** is an insectivorous plant (insect-eating plant). Its leaf gets modified into a pitcher-like structure, which traps the insects. It has both autotrophic and heterotrophic mode of nutrition.
- **Fungi** are saprotrophs. They obtain nutrition from dead or decaying organic matter.
- **Lichens** are organisms formed by a symbiotic relationship between algae and fungi in which algae provide food to fungi while fungi absorb water and nutrients for algae and also provide shelter to algae.
- **Symbiosis** is the association between two organisms where they live together and share shelter and nutrients without harming each others.
- **Ferns** and **orchids** are epiphytes which depend on host plant for support and moisture needs.

    - Soil becomes deficient in nutrients after harvesting.
    - Manures and fertilizers contain essential nutrients like nitrogen, phosphorous and potassium.
    - Manures and fertilizers are added from time to time so that soil regains its fertility.

- **Nutrient management**
    - There are 16 nutrients that are essential for plants
    - Carbon, hydrogen and oxygen are called the framework elements
    - The nutrients required in relatively large quantity for growth and development of plants are called **macro nutrients.** These are nitrogen, phosphorous, potassium, calcium, magnesium and sulphur
    - The nutrients required in small quantity are called **micro nutrients.** These are iron, manganese, boron, zinc, copper, molybdenum and chlorine.

Stages involved in the process of nutrition in animals:

(i) Ingestion: Taking in of food

(ii) Digestion: Breaking down of ingested food into simpler substances

(iii) Absorption: Absorbing of digested food by cells or tissues either directly or after transport through blood

(iv) Assimilation: Utilisation of absorbed food and its incorporation in the body

(v) Excretion: Throwing out of the waste materials/undigested food from the body

1. Nutrition in *Amoeba*: *Amoeba* is a microorganism. The process of nutrition in Amoeba is as follows:

(i) Obtains food with the help of pseudopodia

(ii) Digests food with the help of enzymes secreted by the cell

(iii) Throws out undigested food

2. Nutrition in *Hydra*: It is a simple multicellular organism. The process of nutrition in *Hydra* is as follows:

(i) Catches food using tentacles

(ii) Digests food in the following two steps:

(a) First in the body cavity

(b) Then in the cells of the body cavity

(iii) Throws out undigested food through the mouth

3. Nutrition in earthworm: It is a higher multicellular organism. The process of nutrition in earthworm is as follows:

(i) Food passes through alimentary canal

(ii) Food is digested by enzymes and digested food is absorbed by blood and then utilised by cells

(iii) Undigested food is thrown out through anus

4. Nutrition in man: The digestive system of man includes the following organs:

(i) Mouth – Used for ingestion of food

(ii) Pharynx – Regulates the passage of food into oesophagus and of air into larynx

(iii) Oesophagus – Tube that pushes food into stomach

(iv) Stomach – Digests food with the help of enzymes secreted by its wall

(v) Small intestines – Complete digestion of food takes place in the small intestine with the help of enzymes secreted by its wall and those present in the juices received from liver and pancreas. Absorption of digested food with the help of blood capillaries found in villi also occurs in the small intestines.

(vi) Large intestines- Absorb some water and minerals from the undigested food, store undigested food for some time and expel it out of the body through anus.