PLANT AND ANIMAL NUTRITION WEEK EIGHT (8)

BIOLOGY SS1

PLANT NUTRITION

Nutrition is the process of providing or obtaining the food necessary for health and growth. A nutrient is a substance that provides nourishment essential for the maintenance of life and for growth.

There are two major modes or types of nutrition. They are
1. Autotrophic nutrition
2. Heterotrophic nutrition.

Autotrophic nutrition

Autotrophic nutrition is a process in which the organism (green plants) produces their food from the simple inorganic materials such as water and carbon dioxide.
Plants are referred to as autotrophs, i.e. they are able to manufacture their food. There are two types of autotrophic nutrition. They are Photosynthesis (holophytic) and Chemosynthesis.

Photosynthesis:

This is the process by which green plants synthesize organic compounds from inorganic raw materials in the presence of chlorophyll and light.

$6C0_2 + 6H_20 \text{ ——> } C_6H12O_6 + 60_2$

The main product of photosynthesis is sugar (carbohydrate) while the oxygen given up is a by-product which is released into the atmosphere.

Mechanism of photosynthesis

Photosynthesis involves two stages

Light phase: it takes place during the day. It involves four stages:

1. Activation of chlorophyll: the chlorophyll traps light energy from the sun and get energized.
2. Photolysis of water: light energy splits water molecules;
   $H2O \text{ ——>} H+ + OH- + OH— \text{ —-> } H2O + O2$
3. Hydrogen transfer by NADP (NADP + H + NADPH2)
4. Formation of ATP from ADP: this takes place to store energy for the dark phase reaction

Dark phase: In the dark phase of photosynthesis (occurring in the stoma of chloroplast in the presence of NADPH and ATP), neither light energy nor chlorophyll is needed. This stage takes place in the dark or at night.

During this phase, hydrogen ion and carbon dioxide molecules combine chemically under the control of enzymes to form simple sugar.

$4H^+ + CO_2 \longrightarrow CH_2O + H_2O$

Importance of photosynthesis

1. The products of photosynthesis are the source of energy for their metabolic activities.
2. It is the only process in the food cycle that can trap sun energy.
3. All animals and other heterotrophic plants are directly or indirectly dependent on green plants for food.
4. Photosynthesis helps in the purification of the environment by removing carbon (iv) oxide from it while adding oxygen into it.
5. It provides the basis for the manufacture of other complex organic compounds such as lipids, proteins.

Conditions (factors) necessary for photosynthesis to take place

The conditions necessary for photosynthesis can be grouped into two:

1. External factors: which are carbon (IV) oxide, water, light and temperature
2. Internal factors: which are enzymes and chlorophyll

Mineral elements

Plant cells require mineral salts or elements obtained from the soil for healthy growth and development. These minerals are called plant nutrients.

Classes of plant nutrients

1. **Macronutrient or major elements:** These are nutrients required in large quantities for plant growth and development Eg nitrogen, hydrogen, sulphur, etc.
2. **Micronutrients or trace elements:** These are nutrients that are required by the plants in small quantities for their growth and development e.g. zinc, copper and cobalt.

NUTRITION IN ANIMALS

All living organisms need food for their survival and daily activities. Plants can manufacture their food through a process called photosynthesis, hence they are called **autotrophs**. On the otherhand, animals cannot manufacture their own food as they depend on plants directly or indirectly for their food, hence they are called **heterotrophs**.

Animals sometimes are classified according to the type of food they eat. On this basis, they are classified into three groups, namely:

1. **Carnivorous animals**: These animals feed only on flesh or other animals, e.g dog, lion, lizard, snake, cat, etc.
2. **Herbivorous animals:** These animals feed on plants, e.g. goat, sheep, rabbit, etc.
3. **Omnivorous animals**: These animals feed on both plants and animals, e.g. man, pig, etc.

Classes and sources of food

There are seven major classes of nutrients:
Carbohydrates
Fats
Fibre
Minerals
Protein
Vitamin
Water.

Importance of carbohydrates

1. They provide us with energy.
2. It provides heat during its oxidation which is used in maintaining body temperature.
3. It is used in building the exoskeleton of arthropods.

Importance of proteins

1. Protein is needed for bodybuilding
2. They are necessary for building new cells and replacing old ones.
3. Essential for the repair of cells and worn- out tissues.
4. They are essential for the formation of enzymes
5. Essential for the formation of hormones.

Importance of fats and oils

1. Fats and oil are used for energy storage in the body.
2. They provide more energy to the body than carbohydrate when metabolized.
3. They are solvents for fat-soluble vitamins and also for hormones.
4. They are important components of cell membranes.
    1. 5. They help in maintaining body temperature.

Mineral Salts:

2. Mineral salts regulate the metabolic activities within the body. They are also important in the formation of enzymes, pigments and structural parts of living organisms.
3. The major source of mineral salts is the food we eat. Examples of minerals include sodium, potassium, calcium, chlorine, phosphorus, magnesium, iron, copper, cobalt, fluorine and manganese. lack of minerals in our diet results to ill health and development of symptoms of deficiency diseases.

Vitamins

Vitamins are organic compounds required by humans and other animals in only small quantities for normal growth and healthy development. They promote chemical reactions in the body.

Examples include vitamins A, D, E and K, etc. Inadequacy or lack of these vitamins leads to nutritional deficiency diseases and ill health.

Water

Water is very important in our diet. Sources of water include metabolic water in the food we eat and water is taken in.

Importance of water

It is required for metabolic activities in the body.
It transports digested food substances, excretory products and hormones.
It helps in the regulation of body temperature.
It helps to maintain the osmotic content of the body tissues.
It plays an important role in digestion.
It constitutes a greater part of the blood.
It is the main component of plants and animals.

Balanced diet

A balanced diet is a diet containing the correct proportion or the right amount of all the six food substances required by an organism or man. The balanced diet must contain the six food
substances such as carbohydrates, proteins, fats and oil, minerals, vitamins and water.

Importance of a balanced diet

A balanced diet is important to the body in the following ways:
A balanced diet makes us healthy and by so doing, makes us be resistant to diseases.
It encourages growth and normal development of the body.
It also provides the energy required for normal activities.
Balanced diet prevents malnutrition, deficiency or diseases. Lack of some food substances, e.g protein in a diet can cause a nutritional disease called kwashiorkor in children.

Digestive enzymes

An enzyme is an organic catalyst usually proteinous in nature, which promotes or speeds up chemical changes in living cells but are not themselves used up in the process. Enzymes accelerate metabolic reactions without changing their composition in the process.

Characteristics of enzymes

1. They are protein in nature;
2. They remain chemically unchanged at the end of a reaction;
3. They are specific in action
4. Enzymes are required in small quantities;
5. They act over a specific range of temperature
6. They are destroyed at high temperature
7. They act best at a specific pH most actions are reversible; enzyme action is retarded by poison or inhibitors; some are inactive and require a coenzyme/agents to activate them; enzymes are soluble;
8. They can function outside the body of the organism that produces them;
9. They speed up the rate of biochemical reactions in cells