

## LESSONS-9

### NUTRITION IN PLANTS – MINERAL NUTRITION

•Plants have the nutritional requirement of various inorganic and organic raw materials for building their structure and maintaining body functions. In this lesson you will learn the importance of mineral nutrition in plants and how plants get the nutrients.

- Nutrition is the sum total of processes involving intake or synthesis of food and its utilisation.
- Plants generally derive their inorganic nutrients from soil, water and atmosphere.
- The absorption, distribution and metabolism of various mineral elements by plants is called mineral nutrition
- **Plants require 17 essential elements.** They are C, H, O, N, P, K, S, Mg, Ca, Fe, B, Mn, Cu, Zn, Mo, Cl and Co.
- The essentiality of minerals may be determined by employing the technique of hydroponics and aeroponics.
- Technique of growing plants in a nutrient solution in complete absence of soil is known as **Hydroponics/water culture.**
- **Hydroponics** has been successfully employed for the commercial production of seedless cucumber, tomato and lettuce.
- **Aeroponics:** Like hydroponics, aeroponics is another technique of growing plants in an air/mist environment without the use of soil.
- Inorganic nutrients are broadly classified into two categories-**micronutrients and macronutrients** on the basis of the amount required by plant.
- The nutrients or elements which are essential for the healthy growth of the plant are called essential nutrients or essential elements.
- Essential elements may be required in small amounts or large amounts. Accordingly they have been grouped into two categories

#### **Micro elements/Micronutrients**

Required in minute quantities like 0.1 mg per gram of dry matter or less than that.

Also called as **trace elements**

**Examples :** Manganese, Boron, cobalt, Copper, Molybdenum, Iron, Zinc and Chlorine are required in very small quantities

#### **Macro elements/Macro nutrients**

Required in relatively large quantities like one to 10 milligram per gram of dry matter

**Examples :** Carbon, Hydrogen, Oxygen, Phosphorous, Potassium, Calcium and magnesium, Nitrogen, Sulphur

- Essential elements perform various functions. They carry out several metabolic processes in the plant cells like the maintenance of turgidity of cell, transportation of electrons, membrane permeability and enzyme activity.
- Plants absorb a large number of minerals from soil. The uptake of mineral ions by the roots may be passive or active.

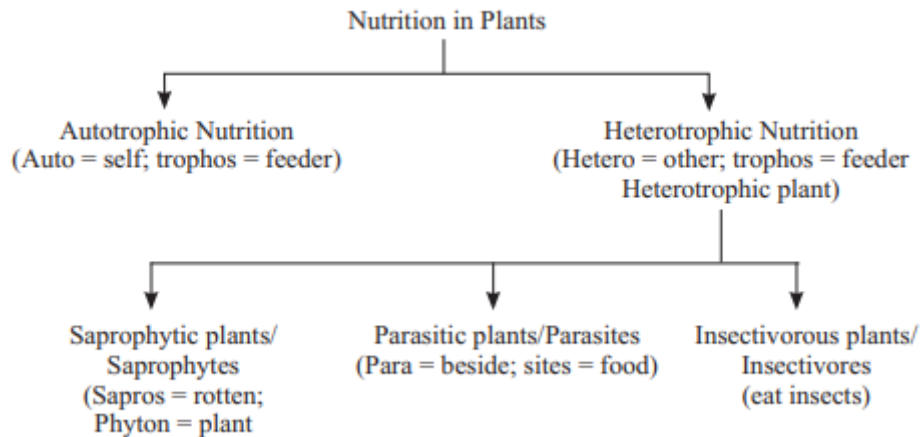
### ESSENTIAL ELEMENTS AND THEIR FUNCTIONS

Element	Function
1. Nitrogen (N)	• Required for the synthesis of Biomolecules
2. Phosphorus (P)	• Required for the synthesis of Biomolecules, Energy transfer and protein metabolism
3. Potassium (K)	• Activates enzymes, osmotic and cation balance
4. Calcium (Ca)	• Required for cell division, cell enlargement
5. Magnesium (Mg)	• Forms part of the chlorophyll molecule. • Activates enzymes of phosphate metabolism. Important for synthesis of DNA and RNA. Essential for binding of ribosome subunits
6. Sulphur (S)	• Present in co-enzyme A, vitamin thiamine, biotin and ferredoxin. Increases root development
7. Iron (Fe)	• Needed for the synthesis of chlorophyll. As a constituent of ferredoxin and cytochromes
8. Manganese (Mn)	• Activates many enzymes of photosynthesis, respiration and N <sub>2</sub> metabolism
9. Molybdenum (Mb)	• Required for nitrogen fixation. Activates the enzyme nitrate reductase
10. Boron (B)	• Increases the uptake of water and calcium. Essential for meristem activity and growth of pollen tube.
11. Copper (Cu)	• Involved in electron transport in photosynthesis.
12. Zinc (Zn)	• Activates dehydrogenases and carboxylases
13. Chlorine (Cl)	• Anion-cation balance in cells.

#### **Absence of any one element may cause deficiency symptoms in plants. These symptoms include**

- **Chlorosis** - It is the loss of chlorophyll leading to yellowing in leaves. It is caused by the deficiency of elements like K, Mg, N, S, Fe, Mn, Zn and Mo.
- **Necrosis** or death of tissues, particularly leaf tissue is caused by deficiency of K, Ca, Mg z Inhibition of cell division is caused due to lack or deficiency of N, K, B, S and Mo.
- **Stunted/Retarded plant growth** caused by the deficiency of N, P, K, Zn, Ca
- Premature fall of leaves and buds is caused by deficiency of K, P.
- Delay in flowering is caused due to deficiency of N, S, Mo

## MODE OF NUTRITION IN PLANTS



- In **autotrophic nutrition** the organisms (plants) manufacture their own food from inorganic raw materials by photosynthesis or chemosynthesis.
- In **heterotrophic nutrition** the organism is dependent on other external sources for its organic nutrition.
- **Heterotrophic** plants are broadly categorised into two main groups: saprophytes, and parasites.
- **Insectivorous plants** are special type of autotrophic plants which grow in N<sub>2</sub>- deficient soils and develop adaptations to trap insects to overcome N<sub>2</sub>- deficiency.

### TEST YOURSELF

1. State criteria for Mineral essentiality. Give the classification of minerals on the basis of requirement of the plants.
2. Write the difference between chlorosis and Necrosis?
3. Describe Mode of Nutrition in plants?