Minerals Nutrition Class 11

Role of Nutrients In Plant Growth

Mineral nutrition can be defined as the naturally occurring inorganic nutrients that are found deep under the soil. The nutrients perform several functions and take part in various metabolic processes in plant cells. It includes maintenance of osmotic pressure, the permeability of the membrane, enzymatic activity, and many more. Further, nutrients are categorized as:

- Macronutrients
- Micro-nutrients

Let us take a deeper look at each of the types of nutrients elaborated under Mineral Nutrition class 11:

Macronutrients

The nutrients present in plants in larger amounts are macronutrients. It includes:

- **Nitrogen**: It is one of the essential components of nucleic acids, proteins, hormones, and is also present in numerous coenzymes, ATP. The element is required by all plant parts, especially the meristematic tissues and the active cells.
- **Sulfur**: The plant tissues attain sulfur in the form of SO_4^{3+}. Present in two amino acids, sulfur serves as a major component of vitamins, coenzymes, and proteins.
- **Calcium**: The plants absorb the calcium in the form of Ca^{2+} ions as mentioned in minerals nutrition class 11 chapter. The element is used in the production of the cell wall, especially as calcium pectate in the middle lamella. It is also implicated in the normal functioning process of the cell membrane and regulating metabolic activities.
- **Magnesium**: The plants obtain it in the form of Mg2+. The element helps in activating the enzymes of photosynthesis, respiration, and is involved in the synthesis of RNA and DNA. The ribosome structure is maintained with the help of this element.

Micronutrients

The nutrients required in little amounts are known as trace or micronutrients. It includes:

- **Copper**: The plant tissues absorb the element as Cu^{2+} ions. The component is essential for the overall metabolic reactions in plants. Additionally, the element helps in balancing carbohydrate-nitrogen regulation
- **Zinc**: The element is absorbed by the plants as Zn^{2+} ions. Tryptophan, metabolism of phosphorus, and carbohydrates are synthesized with the help of zinc.
- **Manganese**: According to the minerals nutrition class 11 chapter, this element is necessary for the process of photosynthesis, nitrogen metabolism, and respiration. The

mineral is essential for chlorophyll synthesis and serves as an activator of nitrogen metabolism.

- **Chlorine**: Plants usually absorb Chlorine in the form of Cl^- ions. The element helps determine the solute concentration and is crucial for the water-splitting in the photosynthetic reaction.
- **Boron**: The plants obtain boron as BO_3^{3-} or $B_4O_7^{2-}$. The utilization of membrane functioning, cell differentiation, pollen germination, carbohydrate translocation, and much more are done with the help of Boron.

Mineral Nutrition Class 11: Chapter at a Glance

Now that you are through with the essential concepts of our mineral nutrition class 11 notes, tabulated below are some of the important pointers and topics of this chapter.

Topics	Overview
Methods to study the mineral requirements of plants	It talks about hydroponics, which is the technique of growing plants in a nutrient solution. Apart from it, the other methods discussed highlight the culture of the plants in a defined and soil-free mineral solution.
Essential mineral elements	It talks about the essential mineral elements for plants, including magnesium, potassium, calcium, cobalt, oxygen, hydrogen, sulfur, phosphorus, nitrogen, nickel, iron, manganese, molybdenum, etc.
Role of macro and Micronutrients	The micronutrients such as iron, copper, zinc, and many more are required in small quantities. However, macronutrients such as carbon, hydrogen, oxygen, etc.
Deficiency symptoms of essential elements	In the biology mineral nutrition class 11 chapter, the deficiency symptoms when essential elements are absent in plants. It includes necrosis, chlorosis, premature fall of leaves, stunted plant growth, and many more.
Toxicity of micronutrients	It acknowledges that the concentration of any mineral ion in tissues that lessens the dry weight nearly to 10% refers to toxicity.
Mechanism of elements absorption	It talks about the mechanism process for the absorption of elements that can be carried out in two main phases. The processes are named as active and passive.

Translocation of solutes	It talks about how the mineral salts get translocated through xylem through the rising water stream that is pulled by the transpirational pull.
Soil as a reservoir of essential elements	It discusses that multiple nutrients, which are essential for plants' growth and development, become accessible to plant roots due to the breakdown and weathering of rocks.
Metabolism of nitrogen	Mineral nutrition class 11 topic talks about the nitrogen cycle and the importance of nitrogen in living organisms.
Biological nitrogen fixation	It reveals that plants get nitrogen in a similar form in which they want, through the process of nitrogen fixation.

Mineral Nutrition Class 11: NCERT Solutions

Here are some of the important questions for the chapter on Mineral Nutrition class 11:

Question: ‘All elements that are present in a plant need not be vital to its survival.’ Explain.

Answer: A nutrient is regarded as inessential for a plant if it is not included in the physiology of plants or metabolism reaction. Hence, all elements are not vital for the plants to complete their entire life cycle.

Question: Name five deficiency symptoms in plants. Explain them.

Answer:

Chlorosis: It is caused due to the deficiencies of potassium, sulfur, nitrogen, zinc, iron, molybdenum, and sulfur.

Delayed flowering: The deficiencies of sulfur, nitrogen, and molybdenum cause delayed flowering.

Necrosis: It refers to the death of plant tissues and often occurs due to deficiencies of copper, potassium, and magnesium.

Stunted plant growth: It is mainly caused by the deficiencies of sulfur, molybdenum, and nitrogen.

Inhibition of cell division: The deficiencies of potassium, nitrogen, molybdenum, and sulfur causes this symptom.

Question: What is the importance of the purification of water and nutrient salts involved in mineral nutrition using hydroponics?

Answer: Hydroponics refers to the process of plants growing in a limited amount of nutrient solution without soil. When the plant roots get exposed to a limited solution, it causes a reduced concentration of oxygen and other minerals in the roots. Thus, purification of water and nutrient salts is necessary to sustain the optimum growth of plants and obtain correct scientific results.

Mineral Nutrition Class 11 NEET Notes

Macronutrients are used in relatively large amounts by plants for their growth

Macroelement	Physiological Role	Deficiency Symptoms
Nitrogen	Absorbed mainly as NO_3^-, NO_2^-, NH_4^+. Chief constituent of proteins, nucleic acids, amino acids, purines.	Yellowing of leaves and development of chlorosis.
Sulphur	Absorbed in the form of SO_4^{2-} ions. Determines protein structure.	Young leaves become chlorotic, anthocyanin pigmentation.
Phosphorus	Absorbed in the form of $H_2PO_4^-$ or HPO_4^{2-} ions. Acts as an activator of some enzymes.	Disruption of general metabolism. Abnormalities in the shape and size of chloroplasts.
Calcium	Absorbed in the form of Ca^{2+} ions. Essential for chromatin or mitotic spindle organisation.	Margins of younger leaves show chlorosis.
Potassium	Absorbed as K^+ ions. Regulates stomatal movement.	Weak stalks are developed.
Magnesium	Absorbed in the form of Mg^{2+} ions.‘Helps in photosynthesis.	Yellowing of leaves. Tips and margins of leaves turn upwards.

Micronutrients are required by plants in minute quantities.

Microelement	Physiological Role	Deficiency Symptoms
Iron	Absorbed in the form of Fe^{3+} ions. Plays an important role in electron transport systems.	Development of characteristic chlorotic spots and the veins remain green.
Boron	Absorbed as BO_3^{3-} or $B_4O_7^{2-}$. Regulates carbohydrate metabolism.	Deformation, discolouration and disorganisation of meristematic tissue.
Manganese	Absorbed in the form of Mn^{2+} ions. Plays a role in photo-oxidation of H_2O and release of molecular O_2.	Chlorosis and necrosis in the interveins of leaves.
Copper	Absorbed in the form of Cu^{2+} ions. Plays a key role in the electron transport chain in photosynthesis.	Distortion and chlorosis in leaves followed by necrosis of the tips of young leaves.
Zinc	Absorbed in the form of Zn^{2+} ions. Plays an important role in the synthesis of auxins.	Shortening of internodes resulting in stunted plant growth. Suppression of seed formation.
Microelement	Physiological Role	Deficiency Symptoms
Molybdenum	Absorbed in the form of MoO_2^{2+} ions. Required for nodulation in legumes, synthesis of tannins and reduction of nitrates to nitrites.	Development of chlorosis along with poor leaf growth. Reduction in nitrogen fixation in symbiotic plants.
Chlorine	Absorbed in the form of Cl^- anions. Essential in the transport of electrons from water to photo oxidised chlorophyll.	Wilted leaves, which then become chlorotic and necrotic.

Nickel	Catalyses the hydrolysis of urea to CO_2 and NH_4.	Development of necrotic spots at the tips.

The usual concentration of essential elements in higher plants according to D.W. Rains (1976) based on the data of Stout are given below-

Element	% of dry weight
Carbon	45
Oxygen	45
Hydrogen	6
Nitrogen	1.5
Potassium	1.0
Calcium	0.5
Magnesium	0.2
Phosphorus	0.2
Sulphur	0.1
Chlorine	0.01
Iron	0.01
Manganese	0.005
Boron	0.002
Zinc	0.002
Copper	0.0001
Molybdenum	0.0001