



NCERT Solutions for 11th Class Biology: Chapter 12-Mineral Nutrition



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NCERT 11th Biology Chapter 12, class 11 Biology chapter 12 solutions

Page No: 205

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-biology-chapter-12-mineral-nutrition/>

Exercises

1. 'All elements that are present in a plant need not be essential to its survival'. Comment.

Answer

Plants tend to absorb different kinds of nutrients from soil but all of them are not essential to its survival because they do not directly involved in the composition of their body. A nutrient is inessential for a plant if it is not directly involved in the plant's physiology and metabolism. However, if the concentration of micronutrients such as Fe, Mn, Cu, Zn, Cl, etc., rise above their critical values, they appear to be toxic for the plant.

2. Why is purification of water and nutrient salts so important in studies involving mineral nutrition using hydroponics?

Answer

As in hydroponics, the plants are grown in a nutrient solution in the absence of soil. Since the plant roots are exposed to a limited amount of the solution, there are chances that the concentrations of oxygen and other minerals in the plant roots would reduce. Therefore, in studies involving mineral nutrition using hydroponics, purification of water and nutrient salts is essential so as to maintain an optimum growth of the plants.

3. Explain with examples: macronutrients, micronutrients, beneficial nutrients, toxic elements and essential elements.

Answer

→ **Macronutrients:** Elements which are present in large amounts in plant tissues are called macronutrients. They are present in plant tissues in amounts more than 10 mmol kg^{-1} of dry matter. Carbon, hydrogen, oxygen,

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nitrogen, phosphorous, sulphur, potassium, calcium and magnesium are examples.

→ Micronutrients: Elements which are present in small amounts i.e. less than 10 mmole per kg of dry matter are called micronutrients. Iron, manganese, copper, molybdenum, zinc, copper, boron, chlorine and nickel are examples.

→ Beneficial Elements: The nutrients that may not be essential, but are beneficial to plants are called beneficial elements. Sodium, silicon, cobalt and selenium are examples.

→ Toxic elements: Any mineral ion concentration in tissues that reduces the dry weight of tissues by about 10 per cent is considered toxic. For example, when manganese is present in large amounts, it induces deficiencies of iron, magnesium, and calcium by interfering with their metabolism.

→ Essential elements: The elements which are absolutely necessary for plant growth and reproduction are called essential elements. The requirement of these elements is specific and non-replaceable. These elements are further divided into two broad categories based on their quantitative requirements.

NCERT 11th Biology Chapter 12, class 11 Biology chapter 12 solutions

4. Name at least five different deficiency symptoms in plants. Describe them and correlate them with the concerned mineral deficiency.

Answer

Five different deficiency symptoms in plants are:

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- Chlorosis is the loss of chlorophyll leads to the yellowing of leaves. It is caused by the deficiencies of nitrogen, potassium, magnesium, sulphur, iron, manganese, zinc, and molybdenum.
- Necrosis is the death of plant tissues as a result of the deficiencies of calcium, magnesium, copper, and potassium.
- Inhibition of cell division is caused by the deficiencies of nitrogen, potassium, sulphur, and molybdenum.
- Delayed flowering is caused by the deficiencies of nitrogen, sulphur, and molybdenum.
- Stunted plant growth is a result of the deficiencies of copper and sulphur.

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5. If a plant shows a symptom which could develop due to deficiency of more than one nutrient, how would you find out experimentally, the real deficient mineral element?

Answer

Every element shows certain characteristic deficiency symptoms in the plants also different plants respond in different ways to the deficiency of the same nutrient. Thus, in order to identify the real deficient mineral element, we need note all the available symptoms in different parts of the plant. Then we have to compare the noted information with the available standard symptom table.

6. Why is that in certain plants deficiency symptoms appear first in younger parts of the plant while in others they do so in mature organs?

Answer

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Mobility of an element play very important role in determining whether the deficiency symptoms appear first in younger parts or older parts. Elements such as nitrogen, potassium, and magnesium are highly mobile. These elements move from the mature organs to the younger parts of a plant. Therefore, the symptoms for the deficiencies of these elements first appear in the older parts of the plant. Elements such as calcium and sulphur are relatively immobile. These elements are not transported out of the older parts of a plant. Therefore, the symptoms for the deficiencies of these elements first appear in the younger parts of the plant.

7. How are the minerals absorbed by the plants?

Answer

The absorption of minerals by plants takes by the roots of plants in two main phases: apoplast and symplast.

In the first phase, there is a rapid uptake of nutrients from the soil into the free spaces of plant cells. This process is passive and it usually occurs through trans-membrane proteins and ion-channels.

In the second phase, the ions are taken slowly into the inner spaces of the cells. This pathway generally involves the expenditure of energy in the form of ATP.

NCERT 11th Biology Chapter 12, class 11 Biology chapter 12 solutions

8. What are the conditions necessary for fixation of atmospheric nitrogen by Rhizobium. What is their role in N_2 -fixation?

Answer

Rhizobium bacteria need symbiotic association with legume plants to carry out nitrogen fixation. Root nodules contain the necessary enzymes for nitrogen fixation and thus enable rhizobium to fix nitrogen. The enzyme nitrogenase facilitates the conversion of nitrogen into ammonia which is <https://www.indcareer.com/schools/ncert-solutions-for-11th-class-biology-chapter-12-mineral-nutrition/>

the first stable product of nitrogen fixation. Ammonia is then converted into glutamic acid. Glutamic acid is then utilised by plants to make amino acids which are ultimately utilised to make protein.

9. What are the steps involved in formation of a root nodule?

Answer

Nodule formation involves a sequence of multiple interactions between Rhizobium and roots of the host plant. These steps are:

- Rhizobium bacteria contact a susceptible root hair and divides near it.
- After successful infection, the root hairs get curled and are invaded by the bacteria.
- This invasion is followed by the formation of an infection thread that carries the bacteria into the cortex of the root.
- The bacteria get modified into rod-shaped bacteroides and cause inner cortical and pericycle cells to divide. Division and growth of cortical and pericycle cells lead to nodule formation.
- The nodules finally get connected with the vascular tissues of the roots for nutrient exchange.

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10. Which of the following statements are true? If false, correct them:

(a) Boron deficiency leads to stout axis.

► True

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(b) Every mineral element that is present in a cell is needed by the cell.

- ▶ Every mineral element that is present in a cell is not needed by the cell.

(c) Nitrogen as a nutrient element, is highly immobile in the plants.

- ▶ Nitrogen as a nutrient element, is highly mobile in plants.

(d) It is very easy to establish the essentiality of micronutrients because they are required only in trace quantities.

- ▶ True

NCERT 11th Biology Chapter 12, class 11 Biology chapter 12 solutions



Chapterwise NCERT Solutions for Class 11 Biology:

- Chapter 1: The Living World
- Chapter 2: Biological Classification
- Chapter 3: Plant Kingdom
- Chapter 4: Animal Kingdom
- Chapter 5: Morphology of Flowering Plants
- Chapter 6: Anatomy of Flowering Plants
- Chapter 7: Structural Organisation in Animals
- Chapter 8: Cell-The Unit of Life
- Chapter 9: Biomolecules
- Chapter 10: Cell Cycle and Cell Division
- Chapter 11: Transport in Plants
- Chapter 12: Mineral Nutrition
- Chapter 13: Photosynthesis in Higher Plants
- Chapter 14: Respiration in Plants
- Chapter 15: Plant - Growth and Development
- Chapter 16: Digestion and Absorption
- Chapter 17: Breathing and Exchange of Gases
- Chapter 18: Body Fluids and Circulation
- Chapter 19: Excretory Products and Their Elimination
- Chapter 20: Locomotion and Movement
- Chapter 21: Neural Control and Coordination
- Chapter 22: Chemical Coordination and Integration

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