

Role of Micronutrients in Plant Nutrition

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ARTICLE ID: 109

Introduction

The plants required micronutrients in small amounts i.e. iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), chlorine (Cl), molybdenum (Mo) and nickel (Ni). Whenever the supply of one or more of these elements is inadequate, yields will be reduced and the quality of crop products impaired (Alloway, 2008). For a trace element to be essential for either plants or animals (i.e., a micronutrient), it needs to satisfy three criteria: (1) the organism cannot grow and reproduce normally without the element, (2) its action must be specific and unable to be replaced by any other element, and (3) its action must be direct (Arnon and Stout, 1939).

Role of micronutrients in plant nutrition

Iron

- Iron available to plants in form of Fe⁺².
- Iron helps in the synthesis of chlorophyll.
- It is a constituent of enzyme system i.e. cytochrome oxidase, catalase, nitrogenase reaction in plants.
- It is a structural component of porphyrin molecules like cytochromes, ferrichrome and hemoglobin which are important for respiration and photosynthesis in plants.
- It is also structural component of non heme compounds like ferredoxins.

Manganese

- Manganese available to plants in form of Mn⁺².
- Manganese is an integral component of the water splitting enzyme associated with photosystem II and involved in formation of O₂ in photosynthesis.
- It involves in oxidation-reduction process and chlorophyll formation.
- It is a substitute for Mg⁺² in many of the phosphorylating reactions.

Zinc

- Zinc available to plants in form of Zn^{+2} .
- Zinc is constituent of carbonic anhydrase, alcoholic dehydrogenase and superoxide dismutase.
- Zinc is essential for reproduction of certain plants and formation of growth hormones.
- It involve in auxin metabolism.
- Zinc influence translocation and transport of P in plants.

Copper

- Copper available to plants in form of Cu^{+2} .
- Copper is essential for the synthesis of vitamin A.
- It is act as a catalyst in respiration and “electron carrier” in enzyme which is important for redox reactions in plants.
- Copper is important in imparting disease resistance to the plants.

Boron

- Boron available to plants in forms of H_3BO_3 .
- It is essential in actively growing region of plants such as root tips.
- Boron is important for cell development in meristematic tissue.
- Boron helps in nodule formation in legumes.
- It involves in translocation of sugars and starches in plant.
- Boron helps in pollination and fruit / seed setting in plants.
- It is important for synthesis of proteins and amino acids.
- Boron facilitates transport of K in guard cells as well as stomata opening.

Molybdenum

- Molybdenum available to plants in forms of MoO_4^{-2} .
- Molybdenum is essential component of nitrate reductase and nitrogenase enzymes.
- It is involved in absorption and translocation of Fe in plant.

Nikel

- Nickel is associated with nitrogen metabolism by way of influencing urease activity.
- It facilitates transport of nutrients to the seeds or grains.

Chlorine

- Chlorine available to plants in forms of Cl^- .



- Chlorine is essential for biochemical reactions..
- It involves in the evaluation of O₂ in photosynthesis.
- It improves disease resistance in plant by increase osmotic pressure in cell sap.

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