JULY 2024 CROPLAND SOLUTIONS

DROUGHT TOLERANCE AND MICRO-NUTRIENTS

Micronutrients play a crucial role in enhancing drought tolerance in crops. These nutrients, though required in small quantities, are vital for various physiological and biochemical processes that help plants cope with water stress. Here are some key micronutrients that contribute to drought tolerance:

1. Zinc (Zn)

Role in Drought Tolerance: Zinc is essential for the synthesis of auxin, a plant hormone that regulates growth and development. It also helps in the stabilization of cell membranes and protection against oxidative stress.

Mechanisms: Enhances root development, improves water uptake, and increases the activity of antioxidant enzymes.

2. Boron (B)

Role in Drought Tolerance: Boron is important for cell wall formation and membrane integrity. It also plays a role in the movement of sugars and other nutrients within the plant.

Mechanisms: Maintains cell wall structure, which is crucial during water stress, and aids in nutrient translocation, supporting overall plant health.



3. Iron (Fe)

Role in Drought Tolerance: Iron is a key component of many enzymes and proteins involved in photosynthesis and respiration. It is also involved in the synthesis of chlorophyll.

Mechanisms: Improves photosynthetic efficiency, enhances root respiration, and contributes to the synthesis of stress-related proteins.

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4. Manganese (Mn)

Role in Drought Tolerance: Manganese is involved in the activation of various enzymes, particularly those related to photosynthesis and nitrogen metabolism.

Mechanisms: Enhances the production of reactive oxygen species (ROS)-scavenging enzymes, improving the plant's defense against oxidative stress.

5. Copper (Cu)

Role in Drought Tolerance: Copper is essential for the functioning of several enzymes involved in ligin synthesis and oxidative stress defense.

Mechanisms: Strengthens plant cell walls, reduce wilting under drought conditions, and boosts the activity of superoxide dismutase, an important antioxidant enzyme.

6. Molybdenum (Mo)

Role in Drought Tolerance: Molybdenum is a critical component of enzymes involved in nitrogen fixation and nitrate reduction. Mechanisms: Enhances nitrogen metabolism, leading to better growth and stress response under drought conditions.







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7. Silicon (Si)

Role in Drought Tolerance: Although not traditionally classified as an essential micronutrient, silicon plays a significant role in strengthening plant cell walls and enhancing stress resistance. Mechanisms: Improves water use efficiency, enhances mechanical strength of tissues, and boosts the plant's ability to withstand water deficit conditions.

How to Ensure Adequate Micronutrient Supply Soil Testing: Regular soil tests can help determine the levels of micronutrients and guide appropriate fertilization.

Foliar Applications:

Applying micronutrients directly to the leaves can quickly address deficiencies and improve plant health.

Micronutrient-Enriched Fertilizers: Using fertilizers that include essential micronutrients ensures a balanced supply for optimal plant growth.

Organic Matter Addition: Incorporating organic matter into the soil can improve micronutrient availability and enhance soil health. Ensuring an adequate supply of these micronutrients can ignificantly enhance the drought tolerance of crops, contributing to better growth and productivity under water-stressed conditions.



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