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Perspective

Role of Different Micronutrients in Crop Production

Ellen Shapiro*

Department of Agronomy, Kansas State University, Manhattan, United States

DESCRIPTION

The importance of micronutrients is sometimes overlooked. Micronutrients, however, are often the secret to how well the other nutrients are utilized and how well the plant develops, grows, and produces. Micronutrients are recognized to have a wide range of intricate functions in the growth and health of plants. A plant's genetic potential is maximized when its robust, consistent development results in bigger yields and better-quality harvests. Their presence can have a significant effect on a variety of plant processes, including root growth, fruit setting and grain filling, seed viability, and plant strength and health. Stunted growth, reduced yields, dieback, or even plant mortality can be caused by micronutrient deficiency or toxicity. By providing food for the soil's microorganisms, which play key roles in the numerous nutrient cycles of the soil-plant root system, they also indirectly help plants. Plants just require a trace quantity of it. Boron, iron, copper, zinc, manganese, magnesium, and molybdenum are the key micronutrients that crops require in varying amounts. Micronutrient requirements are fulfilled in part by the soil, chemical fertilizers, and other sources. Mineral nutrients regulate a variety of physical and metabolic activities. Boron is especially important for pollen germination, copper aids plant growth hormones and enzyme systems, manganese increases chlorophyll synthesis and phosphorus availability, iron acts as an oxygen carrier and promotes chlorophyll formation, and zinc aids plant growth hormones and enzyme systems.

As a result of the enhanced yield and quality of agricultural products as a result of the application of micronutrients, human and animal health is safeguarded through the use of enrichment plant materials in feed. Other vital elements are accessible in balanced ratios for plants only when each important element can fulfill its job in plant nutrition adequately. Manganese, as an electron transporter in photosynthesis, plays a vital part in oxidation and reduction reactions in plants. Manganese shortage has a significant impact on non-structural carbohydrates, particularly carbohydrates found in roots. Manganese shortage reduced crop quality and quantity, which was caused by low pollen productivity and a lack of carbohydrates during grain filling. Zinc is transferred to divalent form or by organic acid bonds in the xylem. Zinc forms a compound with organic acids of low molecular weight in the phloem sap, increasing its concentration. In degraded, calcareous, and weathering acidic soils, zinc shortage can be evident. In calcareous soils, zinc shortage is frequently accompanied with iron insufficiency. Because of the limited solubility of minerals containing iron in many parts of the world, especially in dry regions with alkaline soils, iron in the soil is the fourth most prevalent metal on the planet, but its level was low or unavailable for the needs of plants and microorganisms. Boron (B) is mostly found in soil solutions as the BO_3^{3-} anion, which is the form that plants prefer. B promotes the structural and functional integrity of plant cell membranes, making it one of the most critical micronutrients regulating membrane stability. Boron deficiency symptoms arise initially at the growth points, and some soil types are more susceptible to boron deficiency. In numerous plant-growth processes, Copper (Cu) activates enzymes and catalyzes reactions. Copper is required for proper protein synthesis and is intimately tied to Vitamin A biosynthesis. For crop development and food production, Iron (Fe) is required. Fe is taken up by plants as the Ferrous (Fe^{2+}) cation. Many enzymes involved in energy transmission, nitrogen reduction and fixation, and lignin production contain iron.

Soil application is the most prevalent technique of micronutrient delivery for crops. Because recommended treatment rates are often less than 10 lb/acre (on an elemental basis), it's difficult to apply micronutrient sources individually in the field. As a result, granular and fluid NPK fertilizers are frequently utilized as micronutrient transporters. Including micronutrients in mixed fertilizers is a straightforward application approach that allows for more uniform dispersion with standard application equipment. By removing a separate application, costs are also lowered. The following are four techniques for including micronutrients into mixed fertilizers: Adding granular fertilizers to the mix: Micronutrients are uniformly distributed throughout granular NPK fertilizers due to incorporation during manufacturing. Blending granular fertilizers in bulk: Bulk mixing creates fertilizer grades that meet the micronutrient requirements. Nutrient segregation is unfortunately widespread, leading in unequal nutrient delivery. Applying a coating to granular fertilizers the risk of segregation is reduced by coating powdered micronutrients atop granular NPK fertilizers. Adding liquid fertilizers to the mix: Micronutrients combined with fluid fertilizers have become a common application strategy. Keep in mind that compatibility studies should be performed before attempting tank-mixing operations with micronutrients and fluid fertilizers. Suspension fertilizers are also utilized to transport micronutrients.

Correspondence to: Ellen Shapiro, Department of Agronomy, Kansas State University, Manhattan, United Sates, E-mail: Shapiro@ellen.org

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