Micronutrients Are the Key to Better Yields

Sometimes the Smallest Things Can Unlock Our Greatest Potential

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Micronutrients play a critical role in plant vigor, yield, and harvest quality. Yet, they are often overlooked when growers develop their nutrient programs. In this article we provide an overview of what micronutrients are, the roles they play, how availability is affected by soil and other conditions, how to recognize deficiencies, and the important steps to take when developing a micronutrient plan for your crops.

Science has identified 17 essential nutrients for healthy plant growth. Water and air normally provide the three most important: carbon, hydrogen, and oxygen. The rest are generally expected to come from the soil. We are all familiar with those six nutrients required in large amounts (macronutrients and secondary macronutrients): nitrogen, phosphorus, potassium, calcium, magnesium and sulfur. There are also eight nutrients required in smaller amounts (boron, chlorine, copper, iron, manganese, molybdenum, nickel, and zinc), dubbed ***micronutrients***—as well as several elements that have been identified as non-essential, yet beneficial plant micronutrients such as cobalt, silicon, selenium, vanadium, etc. Micronutrients are often treated as an afterthought, though. Don't sweat the small things, right?

Wrong! Smaller doesn't mean less important. In fact, in many ways micronutrients hold the key to how well the other nutrients are used and how well the plant grows, develops, and yields.

What Micronutrients Do

Micronutrients are known to play many complex roles in plant development and health. These include photosynthesis, chlorophyll synthesis, respiration, enzyme function, formation of hormones, metabolic processes, nitrogen fixation and reducing nitrates to usable forms, cell division and development, and regulation of water uptake. Micronutrients promote the strong, steady growth of crops that produce higher yields and increase harvest quality—maximizing a plant's genetic potential. In particular, their presence can have a great impact on root development, fruit setting and grain filling, seed viability, and plant vigor and health.

Micronutrient deficiency or toxicity can result in stunted growth, low yields, dieback, and even plant death. Micronutrients also benefit plants indirectly by feeding the microorganisms in the soil that perform important steps in various nutrient cycles of the soil-plant root system.

Of course, the end product is the role micronutrients play when the harvest reaches the table. Increasing evidence indicates that crops grown in soils with low levels of micronutrients may not provide sufficient human dietary levels of certain elements, even though the crops show no visual signs of deficiency themselves. These unseen deficiencies can readily be found through proper laboratory analysis, which we discuss below.

The World Health Organization reports that micronutrient malnutrition contributes substantially to the global burden of disease. In 2000, the *World Health Report* identified iron and zinc deficiencies as being among the world's most serious health risk factors. Micronutrient malnutrition is known or suspected to contribute to a wide range of impairments, including reduced resistance to infections, metabolic disorders, learning disabilities, and stunted development and growth of infants and children.

Micronutrients and Soil

Micronutrients occur naturally in soil minerals, which gradually break down from rock minerals and release in forms that are available to plants. Some micronutrients are re-introduced to the soil during decomposition of organic matter from plants and animals.

A critically important concept related to micronutrients is that of their availability to plants. Micronutrients can sometimes be present in soils but not in a chemical form that roots are able to absorb. Soil physical characteristics and environmental conditions play key roles in determining when and how available soil nutrients—especially micronutrients—are to plants.