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Immediate Release

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Micronutrient Fertilization

Recent research on photosynthesis shows the importance of adequate nutrient fertility. On average, corn plants only perform full blown photosynthesis about 10-20% of the time, even when weather conditions are ideal. Why? High rates of photosynthesis required essential mineral elements to build carbohydrates, amino acids, proteins, and enzymes. If an essential nutrient is lacking or not in a plant available form, photosynthesis shuts down. High soil biological activity makes nutrients plant available. A healthy soil with living roots has 1000-2000X more microbes than a bare soil. Each microbe is a soluble bag of fertilizer full of plant available nutrients to feed the crop.

The availability of soil nutrients is dependent on three factors. One is the chemical form that it can be taken up by the plant. Second is the proximity to actively absorbing plant root. Three is the soil nutrient must be in a soluble form that can be absorbed by plant roots. Most plant roots require moist soil and water to absorb soluble nutrients and high biological activity. Soil and plant tissue mobility varies according to the nutrient.

Soil Nutrient Mobility: Mobile nutrients move with the soil solution and are generally negatively charged ions (anions) or uncharged (does not apply to phosphorus) and tend to be in high concentrations in the soil. Examples include nitrogen, sulfur, chlorine, molybdenum, and boron. Immobile nutrients have little soil movement, generally have positive charges (cations) except for phosphorus, tend to have low soil concentrations, and are often highly bound to the soil. Examples include phosphorus, potassium, calcium, magnesium, manganese, iron, zinc, copper, and nickel.

Plant Tissue Nutrient Mobility: Mobile plant nutrients are easily remobilized from the older leaves to the new leaves under deficiency conditions. Deficiencies generally show up on the older leaves because the nutrients are easily mobilized to newer faster growing leaves. Examples include nitrogen, phosphorus, potassium, magnesium, chlorine, zinc, and molybdenum. Immobile plant nutrients deficiency symptoms are most pronounced on young plant leaves and parts that are newly grown. Examples include calcium, sulfur, manganese, iron, copper, and boron.

Several micronutrients or trace elements (boron, chloride, copper, iron, manganese, molybdenum, nickel and zinc) are needed only in extremely small amounts for crop production. Most Ohio soils have adequate amounts of micronutrients for corn production but conditions vary so soil testing and tissue testing are recommended. Ohio soils generally have adequate secondary nutrients (sulfur, magnesium, calcium) if proper pH has been maintained with lime. Sandy or low organic matter soils with low biological activity generally show micronutrient deficiencies first. Soils high in organic matter, manured, or soils will high biological activity generally have less symptoms of micronutrient deficiency. To see pictures of micronutrient deficiencies, visit my website at HoormanSoilHealthServices.com.

Soil temperature and moisture are also important factors. Cool, wet, compacted soils that become anaerobic (lack oxygen) reduce the rate, amounts, and availability of micronutrients taken up by crops. As soil pH increases (less acid, more alkaline conditions), the availability of micronutrients decreases, with the exception of molybdenum. Zinc may be needed for corn production on high pH soils and low soil test zinc levels. Soil pH generally needs to be above 6.6 and the soil test zinc levels below 4 ppm before a yield response would be expected from additional zinc. Zinc rates may be found in the Tri-state Fertilizer Recommendations for Corn, Soybeans, Wheat, & Alfalfa (http://ohioline.osu.edu/e2567/index.html).

For the other micronutrients, no research shows the need for micronutrient fertilization on our Ohio mineral soils. If a micronutrient is needed, a starter band is probably the most efficient way of getting that nutrient to the plant. However, if micronutrient deficiency has never been identified or confirmed for a field, then a micronutrient package is likely unnecessary.

Keeping nutrients levels in balance is an important concept to remember. When one nutrient level gets too high, it tends to tie up other nutrients. For example, high phosphorus levels tend to tie up zinc, copper, and boron. If a micronutrient problem is suspected, take a plant tissue sample to determine if a deficiency exists and a micronutrient fertilizer is required. Micronutrients are expensive to purchase, and avoid over applying micronutrients, because they can become toxic when applied at too high of a rate. Dr. Steve Culman, OSU Soil Fertility Specialist provided some information for this article.