K-STATE Research and Extension | Wildcat District

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A Brief Soil Micro-Nutrient Overview

In well-pH-balanced soils, micronutrient deficiencies in crops are usually rare in our clay soils, but there are some exceptions. Our soils are naturally high in calcium, iron, and magnesium, while the micronutrients of copper, nickel, and molybdenum are needed in such small quantities that deficiencies are unlikely in most soils. Deficiencies in these nutrients in our clay and silt-based soils are normally caused by high or low pH, which makes them unavailable. The nutrients of boron, manganese, chloride, and zinc are a little different, though. There are some places where these nutrients don't have a naturally high background level, but they aren't always a concern either. All of the micronutrients have different aspects, reactions, and levels of concern in the soil. (Technically, calcium and magnesium are secondary nutrients, but they are close enough for this discussion.)

Calcium and Iron: pH opposites

Our soils have massive, largely immobile pools of both calcium and iron. Iron deficiency occurs in our acidic soils, and sometimes, this is possible in thin strips along gravel roads. This is due to years of road dust that has increased the pH above 7.5, where iron can become hard for plants to adsorb. Normally, we are more worried about iron toxicity when pHs get below 5.5. At these acidic pH levels, the plants can't stop all the soluble iron from getting into the roots, and it can "burn" the plant from the inside. Calcium can, on the other hand, become deficient in highly acidic soils, but the risk of iron toxicity will likely happen first in our soils. However, at high pHs, calcium forms into calcium carbonates and once again can become deficient in plants.

Boron: The unknown micro

Our soils are naturally very low in boron, and we can actually fertilize boron into our soils. Research has shown that yield response is rare in corn and unlikely in soybeans and wheat, but it has shown results in some alfalfa fields. Sunflowers are another crop that is possibly benefited from boron application, but it's not certain. Boron becomes more available in slightly acidic soils but can leech from the soil over a period of time. It's possible to see more boron deficiency in drier years because it is water mobile nutrient. Basically, we don't have it pinned down yet, but it is currently not recommended in corn, wheat, and soybeans but has the possibility to be a needed fertilizer in alfalfa and sunflowers. Also, there is a thin line between boron deficiency and toxicity, so care must be taken when fertilizing with boron.

Zinc: The one we know

We know zinc is the best out of all the secondary and micronutrients. We frequently test and fertilize for it, and some fields around here can be somewhat deficient in zinc. It's fairly easy to add fertilizer because it can be soil-applied and is immobilized in the soil. A few pounds of zinc in a fertilizer application can be enough to last for years. Because of our zinc mining past, some

soils in southeast Kansas and southwest Missouri have incredibly high levels of zinc, but toxicity is unlikely except in some specific locations with a history of zinc smelting.

Manganese: The odd one

Manganese isn't often a problem in southeast Kansas, but sometimes it can be in high pH and sandy soils. Deficiencies can happen here in the same areas where iron can become deficient (near old lime piles and gravel roads). Manganese can't be applied to the soil because it becomes instantly adsorbed, and instead, foliar-applied manganese has shown much better yield results in deficient fields. Still, not likely one to worry about in our slightly acidic clays.

All the different ins and outs of micronutrients in the soil can be difficult to understand. Each one has its own compounds, microbial and plant associations, and often its own field of research. In any case, each one is absolutely vital to the healthy functioning of plants and for yield in the field. Contact James Coover to learn more at 620-724-8233 or email jcoover@ksu.edu.

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