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Micronutrient deficiencies rare in Minnesota agronomic crops

BY Mark Bernard

When it comes to micronutrients for Minnesota crops, the watchword is, "Buyer Beware."

Micronutrients are essential for healthy plant growth. Zinc, manganese, boron, iron and other "micros" are necessary for critical plant physiological processes. Unlike macronutrients like N, P and K, micros are taken up by plants in tiny quantities — usually less than a pound per acre.

Still, a micronutrient deficiency can have an outsize effect on crop yield. That's one reason farmers hear a lot of marketing pitches for micros. Where do these nutrients fit in a profitable fertilizer program?

The good news is, micronutrient deficiencies are rare in Minnesota. Our soils usually contain an ample supply for crop production. And we almost never see micronutrient deficiencies in soils that receive regular manure applications.

What's more, micronutrients are no more deficient now than in decades past, despite increases in crop yields and nutrient removal rates, says Dan Kaiser, a University of Minnesota Extension soil scientist, who is leading micronutrient research.

In Minnesota, typically the only micronutrients that might be needed in a fertilizer program are:

- zinc for corn;
- iron for soybeans;
- boron for alfalfa.

Zinc for corn

Corn is the most widely-grown Minnesota crop that may respond to zinc (Zn) fertilization. However, zinc is not needed on all corn fields.

Zinc response is most frequent for corn grown on high-pH soils. Deficiency symptoms usually appear in the first two or three weeks of the growing season, and are characterized by broad bands of striped tissue on each side of the leaf.

The University of Minnesota recommends a soil test to determine if zinc is needed as part of your corn fertilizer program. The soil test for zinc is reliable and will accurately predict the need for zinc.

The greatest likelihood of a response to zinc will be in fields that test less than 0.50 parts per million (ppm) Zn (based on the DTPA test). Zinc will not increase corn yield potential in soils testing 0.75 ppm or greater, Minnesota research shows.

Zinc can be applied in a band or broadcast. Because zinc deficiency is generally limited to distinct portions of fields, variable rate application works well, if you have that capability.

Other micronutrients, including iron, copper, manganese and boron, will not increase corn yields, Kaiser says.

Iron for soybeans

Soybeans grown on calcareous soils with a pH of 7.4 or greater may suffer from an iron deficiency called iron deficiency chlorosis, or IDC. The soil generally has plenty of iron, but because of the soil's chemistry, soybean plants are not able to absorb the nutrient. Leaves turn yellow, and in severe cases, plants may die.

Choosing tolerant soybean varieties is the best way to manage IDC. Recent Minnesota research also found the application of an ortho-ortho-EDDHA chelated iron fertilizer such as SoyGreen in the seed furrow at planting can improve iron uptake on problem soils. Also, seeding a companion crop of oats before soybean planting has been shown to reduce IDC in severely affected fields.

Once symptoms of IDC appear, foliar applications of iron fertilizer may improve leaf greenness, but seldom produce a profitable yield increase, Kaiser says. Minnesota research shows that soybeans do not respond to applications of magnesium, zinc, manganese or copper, he adds. And boron may actually cause yield decreases in soybeans.

Boron for alfalfa

Alfalfa grown on sandy, non-irrigated soils in east central and north central Minnesota is the only Minnesota crop that has been shown to respond to boron (B) fertilizer.

Boron deficiency shows up as yellow, stunted leaves. Plants have a bushy, umbrella-like appearance and winter-kill easily.

Boron should be applied based on a recent soil test. The most likely response to boron is on eroded, low-organic-matter soils testing less than 1.0 ppm B. University of Minnesota recommendations suggest applying two to four pounds B per acre. Boron fertilizer can be blended with other fertilizers.

A word of caution about tissue testing

Tissue testing is often promoted as a way to assess the need for foliar-applied micronutrients during the growing season.

But tissue tests are not a reliable predictor of micronutrient needs, Kaiser says. "Tissue testing was never meant for in-season nutrient corrections," he says.

For one thing, micronutrient sufficiency ranges have not been established for tissue tests, he says. That means there is no demonstrated link between yield and the concentration of micronutrients in plant tissue. In addition, nutrient values can vary widely, depending on when and how plant tissue samples are collected.

Instead, the best way to identify micronutrient deficiencies is with a proper soil test.

Bernard, CPAg/CCA, is a certified professional agronomist from Richland. Find information and links to Minnesota CCAs at http://www.mcpr-cca.org

Key Points

•Micronutrient deficiencies in agronomic crops are rare in Minnesota.
•The main micronutrient fertilizer needed in Minnesota is zinc for corn grown on low-testing soils.
•Tissue tests are not a reliable indicator of in-season micronutrient needs.

[Graphics]

Source: University of Minnesota

Micronutrients are essential for crop growth, but Minnesota soils usually furnish ample supplies.

Which Crops Are Sensitive to Micronutrient Deficiencies?	
Micronutrient	**Sensitive Crops**
Boron	alfalfa, sugar beets
Copper	small grains, corn
Iron	soybeans
Manganese	alfalfa, small grains, soybeans, sugar beets
Zinc	corn, edible beans

Source: Dan Kaiser, University of Minnesota

Micronutrient fertilization pays only in crops that are sensitive to deficiencies — and only when a recent soil test identifies a need for the micronutrient. Tissue tests are not a reliable predictor of micronutrient needs.

Zinc Recommendations for Corn, Sweet corn, and Edible Beans		
Soil Test Zinc (Zinc extracted by DTPA procedure)	**Zinc To Apply** (lb.Acre)	
Parts per million	**Broadcast**	**Band**
0.0 – 0.25	10	2
0.26 – 0.50	10	2
0.50 – 0.75	5	1
0.75-1.00 +	0	0

Source: Dan Kaiser, University of Minnesota

Corn is the primary Minnesota crop that responds to zinc application.