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Manganese Deficiency in Indiana Soils

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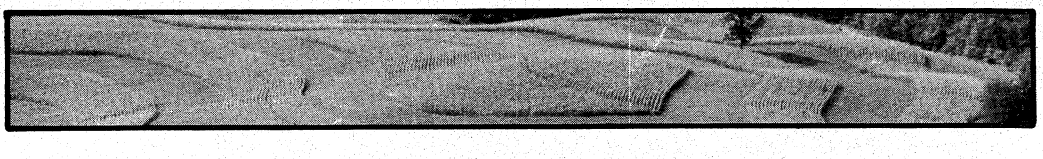

AGRONOMY GUIDE

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Manganese Deficiency in Indiana Soils

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Manganese is one of the micronutrients all crops must have in small amounts for normal growth. A deficiency of this element is most likely to show up, however, in soybeans, wheat, oats, barley and, sometimes, corn.

WHERE MANGANESE DEFICIENCIES OCCUR

Deficiencies are expected in specific areas of Indiana, and principally on two soils -- (1) the black sandy soils in the glacial outwash and lake bed material of the Kankakee River Valley in the northwest, and (2) the depressional heavy soils of Allen, Adams, Wells and adjacent counties in the northeast (Figure 1). The problem has also been noted in Warrick and Vanderburgh counties in southern Indiana and occasionally on light sandy soils in northern Indiana. Heavy, depressional soils in any part of the state are potentially deficient.

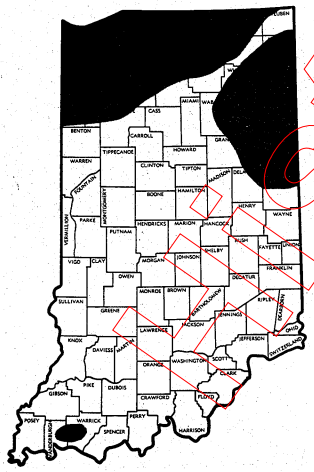

Fig. 1. Areas of manganese deficiency

Manganese deficiency occurs on soils with a pH above 6.2-6.3. It will not appear uniform over a field, but rather will be more severe in the poorly-drained dark soils and depressional areas. Cold, rainy weather enhances the problem.

HOW TO RECOGNIZE MANGANESE DEFICIENCY

Soybeans: Deficiency is easily spotted on soybeans (Figure 2). A "yellowing" occurs in the area between the leaf veins, ranging from pale green with slight deficiency to almost white with severe deficiency. In extreme cases, the yellowing may begin in the seedling stage. The veins remain distinctly green until chlorosis approaches the "white stage", after which the color disappears from the veins and the leaves fall off.

Oats: Symptoms on oats show up when the plants are about 6 inches tall. Grey specks appear near the base of the older leaf blades. These specks may join to form streaks or circular patches. As deficiency becomes more severe, the grey areas turn brown, the blade bends downward at the brown area and hangs limp, and the tip turns yellow, then brown. The heads are shriveled and yellow-white.

Wheat: Symptoms show up on wheat in the spring when plants are 5 to 8 inches tall. Grey streaks appear between the veins on the older leaves and become four to ten times as long as they are wide. The plants lodge badly, and stands are often reduced to the point of crop failure. The tops turn white, then brown.

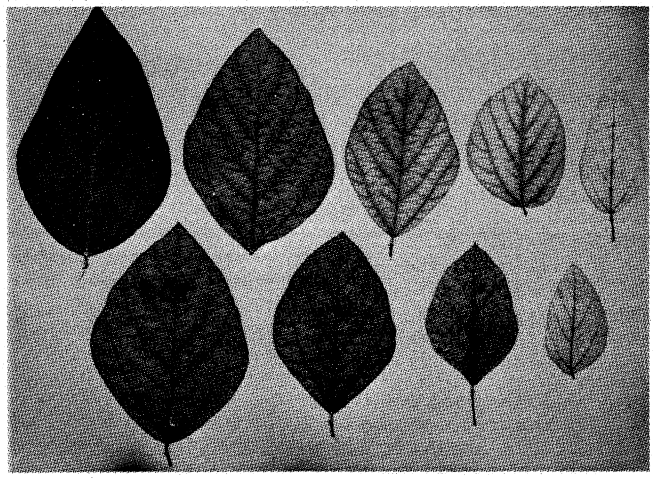

Fig. 2. Progressive stages of manganese deficiency in soybean, left to right.

Corn: Deficiency in corn occurs as long yellow and green stripes running the length of the leaf, a symptom very similar to a magnesium deficiency in corn.

CORRECTIVE MEASURES

Manganese deficiency may be corrected two ways -- (1) use a row fertilizer containing manganese, or (2) spray crops early in the growing season with a manganese carrier as soon as symptoms are observed.

Soil Treatment: Either manganese sulfate or manganese oxide (powdered form) may be incorporated with row fertilizer material. For mineral soils, apply 5 to 8 pounds of elemental manganese per acre for soybeans, wheat, oats and barley, and no more than 5 pounds for corn. (Rate of application on muck or peat soils is 10 pounds or more; therefore, consider foliar instead of soil treatment.) Manganese is rapidly fixed in the soil in an unavailable form and carryover effect is low, so make an application every year. Row placement of manganese is best because it reduces the volume of soil in contact with the fertilizer and slows fixation. Broadcast application is not recommended.

Foliar Treatment: Consider this approach to correcting a manganese deficiency if (1) pesticide sprays are used, (2) band fertilization is not practiced, or (3) deficiency symptoms appear on the foliage. The recommended rate for leaf application is 1 to 2 pounds manganese per acre, and only 1 pound if plants are small. A number of manganese foliar sprays are on the market, so follow carefully the manufacturer's directions for each material.

Manganese sulfate sprays combined with certain pesticides can cause plant damage. Experiment with spray mixtures on a small test area first, if there is some question as to possible damage.

TESTING FOR MANGANESE

Since available manganese in a soil can vary considerably across a field, soil type and pH are effective guides for determining manganese usage. On new land unfamiliar to the grower, a soil test for the element may be helpful.

If the leaves of growing soybean, wheat, oat or corn plants develop the symptoms described earlier, manganese deficiency may be the reason. Confirmation of these symptoms can be obtained by laboratory analysis of plant tissue. Such a service is available through Purdue University. Contact your local county Extension office for further information.

PLANT SAMPLING TECHNIQUES

Accurate plant analysis depends on the proper sample collecting techniques for each crop. At random, select plants across the field that represent the abnormal condition. For soybeans, take the uppermost fully expanded trifoliate leaves from 15 to 20 plants. For wheat and oats, collect the upper leaves from 50 to 60 plants prior to heading, or select basal leaves if deficiency symptoms develop in advance of the jointing stage. For corn, collect 15 to 20 entire plants if in the seedling stage, 12 to 15 mature leaves below the whorl if in the pre-tasseled stage, or 12 to 15 ear leaf blades if in the early silking stage.

Allow time for the tissue to air-dry before placing in an envelope for mailing to the laboratory for analysis.

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