

2011 Statewide Nutrient Management Benchmarking Project:

Soybean Manganese Status

Problem addressed

Recently, discussions about Mn deficiency in soybean have become common across many Midwestern states. There were speculations that soybean Mn deficiency might be caused by glyphosate that can potentially reduce Mn availability in the soil.

Manganese is relatively immobile and it cannot be transferred easily from the old to the young leaves. Thus, Mn deficiency appear as interveinal chlorosis on younger leaves. Because of strong interaction with Fe, soybean Mn deficiencies are often observed in Iowa within areas with high pH and high carbonate soils. Soybean Mn status across the state has never been studied.

Summary of soil testing

The median soil Mn test value was 8 ppm, with 75% of the values ranging from 6 to 12 ppm (Fig. 1A).

Based on Midwest Labs interpretations, about half of soil samples were Very Low and Low in Mn.

There were no significant effects of sampling area ("good" or "bad"), crop stage or other variables on average Mn soil test values.

Summary of tissue testing

The median tissue Mn value was 74 ppm, with 75% of the data ranging from 58 to 100 ppm (Fig. 2A). Based on Midwest Labs interpretations, about 35% of soybean samples were in Deficient and Low categories (Fig. 2B). This is slightly lower than considering the soil Mn test interpretations (Fig. 1B).

There were not significant effects of sampling area ("good" or "bad"), soil pH, crop stage or other variables on tissue Mn values.

There was no relationship between soil Mn and tissue Mn, indicating that many other factors influence tissue Mn values.

Tissue Mn concentrations tended to increase with an increase in tissue Ca (Fig. 3).

Mn interaction with Fe

In general, Mn has strong antagonistic relationships with Fe. Iron tissue concentrations often decrease with higher Mn concentrations. There was no relationship between Fe and Mn across all of the tissue samples in this study.

Fe deficiency is possible in soybeans if the Fe/Mn ratio is <1. The opposite is true for Fe if Fe/Mn ratio is >2.5. Across the state, about 20% of the samples may have Mn deficiency, and about 15% of samples suggested Fe deficiency (data not shown).

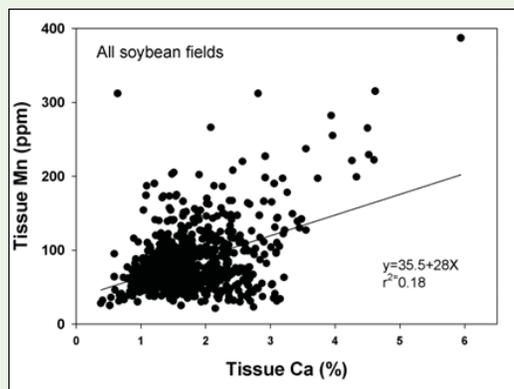


Fig. 3. Relationship between soybean tissue Ca and tissue Mn content.

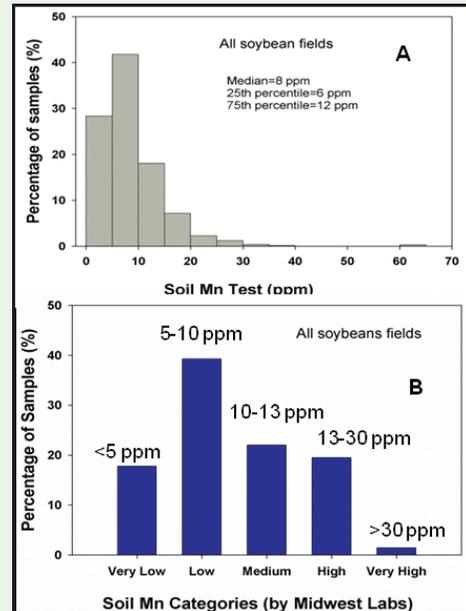


Fig. 1. Distribution of soil Mn test values and soil test sufficiency categories (by Midwest Labs).

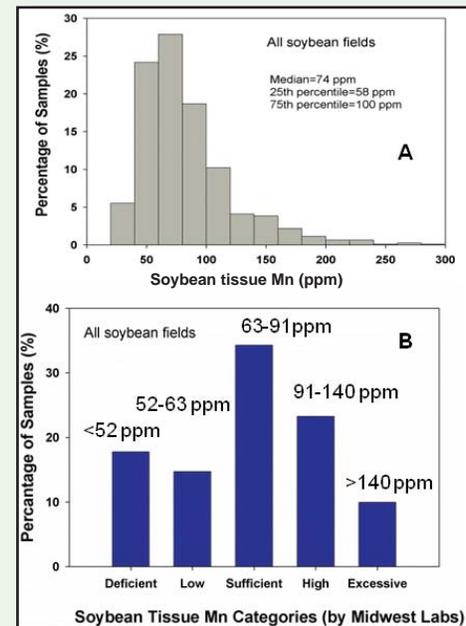


Fig. 2. Distribution of tissue Mn values and tissue test sufficiency categories (by Midwest Labs).