

2011 Statewide Nutrient Management Benchmarking Project:

# Crop Copper Status

## Problem addressed

Copper is another important micronutrient that affect many plant enzyme systems. In the past, Cu deficiencies in corn and soybean have been rarely observed in Iowa.

A statewide Cu status of corn and soybean fields has never been studied before.

## Soil and tissue testing: Corn

Across Iowa, the median soil test Cu value was 1.2 ppm, with 75% of soil test values ranging from 1 to 1.6 ppm (Fig 1. A). Copper is relatively immobile in the soil and its availability depends on SOM, soil pH, and soil texture. In this study, soil test Cu values tended to positively correlate with soil CEC values (data not shown).

Based on Midwest Labs interpretations, <20% of samples had Low Cu status (Fig. 1 B). But the majority of the samples were in Medium and High categories.

The distribution of corn tissue Cu categories (Fig. 1 D) did not exactly match that of the soil Cu test categories (Fig. 1 B). Based on Midwest Labs interpretations, about 50% of tissue samples were Deficient and Low. However based on University of Minnesota interpretations, the majority of the samples were Sufficient (data not shown).

Corn tissue Cu values positively correlated with tissue N values ( $r^2=0.15$ ) and tissue S values ( $r^2=0.22$ ). These could be explained by the importance of mineralization of SOM in increasing availability of N, S and Cu. The majority of the Cu in the soil is tied up with SOM.

## Soil and tissue testing: Soybean

The distribution of soil Cu test categories for soybean (Fig. 2B) did not match that of soybean tissue Cu categories (Fig. 2D). Based on Midwest Labs interpretations, about 80% of soybean samples were considered Deficient. Only about 10% of samples were classified as Sufficient.

## General comments

A relatively large percentage of Deficient samples based on tissue Cu testing in corn, and especially in soybean, is unexpected. Traditionally, Cu deficiencies of in corn and soybean have been rarely observed in mineral, high organic matter and fine-texture soils.

Also, we are not aware any reports about visual symptoms of Cu deficiencies in Iowa. In general, copper is relatively immobile

and symptoms of Cu deficiency often develop on the younger upper leaves.

Tissue Cu test interpretations differed significantly between Midwest Labs and University of Minnesota. For Cu, the soil testing is often considered more reliable than tissue testing.

Yield response studies are needed to verify the observations of possible Cu deficiencies in both corn and soybean.

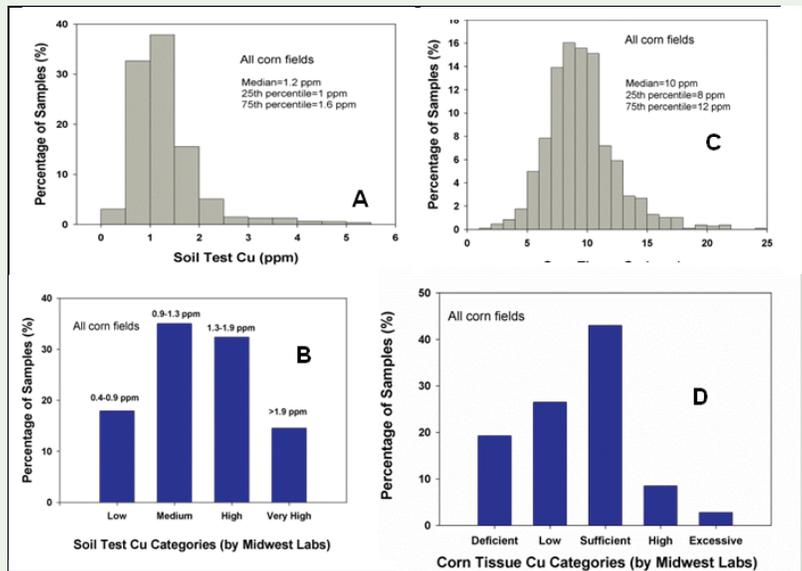


Fig. 1. Distribution and sufficiency categories of soil Cu test values and ear leaf Cu concentrations for 505 corn fields sampled across Iowa in 2011.

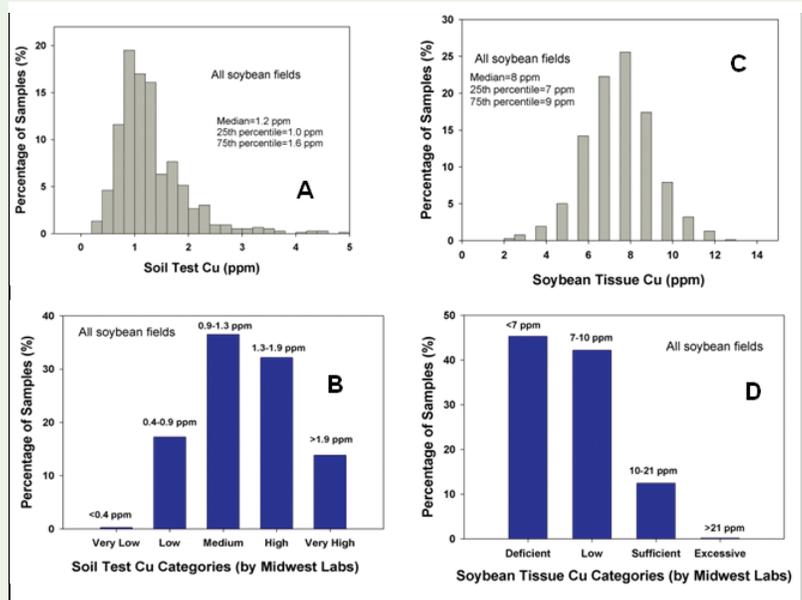


Fig. 2. Distribution and sufficiency categories of soil Cu test values and Cu concentrations of fully developed trifoliates for 376 soybean fields sampled across Iowa in 2011.