

2011 Statewide Nutrient Management Benchmarking Project:

Crop Boron Status

Problem addressed

Boron is another important micronutrient that affects plant metabolism. It is also a unique micronutrient because a limited supply of available B can cause potential plant B deficiency while an excessive supply can cause potential toxicity. In the past in Iowa, B deficiencies in corn and soybean have not been officially documented.

But a statewide B status of corn and soybean fields has never been studied before.

Soil and tissue testing: corn

Across Iowa, the median soil test B value was 0.6 ppm, with 75% of soil test values ranging only from 0.5 to 0.8 ppm (Fig. 1A). Based on Midwest Labs interpretations, about 60% of soil samples had Low and additional 10% had Very Low B status (Fig. 1B).

The distribution of corn tissue B categories (Fig. 1D) almost matched that of the soil B test categories (Fig. 1B). Based on Midwest Labs interpretations, about 55% of tissue samples were Deficient and 10% were Low. But based on the University Minnesota interpretations, about 80% of the samples were Sufficient and only about 20% were Low in B (data not shown).

In general, B availability depends on SOM. That is why in this study soil test B values positively correlated with soil SOM ($r^2=0.29$) (data not shown).

Soil and tissue testing: soybeans

The distribution of soil B test categories for soybean (Fig. 2B) partially matched the distribution of soybean tissue B categories (Fig. 2D). Based on Midwest Labs interpretations, about 50% of soybean samples were considered Deficient and Low in B. But in contrast with corn (Fig. 1D), soybean fields had a larger percentage of Sufficient samples (Fig. 2D)

Soil B test values also positively correlated with SOM ($r^2=0.17$), suggesting that SOM supplies the majority of plant available B.

General Comments

Surprisingly, more than half of corn tissue samples were Deficient in B. But we are not aware any reports about visual symptoms of B deficiencies in Iowa. In general, corn and soybean B uptake is about 1 or 2 lb/acre, and Iowa soils should supply enough B to both crops.

For both corn and soybean, tissue B test interpretations differed drastically between Midwest Labs and the University Minnesota (UM). One reason for this discrepancy is that the UM categories could be appropriate only for corn tissue sampled at silking.

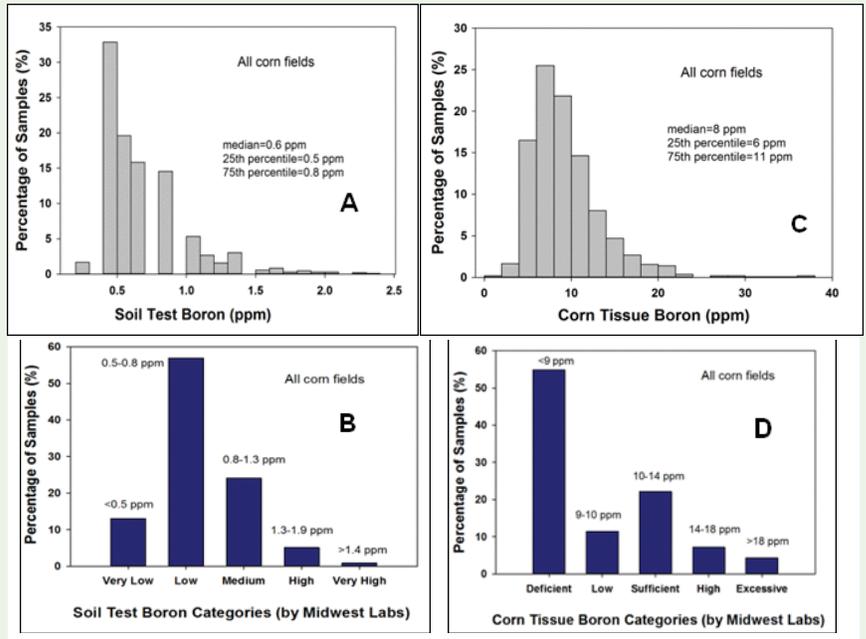


Fig. 1. Distribution and sufficiency categories of soil B test values and ear leaf B concentrations for 505 corn fields sampled across Iowa in 2011.

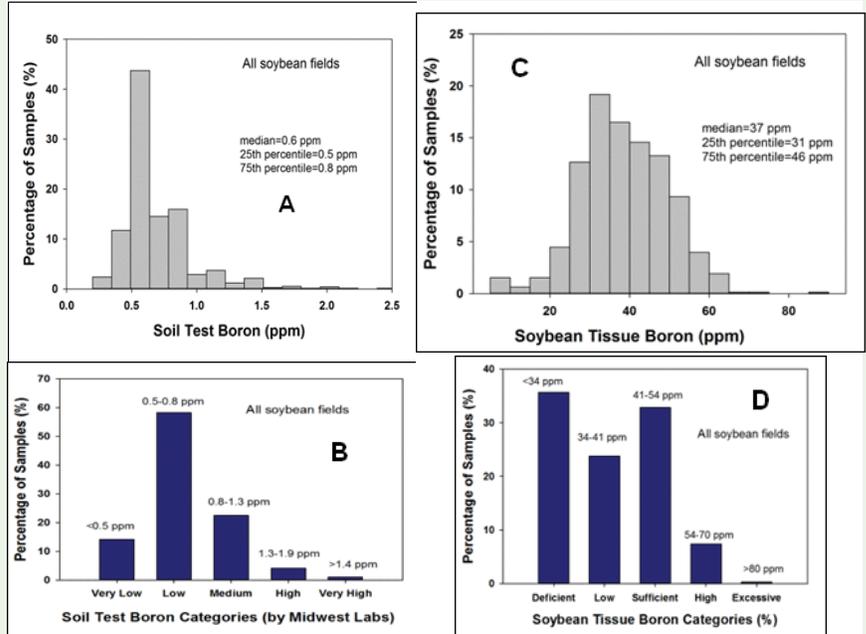


Fig. 2. Distribution and sufficiency categories of soil B test values and B concentrations of fully developed trifoliates for 376 soybean fields sampled across Iowa in 2011.

But, the majority of corn fields in our study was sampled later, between R3 and R5. Also, Midwest Labs used a DTPA solution to extract available B from the soil while in the past hot water extraction of B was often recommended.

Without yield response observations, practical interpretations of the results in Fig. 1D and 2D are very difficult.