

2011 Statewide Nutrient Management Benchmarking Project:

Corn Ear Leaf Nitrogen Status

Problem addressed

Leaf N concentrations have been historically used to assess in-season corn N status. Previous studies in Iowa showed that ear leaf N values measured at silking were not very sensitive for detecting above optimal corn N status. Overtime this diagnostic test was replaced by the use of chlorophyll meters, and especially by the late-season corn stalk nitrate test, which is more sensitive for detecting corn N excess. However, compared with chlorophyll meters, corn tissue testing does not require the use of reference, N rich strips in growers' fields.

The in season corn leaf N values measured across the state may provide a proxy information about corn N status and factors that influence it in individual fields.

Ear leaf N testing

The majority of sampling took place when the corn was at the R3, R4, and R5 growth stage. The median N concentration was 2.2%, with 75% of the values ranging between 1.9 and 2.5% (Fig. 1A).

There were no significant effects of growth stage, manure history, total N rate applied or landform area on leaf N values. However, N concentrations tended to decrease over the time of sampling the fields. Also, target "Bad Sampling Areas" had a larger percentage of Deficient samples than target "Good Sampling Areas" (Fig. 2).

Based on MidWest Labs interpretations, about 35% of samples were Deficient and 20% were Sufficient (Fig.1B). Only a fraction of samples were classified as Excessive. This is a relatively low percentage considering dry and hot weather patters during the summer of 2011. In contrast, the corn stalk nitrate test showed a relatively large percentage (~30%) Excessive samples and relatively low (<20%) of Deficient samples across of 476 corn fields sampled in 2011.(Fig. 2).

A few samples detected as Excessive could be because the ear leaf N test does not show the luxury uptake, meaning tissue N values do not increase with reaching maximum or plateau corn yields.

Interaction with Sulfur

Summary Sheet NB2012-05 describes the relationship between tissue N and S in corn. Corn tissue N values were highly correlated with tissue S values. Relatively high N/S ratios (>16) can indicate potential S stress. Unlike S, N is mobile within corn plants with N stress symptoms usually appearing on lower corn leaves and later in the season.

Interaction with Phosphorous:

Tissue N concentrations tended to increase with tissue P concentrations ($r^2=0.21$, data not shown). This could be partially explained by larger corn root systems with a larger P supply or better plant growth in higher fertility soils.

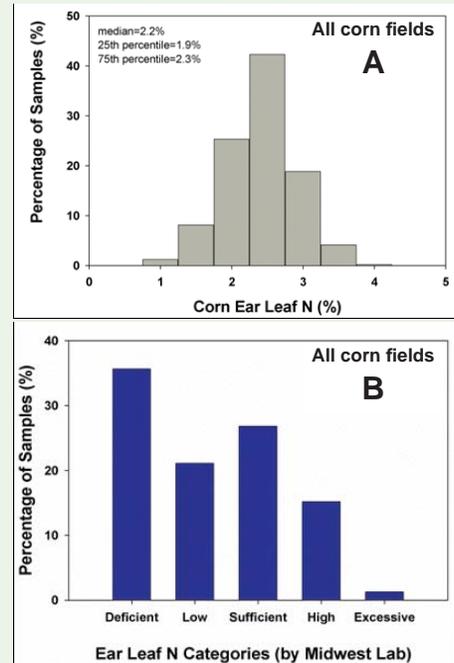


Fig. 1. Distribution and sufficiency categories of ear leaf N for 505 corn fields sampled across Iowa in 2011

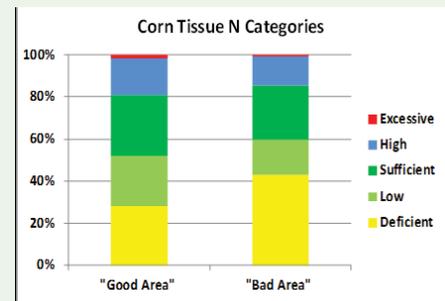


Fig. 2. Effect of sampling area on corn stalk nitrate test category distribution of 476 corn fields in 2011.

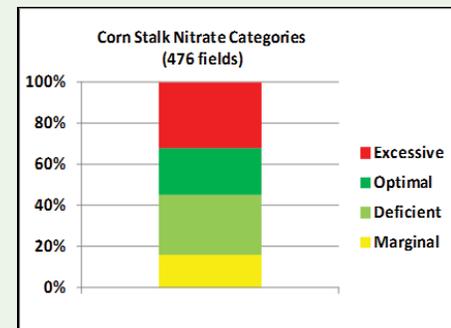


Fig. 3. Distribution of corn stalk nitrate test categories of 476 corn fields sampled in the 2011 NB Project. Three stalk samples were collected to characterize the field average N status.