A Unique Dataset of Corn Yield Response to Nitrogen

Optimizing nitrogen (N) fertilization is important to improve corn yield and reduce N losses to the environment. However, the economic optimum nitrogen rate (EONR) is variable and depends on many factors, including weather conditions and crop management. The impact of these factors has not been well documented for one of the most important corn-producing areas in eastern Canada.

In a recent article in Agronomy Journal, researchers report on an eight-year study of corn N fertilization on high-yielding fields in Québec, using 11 sites with 23 hybrids and four N application rates, for a total of 45 sites-years. Trials were separated into two groups based on optimal and late planting dates.

The researchers found that grain yield response to N rates varied among sites-years. Overall, the optimal planting window increased grain corn yield compared with late planting. They also conclude that the EONR was affected by planting date, soil textural classes, and rainfall. The average of EONR across the above factors was 195 kg N ha\(^{-1}\), which is more than the current N recommendation for this region (170 kg ha\(^{-1}\)).

This work demonstrates that N guidelines may need to be increased for the optimal planting window and should be based on soil texture and weather.


Applied Liquid N Has No Effect on Corn Residue Decomposition

Corn residue is a source of soil organic carbon in row cropping systems in the Midwest. Farmers apply liquid nitrogen (N) to corn residue after harvest, assuming it will increase residue decomposition to overcome early spring cold soil temperatures associated with a no-tillage system.

In a recent article published in Agronomy Journal, researchers conducted field and laboratory experiments in 2012 and 2013 to test the assumption that liquid N increases corn residue decomposition. Field experiments were conducted at two different locations in Iowa. At the same time, laboratory experiments were conducted at three incubation temperatures (0, 25, and 35°C). Three N rates (0, 34, or 67 kg N ha\(^{-1}\)) of liquid 32% urea ammonium nitrate (UAN) were applied to corn residue after harvest for the field experiments. Residue samples from the field N treated corn residue were used for the laboratory experiment.

The average residue organic carbon (OC) mass after harvest was 1.6 to 1.7 Mg ha\(^{-1}\). Corn residue OC mass declined sharply in both years, particularly during the first three months, with no significant differences between N treatments. The only difference in residue decomposition occurred after six months (\(P = 0.0241\)) at one field location in 2012, where a greater amount of remaining OC mass was associated with 0 kg N ha\(^{-1}\). In this study, both field and laboratory experiments showed that air and soil temperatures are the driving forces in influencing corn residue decomposition and not liquid N.


Nitrogen recommendations for corn in Québec should consider the variability in response associated with site-specific effects of planting date, soil texture, and weather. Photo by L. Kablan.

Above: Liquid N application over corn residue in the field. Right: Measuring corn residue decomposition in the field.