How much nitrogen is too much for corn?

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North Carolina State researchers recently discovered a test that quickly predicts nitrogen levels in the humid soil conditions of the southeastern United States. These scientists report that the Illinois Soil Nitrogen Test (ISNT) can assess the nitrogen levels in soil with more accuracy than current soil-based tests. This test will allow growers to cut back on the amount of nitrogen-based fertilizer added to soil, leading to economic and environmental benefits.

The proper management of nitrogen is critical to the success of many crop systems. Based on an assessment of the natural amount of nitrogen in soil, growers calculate their optimum nitrogen rates, the concentration of nitrogen that must be present in fertilizer in order to achieve expected crop yields. Under- and over-applying nitrogen fertilizer to corn crops often leads to adverse economic consequences for corn producers. Excess levels of nitrogen in nature also pose serious threats to environment. Agricultural application of nitrogen has been linked to rising nitrate levels and subsequent death of fish in the Gulf of Mexico and North Carolina's Neuse River.

"Although offsite nitrogen contamination of ground and surface waters could be reduced if nitrogen rates were adjusted based on actual field conditions, there is currently no effective soil nitrogen test for the humid southeastern U.S.," said Jared Williams, lead author of the North Carolina State study that was published in the March-April 2007 issue of the Soil Science Society of America Journal. This research was supported in part by USDA Initiative for Future Agricultural and Food Systems (IFAFS) grant.

From 2001 to 2004, scientists collected and tested the soil from 35 different sites in North Carolina. According to the North Carolina scientists, the collected soil samples were representative of millions of hectares in agricultural production in the southeastern USA. Corn was planted at each site with a range of nitrogen fertilizer rates, and the optimum nitrogen rates and the soil assay results were compared among the sites.

From the collected samples, researchers discovered that the Illinois Soil Nitrogen Test (ISNT) could be used to accurately measure the economic optimum nitrogen rates (EONR) of southeastern soils, despite moderate weather variation over the collection period. While the test can be used to predict the optimum nitrogen rates, the relationship between ISNT and EONR varied by soil drainage class. Researchers believe that these differences represent differences in organic matter that lead to less mineralization and/or more denitrification on poorly drained soils. The results indicate that the Illinois Soil Nitrogen Test can serve as a model for predicting economic optimum nitrogen rates on well- and poorly drained soils and show promise as a tool for nitrogen management.

"Additional research is needed to calibrate and validate the EONR versus ISNT relationships under a wider variety of conditions," says Williams. "Because the Illinois Soil Nitrogen Test predicted EONR robustly to different cost/price ratios, ISNT has the potential to modify or replace current nitrogen recommendation methods for corn."

Source: American Society of Agronomy