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Testing shows agronomical N rate better than reduced rate.

By Brian Oltman, assistant editor

A rise in nitrogen fertilizer prices and concerns with water quality have made appropriate N application more pertinent than ever. Using tools to test corn for N stress/deficiency can be implemented for nutrient management options, says John Sawyer, Extension soil fertility specialist and associate professor in agronomy, Iowa State University.

"In my opinion, N stress sensing in corn would be for folks to have a tool available where they can monitor the N status of corn and make adjustments as far as application if needed, rather than a planned approach of reduced rate and applying more N," Sawyer says. "It can be used as a system to monitor corn and see if things are going okay when applying the agronomic rate or normal rate. If there is a problem year where it is excessively wet, then N stress sensing will help on some decisions to apply more N."

Speaking at the 2007 Integrated Crop Management Conference sponsored by Iowa State University, Sawyer presented information from a project studying the concept of corn plant N stress sensing and application of N in-season based on resulting sensing information. Two approaches were examined. One started with a reduced rate of N with additional N applied as needed. The other approach looked at starting with a recommended agronomic N rate—120 pounds of N per acre for corn following soybean—and then see if additional N was needed. In that approach, the expectation was that in-season N would not need to be applied to most fields.

Research was conducted on Iowa corn fields from 2004 to 2006 using N stress sensing to determine the benefits of standard and controlled application rates. The project examined 30 fields of corn after soybeans and seven fields of corn following corn. "We had producers apply four N rates across fields in replicated strips before planting corn or at early sidedress," Sawyer says.

At the different locations, N rates of zero, 60, 120 and 240 pounds per acre were applied and each was replicated three times. "We did sensing on each N strip and determined if additional N was needed for each N rate. If the sensing called for additional N, we went into those particular strips and applied liquid urea-ammonium nitrate solution (UAN) with high-clearance equipment," Sawyer says.

Some fields showed a full recovery of yield if additional N was needed, and other fields didn't have a full yield recovery, especially with the 60-pound N per acre rate, Sawyer says. "Corn following soybean data showed that the common agronomic rate of 120 pounds per acre was the most economical rate to apply," Sawyer says.

"We found it makes more sense to use the agronomic rate and then apply N only as needed rather than starting with a reduced rate and then needing to apply more N in most fields. Right now starting with an agronomic rate is an easier system to implement." Sawyer says. "Also, this approach increases confidence in using the recommended agronomic rate because it provides a backup system if losses occur or more N than normal is needed in a particular field. If the original rate of N is not enough, additional N can be applied if needed."

For N stress sensing, it is important to know if a lack of green color in corn leaves is due to N deficiency or

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another culprit. A reference area in fields is needed where a non-limiting N rate (higher than normal) is applied to ensure the corn has adequate N; so, it can be compared to the rest of the field, Sawyer says. "With the reference area, then the N stress sensing shows us if corn is lacking from N rather than other things such as hybrid difference, other nutrient deficiencies or drought stress."

Corn plant N stress sensing in this project was done with the hand held Minolta SPAD 502 chlorophyll meter. By placing a corn leaf between the light source and the sensor, the SPAD meter measures the color of leaves as influenced by the chlorophyll content, and therefore provides a reading of the plant N status. Sensing can also be done with other sensing tools available on the market.

Since corn takes up N starting at the V8 growth stage, Sawyer recommends N stress sensing be done starting at the V10 growth stage until tassel emergence. "You need to have the plant get some size and put some stress on N supply to do a good job of telling if it's N stressed. Also don't wait too late to get N on and have plant access to it. Testing around the V10 growth stage is better rather than waiting until later," he says. Using high-clearance equipment is necessary to perform the additional application, which should be accomplished before silk emergence.

Sawyer recommends publication PM-2026, *Sensing Nitrogen Stress in Corn*, from ISU Extension as a resource available to outline how to implement an N stress sensing program.

To read the entire study, go to http://extension.agron.iastate.edu/soilfertility/info/NC2007-p38-Sawyer.pdf AG

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