NITROGEN TIMING AND NITRIFICATION INHIBITORS FOR CORN IN KANSAS

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Abstract

Anhydrous ammonia is a common Nitrogen (N) source used for corn production in Kansas. Two common mechanisms of N loss in corn production in Kansas soils are denitrification and leaching. By minimizing these losses, producers can maximize yield with lower input use and have less impact on the environment. Time of application, particularly fall vs. spring application can have significant impact on N loss, particularly in some soils. The use of nitrification inhibitors (NI) with anhydrous ammonia to retain N in the ammonium form can also potentially lower N losses and increase NUE recovery. This project was initiated in the fall of 2011 to evaluate the effectiveness of NI's with anhydrous ammonia, as well as compare the effect of spring versus fall application as tools for reducing N loss. Three very different soils were chosen: a high yielding silt loam site near Manhattan, KS, with moderate potential for denitrification; a lower yielding silt loam site near Ottawa, KS, with a high potential for denitrification loss; and a very high yielding irrigated, soil near Rossville, KS, with a high potential for leaching loss. Conditions in the eastern part of Kansas were not conducive to high losses of N through leaching or denitrification during the winters and springs of 2012 or 2013. However, there were short high rainfall periods during May and early June which were conducive to N loss both years.

At the Manhattan location yields were good both years. A significant response to N was seen. No difference was observed between fall or spring N application in 2013, nor was any response to the use of an NI observed. In 2012 however, a significant difference between fall N and spring N was observed, and the use of an NI was able to mask this difference. This probably the result of an extended rainy period shortly after corn planting.

At Rossville, a site prone to leaching loss, a significant response to applied N was observed both years. In 2013, no difference in yield was observed between fall and spring N application, nor was any impact of NI observed on yield in spring or fall application. In 2012, a significant increase in yield was observed with spring application as compared to fall, and the use of an NI was not effective at overcoming this difference. These results are consistent with earlier work at this site which showed only response from NI use.

At Ottawa, the high denitrification potential site, the crop was destroyed in 2012 by severe drought. In 2013, spring N application was made in a timely manner, but planting was delayed approximately 30 days by wet soil conditions in the spring. As a result spring N application resulted in significantly higher yields than the fall application. In addition, the use of a NI with spring ammonia also resulted in a significant yield increase as compared to the same rate without NI.

The results from this study show that selection of N management practices for corn production in eastern Kansas is very site/soil dependent. Soil properties such as drainage and saturated conductivity will have a significant impact on performance of N management systems and resulting yield and NUE.

PROCEEDINGS OF THE

43rd

NORTH CENTRAL EXTENSION-INDUSTRY SOIL FERTILITY CONFERENCE

Volume 29

November 20-21, 2013
Holiday Inn Airport
Des Moines, IA

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PUBLISHED BY:
International Plant Nutrition Institute
2301 Research Park Way, Suite 126
Brookings, SD 57006
(605) 692-6280
Web page**: www.IPNI.net**

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