ASSESSING NITROGEN USE EFFICIENCY OF MAIZE ON HIGHLY PRODUCTIVE IRRIGATED SANDY SOILS AS AFFECTED BY THREE NITROGEN SOURCES

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Abstract

Irrigated soils in Minnesota account for only 500,000 acres, but these acres are some of the most productive and environmentally sensitive areas in the state. Ground water is the major source of drinking water in the sandy areas of Minnesota, so obtaining information on nitrogen use efficiency is critical for corn (*Zea mays* L.) grown on these soils. Slow release urea products have the potential to increase nitrogen (N) use efficiency by releasing N at a time when crop demands are highest. Two such slow release fertilizer sources are SuperU (Koch Fertilizer, LLC) and ESN (Agrium Advanced Technologies Inc.). SuperU features urease and denitrification inhibitors. ESN features a polymer coating which releases urea over time. Corn was planted at three locations on sandy soils in Minnesota. Urea was broadcast as split applications at rates of 179 and 224 kg ha^{-1}. SuperU was broadcast one time at a single rate of 179 kg ha^{-1}. ESN was broadcast one time at rates of 179 and 224 kg ha^{-1} and as a fifty percent mixture with urea at a rate of 179 kg ha^{-1}. A zero N rate control was also established. Single applications were done at planting and in-season applications were done at the V3 growth stage. A randomized complete block with four replications was used at each site. In-season measurements of leaf chlorophyll were taken at the VT growth stage. Plant samples taken at the V8 growth stage were weighed for dry biomass and analyzed for total N tissue analysis. Whole plant samples were taken at physiological maturity and assessed for N uptake. Nitrogen use efficiency by the difference method was calculated using whole plant uptake. At the V8 stage, differences in N uptake were not significant ($P>0.05$) for any treatments aside from the control at all locations. Leaf chlorophyll at VT for the 179 kg ha^{-1} urea treatment was significantly greater than the 179 kg ha^{-1} ESN/ urea mixture treatment at Site 1. A significant increase in NUE was found with the 179 kg ha^{-1} SuperU treatment in comparison to the 179 kg ha^{-1} ESN/ Urea mixture and 224 kg ha^{-1} urea treatments at Site 1. The 224 kg ha^{-1} urea treatment had a significantly greater grain yield than all other treatments aside from the 224 kg ha^{-1} ESN treatment at Site 3. Yield was not affected by fertilizer treatment at two of the three locations. Increased nitrogen use efficiency from using slow release urea products was minimal.

PROCEEDINGS OF THE

42nd

NORTH CENTRAL EXTENSION-INDUSTRY SOIL FERTILITY CONFERENCE

Volume 28

November 14-15, 2012
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