Public Abstract

First Name:Adam
Middle Name:John
Last Name:Noellsch
Adviser's First Name:Peter
Adviser's Last Name:Motavalli
Co-Adviser's First Name:
Co-Adviser's Last Name:

Graduation Term:SP 2008
Department:Soil, Environmental & Atmospheric Sciences
Degree:MS

Title:Optimizing Crop N Use Efficiency Using Polymer-coated Urea And Other N Fertilizer Sources Across Landscapes With Claypan Soils

Development of improved management practices to increase nitrogen use efficiency (NUE) within agricultural fields is needed to improve crop production and reduce nitrogen (N) loss. Field studies planted to maize were conducted in 2005 and 2006 in the claypan region of north central and northeast Missouri to determine the effects of landscape position and soil depth to the claypan on crop growth and N uptake, and to examine the use of a variable-source N fertilizer application strategy to optimize crop N fertilizer use. Treatments at the northeast Missouri site consisted of a control and 168 kg N ha-1 of urea, polymer-coated urea (PCU), a 50% urea/50% PCU mixture, or anhydrous ammonia applied in 457 m long strips that included variation in elevation and claypan depth. At the north central Missouri site, N fertilizer treatments of 168 kg N ha-1 of urea or PCU were broadcast surface-applied within three different cropping/tillage systems and at different landscape positions representing the summit, sideslope and footslope positions in the field. PCU treatments showed a consistent 1505 to 1818 kg ha-1 increase in maize grain yields in 2005 and 2006, respectively, in the low lying area, possibly due to the wetter conditions in the low-lying area affecting the fate of the applied N. Similarly, anhydrous ammonia application resulted in a 1505 and 1630 kg ha-1 yield increase in 2005 and 2006, respectively, in the low-lying area. At the north central Missouri site in 2006, the maize grain yield of the PCU-treated area was 1191 kg ha-1 higher than that of the urea-treated area only at the footslope landscape position in the no-till cropping system. These results suggest that a variable source N fertilizer application approach based on identifying areas in a field which are periodically wet due to their lower elevation, may improve NUE.