NITROGEN FERTILIZER MANAGEMENT OF TEMPORARILY WATERLOGGED SOILS TO IMPROVE CORN PRODUCTIO AND REDUCE ENVIRONMENTAL NITROGEN LOSS

Brendan Zurweller

Dr. Peter Motavalli, Thesis Supervisor

ABSTRACT

Extreme precipitation events during the warm season months of April to June can often cause decreases in corn (*Zea mays* L.) grain yield on poorly-drained soils in the Midwestern United States and escalated nitrogen (N) loss. The objectives of this study were to determine the effects of waterlogging on pre-plant and rescue N fertilizer applications on corn production and N availability. Another objective was to quantify N$_2$O emissions during a period of waterlogging and the subsequent soil drying phase. Pre-plant fertilizer treatments were a non-treated control (CO), urea (NCU), urea plus nitrapyrin (NCU+NI), and polymer coated urea applied at 168 kg N ha$^{-1}$. Waterlogging durations of a non-waterlogged control, one, and three days were initiated at the V6 corn growth stage. A rescue N application of 83 kg N ha$^{-1}$ of urea plus N-(n-butyl) thiophosphoric triamide (NBPT) (NCU+UI) was applied at the V10 growth stage to half of all treatments. In the severe drought year of 2012 there was a 320 kg ha$^{-1}$ yield increase when comparing PCU to NCU in plots where no NCU+UI was applied. When NCU+UI was applied to pre-plant N treatments of NCU and NCU+NI in 2012, there was a 500 and 300 kg ha$^{-1}$ yield increase, respectively. In 2013 there was a 10% reduction in yield with the three days of waterlogging. The proportions of N fertilizer lost as N$_2$O-N averaged over all pre-plant N treatments for sampling periods in both years were 0.04% and 1.9% in the non-waterlogged and waterlogged treatments, respectively.