Liquid Swine Manure Application Timing and Instinct™ on Net Soil N Mineralization and Corn Yield in Indiana

Min Xu*, Brad C. Joern, James J. Camberato
Department of Agronomy, Purdue University, West Lafayette, IN, 47907

Introduction

In the Midwest USA, farmers tend to apply manure to cropland in the fall due to storage limitations and favorable soil conditions. Greater N losses are associated with fall-applied manure compared to spring-applied manure due to the long time between manure application and corn N demand. Delaying manure application until soils are cool (< 4°C) and using of nitrification inhibitors like Instinct™, may reduce N losses from liquid swine manure and increase manure N availability to corn.

Objectives

To evaluate the effects of swine manure application timing and Instinct™ on manure N availability and corn grain yield.

Materials and Methods

Treatments:
Manure Applications Timing Treatments:
- Early fall (Aug./Sept.), late fall (Oct./Nov.) and spring (Mar., Apr./May)
- Manure plus Instinct™ (2.6 L/ha) Treatments:
  - Late fall (Oct./Nov.), and spring (Mar., Apr.)
Commercial Fertilizer Treatments:
- 134 kg N/ha, 179 kg N/ha, 224 kg N/ha.
  (Pre-plant anhydrous ammonia 82-0-0 at Location 1 and sidedress UAN 28-0-0 at Location 2, 3 and 4.)
Corn was planted in April 2012 at Locations 1 and 2 and May 2013 at Locations 3 and 4. Corn grain yields were taken from the center rows with a combine.
Soil samples were collected 12/14/2011 at Locations 1 and 2, and 11/20/2012 at Locations 3 and 4.

Randomized Complete Block Design

Materials and Methods

Results and Discussion

During incubation study, negligible amounts of NH₄⁺-N were recovered from 1M KCl soil extracts in all treatments.

Topsoil and subsoil N levels were greater at Location 1 than Location 2, but the differences in soil N were small compared to the differences in the amount of manure N applied.

Differences in total inorganic N after 16 weeks of incubation were mainly due to the differences in initial total inorganic N.

Movement of manure N applied in Aug. and Sept. from 0-30 cm to 30-60 cm soil was evident at Location 1, likely due to nitrification of swine manure and subsequent nitrate leaching in the soil profile.

No significant effects on corn grain yield were observed from the use of Instinct™ with manure application.

Grain yield was unaffected by manure application timing at Locations 1 and 2 due to limited rainfall during 2012 growing season.

At Location 3, corn grain yield was significantly greater in spring-applied manure treatments compared to early fall manure treatments; and grain yield in manure-treated soils was significantly less than in fertilizer-treated soils.

Additional 67 kg N/ha fertilizer N input together with 165 kg total manure N/ha supplied enough N for optimum grain yield at Location 4.

Water holding capacity of different soil types significantly affected corn yield in a drier-than-normal growing season. (Brookston: 18.1 cm H₂O/100 cm soil; Crosby: 16.8 cm H₂O/100 cm soil)

Summary

Swine manure application timing or the use of Instinct™ did not affect cumulative soil mineralized N.

Swine manure N availability potential: Spring > Fall

Weather variations have a great influence on swine manure N availability to corn;

Little impact from Instinct™ on manure N availability was observed during the two study years.

Acknowledgement

Thanks to the Indiana Soybean Alliance and the Indiana Corn Marketing Council for providing funding for this research.