Manure and Commercial Fertilizer Comparison

Alan Sundermeier, Ohio State University Extension Educator, Agriculture & Natural Resources
Jon Rausch, Ohio State University Extension Educator, Agriculture & Natural Resources
Amanda Meddles, Ohio State University Extension, Program Coordinator, Manure Management

Objective

To evaluate the response of corn from a sidedress application of manure compared to commercial fertilizer.

Background

Cooperator:	Paul Herringshaw, Walter Manders	Soil test:	CEC 12.8, pH 7.5, OM 3.4, P 64 ppm, K 242ppm
County:	Wood	Fertilizer:	35 gal/ac 28%
Nearest Town:	Weston	Planting Date:	5-8-09
Drainage:	Tile, well-drained	Planting Rate:	32,000
Soil type:	Hoytville, clay loam	Row Width:	30 in.
Tillage:	conventional	Herbicides:	
Previous Crop:	soybean	Harvest Date:	11-2-09
Variety:			

Methods

The entries were replicated four times in a completely randomized design. Plot size- 30 x 300 feet each entry. Harvest data was collected from the entire area of each plot.
All treatments received the same tillage, herbicide, and pre-season fertilizer applications. Compaction from manure application versus sidedress fertilizer application were not visually different due to dry soil at that time.

Manure treatments had a drag-line applicator inject liquid dairy manure between each corn row on June 10, 2009 at corn growth stage V6. Manure application was 7,000 gallons/acre with a total nitrogen content of 21 lbs/1,000 gallon. The total nitrogen value estimated in animal manure is not fully available during the growing season. With direct incorporation with a growing crop, we expect 95% of the NH4-N and 33 % of the organic nitrogen to be available in the first year. This would be 15.5 lb N /1,000 gal which equals 108 lb/acre of plant available nitrogen (PAN) applied at side-dress from dairy manure. This also includes some 7.75 and 15.0 lb/1,000 gal of P_2O_5 and K_2O respectively or 54 lb P_2O_5 and 105 lb K_2O per acre.

Commercial fertilizer treatments had an application of 35 gal/ac liquid 28% UAN which equals 105 lb/ac nitrogen. No additional P_2O_5 or K_2O was supplied from this nutrient resource.

Results

Soil nitrate levels that supply adequate amounts of nitrogen range from 25 – 30 ppm. Stalk nitrate levels that are sufficient range from 750 – 2,000 ppm.

Treatment	Soil Nitrate ppm 6-10-09	Soil Nitrate ppm 6-25-09	Soil Nitrate ppm 7-15-09	Soil Nitrate ppm 7-29-09	Stalk Nitrate ppm 9-18-09	Yield bu/ac
manure	12	10	13	17	98	146.7 A
28%	13	11	11	24	1560	151.9 B
					LSD (0.05)	3.7

Economic Analysis

All calculations on a per acre basis

Nutrient Resource	PAN	P_2O_5	K_2O
UAN 28% (lb/acre)	105	0	0
Dairy manure-7,000 gal (lb/ac)	108	54	105
Nutrient value ($/lb)	$0.66	$0.37	$0.65
UAN ($/ac)	$69.30		
Dairy manure ($/ac)	$71.28	19.98	$68.25

PAN 28% commercial fertilizer = $0.66 / lb N
105 lb PAN applied as UAN 28% x .66 = $ 69.30 / acre PAN
($69.30/ac) / 151.9 bu/ac = $ 0.46 (N cost per unit of production)

Nutrient value of manure/ac applied:

N, P_2O_5 , K_2O = $159.51 / acre
108 lb PAN applied x $0.66 = $71.28
$71.28/acre / 146.7 bu/ac = $0.48 (N cost per unit of production)

UAN 28% grain yield: 151.9 bu/ac
Dairy manure grain yield: - 146.7
Yield difference: 5.2 bu/ac x $3.50 /bu = $18.20 less income with manure

Application cost (published custom rates):

UAN 28% $12-$13 /ac
Dairy manure ($0.02/gal) $140/ac

Summary

In 2009 grain yield from UAN 28% applied at side-dress was significantly higher than from dairy manure applied at the same time. There are a number of factors that may be contributing to this and include under estimating PAN available from dairy manure. This is highly probably given PSNT levels during the growing season and end of year stalk nitrate nitrogen levels reported. Other factors include environmental conditions that limited mineralization of the organic nitrogen fraction.

For more information, contact:
Alan Sundermeier
OSU Extension, Wood County
639 S. Dunbridge Rd, Suite 1
Bowling Green, Ohio 43402
sundermeier.5@osu.edu

THE OHIO STATE UNIVERSITY EXTENSION