Effect of Boom Applied Dairy Manure as a Source of Supplemental Nitrogen at Side-dress for Corn Yield

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Objective

To compare corn yield response to nitrogen applied at side-dress as surface applied dairy manure and incorporated UAN 28%.

Background

Crop Year:	2014	Soil Test:	pH 6.1
Cooperator:	Chris Laukhof		P 51 ppm (102 lb/ac)
County:	Paulding		K 170 ppm (340 lb/ac)
Nearest Town:	Haviland		Organic Mater 3.47%
Drainage:	Tile-50 feet spacing	Planting Date:	May 15, 2014
Soil Type:	Hoytville	Row Width:	30 inch
Tillage:	Conservation	Herbicide:	Surestart 1 qt/ac
Previous Crop:	Corn	Insecticide:	N/A
Variety:	Pioneer	Harvest Date:	October 31, 2014

Methods

A randomized block design with four treatments and four replications was used. Plots were 48 rows (120 feet) wide and 1,220 feet long. The corn was planted in early May and side-dressed with UAN 28% at the V2 stage of growth. Sidedress nitrogen rates were 120#, 140#, 160# and 180# per acre.

A boom manure applicator was used to apply dairy manure to the growing corn. The original plan was to make one manure application to the 160#N treatments, two manure applications to the 140#N treatments, and three manure applications to the 120#N treatments. The plot received rainfall on almost a weekly basis through May, June and July. Only a single boom dairy manure application of 10,000 gallons per acre was made to each manure treatment the second week of July. The plot was expected to be harvested for silage in September. Due to an outstanding growing season, the dairy farm did not have room for additional silage and the plot was harvested for grain in late October.

Manure samples indicated 8.1 pounds of available nitrogen per 1,000 gallons. The surface application of 10,000 gallons contained 81 units of available nitrogen, 23 pounds of P_2O_5, and 153 pounds of K_2O per acre.

Table 1. Dairy Manure Analysis

Nutrient	lbs. per 1,000 Gallons
Nitrogen (available the 1st year)	8.1
Phosphorus as P_2O_5	2.3

Potassium as K_2O	15.3

Tissue tests were taken at corn pollination in early August. The results indicated all treatments had adequate nitrogen.

Table 2. Leaf Tissue Test Results

Treatment	Ear Leaf % Nitrogen
180# Nitrogen	3.51
160# Nitrogen + one manure application	3.48
140# Nitrogen + one manure application	3.25
120# Nitrogen + one manure application	3.13

OSU Extension Corn Soybean, Wheat, & Alfalfa Guide, Bulletin 827, has a nitrogen sufficient range on page 65 of 2.9% to 3.5%.

Table 3. Treatment Summary

Treatment	Description
Treatment 1 (T1)	120# of nitrogen+ one trip with the manure boom applicator (added 81 units of nitrogen)
Treatment 2 (T2)	140# of nitrogen+ one trip with the manure boom applicator (added 81 units of nitrogen)
Treatment 3 (T3)	160# of nitrogen+ one trip with the manure boom applicator (added 81 units of nitrogen)
Treatment 4 (T4)	180# of nitrogen

Results and Discussion

Table 4. Yield Summary

Treatments	Yield (bu/ac)
120# Nitrogen + one manure application	193.9_a
140# Nitrogen + one manure application	196.5_a
160# Nitrogen + one manure application	192.5_a
180# Nitrogen	192.7_a
	LSD (0.05)

The results of this plot indicated no statistically significant difference between the treatments (LSD (0.05) = 5.91, C.V=1.91).

The regular rainfall throughout the growing season resulted in mineralization of soil organic matter and the ongoing release of nitrogen to the corn crop.

Based on Table 8, in OSU Extension Bulletin 604, it was expected that 75% of the available surface applied nitrogen would be lost and 25% would be captured by the growing crop. It's possible a greater percentage of the manure nitrogen applied was captured by the growing crop due to the crop having a canopy when the manure was applied. Also, much of the dairy manure flowed into small soil cracks which may have made it more available for uptake by the corn roots.

Acknowledgement

The authors would like to thank Spruce Haven Dairy for the use of for the boom manure application equipment, Van Erk Dairy for the manure, and Chris Laukhof for the use of his corn field.

The authors would also like to thank the Ohio Corn Marketing Program and the Ohio Dairy Research Fund for their financial support of this research.

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