Comparing Corn Yields of Fields Side-dressed with 28% UAN Versus Swine Finishing Manure

Amber Emmons, Ohio State University Water Quality Extension Associate, Wood County Glen Arnold, Ohio State University Field Specialist-Manure Nutrient Management Systems
Published August 21, 2023

Objective

To compare swine finishing manure versus 28% UAN as a side-dress nitrogen source in corn in yield, ear leaf nitrogen levels, and corn stalk nitrate content at harvest.

Background

Crop Year: 2022	Tillage: Conventional Tillage
Location: Holgate, OH	Soil Test: pH 6.3, P 17, K 125, OM 2.1
County/Town: Henry County/Holgate	Planting Date: May 19, 2022
Soil Type: Hoytville Silty Clay Loam	Manure Application Date: June 19, 2022
Drainage: Systematic Tile Drainage Every 50’	Harvest Date: November 9, 2022
Previous Crop: Alfalfa	

Incorporating manure into a growing crop, like sidedressing corn, can make good use of the nutrients in livestock manure. Using the nutrients in livestock manure can save the farmer money on commercial fertilizer costs. It can also help reduce nutrient losses, potentially boost crop yields, and give livestock another time in the year to apply manure to fields. Applying the manure to a growing crop instead of bare ground can reduce the nitrogen and phosphorus being lost and improve water quality. Giving livestock producers another window of time to apply manure help as the window of time for application in the fall in spring has been decreasing due to weather conditions. The University of Minnesota along with other trials done at Ohio State University support the use of manure as a sidedress material for farmers and show that sidedressing with livestock manure can lead to higher corn yields.

From the time of planting, May 19th, to the time of applications, June 19th, this field received 7.74 inches of rain when the average is 5 inches. The field experiences flooding during that month interval. The field conditions at the time of manure application were not ideal as the weight of the manure tanker left indentations that lasted all season since the ground was soft. After the manure application, the plot received almost weekly rainfall through July and August totaling 8.65 inches.

Methods

A randomized complete block design was used with two treatments and three replications. Plots were 15 feet wide (six rows) and 0.5 mile long. Before corn planting in May, this field was ripped

in the fall of 2021. In the spring, before planting, a single tillage pass with a Harrigator, a tine harrow, to was completed. The swine manure was applied at 6,100 gallons per acre when the corn was at the V3 growth stage. The other treatment was 200 pounds per acre of 28% UAN, applied when the corn was at the V3 growth stage. The manure was subsurface applied using Dietrich Sweeps with closing wheels at a depth of four inches using a 5,250-gallon manure tanker.

Throughout the growing season a variety of sampling was done. Prior to any nutrient application at the beginning of the growing season soil samples were taken from each plot. Ear leaf samples were collected when the corn was at R1 (silking) and stalk nitrate samples were collected at harvest. Lastly, soil samples were again pulled at harvest time. The yield data was collected by the farmer's yield monitor.

Table 1. Manure Analysis

Nutrient	lbs/1000 gallons
Nitrogen	29.65
Phosphorus as P_2O_5	50.39
Potassium as K_2O	30.40

Results

Table 2. Corn Ear Leaf Nitrogen Results

	Nitrogen (%)	Phosphorus (%)	Potassium (%)
28% UAN	3.64a	0.38B	2.32^
Manure	3.87a	0.42A	2.51^

Nitrogen LSD = 0.36, C.V. = 3.97
Phosphorus LSD = 0.04, C.V. = 3.66
Potassium LSD = 0.42, C.V. = 7.24
*Each nutrient was analyzed separately

Table 3. Stalk Nitrate Results

Treatment	Nitrate-N (ppm)
28% UAN	276.7a
Manure	379.3a

LSD = 1237, C.V. =158.24

Table 4. Yield Results

Treatment	Yield (bu/ac)	Moisture (%)
28% UAN	218.2b	16.9A
Manure	231.4a	18.3A

Yield LSD = 6.54, C.V. = 1.22
Moisture LSD = 3.55, C.V. = 8.48

The ear leaf levels from the manured replications had larger percentages of nitrogen though there was no significant difference. The ear leaf samples from the manured plots had a significantly higher phosphorus percentage than the control plots. The manure plots had higher percentages of potassium when compared to the ear leaves from the control plots but there was no significant difference.

At harvest, the stalk nitrate test showed there was no significant difference in the nitrate concentrations (ppm) from the manure plots versus the control plots. The yield results of this plot indicated a significant difference between the manure plots and the control plots. The manure plots appeared greener longer into the growing season than the control plots. There was no significant difference in the moisture at harvest. The sidedress manure yielded higher than 28% in 2022.

Summary

When looking at the nutrient contents of corn ear leaves and the corn stalks at harvest, the manure resulted in higher nutrient concentrations. That did not necessarily result in the manure plots have significantly higher nutrient concentrations. The only significantly higher nutrient concentration was the percentage of phosphorus in the ear leaf samples taken at R1. From that we can conclude that manure as a sidedress material will not result in higher nutrient concentrations in the corn plants.

Both the manure plots and the control plots yielded higher than Henry County's average yield, 201.3 bushels per acre. The manure plots had a significantly higher yield in the growing conditions of 2022 than the control plots but that is from only one year of data. The higher manure plot yields line up with other manure sidedress studies being done where the plots sidedressed with manure will yield higher. This study is being repeated in 2023 in order to produce a second year of data.

Acknowledgements

The author expresses appreciation to Tim Brinkman for the swine finishing manure and use of his field.

For more information, contact:
Amber Emmons
OSU Extension –Wood County
639 S. Dunbridge Road, Suite 1
Bowling Green, Ohio 43529
emmons.118@osu.edu