

Impacts from Fall Strip-Till Using Swine and Dairy Manure on Corn Germination, Emergence and Yield

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Objective

To assess the germination and emergence impacts of planting corn directly into fall strip-tilled swine and dairy manure application. To compare yields of corn planted into the strips of fall-applied manure against strips without manure applied.

Background

Crop Years: 2021 & 2022	Tillage: Conservation Tillage
Location: Northwest OARDC	Soil Test: pH 6, P 45, K 180, OM 2.5
County/Town: Wood County/Hoytville	Seeding Rate: 31,000 plants/acre
Soil Type: Hoytville Silty Clay	Previous Crop: Soybeans
Drainage: Systematic Tile Drainage on 40' spacings	

	2021 Crop	2022 Crop
Fall Manure Application Date	October 7 th , 2020	December 8 th , 2021
Planting Date	April 26 th , 2021	May 23 rd , 2022
Harvest Date	October 14 th , 2021	November 9 th , 2022

Figure 1.

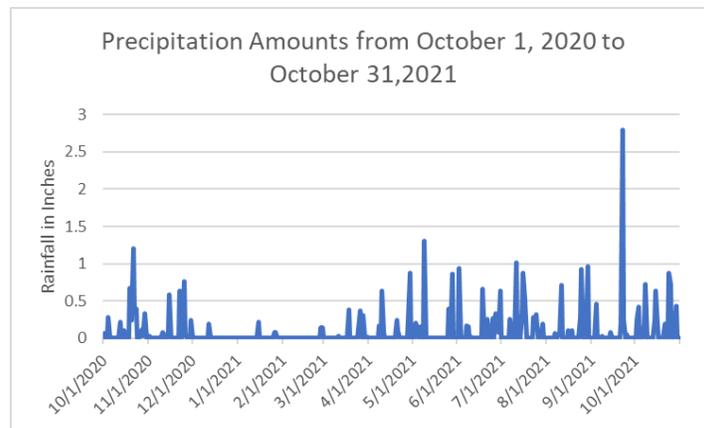


Figure 2.

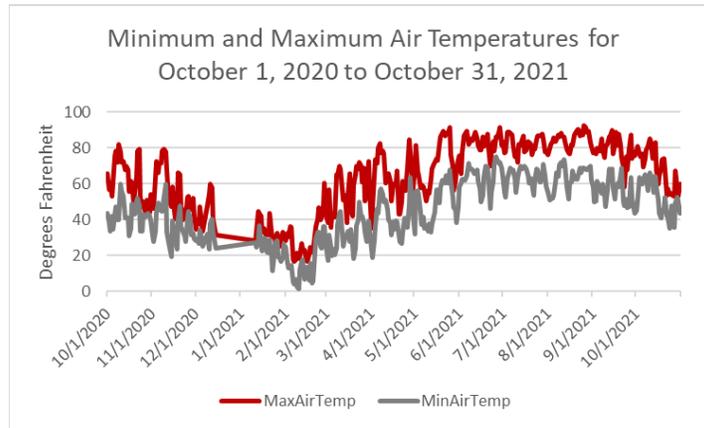


Figure 3.

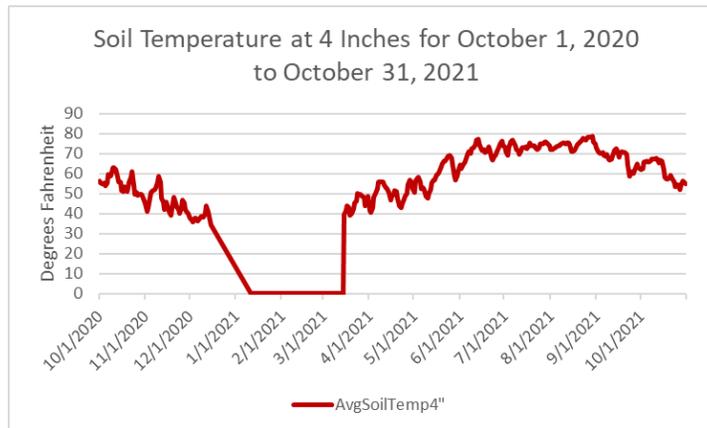


Figure 4.

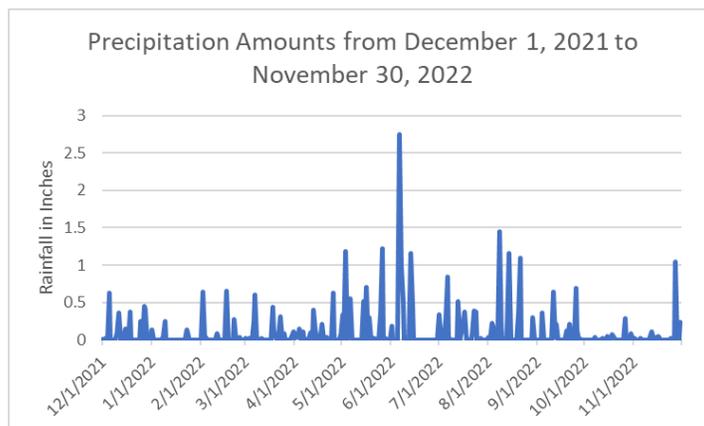


Figure 5.

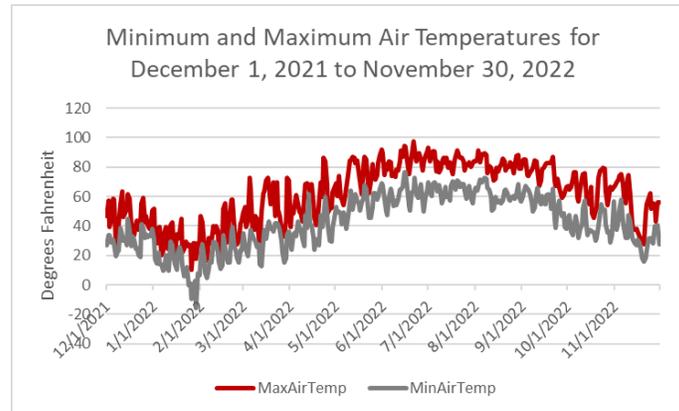
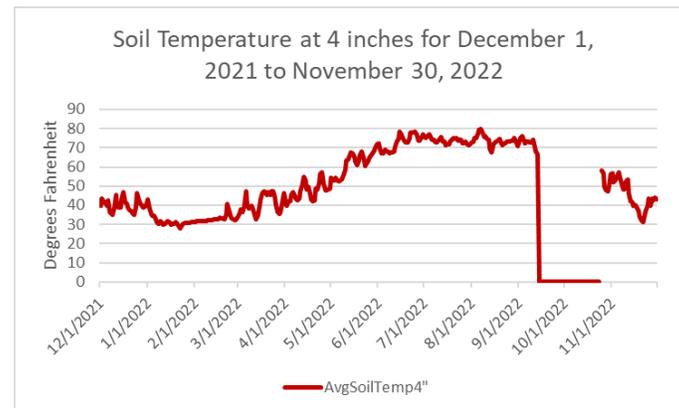


Figure 6.



Livestock producers and commercial manure applicators have had decreasing windows of time in the spring and fall for manure applications due to weather conditions. Farmers raised the question that if they want to apply manure in the fall and use strip-tillage, would there be an effect on their corn stand and yield the following year. Similar research has been done by Christine Brown in Canada who works for the Ontario Ministry of Agriculture, Food and Rural Affairs. They used strip-tillage in the spring and found they had a 30 percent reduction in the corn stand. The goal is to determine if livestock producers and or commercial manure applicators in Ohio can incorporate fall-applied manure with a strip-till method and see no negative effect on their corn stand and yield.

Methods

This trial was a randomized complete block design. The plots were four rows wide and 90 feet long. Prior to harvest, the ends of the plots were mowed to be squared off and consistent. A manure sample was collected and analyzed prior to the first manure application of the study in



2020. The corn crop was planted the following year directly into the manure strips without any starter nitrogen. The swine manure was applied at 5,000 and 8,000 gallons/acre and the dairy manure was applied at 8,000 and 12,000 gallons per acre. All manure treatments were applied with a Dietrich sweeps at a depth of four inches. Lastly a strip-tilled treatment with no fall application of any kind was used as a check. Soil test levels for phosphorus and potassium were in the maintenance range for both years. All plots received 200 pounds/acre of 28% UAN nitrogen around the V3 stage the following June as a sidedress application. This study is to be repeated in 2023. The data will be analyzed separately.

Table 1. Manure Analysis

Nutrient	Swine (lbs./1000 gallons)	Dairy (lbs./1000 gallons)
Nitrogen, Ammonium	40.10	17.24
Nitrogen, Organic	15.21	9.31
Phosphorus as P_2O_5	14.70	8.10
Potassium as K_2O	28.30	31.30

Table 2. Treatment Summary

Treatment	Description
Treatment 1	Fall Incorporated Swine Manure at 5,000 gal/acre
Treatment 2	Fall Incorporated Swine Manure at 8,000 gal/acre
Treatment 3	Fall Incorporated Dairy Manure at 8,000 gal/acre
Treatment 4	Fall Incorporated Dairy Manure at 12,000 gal/acre
Treatment 5	Strip-Till (Check)

Results

Table 3. Stand Count Results

Treatments	Stand Counts (plants/ac)	
	Average	
	2021	2022
Treatment 1	32,000	31,500
Treatment 2	30,500	31,000
Treatment 3	31,000	32,000
Treatment 4	31,500	32,000
Treatment 5	32,000	32,000



Table 4. Yield Results

Treatments	Yield (bu/ac)	
	Average	
	2021	2022
Treatment 1	243.9a	260.7A
Treatment 2	245.0a	267.7A
Treatment 3	239.1a	225.8C
Treatment 4	242.0a	245.5B
Treatment 6	64.6b	90.4D

2021: LSD = 10.08, C.V. = 3.86

2022: LSD = 9.42, C.V. = 3.47

*Years were analyzed separately. Trial is being repeated in 2023 and then all data will be analyzed together.

In 2021, all the treatments that received swine or dairy manure had corn yields that were statistically the same. The differing rates of swine and dairy manure did not cause a significant yield difference. The strip-tillage with zero nitrogen plot did have significantly lower yields from all the manure treatments.

In 2022, the two swine manure treatment yields were not statistically different. Both swine treatments had the highest yields of all treatments. Yield in the treatments where dairy manure was applied were significantly less than the swine treatments but significantly more than the zero nitrogen treatments. The higher application rate of dairy manure did result in a significantly higher yield than the lower application rate. Again, the strip-tillage with zero nitrogen had the lowest yield.

Summary

Corn germination and emergence were similar for each of the treatments. The manure applied in the fall using strip-tillage did not negatively impact corn population stands. Farmers can plant directly in the fall strip-tillage where manure was applied without seeing a loss to the overall plant stand.

After 2 years of this study, with both years being analyzed separately, strip-tilling in the fall and applying swine manure at either rate will give farmers a yield increase when compared to no manure application at all. Both dairy manure treatments resulted in a yield increase, though in 2022 the dairy manure treatments yielded lower than the swine manure. Farmers can apply manure in the fall and use strip-tillage without a negative effect on stands and yield. This study will be repeated in 2023 for a third year of data to write up a three-year summary of the experiment.



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