Over 30 Years of Conservation Innovation

Farmer Phosphorus Plot – Fulton County

Objective

To evaluate the agronomic and economic impacts of phosphorus fertilizer applications.

Background

Crop Year: 2023 corn
Location: Fayette
County: Fulton
Soil Type: Blount loam
Drainage: Pattern
Tillage: No-till
Previous crop: soybeans
Herbicides: Resicore, Glyphosate, 2,4-D
Planting Date: 5-24-23
Variety: Pioneer P0859AM
Seeding Rate: 34,000
Fertilizers: see below
Harvest Date: November 19, 2023
Soil test preplant: pH 6.3, P 17.6 ppm M3, K 76 ppm, CEC 11.7, O.M. 2.8 %

Methods

Phosphorus starter fertilizer was compared to no phosphorus applied. Treatments were replicated seven times in a random block design. Treatments are 20 feet wide by 1330 feet long. All treatments received the same inputs except for starter phosphorus fertilizer. On September 15, 2022, cereal rye cover crop was flown on at a rate of 60 lbs/acre before soybean harvest. On July 5, 2023 at V7 growth stage, standard soil test, Haney soil health test, and PLFA soil samples were collected at 0-6 inch depth from a composite sample. Soil probes were taken every 3 inches from row middle to row middle. Plant tissue samples were collected from corn ear leaves on July 25, 2023. Yields and moistures were obtained by using a weigh wagon. Yields were adjusted to 15.5% moisture.

Fertilizers:

28% UAN ; 81# at planting 2 x 2
12-0-0-26 thiosul ; 3 gal/acre at planting
10-34-0 ; 5 gallon/acre (58.2#) for treated area only at planting 2x2

28% UAN ; 96# at sidedress on June 14, 2023
12-0-0-26 thiosul ; 3 gal/acre on June 14, 2023

Treatments*:*

1. 28% UAN & thiosul
2. Phosphorus starter fertilizer (10-34-0 and 28%) & thiosul

Results

Table 1. Impact of Phosphorus (P) Fertilizer

Starter P Rate (gal/ac of 10-34-0)	Corn Yield (bu/ac)	Value of Corn ($/ac)	Cost of Phosphorus ($/ac)	Return Minus P Cost ($/ac)
0	196.5	$884.25	0	$884.25
5	195.5	$879.75	$23.25	$856.50

CV 4.55; P<.05,No Significant Difference in yield. Based on $4.50/bu corn and $800/ton 10-34-0 P ($4.65/gal.)

Table 2 Weather Data

	2023 Local Rainfall WeatherLink (Border View)	Archbold Historic Rainfall www.weather-us.com
May	1.33 in.	2.28 in.
June	2.34 in.	2.6 in.
July	5.32 in.	2.17 in.
August	3.13 in.	2.13 in.
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Total	12.08 in.	9.18 in.

Table 3 Standard Soil Test (A & L lab) V7 growth stage

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
OM %	2.9	3.0	10.98	NS
Phosphorus P-M3 (ppm)	17.7	17.7	17.29	NS
Potassium (ppm)	80.7	74.3	14.15	NS
pH	6.2	5.9	4.01	NS
CEC	15.6	15.9	7.27	NS
Ca %	64.1	62.5	8.74	NS
Mg %	16.6	13.7	8.42	2.88 Signif.

Table 4 Haney Soil Health Test (Regen lab) V7

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
CO2 (ppm) Respiration	56.8	62.1	22.95	NS
Org.C (ppm) C (organic C)	165.7	158.0	6.63	NS
MAC % (microbially active C)	34.3	39.3	21.05	NS
C:N (carbon:nitrogen ratio)	9.8	11.2	15.71	NS
SHC (soil health score)	10.7	10.8	14.65	NS
Available N (lbs/ac	136.3	119.8	17.06	NS
Available P (lbs/ac)	15.4	17.9	22.37	NS
POxC(ppm) (active carbon)	481.0	482.3	14.25	NS

Table 5 PLFA Test Phospholipid Fatty Acids (Regen lab) V7

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
Total Biomass(ng/g soil)	2680	2613	40.34	NS
10.67Functional Group Diversity	1.3	1.3	10.67	NS
Total Bacteria (% of Biomass)	45.5	39.8	8.78	NS
Total Fungi (% of Biomass)	4.2	4.3	46.99	NS
Protozoa (% of Biomass)	0	0		
Undifferentiated (% of Biomass)	50.3	55.6	5.68	NS

Table 6 Plant Tissue Analysis (A & L lab) R1 initial silking

	Normal Range	No Phosphorus Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
Nitrogen %	3.0 -4.0	3.7	3.6	4.02	NS
Phosphorus %	0.25-0.45	0.3	0.3	9.28	NS
Potassium %	2.0-2.5	2.1	1.9	8.66	NS
Magnesium %	0.13-0.3	0.3	0.4	13.07	NS
Calcium %	0.25-0.50	0.6	0.6	9.66	NS
Sulfur %	0.15-0.50	0.26	0.25	5.03	NS

Summary

Corn yield was not influenced by the addition of starter fertilizer phosphorus 10-34-0. A loss of $27.75 per acre was incurred when phosphorus fertilizer was applied (table 1). Soil and plant testing showed no significant difference with phosphorus fertilization (table 2-6).

Acknowledgement

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