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Farmer Phosphorus Plot – Henry County

Objective

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

Background

Crop Year: 2023
Location: Napoleon
County: Henry
Soil Type: Lenawee Silty Clay Loam
Drainage: Patterned
Previous Crop: Soybeans
Tillage: No-Till
Soil Test, preplant: pH 6.2, P 25 ppm M3, K 148 ppm, CEC 21.5, O.M. 3.6%

Herbicide: FS MaxSupreme, Acuron, Radar LV6MB, Agsaver
Planting Date: May 17, 2023
Variety: Pioneer PO843AM
Seeding Rate: 32,500 seeds per acre
Fertilizers: see below
Harvest Date: November 4, 2023

Methods

Phosphorus starter fertilizer was compared to no phosphorus applied. Treatments were replicated three times in a complete block design. Treatments are 120 feet wide by 1330 feet long. All treatments received the same inputs except for starter phosphorus fertilizer.
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 calibrated yield monitor. Yields were adjusted to 15.5% moisture.

Fertilizers:

28% UAN – 75# at planting 4 x 2
10-34-0 – 10 gallon/acre (116.5#) for treated area at planting 4x2
28% UAN – 105# at sidedress (non 10-34-0 treatment) on June 8, 2023
28% UAN – 94.5# at sidedress (10-34-0 treatment) on June 8, 2023

Treatments*:*

1. 28% only
2. Starter fertilizer (10-34-0 and 28%)

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	188.1	$846.45	0	$846.45
10	192.7	$867.15	$46.50	$820.65

CV 2.43; 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 (Homan)	Napoleon Historic Rainfall www.weather-us.com
May	0.83 in.	2.87 in.
June	2.11 in.	3.11 in.
July	7.59 in.	2.72 in.
August	2.57 in.	2.64 in.
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Total	13.10 in.	11.34 in.

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

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
OM %	3.3	3.5	3.16	NS
Phosphorus P-M3 (ppm)	25	37	22.0	NS
Potassium (ppm)	147	144	4.79	NS
pH	5.6	5.5	1.95	NS
CEC	21.3	19.6	1.4	1.0
Ca %	60.8	58.7	5.33	NS
Mg %	12.8	12.8	2.30	NS

Table 4 Haney Soil Health Test (Regen lab) V7

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.05)
CO2 (ppm) Respiration	89.4	91.1	33.73	NS
Org.C (ppm) C (organic C)	156.3	161.0	17.01	NS
MAC % (microbially active C)	55.4	56.6	25.44	NS
C:N (carbon:nitrogen ratio)	11.4	9.6	31.99	NS
SHC (soil health score)	12.8	13.4	20.65	NS
Available N (lbs/ac	138	139.6	20.05	NS
Available P (lbs/ac)	29.4	32.1	17.82	NS
POxC(ppm) (active carbon)	287.7	290.3	61.31	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)	2370	1364	92.62	NS
Functional Group Diversity	1.3	1.3	15.18	NS
Total Bacteria (% of Biomass)	46.3	47.0	15.51	NS
Total Fungi (% of Biomass)	5.2	5.3	67.52	NS
Protozoa (% of Biomass)	0.1	0	244.95	NS
Undifferentiated (% of Biomass)	48.5	47.7	22.28	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	3.2	3.2	2.43	NS
Phosphorus %	0.25-0.45	0.3	0.3	3.83	NS
Potassium %	2.0-2.5	2.1	1.9	4.86	NS
Magnesium %	0.13-0.30	0.2	0.2	10.62	NS
Calcium %	0.25-0.50	0.5	0.5	14.99	NS
Sulfur %	0.15-0.50	0.2	0.2	4.58	NS

Summary

Corn yield was not influenced by the addition of starter fertilizer phosphorus 10-34-0. A loss of $25.80 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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