



Over 30 Years of Conservation Innovation



2024 Farmer Phosphorus Plot – Henry County

Objective

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

Background

Crop Year: 2024
Location: Napoleon
County: Henry
Soil Type: Lenawee Silty Clay Loam
Drainage: Patterned
Previous Crop: Corn
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 MAX Supreme, Tendovo, Glyphosate, Radar

Planting Date: May 24, 2024
Variety: Pioneer P28A83PR
Seeding Rate: 170,000
Fertilizers: see below
Harvest Date: October 5, 2024

Methods

The addition of Phosphorus (P) to a cropping system has been a longstanding practice within the industry. P is often the nutrient of concern in regard to water quality and the formation of toxic algal blooms. This study was conducted in the Western Lake Erie Basin, an area where producers are actively exploring strategies that are agronomically, economically, and environmentally sound when contemplating P amendments.

This study utilized a randomized complete block design with three replications. This is the second year of tracking phosphorus agronomic response. In 2023, the two treatments in this study were 1) No P added and 2) 10 gal of 10-34-0 added in the starter fertilizer at corn planting. In 2024, soybeans were planted in the same treatments and data collected according to the location of 2023 treatments. Each treatment replication was 120 feet wide by 1330 feet long. All treatments received the same inputs except for starter phosphorus fertilizer in 2023

On May 26, 2024, soil samples were collected at 0–6-inch depth. Yields and moistures were obtained by using a calibrated yield monitor. Yields were adjusted to 13% moisture.

Treatments:

1. No Phosphorus fertilizer
2. Starter fertilizer (10-34-0) applied in 2023

Results

Table 1. Impact of Phosphorus (P) Fertilizer

Starter P Rate (gal/ac of 10-34-0)	Soybean Yield (bu/ac)	Value of Grain (\$/ac)	Cost of P (\$/ac)	Return Minus P Cost (\$/ac)
0	50.5	\$505.00	0	\$505.00
10	53.0	\$530.00	\$46.50	\$483.50

CV 7.89, LSD (P<.10) = 9.73; No Significant Difference in yield. Based on \$10.00/bu soybean 2024 price and \$800/ton 10-34-0 P (\$4.65/gal.) at 2023 price.

Table 2 Weather Data

	2024 Local Rainfall WeatherLink (Homan)	Napoleon Historic Rainfall www.weather-us.com
May	4.50 in.	2.87 in.
June	5.16 in.	3.11 in.
July	2.52 in.	2.72 in.
August	4.16 in.	2.64 in.
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Total	16.34 in.	11.34 in.

Table 3 Standard Soil Test (A & L lab) 6-26-24 V3

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.10)
OM %	2.9	2.9	1.42	NS
Phosphorus P-M3 (ppm)	18.3	21.0	7.48	NS
Potassium (ppm)	126	122	2.3	NS
pH	6.5	6.6	1.64	NS
CEC	19.8	18.3	2.53	1.15
Ca %	73.7	77.4	5.17	NS
Mg %	16.9	14.3	11.39	NS

Table 4 Haney Soil Health Test (Regen lab) 6-26-24 V3

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.10)
CO2 (ppm) Respiration	116.8	89.8	49.01	NS
Org.C (ppm) C (organic C)	209.3	206.0	8.99	NS
MAC % (microbially active C)	58.5	43.5	57.5	NS
C:N (carbon:nitrogen ratio)	12.5	12.3	5.77	NS
SHC (soil health score)	16.0	14.2	22.28	NS
Available N (lbs/ac)	45.2	44.0	5.20	NS
Available P (lbs/ac)	35.5	30.2	11.50	NS

POxC(ppm) (active carbon)	478.3	406.0	0.82	8.65
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Table 5 PLFA Test Phospholipid Fatty Acids (Regen lab) 6-26-24 V3

	No P Fertilizer	Phosphorus Applied	CV	LSD (P<.10)
Total Biomass(ng/g soil)	2266	2670	21.78	NS
Functional Group Diversity	1.4	1.4	5.22	NS
Total Bacteria (% of Biomass)	53.2	51.4	12.49	NS
Total Fungi (% of Biomass)	7.8	7.9	26.0	NS
Protozoa (% of Biomass)	0.1	.1	130.0	NS
Undifferentiated (% of Biomass)	38.9	40.6	21.53	NS

Table 6 Plant Tissue Analysis (A & L lab) 7-25-24 R1

	Normal Range	No Phosphorus Fertilizer	Phosphorus Applied	CV	LSD (P<.10)
Nitrogen %	3.25-5.00	5.2	4.8	1.8	NS
Phosphorus %	0.3-0.6	0.4	0.4	4.22	NS
Potassium %	1.5-2.25	2.0	1.7	9.8	NS
Magnesium %	0.25-.070	0.5	0.5	6.42	NS
Calcium %	0.80-1.40	1.5	1.5	5.15	NS
Sulfur %	0.25-0.60	0.3	0.3	5.32	NS

Summary

Soybean yield was not influenced by the addition of 2023 applied starter fertilizer phosphorus. A loss of \$21.50 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) expect for CEC and POxC. P soil test trended lower by 2.7 ppm with no P fertilizer yet yield was not significantly affected.

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