



Over 30 Years of Conservation Innovation



2024 Replicated Farmer Phosphorus Plot – Fulton County

Objective

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

Background

Crop Year: 2024 soybean

Location: Fayette

County: Fulton

Soil Type: Blount loam

Drainage: Pattern

Tillage: No-till

Previous crop: corn

Soil test preplant: pH 6.3, P 17.6 ppm M3, K 76 ppm, CEC 11.7, O.M. 2.8 %

Herbicides: Sonic, metribuzin, Glyphosate, 2,4-D

Planting Date: 5-24-24

Variety: Pioneer P22A36PR

Seeding Rate: 168,000

Fertilizers: see below

Harvest Date: October 10, 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. (K. Lovejoy)

Phosphorus (P) starter fertilizer was compared to no phosphorus applied. Treatments were replicated seven times for yield and four times for soil data in a randomized complete block design. This is the second year of tracking phosphorus agronomic response. In 2023, the two treatments were 1) No P added and 2) 5 gallon 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. Treatments are 20 feet wide by 1330 feet long. All treatments received the same inputs except for starter phosphorus fertilizer. On September 12, 2023, cereal rye/barley cover crop was flown on at a rate of 65 lbs/acre before corn harvest. Yields and moistures were obtained by using a calibrated yield monitor. Yields were adjusted to 13% moisture.

Treatments:

1. No Phosphorus fertilizer
2. Phosphorus 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	45.2	\$452.00	0	\$452.00
5	46.1	\$461.00	\$23.25	\$437.75

CV 1.99; P<.10, LSD 0.95 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 (Border View)	Archbold Historic Rainfall www.weather-us.com
May	2.52 in.	2.28 in.
June	2.98 in.	2.6 in.
July	2.68 in.	2.17 in.
August	5.19 in.	2.13 in.
	-----	-----
Total	13.37 in.	9.18 in.

Table 3 Standard Soil Test (A & L lab) V3 growth stage

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
OM %	4.0	4.0	14.98	NS
Phosphorus P-M3 (ppm)	33.8	33.3	27.22	NS
Potassium (ppm)	134.8	145.3	19.87	NS
pH	6.1	6.0	4.72	NS
CEC	15.8	16.4	15.0	NS
Ca %	66.6	65.9	8.21	NS
Mg %	12.6	13.4	9.12	NS

Table 4 Haney Soil Health Test (Regen lab) V3

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
CO2 (ppm) Respiration	237.3	207.3	31.36	NS
Org.C (ppm) C (organic C)	250.3	241.8	11.4	NS
MAC % (microbially active C)	94.9	84.2	23.14	NS
C:N (carbon:nitrogen ratio)	12.4	12.2	2.78	NS
SHC (soil health score)	24.0	21.7	18.21	NS
Available N (lbs/ac)	57.73	58.9	16.54	NS
Available P (lbs/ac)	38.4	35.4	40.72	NS
POxC(ppm) (active carbon)	481.8	499.8	12.71	NS

Table 5 PLFA Test Phospholipid Fatty Acids (Regen lab) V3

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
Total Biomass(ng/g soil)	4023	4635	21.2	NS
Functional Group Diversity	1.4	1.4	7.25	NS
Total Bacteria (% of Biomass)	54.3	52.5	4.89	NS
Total Fungi (% of Biomass)	7.1	6.8	44.45	NS
Protozoa (% of Biomass)	0.8	0.3	76.2	NS
Undifferentiated (% of Biomass)	37.8	40.4	5.91	NS

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

	Normal Range	No Phosphorus Fertilizer	Phosphorus Applied	CV	LSDP<.10)
Nitrogen %	3.25-5.00	5.1	4.8	13.25	NS
Phosphorus %	0.3-0.6	0.5	0.4	7.57	NS
Potassium %	1.5-2.25	2.1	2.1	10.11	NS
Magnesium %	0.25-.070	0.4	0.4	10.03	NS
Calcium %	0.80-1.40	1.2	1.3	5.83	NS
Sulfur %	0.25-0.60	0.3	0.3	8.79	NS

Summary

Soybean yield was significantly different by 0.9 bu/ac with the addition of starter fertilizer phosphorus 10-34-0 in 2023. However, a loss of \$14.25 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). P soil test did not change between treatments.

Acknowledgement

The author expresses appreciation to on-farm collaborator Seiler Farms for the land use, planting and harvesting of this plot.

Support for this trial was from the Conservation Action Project. (www.capofohio.org) and the H2Ohio program administered by the Ohio Department of Agriculture. (www.h2.ohio.gov)



For More Information Contact:

Alan Sundermeier
Coordinator - Conservation Action Project
alansundermeier@gmail.com
cell 419-261-0625
<http://capofohio.org>