Effect of Starter Phosphorous Fertilizer on Corn Yield - 2

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Objective

Evaluate the agronomic and economic impacts of phosphorus (P) fertilizer applications in corn.

Background

The addition of P to a cropping system has been a longstanding practice within the industry. P is often the nutrient of concern regarding water quality and the formation of toxic algal blooms (LaBarge, 2023). 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 took place in Fulton County, Ohio on silty clay loam soil. This farm's management includes no-till across all acres, pattern drainage tile, and a 34k seeding rate. The producer wanted to reintroduce P into this system after nine years without, seeing if there were any yield advantages to adding P. The optimal P levels for Ohio field crops range from 20-40 parts per million for a traditional corn and soybean rotation (Culman et al., 2020).

Methods

This study utilized a randomized complete block design (RCBD) with ten replications. Pioneer P0995AM seed corn was planted on May 14, 2023. The two treatments in this study were 1) No P added to the starter fertilizer blend (32 gallon 28% UAN, 3 gallon 12-0-0-26) and 2) 5 gal/ac of 10-34-0 (equivalent of 19.9 lbs. P_2O_5/ac) added in the starter fertilizer applied 2x2. Each treatment replication was 20 feet wide by 585 feet long. All treatments received the same inputs and management 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 November 12, 2023, soil samples were collected at 0–6-inch depth. Soil cores were collected every 3 inches in between two rows of corn from row middle to row middle in each strip. Yield and grain moisture data were obtained using a weigh wagon. Yields were adjusted to 15.5% moisture.

Results

Table 1. Impact of Phosphorous (P) Fertilizer		
Starter P Rate (gal/ac of 10-34-0)	**Yield (bushels/acre)**	**Return Over P ($/ac)**
0 gal/acre	185.7 a	836
5 gal/acre	195.3 b	856
C.V.=3.57 (%); LSD (0.05) = 6.38		

Table 2. Weather Data		
	2023 Local Rainfall (Seiler Weather Link)	**Historic Rainfall (Wauseon, OH)**
May	1.04 in	2.80 in
June	2.19 in	2.99 in
July	5.04 in	2.80 in
August	2.97 in	2.68 in
Total	**11.24 in**	**11.27 in**

Table 3. Soil Test Results					
	Baseline (Pre-Planting)	**No P (Post-Harvest)**	**5 gal 10-34-0 (Post Harvest)**	**CV (%)**	**LSD (P<.05)**
OM %	2.8	2.8	3.0	17.4	NS
Phosphorous P-M3 (ppm)	21	33.0	30.3	43.9	NS
Potassium (ppm)	98	113	126	29.2	NS
pH	6.3	6.2	6.5	5.9	NS
CEC	11.2	12.0	12.1	13.6	NS
Ca %	-	62.3	65.5	7.3	NS
Mg %	-	20.6	21.6	11.1	NS

Summary

There was a statistical difference in corn yield with the addition of P in the starter fertilizer blend. Additionally, there was an economic advantage to the amendment. The treatment returned $20 per acre more after the P cost was realized (Table 1). Soil testing showed no significant difference with a P amendment (Table 3). These results suggest that the corn crop responded and utilized the added P, which resulted in the yield advantage.

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