INVESTIGATING POTASSIUM FERTILITY IN INDIANA: K RATES AND NUTRIENT INTERACTIONS

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INTRODUCTION

Efficient nutrient management is essential for optimizing crop productivity and sustaining agricultural profitability. In Indiana, potassium (K) fertility has been a focal point of fertility management research in the state dating back to 1997. This paper presents a small subset of findings from these K plots, with more discussion planned for the presentation during the conference. New to fertility work in the state, nutrient interaction trials were established in 2025 to investigate the effects of nitrogen (N)xK interactions and NxSulfur (S) interactions on corn nutrition and yield. Preliminary results from one location of the NxK study will be discussed here, with additional results presented during this conference.

MATERIALS AND METHODS

Potassium Rate Study

Potassium fertility research has been ongoing in the state of Indiana at multiple sites since 1997. Potassium rates and management have changed over time at each location. Here, we will focus on results from the Davis Purdue Agricultural Center (DPAC; Farmland, IN) from 2020-2022, with additional site-years covered in the presentation. The majority of soils at DPAC are fine textured, heavy clay soils that are relatively poorly drained, with gently rolling topography. These plots are set up as a randomized complete block design with four replications and five K rate treatments (0, 45, 90, 135, and 180 lb K_2O/ac). All K_2O treatments were applied as potash in the spring. The site rotates between soybean (in even years) and corn (in odd years). Background fertility and other agronomic management (e.g., herbicides, fungicides, etc.) are managed at the discretion of farm management staff. Soil samples were collected in spring, prior to fertilization and planting. Soil samples were collected by plot, to a depth of 8” and analyzed for Mehlich-3 K. Soil test K can be found in Table 1.

Table 1. Pre-plant, pre-fertilization average soil test data by potassium rate treatment each year.

K Rate Treatment (lb K_2O/ac)	Spring 2020 (ppm)	Spring 2021 (ppm)	Spring 2022 (ppm)
0	88	78	67
45	85	80	71
90	71	71	78
135	72	83	77
180	88	97	85

Harvest data is collected from the center of each plot using a combine equipped with a calibrated yield monitor. Soybean yield is corrected to 13% and corn yield is corrected to 15%.

Nutrient Interaction Studies

Studies were established in the 2025 growing season to investigate interactive effects between nitrogen and potassium (NxK) and nitrogen and sulfur (NxS) for corn production. Both trials were established at two locations in the state including the Agronomy Center for Research and Education (ACRE; West Lafayette, IN) and Pinney Purdue Agricultural Center (PPAC; Wanatah, IN). Data collection included soil, tissue, and grain samples, as well as yield. Here, we will focus on the NxK trial at ACRE, but additional results will be discussed in the presentation.

The NxK trials involved four rates of K_2O (0, 60, 120, and 180 lb K_2O/ac) in a complete factorial design with six rates of N (0, 50, 100, 150, 200, and 250 lb N/ac) with four replications. The K_2O source was potash (0-0-60) and the N source was urea ammonium nitrate (UAN; 28-0-0). Potassium was broadcast and incorporated preplant, in the spring, and UAN was applied at V3. The site also received a blanket application of 20 lb S/ac as ammonium sulfate (AS; 21-0-0-24S). This provided an additional 18 lb N/ac for each NxK treatment combination. Prior to fertilization, soil samples were collected from each replicate and analyzed for the full suite of agronomic nutrients, including soil test K on a Mehlich-3 basis. Corn was planted and managed by ACRE staff (e.g., herbicide and fungicide applications, as needed). A total of 10 whole plant samples were collected from each plot at V6 and analyzed for K and N concentration. A total of 10 ear leaf samples were collected from each plot at R1. The center rows of each plot were harvested to determine grain yield using a Wintersteiger combine equipped with a HarvestMaster system. Yield data are corrected to 15% moisture content.

RESULTS AND DISCUSSION

Potassium Rate Studies

Soybean yield responded similarly to K rate in 2020 and 2022. The three highest K rate treatments (90, 135, and 180 lb K_2O/ac) significantly increased yield compared to the 0-K control (Figure 1). Yield of the 45 lb K_2O/ac treatment was similar to yield at both the higher K rates and the control.

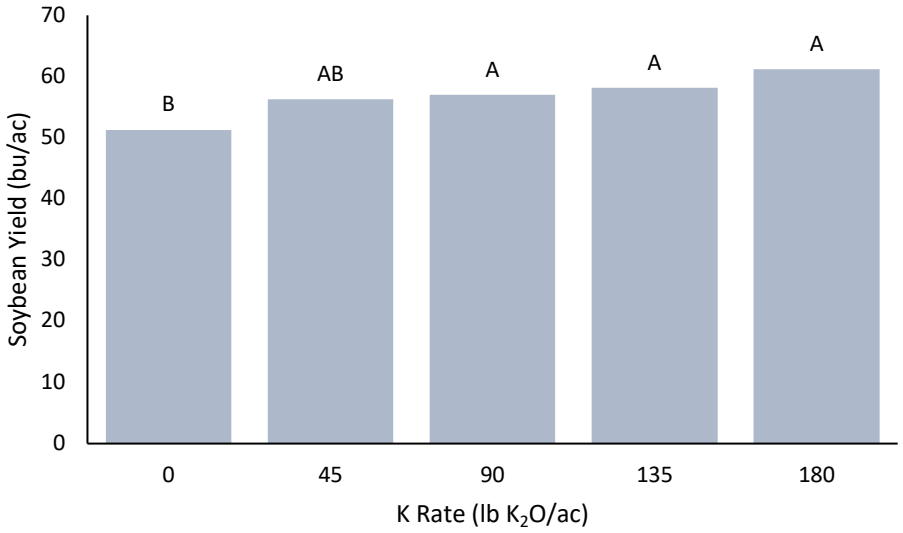

Figure 1. Soybean yield, averaged across 2020 and 2022, by potassium fertilizer rate.

In 2021, corn yield was significantly reduced in the 0-K control treatment, but was similar across all other rates (Figure 2). Based on the tri-state fertilizer recommendations (Culman et al., 2020) we would have expected to need the 135 or 180 lb K_2O/ac rate to maximize yield.

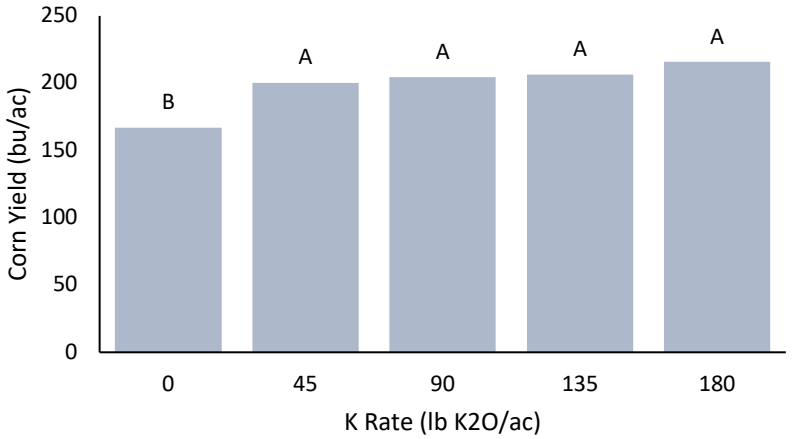

Figure 2. Corn yield across K rates in 2021.

Nutrient Interaction Studies

Whole plant K concentration at V6 was not affected by N rate, K rate, or their interaction at ACRE. However, N concentration in the whole plant at V6 was significantly affected by K rate (Table 2). Ear leaf samples did not show any response of N or K concentration from the treatments. Corn yield was significantly affected by N rate (Figure 3) but was not affected by K rate or the interaction between N and K rates.

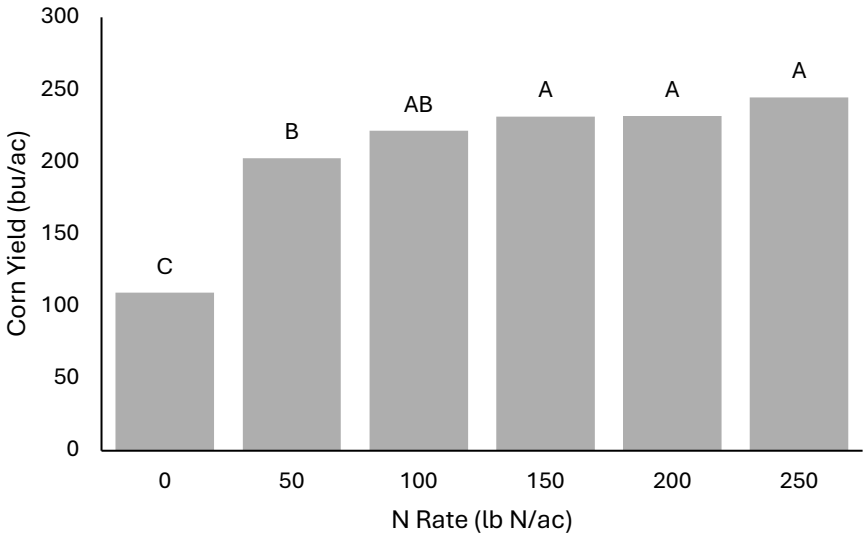

Figure 3. The effect of N rate on corn yield at ACRE, 2025.

REFERENCES

Culman, Fulford, Camberato, & Steinke. (2020). *Tri-State Fertilizer Recommendations for Corn, Soybean, Wheat, and Alfalfa*.