

# **SOYBEAN RESPONSE TO PHOSPHORUS FERTILIZER AND COVER CROP COMBINATION IN KANSAS**

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## **ABSTRACT**

Phosphorus (P) plays a critical role in supporting plant growth and maximizing crop yields, but its availability is often limited in agricultural soils. Cover crops (CC), widely used to improve soil health, can also influence nutrient availability and moisture dynamics. This study investigates the effects of P fertilization and CC on soybean P uptake, soil moisture, and grain yield in Kansas. Field trials were conducted across multiple sites in 2022 and 2023, using a randomized complete block design with a 2x2 factorial treatment structure involving oat and triticale CC and P fertilization of 0 and 45 kg ha<sup>-1</sup> of P<sub>2</sub>O<sub>5</sub>. The goal was to enhance soybean P uptake, improve grain yield, and evaluate the effect on soil moisture. Results indicated that triticale, with its longer growing season, produced more biomass than oat, contributing to greater P uptake. However, CC reduced soil moisture at soybean planting and temporarily limited P uptake in the early season. At later growth stages, P fertilization significantly increased the soybean P uptake, but the addition of CC did not further enhance P uptake or yield. Additionally, a critical CC biomass threshold of 2465 kg ha<sup>-1</sup> was identified, beyond which soybean grain yield began to decline. Despite the potential benefits of CC for soil health and erosion control, careful management of CC biomass and termination timing is crucial to avoid negative impacts on soil moisture and yield. This research highlights the importance of balanced P fertilization and adaptive CC management to optimize soybean production in Kansas.