

# CORRELATION AND CALIBRATION OF THE MEHLICH 3 P SOIL TEST FOR SOYBEANS IN KANSAS

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## Abstract

Kansas currently uses the Mehlich 3 soil test for P, with a general P soil test (STP) critical level for all crops of 20 ppm (colorimetric). This critical level was established based on field research primarily with wheat in 2003. A review of the limited research data available from Kansas suggests that soybeans may not require as high a STP level as wheat for optimum yield. Therefore the objective of this study is to determine what the appropriate critical STP level is for optimum soybean production in Kansas, and calibrate fertilizer application vs. the Mehlich 3 ST at STP levels below the observed critical level.

Data from phosphorus response studies with soybeans in eastern Kansas reported in the Kansas Fertilizer Reports dating from 1966 were collected, and a preliminary correlation was plotted using relative yield of the control treatments vs Bray P-1 or Mehlich 3 STP level. (Previous unpublished work in Kansas has shown that on soils with pH < 7, Bray P-1 and Mehlich 3 ST are essentially the same). This preliminary examination of previous work suggests that the critical STP level above which no response in yield of soybeans to P fertilizer would be expected, was <15 ppm STP.

Beginning in 2011, a series of 16 field experiments have been conducted in eastern Kansas examining the response to P fertilizer by soybeans at varying Mehlich 3 STP levels. The experiments were conducted on both cooperating farmer's production fields and university experiment fields. Soil Test P levels varied from 3 to 56 ppm, with the majority of the sites testing from 8 to 25 ppm. At all locations a randomized complete block design was used with four replications. Individual plot size used was 15 foot (6-30 inch rows) x a minimum of 40 foot. In 2011 two sites were conducted using broadcast P rates of 0, 20, 40, 60 and 80 pounds P<sub>2</sub>O<sub>5</sub> per acre. In both 2012 and 2013, 7 experiments were conducted each year with an additional rate of 100 pounds P<sub>2</sub>O<sub>5</sub> per acre added. Broadcast P treatments were applied as granular Monoammonium phosphate (MAP, 11-52-0) immediately after the field was planted by the cooperating farmer, or research staff.

In 2011 and 2012, 0-6 inch soil samples for P were taken by block to determine initial STP levels. In 2013 the soil sampling was intensified to each individual plot. Measurements made included whole plant dry matter and P content at 4 to 6 leaf stage, leaf P content at R-4, and yield. Yield was determined by combine harvesting the two middle rows of each plot. Due to severe heat and drought in Kansas in 2012, only yield data from locations with yields >30 bushel per acre are included in the analysis. This work is ongoing, and an additional 7 experiments are planned for 2014.

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