

Phosphorus Fertilizer Evaluation for Irrigated Corn on Low P Soils – 2006 Clay Center, NE

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Rationale:

Nearly 20 to 30 percent of Nebraska soils need phosphorus to increase corn yields. Yield increases are expected from phosphorus applications when soil test levels are below 16 ppm by the Bray -1 and Mehlich-3 phosphorus soil tests, or 11 ppm by the Olsen phosphorus soil test. For yields above 200 bushels/acre, increased phosphorus application may be required on soils with <25 ppm Bray-P or <15 ppm Olsen P.

Procedures:

This long-term, continuous corn study was initiated in 2002 at the South Central Agricultural Laboratory in a high yield, sprinkler irrigated environment on P deficient soils (Crete silt loam). The site was taken out of long-term brome pasture in 2001, with a history of little or no phosphorus fertilization. The goals of the study are to examine the effects over time of P fertilization on corn yield and P use efficiency, and to evaluate long-term changes in soil P level with fertilizer application. Experimental variables include fertilizer N rate and P rate. Fertilizer treatments were applied preplant each year, then incorporated with a shallow disking. In 2006, Pioneer 33H26 corn was planted April 27 at 26,300 seeds per acre (no starter was used). Plots were harvested Oct.12, 2006.

Results:

Treatment Variables		2002	2003	2004	2005	2006
N Rate (lb/ac)	P ₂ O ₅ Rate (lb/ac)	Yield (bu/ac)	Yield (bu/ac)	Yield (bu/ac)	Yield (bu/ac)	Yield (bu/ac)
0	0 check	143 a	221 a	151 c	140 c	146 d
	20	136 a	221 a	156 c	148 bc	156 cd
	40	143 a	233 a	180 b	163 b	166 c
120	0	138 a	226 a	220 a	215 a	199 b
	20	134 a	225 a	218 a	233 a	228 a
	40	137 a	224 a	221 a	222 a	222 a
	80	130 a	223 a	225 a	229 a	225 a
220	0	138 a	229 a	218 a	219 a	203 b
	20	132 a	223 a	228 a	227 a	225 a
	40	126 a	224 a	225 a	226 a	228 a
	80	126 a	225 a	228 a	230 a	236 a
	120	124 a	219 a	223 a	230 a	231 a

Values with the same letter are not significantly different at P=0.05
Yields in 2002 were affected by heavy spider-mite activity

Discussion:

Initial 8-inch surface soil test values in March, 2002 confirmed the presence of low P levels (10.5 ppm, Bray1-P) at this site. Other nutrient levels were in adequate supply (366 ppm K, 0.99 ppm Zn). Organic matter (4.1% OM) and residual nitrate (18.2 ppm NO₃-N) both tested high; a result of the former pasture ground being tilled in the fall of 2001. The high values of OM and N probably contributed to the lack of yield response to added P through the first 2 years of this study. In years 3 and 4, there was some response to P, but statistically significant only in plots with no added N. Finally in year 5 (2006), there was a significant yield response to added P fertilizer at all levels of added N. Twenty lb P₂O₅/acre has been adequate to optimize yield potential.

Soil samples will be collected in the spring of 2007 to examine cumulative effects on soil P concentrations.