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CRIMSON CLOVER RESPONSE TO RESIDUAL AND APPLIED PHOSPHORUS

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Background. Soil scientists and agronomists generally agreed that liming acid soils makes residual-soil phosphorus (P) more available to plants. Phosphorus added to a strongly acid soil is not as effective at increasing production of clovers as it is when applied to a well-limed soil. A test for P on a strongly acid soil is not effective for prediction of the P fertilizer needs of this soil after it has been properly limed. The most efficient approach is to lime the soil, allow the limestone to react for several months, then test the soil to determine the P needs of the crop. Data in this report are from research on clover response to residual and applied phosphorus at varying soil pH levels. This research will be used to calibrate the soil test to predict the needs of ryegrass on limed, acid soils.

Yield data were collected from three different soils over a two-year period. These soils had been limed, then fertilized in 1992, 1993, 1994, and in 1995 with increasing rates of P for alfalfa production. Annual applied rates of P as P_2O_5 were zero, 50, 100, and 150 pounds per acre. In fall of 1996, the original 10 by 20 foot plots were split. One-half of each original plot was re-fertilized annually with 80 pounds of P_2O_5 per acre. Four years of ryegrass production followed the alfalfa before beginning the studies with crimson clover. Data from crimson clover growth in these P-treated plots were collected in 2000 and 2001. An area approximating 5 x 8 ft was harvested and the weight per area harvested was projected to yield per acre. Soil samples from the six-inch depth were collected each year. Soils were analyzed for P by the ammonium acetate-acetic acid-EDTA method used in state-operated soil testing laboratories in Texas.

Research Findings. Data in Table 1 represent crimson clover response to residual P and to re-applied P on a Keithville-Sawtown soil complex for two years, and on a Bowie and a Cuthbert soil for one season each. In 2000, clover yields were not significantly different on the residual P plots even with a significant increase in residual P levels in these soils. A significant clover yield increase occurred on plots that received the re-applied P on the Keithville-Sawtown soil complex. In 2001, the increasing levels of residual soil P significantly increased clover yield on the Keithville-Sawtown soil. Data indicate that in the range of about 13 to 19 ppm residual soil P, clover yields were optimized for that single harvest that was made in 2001. Re-applied P produced a significant yield response for similar soil test P levels. Clover yield on the Cuthbert soil was not significantly affected by increasing soil test P levels except in the plots that received the re-applied P. An example of the response of crimson clover to fertilizer phosphorus in shown in Figure 1 at the bottom of the next page.

Application. These data will be used in the continuing effort to calibrate the soil test for prediction of crop response to residual and applied P.

Table 1. Crimson clover dry matter yield and soil P response to previous phosphorus treatment and to annually reapplied phosphorus fertilizer.

Original	----------Year 2000----------				----------Year 2001----------			
P_2O_5	-----Bowie soil-----		Keithville-Sawtown		Keithville-Sawtown		----Cuthbert soil---	
rate†	Yield	Soil P	Yield	Soil P	Yield	Soil P	Yield	Soil P
lb/ac	lb/ac	ppm	lb/ac	ppm	lb/ac	ppm	lb/ac	ppm
0	4998 ns	12.6 ab	4583 ns	4.3 c	1391 b	4.6 b	3138ns	11.8 c
50	5776	9.2 b	5115	7.2 c	2043 ab	6.9 b	3899	20.2 bc
100	5047	19.1 ab	5450	14.0 b	2524 a	12.8 ab	3859	25.6 b
150	5140	23.3 a	6100	20.9 a	2572 a	18.9 a	3882	39.9 a
Reappli-ed P_2O_5								
0	5159 ns	14.0 ns	4495 b	8.7 b	1641 b	6.2 b	3502 b	13.9 b
80	5321	18.1	6129 a	14.5 a	2624 a	15.4 a	3887 a	34.9 a
R^2	0.56	0.89	0.85	0.96	0.87	0.95	0.86	0.96
C.V.	13.7	31.6	16.5	22.0	24.1	30.9	10.0	22.0

† Rates of P_2O_5 applied in 1993, 1994, 1995, and 1996 after which one-half of each plot received no additional phosphorus, the other half was annually fertilized with 80 lb of P_2O_5 per acre.

Figure 1. Crimson clover response to annual application of 80 lb of P_2O_5/acre (at left) on a plot that had received no fertilizer phosphorus in past years compared to clover at right that still had not received phosphorus fertilizer. The soil test P level in the plot at the right was very low.