

PUBLICATIONS

2004

RESIDUAL SOIL PHOSPHORUS AFTER FERTILIZING CRIMSON CLOVER-COASTAL BERMUDAGRASS WITH BROILER LITTER AND NITROGEN

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Background. Broiler litter is an excellent plant nutrient source for East Texas pastures because it contains all the nutrients necessary for plant growth, adds organic matter that improves soil quality, and reduces soil acidity. On average, broiler litter contains equal amounts of nitrogen (N) and phosphorus (P) as P_2O_5 (the form of phosphorus that is used in the fertilizer industry). Unfortunately most forages require only 1 lb phosphorus as P_2O_5 for every 4 lb N. When only broiler litter is used as a plant nutrient source for pastures, the excess P builds up over time. If some of the excess P moves into surface water through runoff during heavy rainfall, it can cause environmental problems. Elevated water P levels contribute to growth of algae and aquatic weeds. When this plant material dies and decays the oxygen level drops causing fish kills. Excessive algae growth can also cause water to have a bad odor and taste. Broiler litter was applied at 4 tons/acre in April 1999 and 2000 and at 2 tons/acre in April 2001 and 2002 to a crimson clover-Coastal bermudagrass sod. Fifty lb N/acre were applied 1 to 3 times during the year in April, June, and/or July. There were 4 replications of each treatment. After 4 years of applying broiler litter, six 1 in. diameter soil cores were taken to a 24 in. depth from each plot. Soil cores were divided into 0-6, 6-12, and 12-24 in. depths and similar depths of the 6 core samples combined for analysis.

Research Findings. Because P moves very slowly in soil most of the excess P accumulates near the soil surface. Soil P levels in the 0-6 in. depth were about 3 times higher than at the 6-12 in. depth (Table 1). The lowest soil P levels at the 0-6 and 6-12 in. depths were in the treatment that did not receive broiler litter or nitrogen fertilizer. At the 0-6 in. depth none of the N fertilizer treatments had lower soil P levels than the broiler litter treatment with no N. At the 6-12 in. depth, the July and April-June-July treatments did have lower soil P levels than the broiler litter only treatment. There was little difference in soil P levels at the 12-24 in. depth because the excess P had not moved that deep after 4 years of applying broiler litter to clover-bermudagrass. Combining N fertilizer with broiler litter did little to reduce soil P levels. This agrees with the yield and phosphorus uptake data reported in this handout. These residual soil P levels are similar to the ryegrass-bermudagrass study when N fertilizer was added with broiler litter, but substantially less than the broiler litter, no N treatment.

Application. The low residual soil P levels observed in this study when broiler litter was applied to crimson clover-bermudagrass indicates that using clovers is as effective as applying N fertilizer to ryegrass-bermudagrass at reducing soil P.

Table 1. Soil phosphorus levels at 0-6, 6-12, and 12-24 in. depths after fertilizing Coastal bermudagrass overseeded with crimson clover with broiler litter for 4 years and 50 lb N/acre from 1 to 3 times each year.

50 lb N/acre/month	Depth (in.)		
	0-6	6-12	12-24
-----P (ppm)-----			
No BL† or N	9.2 c‡	3.0 d	2.4 b
BL, no N	26.7 ab	10.5 a	3.3 ab
BL, Apr.	23.5 ab	9.1 ab	3.8 ab
BL, June	25.9 ab	9.8 a	3.4 ab
BL, July	19.3 b	6.2 c	4.1 a
BL, Apr., June	31.4 a	10.2 a	3.8 a
BL, Apr., July	23.3 ab	8.4 a-c	2.7 ab
BL, June, July	26.7 ab	9.7 a	3.6 ab
BL, Apr., June, July	29.8 a	6.7 bc	3.5 ab

†Broiler litter.

‡Values in a column followed by the same letter are not significantly different at the 0.05 level, Fisher's Protected LSD.