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PHOSPHORUS UPTAKE BY CRIMSON CLOVER-BERMUDAGRASS FERTILIZED WITH BROILER LITTER AND NITROGEN FERTILIZER

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Background. A disadvantage of only using broiler litter as a plant nutrient source is that the nitrogen(N):phosphorus(P) nutrient ratio in broiler litter does not match forage crop requirements. Although it can vary widely, the average N-P_2O_5-K_2O ratio in broiler litter in East Texas is about 4:4:3. Because about 25% of the N in broiler litter is lost, the available nutrient ratio is about 3:4:3. The N:P_2O_5:K_2O uptake ratio is 4:1:3 for Coastal bermudagrass and 4:1:4 for annual ryegrass to reach 90% of maximum yield. This difference in nutrients applied vs. crop needs results in the soil buildup of excess nutrients, especially P. Other research at Overton has shown that applying commercial N fertilizer in combination with broiler litter increased yield and P uptake by an annual ryegrass-Coastal bermudagrass pasture. A similar study was carried out substituting Dixie crimson clover for annual ryegrass to determine if the clover could fix sufficient N from the air to eliminate the need for N fertilizer. Broiler litter was applied in late April after the last clover harvest, at 4 tons/acre in 1999 and 2000 and 2 tons/acre in 2001 and 2002. Fifty lb of N/acre were applied from 1 to 3 times in April, June, and/or July each year. Forage yield is reported in another paper in this handout. Results from 2001 and 2002 will be presented in this paper since the 1999 and 2000 data were reported in the 2002 Overton Field Day handout.

Research Findings. Little P was removed by the control treatment (no broiler litter or N fertilizer) either year. In 2001 (Table 1), there was no difference in P uptake by bermudagrass or the total P uptake of bermudagrass and crimson clover. This is in agreement with the yield data since there was no difference in yield among treatments fertilized with broiler litter. Phosphorus uptake by crimson clover in the April-June-July treatment was only 2 lb/acre higher than the broiler litter treatment with no N. In 2002, there were small differences in P uptake by bermudagrass or clover among treatments fertilized with broiler litter (Table 2). None of the N fertilizer treatments increased P uptake over the broiler litter alone without N. Although applying N fertilizer increased forage yield 1 out of 2 years, it did not enhance P uptake. Crimson clover appears to have provided the bermudagrass with sufficient nitrogen that applying nitrogen fertilizer did not increase yield enough to increase phosphorus uptake.

Application. When fertilizing warm-season perennial grasses like bermudagrass with broiler litter, overseeding with crimson clover was as effective at removing excess P as overseeding with annual ryegrass and applying 100 lb N/acre. It is important that the broiler litter

be applied in late April to May after the clover growing period. If broiler litter is applied during the clover growing period, the clover will use N from the broiler litter instead of from the air. Therefore the amount of N contributed by the clover from the air through N_2-fixation will be reduced.

Table 1. Phosphorus uptake of Dixie crimson clover and Coastal bermudagrass fertilized with 2 tons/acre of broiler litter in April 2001 and 50 lb N/acre one to three times during the year.

50 lb N/acre/month	Bermuda	Crimson	Total
	P (lb/acre)		
No BL† or N	2.9 b‡	0.9 c	3.8 b
BL, no N	23.2 a	9.9 b	33.1 a
BL, Apr.	21.6 a	10.5 ab	32.1 a
BL, June	22.3 a	9.8 b	32.1 a
BL, July	20.3 a	10.1 ab	30.4 a
BL, Apr., June	22.5 a	11.3 ab	33.8 a
BL, Apr., July	21.6 a	11.2 ab	32.9 a
BL, June, July	21.7 a	10.1 ab	31.8 a
BL, Apr., June, July	21.6 a	11.8 a	33.4 a

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

Table 2. Phosphorus uptake of Dixie crimson clover and Coastal bermudagrass fertilized with 2 tons/acre of broiler litter in April 2002 and 50 lb N/acre one to three times during the year.

50 lb N/acre/month	Bermuda	Crimson	Total
	P (lb/acre)		
No BL or N†	13.3 c‡	8.4 c	21.6 c
BL, no N	27.2 a	11.8 ab	39.0 a
BL, Apr.	22.0 b	11.6 ab	33.6 b
BL, June	22.2 b	12.1 ab	34.4 b
BL, July	23.7 ab	12.0 ab	35.7 ab
BL, Apr., June	23.6 ab	11.5 ab	35.0 b
BL, Apr., July	26.1 a	12.8 a	38.9 a
BL, June, July	23.7 ab	11.4 ab	35.2 b
BL, Apr., June, July	22.3 b	10.9 b	33.2 b

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