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

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Background. A disadvantage of using broiler litter as a plant nutrient source is that the 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 volatilizes and is lost, the available nutrient ratio is about 3:4:3. The N:P_2O_5:K_2O uptake ratio is 4:1:3.3 for Coastal bermudagrass and 4.4:1:4.3 for annual ryegrass to reach 90% of maximum yield. This difference in nutrients applied vs. crop needs results in the use of all the N but not P and K. With continued annual broiler litter applications the P remaining in the soil accumulates over time. Phosphorus can and does move in to rivers and lakes through runoff and erosion and cause environmental problems. Other research at Overton has shown that applying commercial N fertilizer in combination with annual broiler litter applications increased P uptake by an annual ryegrass-Coastal bermudagrass pasture. A similar study was carried out substituting crimson clover for annual ryegrass and applying fifty pounds of N/acre from 1 to 3 times a year in April, June, and/or July in 1999 to the Coastal bermudagrass. Broiler litter was applied at 4 tons/acre in late April after the last clover harvest in 1999. The theory was that the clover would fix enough N from the air and eliminate the need for commercial N fertilizer. This apparently occurred since applying N fertilizer did not increase the annual combined yield of bermudagrass and clover (yields reported in another paper in this publication). A sample of the harvested forage from each plot was analyzed for P and K to calculate P and K uptake.

Research Findings. Phosphorus uptake by bermudagrass ranged from 17 to 24 lb/acre and was directly related to yield. The higher the yield the more P was removed. Treatments removing the most P were the control with no N applied, applying N in April and June, and in April and July. These same treatments had the highest forage production. Phosphorus uptake by clover only ranged from 6.9 to 10.2 lb/acre. Clover removed the least P when N was applied in April and July, and April and June. There was no statistical difference in total (bermudagrass and clover) P removed among the N treatments but the control did remove the largest amount of P at 33.1 lb/acre. The clover appears to have provided sufficient N to the bermudagrass since there was no yield response to N fertilizer. There was no difference among treatments for K uptake by bermudagrass, clover, or bermudagrass + clover combined (Table 2).

Application. Phosphorus and potassium uptake by Coastal bermudagrass was not influenced by N fertilization. Overseeding bermudagrass fertilized with broiler litter with a clover was as effective as applying N fertilizer to remove excess P and K from the soil.

Table 1. Bermudagrass, clover and total phosphorus uptake by nitrogen treatment for 1999-2000 growing season.

	Bermudagrass	Clover	Total
	lb P/acre		
50 lb N/month			
None	24.1 a†	9.1 ab	33.1 a
April	20.1 bc	9.7 a	29.8 a
June	18.5 bc	8.8 a-c	27.3 a
July	20.4 bc	10.2 a	30.6 a
April, June	21.2 ab	7.2 bc	28.3 a
April, July	20.8 a-c	6.9 c	27.7 a
June, July	17.2 c	9.6 a	26.8 a
April, June, July	18.7 bc	8.3 a-c	27.1 a

†Values within a column followed by the same letter are not significantly different at 0.05 level.

Table 2. Bermudagrass, clover and total potassium uptake by nitrogen treatment for 1999-2000 growing season.

	Bermudagrass	Clover	Total
	lb K/acre		
50 lb N/month			
None	185	52	237
April	167	43	210
June	152	45	198
July	161	45	206
April, June	167	37	204
April, July	175	37	212
June, July	154	44	197
April, June, July	162	44	206