

**NUTRIENT UPTAKE BY COASTAL BERMUDAGRASS  
AND AN ANNUAL RYEGRASS-COASTAL BERMUDAGRASS  
MIXTURE FERTILIZED WITH FOUR RATES OF BROILER LITTER**

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**Background.** An estimated 350,000 tons of broiler litter are generated by the broiler industry each year in northeast Texas. Broiler litter is particularly well suited as a plant nutrient source because it is relatively dry (75 to 80% dry matter), is essentially totally collectable, and has a higher nutrient content than other animal manures. Broiler litter is good for the low fertility, sandy, acid soils in East Texas because it contains all the essential plant nutrients organic matter to improve water and nutrient holding capacity, calcium that helps prevent a drop in soil pH, and can be lower cost than commercial fertilizer. Data are reported for the second year of a 3-year study where broiler litter was applied to Coastal bermudagrass and an annual ryegrass - Coastal bermudagrass mixture. Broiler litter rates of 0, 3, 6, and 12 tons/acre were split into four equal applications applied in October 1994, January, April, and July 1995.

**Research Findings.** The amount of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) applied to, and removed by, the bermudagrass and the annual ryegrass-bermudagrass systems are reported in Table 1. The percent utilization, or uptake, of N, P, and K applied in the broiler litter was always greater for the ryegrass-bermudagrass system. This was due to the higher forage production of that system. Concentration of N, P, and K in the forage increased as broiler litter rate increased (data not shown). Nitrogen utilization was about 40% for the bermudagrass system and about 50% for the ryegrass-bermudagrass system. From 20 to 25% of the N in broiler litter applied to a pasture surface can volatilize and is lost. Percent utilization of the remaining 75 to 80% N was similar to commercial N fertilizer. Utilization of the P applied was very low ranging from about 20 to 30%. This points out one of the major problems associated with using broiler litter. The amount of P as  $P_2O_5$  in broiler litter is similar to the amount of N, but warm-season perennial grasses take up only 1 lb P for every 4 lb N. Therefore, the excess P builds up in the soil over time. Both pasture systems removed more pounds of K than N at all broiler litter rates. For maximum growth, bermudagrass requires about 3 lb/K for every 4 lb N. These data show bermudagrass and ryegrass will remove more K than required if available. The ryegrass-bermudagrass system utilized a higher percentage of the Ca and Mg than the bermudagrass system only at the 3 ton rate. Calcium utilization was very low ranging from 12 to 20%. Buildup of Ca in the soil has no harmful effects and may be beneficial by maintaining or slightly raising soil pH.

**Application.** Fertilizing pastures with broiler litter to meet the N requirements will result in excess P, K, Mg, and Ca. This results in poor utilization of those nutrients and a lower economic value for the litter since only a portion of the nutrients in the litter is used by the crop. Since N becomes the limiting nutrient for growth, adding N from commercial fertilizer or legumes should result in higher utilization of the other nutrients. Broiler litter could be applied once a year in the spring followed by commercial N applications later in the growing season.

Table 1. Nutrient removal by Coastal bermudagrass and an annual ryegrass-Coastal bermudagrass mixture fertilized with four rates of broiler litter in 1995.

Pasture System	Broiler litter (tons/acre)			
	0	3	6	12
	lb N/acre (% utilization)			
Applied	0.0	153.7	307.4	614.8
Bermudagrass	40.9	95.6 (36)	159.8 (39)	284.8 (40)
Ryegrass-Berm.	71.1	145.5 (48)	226.3 (50)	401.6 (54)
	lb P/acre (% utilization)			
Applied	0.0	69.6	139.2	278.4
Bermudagrass	10.4	26.0 (22)	41.4 (22)	57.6 (17)
Ryegrass-Berm.	18.0	42.2 (35)	60.5 (31)	97.4 (29)
	lb K/acre (% utilization)			
Applied	0.0	106.3	212.6	425.2
Bermudagrass	54.0	127.1 (69)	213.9 (75)	352.6 (70)
Ryegrass-Berm.	93.1	184.9 (86)	291.2 (93)	504.9 (97)
	lb Ca/acre (% utilization)			
Applied	0.0	85.5	171.0	342.0
Bermudagrass	16.8	27.7 (13)	44.7 (16)	60.4 (13)
Ryegrass-Berm.	21.5	39.0 (20)	42.8 (12)	72.2 (15)
	lb Mg/acre (% utilization)			
Applied	0.0	21.7	43.4	86.8
Bermudagrass	8.4	17.8 (43)	27.3 (44)	45.4 (43)
Ryegrass-Berm.	10.6	22.1 (53)	29.4 (43)	52.5 (48)