YIELD RESPONSE OF ANNUAL RYEGRASS-COASTAL BERMUDAGRASS TO BROILER LITTER PLUS NITROGEN FERTILIZER

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Background. An estimated 600,000 tons of broiler litter are generated by the broiler industry each year in Texas. Broiler litter is particularly well suited as a plant nutrient source for pastures 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 1) all the nutrients essential for plant growth, 2) organic matter to improve water and nutrient holding capacity of the soil, 3) calcium that helps reduce soil acidity, and 4) it can be lower in cost than commercial fertilizer. If broiler litter is applied at a rate to meet the nitrogen (N) requirements of the pasture only about 25% of the phosphorus (P) and about 60% of the potassium (K) is taken up by forges. The unused nutrients build up in the soil over time or are lost. Buildup of soil P is of particular concern since it can cause water quality problems if it moves into surface water. Since the N is used up, applying additional N as fertilizer should stimulate plant growth and take up the excess nutrients in the soil from the broiler litter. Broiler litter was applied at 4 tons/acre in October 1998 and 1999 and 2 tons/acre in October 2000 and 2001 to Coastal bermudagrass overseeded with annual ryegrass each fall. Fifty lb N/acre were applied 1, 2, 3, or 4 times during the year in December, March, May, and/or July. The study was harvested five times each year. The 1999 and 2000 results were reported in the 2002 Overton Field Day Report. Results from 2001 and 2002 will be presented in this report.

Research Findings. The benefit of applying broiler litter can be determined by comparing the no broiler litter or N fertilizer with the broiler litter but no N fertilizer treatments (Table 1). The broiler litter had a greater impact on ryegrass than bermudagrass production because it was applied in October at the beginning of the ryegrass growing season. Broiler litter alone increased ryegrass yields 260% in 2001 and 600% in 2002 and bermudagrass yields about 60% in 2001 and 35% in 2002. Ryegrass accounted for about 20 to 25% of the total yield in the broiler litter only treatment. When 4 tons/acre of broiler litter were applied in October 1999 and 2000, ryegrass accounted for about 50% the total yield.

Nitrogen fertilizer applied in December and/or March increased ryegrass yields and when applied in May and/or July it increased bermudagrass yields. When one N application was made, application time had little effect on total yield. However, a December or March application increased ryegrass yields which would be of greater value than bermudagrass yield because it

occurs during the livestock winter feeding period and has higher nutritive value than bermudagrass. If two N applications would be made, March and May are recommended since N would be applied during the peak ryegrass and bermudagrass growing periods. In 2001, maximum yield occurred when 100 lb N/acre were applied (50 lb N in March and May or May and July). In 2002, maximum yield was reached when 150 lb N/acre were applied (50 lb N/acre in March, May, and July). Because the study was harvested mechanically, these results simulate a hay harvesting scenario. If the ryegrass was grazed or if both ryegrass and bermudagrass were grazed, there would be a recycling of all nutrients in the urine and feces. Under grazing there would probably be no advantage to applying more than 50 lb N/acre. Results from this study shows that forage yields can be increased by combining additional N fertilizer with broiler litter.

Application. Using only broiler litter to fertilize pastures results in excess P, K, and other nutrients not being used. By adding additional N fertilizer, these excess nutrients are used, getting more value out of a ton of broiler litter. Utilizing the excess P also avoids potential environmental problems from P entering surface water. Fertilizing ryegrass overseeded on warm-season grass pastures with 2 to 4 tons/acre of broiler litter in autumn and applying N once during the ryegrass growing season or twice in March and May would result in the most economical use of broiler litter.

Table 1. Yield of ryegrass-Coastal bermudagrass when fertilized with 2 tons/acre of broiler litter in October 2000 and 2001 and 50 lb/acre of nitrogen fertilizer in certain months during the growing season.

50 lb N/acre	2001			2002		
	Ryegrass	Bermuda	Total	Ryegrass	Bermuda	Total
	dry matter (lb/acre)					
No BL† or N	520 e‡	3433 g	3952 e	325 f	4225 f	4550 g
BL, no N	1369 d	5480 f	6849 d	1928 e	5692 e	7620 f
Dec.	2396 ab	5525 f	7921 cd	2495 d	6511 de	9006 e
Mar.	1847 b-d	5711 ef	7558 cd	3039 c	6072 de	9111 de
May	1380 d	7140 b-d	8520 c	2022 e	8108 b	10129 b-d
July	1513 cd	6629 c-e	8142 c	2120 de	7622 bc	9742 c-e
Dec., Mar.	2239 ab	6399 d-f	8638 bc	3548 ab	6810 cd	10358 bc
May, July	1385 d	8239 a	9624 ab	1780 e	9132 a	10912 b
Mar., May	2060 bc	8314 a	10373 a	3201 bc	7716 bc	10917 b
Mar., May, July	2223 ab	7744 ab	9967 ab	3419 a-c	9637 a	13056 a
Dec., Mar., May, July	2734 a	7587 a-c	10320 a	3672 a	9508 a	13180 a

†Broiler litter.

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