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RESPONSE OF TIFTON 85 BERMUDAGRASS TO RESIDUAL AND APPLIED PHOSPHORUS

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Background. 'Tifton 85' bermudagrass first released to certified growers in 1992 is reported to have better nutritive value and greater yield potential than does 'Coastal' bermudagrass. Data on response of Tifton 85 bermudagrass to applied plant nutrients is limited. Forage growers increasingly are planting test meadows of Tifton 85 bermudagrass. This field research, under rain-fed conditions, was designed to evaluate the effects of residual levels of soil phosphorus (P) from applications made several years earlier and to one spring-applied rate of P.

This Darco loamy fine sand was initially fertilized with 0, 50, 100, and 150 lbs of P_2O_5 in summer 1992 in preparation for planting alfalfa in established bermudagrass. The same P rates were re-applied for three years of alfalfa and one season of ryegrass/bermudagrass production, after which each 10 x 20 ft plot was divided into 10 x 10 ft subplots. From 1997 to the present, one designated subplot in each of the main plots annually received 80 lb/acre additional P. The alternate subplot received no additional P since 1997. All plots annually were treated with adequate levels of nitrogen, potassium, sulfur, and magnesium to prevent deficiencies of these nutrients. Nitrogen rates were split and applied for each grass regrowth. Soil samples collected from the 0-6-inch surface depth in 2001 were analyzed for extractable P using the ammonium acetate-EDTA procedure published by Hons et al. (1990) in Soil Science 149(5):249-256.

Research Findings. Extractable soil P levels in samples collected in 2001 were 3.3, 4.3, 8.5, and 14.3 ppm, respectively, as the mid-1990's annual P application rates were increased from 0, to 50, 100, and 150 lb P_2O_5/acre. No additional P was applied to these major plots since 1996. In the subplots that received 0 or 80 lb/acre additional P_2O_5, extractable soil P levels were 5.3 or 9.9 ppm, respectively. These data indicate that soil P levels raised by application of 100 or 150 lb/acre rates of P_2O_5 for five years are no longer adequate for optimum grass production. Annual application of an additional 80 lb of P_2O_5/acre to these plots maintained P levels at only 9.9 ppm in this Darco soil continuously cropped with clover/bermudagrass or ryegrass/bermudagrass after discontinuing the 0 -150 lb/acre rates of P_2O_5.

Yield data from 2002, a low rainfall season, showed no statistically significant differences in dry matter due to residual P levels in the soil or to the annual 80 lb/acre rate of P_2O_5. Yield data collected from harvests in 2003, a more abundant rainfall year, show statistically different dry matter production levels as the soil residual P levels were increased due to the original 0 to

150 lb/acre rates of P_2O_5 (Table 1). Statistical evaluation by analysis of variance followed by testing pairwise comparisons using the Newman-Keuls test indicated that yields were increased

Table 1. Tifton 85 bermudagrass dry matter yield response to residual and re-applied phosphorus.

P_2O_5 rate[†]	*Soil test P in 2001*	*Harvest date*				*Total yield 2003*
		05/22/03	06/27/03	08/04/03	09/11/03	
lb/acre	ppm	lb/acre				
0	3.3 ns	2,548 b[‡]	2,947 b	2,487 b	1,088 ns	9,070 b
50	4.3 ns	2,846 ab	3,286 b	2,869 b	1,102 ns	10,102 b
100	8.5 ns	2,859 ab	3,189 b	3,295 a	1,099 ns	10,442 b
150	14.3 ns	3,106 a	3,778 a	3,563 a	1,311 ns	11,758 a
P_2O_5[§], lb/ac						
0	5.3 ns	2,535 b	2,701 b	2,525 b	957 b	8,719 b
80	9.9 ns	3,144 a	3,898 a	3,581 a	1,344 a	11,967 a
R^2	0.98	0.93	0.90	0.88	0.76	0.94
C.V.	12.6	8.6	12.9	14.9	22.6	8.3

[†] Rate of P_2O_5 applied five successive years with no additional P applied in the past five years.
[‡] Yields followed by a dissimilar letter are significantly different statistically (p = 0.05).
[§] Rates of fertilizer P annually applied to specific split plots since 1997.

by increasing residual soil P levels, especially at the 14.3-ppm P level compared to the 3.3-ppm soil P level. Dry matter yield was not statistically different in the Sept. harvest due to the dry conditions that normally occur during Aug. to mid-Sept. Total yield was significantly different only at the 14.3-ppm soil P level. Phosphorus annually applied at the 80 lb P_2O_5/acre rate significantly increased bermudagrass dry matter yield compared to split plots that received no additional P since 1997. Yields were related to residual soil P levels or to reapplied P as indicated by the R^2 of 0.93, but the relationship declined as the season progressed.

Application. These results indicate the long-term effect of increased soil P levels on yield response. The P level in the soil can be increased by annual applications exceeding 100 lb P_2O_5 for several years or by annual additions of high-P broiler litter. Once the soil P level has been increased to the point where the soil test predicts no additional P is needed, only a maintenance level of P need be applied to maintain the soil test level. Alternatively, once the soil P level has increased to the high level, if the price of P suddenly increases one year and is expected to decline later, fertilization with P can be omitted for one or more years, followed by annual soil testing to determine when additional P is needed.