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TREATMENT AND SEASONAL EFFECTS ON ALFALFA CRUDE PROTEIN CONTENT

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Background. Excellent-quality alfalfa can be grown on the acid soils of East Texas. Research conducted over the last eight years at Texas A&M-Overton has shown that yields approaching 6 tons/ac are possible when alfalfa is no-till planted on well-drained, adequately limed, and properly fertilized acid soils. Economic evaluation of farming practices required to produce these yield levels has shown that alfalfa is economical even in the seedling year. Data on quality of this alfalfa were obtained during the fourth, fifth, and sixth years post-establishment on a Darco loamy fine sand. 'Alfagraze' alfalfa was drilled into bermudagrass in rows spaced 9, 18, 27, and 36 inches apart in major plots that measured 50 by 20 feet. Over the six-year period, sub-plots (10' x 20') were fertilized with nitrogen (N) rates of 0, 25, 50, 75, and 100 lb/ac after each harvest. Additional ECCE 72 limestone was applied to the N plots at 0, 0.5, 1.0, 1.5, and 2.0 tons/ac, respectively, on 5 Oct. 1994. One ton of ECCE 72 limestone/ac was applied to all plots on 28 Sept. 1995. Alfalfa was harvested at 10% bloom and forage was sampled for dry matter and protein analysis. Alfalfa was fertilized as shown in Table 1.

Table 1. Fertilizer history (lb/ac) for the fourth through sixth years of alfalfa.

Date	P_2O_5	K_2O	Mg	S	B	Cu	Zn	Mo
8-2-93		100			2			
3-14-94								0.084
6-7-94	72	150	19	33	1.25	0.6	0.75	
10-12-94		150	22	45	2			
4-28-95		150	22	45	2			
3-4-96	72	150	19	33	1.25	0.6	0.75	

Research Findings. Fertilizer N applied to the alfalfa-bermudagrass mixture had no effect on crude protein of the alfalfa in years 4-6 (Table 2). This indicates that the alfalfa was adequately nodulated for symbiotic N-fixation. Row spacing had minimal effect on protein of alfalfa. The greatest change in alfalfa protein occurred in mid- to late-season. As expected, the earliest harvest had the highest protein content. Late-season alfalfa contained about 20% crude protein. This decline in protein and overall nutritive value of alfalfa during the summer months follows a predictable trend created by length of day, temperature, drought, and other climatic conditions that affect physiological function.

Application. Alfalfa had the highest protein in early spring-early summer. During periods of highest protein, however, climatic conditions in East Texas may not be favorable for curing hay. Other alternative methods of forage utilization may be necessary for the first couple of potential harvest dates (silage, graze, green chop). Although nutritive value declined 20 to 30% with season and maturation, the lowest quality alfalfa harvested (20% protein) was more than adequate to meet nutritive requirements for recreational livestock, beef, dairy, or other domestic-exotic livestock.

Table 2. Crude protein percentage in alfalfa as affected by nitrogen applied for Coastal bermudagrass production, row spacing of alfalfa, and harvest in 1994, 1995, and 1996.

Treatment	N rate	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Harvest 6
1994	lb/ac	----------%----------					
N_0	0	27.24 a†	26.66 ns	22.36 ns	21.04 a	19.98 ns	20.13 ns
N_1	25	26.52 a	28.21	24.19	18.75 b	20.63	19.87
N_2	50	28.31 a	27.24	25.65	19.29 ab	19.92	20.63
N_3	75	27.26 a	34.93	25.34	20.12 ab	19.50	20.81
N_4	100	27.07 a	28.63	24.19	19.50 ab	20.54	20.78
	inches						
RS_1‡	9	27.94 a	28.04	25.27	19.79 a	20.36	20.77
RS_3	27	26.61 b	27.73	23.71	19.69 a	19.87	20.12
1995	N, lb/ac						
N_0	0	25.15 ns	23.17 ns	24.71 a	22.20 ns	21.83 ns	
N_1	25	24.96	22.88	25.31 a	22.86	22.87	
N_2	50	24.48	23.69	24.40 a	22.45	22.29	
N_3	75	24.76	23.59	24.50 a	22.08	22.36	
N_4	100	24.28	24.11	25.65 a	21.86	23.13	
	inches						
RS_1	9	24.87	23.70	25.93 a	21.97	22.94	
RS_3	27	24.58	23.30	23.89 b	22.61	22.04	
1996	N, lb/ac						
N_0	0	29.89 ns	21.74 ns	23.69 ns	26.66 a	21.67 ns	23.12 ns
N_1	25	29.42	20.68	23.71	27.38 a	22.29	23.34
N_2	50	30.08	21.77	22.18	27.30 a	20.40	24.03
N_3	75	27.93	20.50	22.05	28.11 a	21.85	23.29
N_4	100	30.02	21.11	24.52	27.19 a	21.89	24.08
	inches						
RS_1	9	29.68	20.94	23.02	28.06 a	21.29	22.81
RS_3	27	29.26	21.36	23.61	26.59 b	21.95	24.34

†Numbers followed by the same letter are not statistically different at alpha = 0.05.
‡RS_x refers to spacing between rows of alfalfa.