Performance of Steers as Influenced by Overseeding Annual Grasses and Clover into Tall Fescue

J.M. Phillips, A. H. Brown, Jr., W.C. Loe, R.W. Parham and R. L. Smith[1]

INTRODUCTION

Tall fescue *(Festuca arundinacea* Schreb.) is grown on approximately 809,400 ha in Arkansas. Its popularity as a forage is due to wide adaptation, ease of establishment, long productive season and tolerance to grazing, drought, poor drainage, pests and a wide range in soil pH (Burns and Chamblee, 1979). Many Arkansas livestock producers grow tall fescue in conjunction with a broiler litter operation and use the litter as an inexpensive fertilizer. Even though tall fescue is a popular forage grass among livestock producers in the southeastern United States, poor animal performance associated with the fungal endophyte *(Acremonium coenophialum* Morgan-Jones and Gams) is widespread (Stuedemann and Hoveland, 1988). Development of low-endophyte, tall fescue cultivars in recent years has improved steer performance at several locations in the southeastern United States (Read and Camp, 1986; Pedersen et al., 1986; Stuedemann et al., 1986; and Hoveland et al., 1983).

The objectives of this study were to evaluate the practice of diluting high- and low-endophyte tall fescue by overseeding with wheat *(Triticum aestivum* L.), annual ryegrass *(Lolium multflorum* Lam.) and white clover *(Trifolium repens* L.), while realizing that fall and early winter grazing will be sacrificed due to no-till overseeding. The criteria for evaluation were steer average daily gain (ADG), steer gain per hectare (SG/ha) and changes in pasture species composition over three 28-day grazing periods in the spring of the year.

METHODS

The study was conducted at the Southwest Research and Extension Center near Hope, Arkansas, on a Sawyer loam soil (fine-silty, siliceous, thermic Aquic Paleudults) (Hoelscher and Laurent, 1979). Three of the six 1.62-ha pastures had been established and maintained for many years as high-endophyte (HE) 80% 'Kentucky 31' tall fescue. Three other pastures containing low-endophyte (LE) (less than 5%) Kentucky 31 tall fescue were established in the fall of 1984 and spring of 1985. The LE pastures were not grazed for approximately one year after establishment to allow adequate root development. The pastures were overseeded with a Tye no-till drill on 25-cm spacing in the fall of 1985 and 1986. Pasture treatments were as follows: (1) LE tall fescue, (2) LE tall fescue overseeded with wheat and white clover, (3) LE tall fescue overseeded with wheat and annual ryegrass, (4) HE tall fescue, (5) HE tall fescue overseeded with wheat and white clover and (6) HE tall fescue overseeded with wheat and annual ryegrass.

'McNair 1003' wheat and 'Regal' ladino white clover were used in treatments two and five at seeding rates of 55 kg and 1.4 kg pure live seed (PLS)/ha, respectively. McNair 1003 wheat and 'Gulf annual ryegrass were used in treatments three and six at seeding rates of 27 kg and 9 kg of PLS/ha respectively. All pastures were fertilized with 56 kg/ha nitrogen as ammonium nitrate in mid-September of 1985 and 1986 and early March and mid-April of 1986 and 1987. Steers grazed the pastures for approximately 35 days in the fall of 1985 and 1986. All pastures were grazed for three consecutive 28-day periods in the spring of 1986 and 1987. No significant steer gain was obtained in either the fall of 1985 or 1986 on any pasture treatments; thus, no fall data will be presented.

Crossbred steers from other grazing experiments were weaned in the late summer of 1985 and 1986. Steers were dewormed with fenbendazole at weaning and grazed bermudagrass *[Cynodon dactylon* (L.) Pers.] pasture until fall, at which time they were wintered on bermudagrass hay. Grazing was initiated on 11 March 1986 and 25 February 1987, at which time all steers were dewormed with fenbendazole and weighed. Steers were weighed at the end of each of the three 28-day periods (Periods 1, 2 and

[1]Associate professor, Southwest Research and Extension Center, Hope, Arkansas; professor, Department of Animal and Poultry Sciences. University of Arkansas, Fayetteville, Arkansas; and Director, research specialist and research specialist, Southwest Research and Extension Center, Hope, Arkansas.

3 in succession). Pastures were stocked at 4.9 steers/ha throughout the trial periods, resulting in 1646 and 1371 kg of liveweight/ha in 1986 and 1987, respectively. All pastures were grazed continuously both years.

Pastures were periodically evaluated for species composition by randomly tossing a quadrat 20 times in each pasture on 19 March, 21 April and 6 June in 1986 and on 3 March and 13 May in 1987. Two investigators visually estimated the percentage composition in each quadrat on a ground area basis, and means were calculated for each pasture.

Data from the three-factor, factorial design experiment were analyzed by analysis of variance. Average daily gain was evaluated for year, pasture type and grazing effects, and SG/ha was evaluated for year and pasture type effects. Steers were used as replications within a given grazing period each year.

RESULTS AND DISCUSSION

Interactions among year, pasture type and period effects were observed for steer performance measurements; therefore, main-effect means are not given (Table 1). Average daily gain was greater in Period 1 in both years when overseeding was conducted in LE and HE tall fescue pastures as compared with fescue grown alone. Average daily gain for HE tall fescue tended to be enhanced by overseeding wheat-clover and wheat-ryegrass only in Period 1 of both years because selective grazing of wheat and ryegrass components in early spring nearly depleted the overseeded species by Periods 2 and 3 (Table 2). White clover contents were negligible in most cases. Average daily gain was less for Period 3 in 1986 than for Periods 1 and 2 in all pastures containing HE fescue (Table 1). Although forage availability was sufficient, tall fescue in these pastures became mature because of low consumption rates. Overseeding wheat-clover and wheat-ryegrass into LE fescue in 1986 roughly doubled ADG in Period 1 to 1.44 and 1.24 kg/head/day, respectively, compared with fescue alone. Average daily gain was generally acceptable (0.68 to 0.91 kg/head/day) for Periods 2 and 3 for the LE pastures, with and without overseeding. Steer gain per ha in 1986 tended to be higher with LE tall fescue overseeded with wheat-clover and wheat-ryegrass than with LE fescue alone. Overseeding HE fescue, however, did not significantly boost SG/ha in 1986.

Responses of steer performance to overseeding and grazing period in 1987 were similar to those in 1986 except that a low ADG (0.31 kg/head/day) was observed for LE tall fescue in Period 1 (Table 1).

Table 1. Steer performance as influenced by year, pasture type and grazing period on tall fescue pastures.

Year	Pasture type[1]	Average daily gain Per. 1[2]	Per. 2	Per. 3	Steer gain per ha
		------kg/head/day ----			kg/ha
1986	LE	0.67	0.97	0.69	321
	LE + W + C	1.44	0.94	0.92	455
	LE + W + R	1.24	0.63	0.96	395
	HE	0.49	*0.59*	0.32	199
	HE + W + C	*0.59*	0.64	0.32	205
	HE + W + R	0.77	0.57	0.30	226
1987	LE	0.31	0.85	0.95	291
	L E t W t C	1.39	1.34	0.79	485
	L E t W t R	1.50	1.31	0.83	502
	HE	1.07	1.11	0.57	372
	H E t W t C	1.10	1.15	0.41	367
	HE + W + R	1.47	1.28	0.49	448
LSD (0.01)			0.38		157

[1]LE = low-endophyte tall fescue, W = wheat, C = white clover, R = ryegrass, HE = high-endophyte tall fescue.
[2]Each of the three consecutive grazing periods consisted of 28 days. Grazing was initiated on 11 March and 25 February in 1986 and 1987, respectively. Per. = period.

Table 2. Forage composition changes during the grazing season in 1986 and 1907.

Pasture type[1]	Forage species[2]	1986 3/19	4/21	6/6	1987 3/3	5/13
LE	F	82	79	68	41	74
	B	16	19	28	*59*	26
	C	2	2	4	0	0
LE + W + C	F	28	44	30	51	71
	W	55	10	0	27	1
	B	14	39	*54*	14	19
	C	3	7	16	8	9
LE + W + R	F	28	35	42	19	18
	W	39	13	0	33	3
	R	28	15	0	25	18
	B	3	35	51	15	42
	C	2	2	7	8	19
HE	F	87	90	85	86	92
	B	11	9	13	11	3
	C	2	1	2	3	5
H E t W t C	F	77	97	88	70	88
	W	12	2	0	21	1
	B	10	1	9	7	8
	C	1	0	3	2	3
HE + W + R	F	67	92	91	39	69
	W	17	1	0	28	1
	R	11	2	0	*22*	16
	B	5	4	7	5	8
	C	0	1	2	6	6

[1]LE = low-endophyte tall fescue, W = wheat, C = white clover, R = ryegrass, HE = high-endophyte tall fescue.
[2]F = fescue, B = bermudagrass, C = white clover, W = wheat, R = ryegrass.

This pasture treatment contained only 41% tall fescue during Period 1 with bermudagrass comprising the remaining 59% ground cover (Table 2). All other pastures during Periods 1 and 2 produced ADGs that exceeded 1.06 kg/head/day. Although ADGs for pasture treatments containing LE fescue were again in an acceptable range (0.77 to 0.95 kg/head/day) in Period 3, ADGs for HE fescue treatments were lower in Period 3 than in Periods 1 and 2. The HE pastures was composed predominantly of mature tall fescue during Period 3 (Table 2), which, again, was apparently consumed at a low rate.

LITERATURE CITED

1. Burns, J.C., and D.C. Chamblee. 1979. Adaptation. In R.C. Buckner and L.P. Bush (eds.). Tall fescue. Agronomy 29:930.
2. Hoelscher, J.E., and G.D. Laurent. 1979. Soil survey of Hempstead County, Arkansas. United States Department of Agriculture, Soil Conservation Service, in cooperation with the Arkansas Agricultural Experiment Station.
3. Hoveland, C.S., S.P. Schmidt, C.C. King and E.M. Clark. 1983. Summer syndrome on tall fescue. Proceedings of the Tall Fescue Toxicosis Workshop, Atlanta, Georgia.
4. Pedersen, J.F., J.A. McGuire, S.P. Schmidt, C.C. King Jr., C.S. Hoveland and L.A. Smith. 1986. Steer performance as affected by tall fescue cultivar and level of Acremonium coenophialum. N. Z. J. Exp. Agric 14:307-312.
5. Read, J.C., and B.J. Camp. 1986. The effect of the fungal endophyte Acremonium coenophialum in tall fescue on animal performance, toxicity, and stand maintenance. Agron. J. 78:848-850.
6. Stuedemann, J.A., and C.S. Hoveland. 1988. Fescue endophyte: History and impact on animal agriculture. J. Prod. Agric 1:39-44.
7. Stuedemann, J.A., S.R. Wilkinson, D.P. Belesky, C.S. Hoveland, O.J. Devine, F.N. Thompson, H.C. McCampbell, W.E. Townsend and H. Ciordia 1986. Effect and level of fungus and nitrogen fertilization rate of KY31 tall fescue on steer performance. J. Anim. Sci 63 (Supplement 1):290-291.