Using Orchardgrass and Endophyte-Free Fescue Versus Endophyte-Infested Fescue Overseeded on Bermudagrass for Cow Herds: Three-Year Summary of Forage Characteristics

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Story in Brief

A trial was initiated in January 2000 to evaluate endophyte-free tall fescue (*Festuca arundinacea* Schreb.) or orchardgrass (*Dactylis glomerata* L.) overseeded into dormant common bermudagrass [*Cynodon dactylon* (L.) Pers.] sods for spring-calving cows. Two management systems were evaluated in an effort to help these cool-season grasses persist; these included rotations to new paddocks twice weekly or twice monthly. The grazing system x evaluation date interaction affected ($P = 0.08$) the percentage of desired cool-season species in each pasture. Generally, endophyte-free and endophyte-infested tall fescue remained stable over the entire study. Endophyte-free tall fescue managed with both a twice weekly and twice monthly rotation schedule had similar ($P > 0.1$) percentages of endophyte-free fescue on the June 2000 and November 2002 evaluation dates. In both endophyte-free systems, the percentage of fescue was greater than 55% on all dates after grazing was initiated. Through June of 2002, the orchardgrass systems maintained at least as high a percentage of orchardgrass as observed on the initial evaluation date (November 1999); however, the percentage of orchardgrass in pastures rotated twice monthly declined sharply ($P < 0.10$) from 34.1 to 14.7% between June and November 2002. We intend to monitor these pastures for at least one additional year prior to conducting a final summary because of annual variation.

Introduction

Many cow-calf enterprises in the Ozarks are maintained on pasture systems that are mixtures of endophyte-infested tall fescue and common bermudagrass. The association of the fungus *Neotyphodium coenophialum* with tall fescue has a positive effect on plant persistence, but the toxins produced by this fungus affect livestock performance negatively. Generally, other perennial cool-season grasses, such as endophyte-free tall fescue and orchardgrass, have persisted poorly when subjected to the same types of management as endophyte-infested fescue. A trial was initiated in January 2000 to evaluate the effectiveness of overseeding endophyte-free tall fescue or orchardgrass into dormant common bermudagrass sods for spring-calving cows. Two management systems were used in an effort to help these cool season grasses persist; these included rotations to new paddocks either twice weekly or twice monthly. Our objective was to compare these forage management systems with a typical mixture of endophyte-infested tall fescue and common bermudagrass that was managed on a twice monthly rotation schedule. This report includes data from the initial 3 years of the study.

Experimental Procedures

Establishment and Maintenance of Pastures. Nine 10-acre mixed-species pastures with a base sod of common bermudagrass were sprayed (Roundup Ultra®, Monsanto Co., St. Louis, MO) in the spring of 1998 to eliminate annual and perennial cool-season grasses. In the late-summer of 1998, cattle were used to remove summer growth of forage that was primarily bermudagrass. Cattle were used to remove available forage because many of the pastures were not suitable for haying.

In September and early October 1998, thirteen 10-acre pastures (including the nine pastures sprayed in the spring) were fertilized to soil test recommendations of the Arkansas Cooperative Extension Service, and 'Benchmark' orchardgrass and 'Kentucky 31' endophyte-free tall fescue were overseeded into five and four of these pastures, respectively. The remaining four pastures had mixtures of endophyte-infested tall fescue and bermudagrass that had been established previously, and these were retained as controls that represented typical pastures in the southern Ozarks. In April 1999, three independent observers evaluated each overseeded pasture for continuous row coverage by cool-season seedlings. During the 1999 growing season, pastures were grazed lightly to control forage growth. All pastures were fertilized with urea (46-0-0) at a rate of 60 lb N/acre on September 9 or 10, 1999. Similar applications were made each subsequent year in mid February, early June, and early September; therefore a total of 180 lb N/acre were applied annually. Soil tests were obtained each year in August and any needed potassium, phosphorus, or lime was applied based on soil test recommendations each September. All 13 pastures were evaluated initially (November 1999; prior to initiating the trial) for basal cover and species composition by the modified step-point method (Owensby, 1973). In this method, a modified pointer is placed randomly throughout the pasture; at each pointer placement the species of the nearest plant is identified, and species composition can be calculated on a percentage basis. These procedures were repeated in June and November of each subsequent year to assess the effects of grazing on the species composition and basal cover of the experimental pastures.

Each 10-acre pasture was subdivided into either eight (1.25-acre) or two (5-acre) paddocks using electric fencing to supplement existing permanent fences. Orchardgrass and endophyte-free tall fescue mixtures with bermudagrass were managed with either a twice weekly rotation to a fresh 1.25-acre paddock or a twice-monthly rotation to fresh 5-acre paddock. The endophyte-infested pastures were managed on a twice monthly rotation schedule. There were two replications of the orchardgrass pastures managed with the twice monthly rotation system, and three replications of the twice weekly rotation system. There were two replicates of both the twice weekly

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and twice monthly rotation systems for the endophyte-free tall fescue pastures. Pastures were evaluated monthly for forage availability using a rising-plate disk meter. To protect the non-toxic forages from trampling and overgrazing when forage was limiting, cattle were fed bermudagrass hay on single 1.25-acre paddocks in the twice weekly rotation system and on an area of comparable size constructed with electric wire for the twice monthly rotation system.

Cattle Management. Sixty-five spring-calving cows (1208 ± 150 lb) were stratified by weight, age, and breeding and assigned randomly to one of the 13 pastures (five per pasture) on January 11, 2000. Cows initially assigned to each pasture remained on their assigned pasture continuously throughout the trial to assess the cumulative effects of each grazing system on animal performance. Cows were checked for pregnancy by rectal palpation in January of each year, and any open cows were replaced with pregnant first-calf heifers. Similarly, any cows without calves at the end of the calving season (May 1) were replaced with a primiparous cow and her calf. In an effort to control the flush of forage growth that occurs in the spring, extra "thin" cows were placed on these pastures in order to improve their body condition. This technique was used because all pastures were not suitable for harvesting extra forage as hay. Extra cows were assigned to a specific 10-acre pasture and remained there as long as forage availability permitted. Within each pasture, cows were co-mingled and managed with the same rotation schedule as the five permanently assigned cows. Additional grazing days for these extra cows were tabulated for each pasture and analyzed as a response variable.

Forage species composition and basal cover data were analyzed as a repeated measures design with grazing systems as the whole-plot term and evaluation date as the repeated measures term. Forage availability and data from extra spring grazing cows were analyzed similarly. Significance was declared at P = 0.1 unless otherwise indicated.

Results and Discussion

Visual evaluation of continuous row coverage by cool-season seedlings in April 1999 indicated that there were no differences (P = 0.81) between orchardgrass and endophyte-free tall fescue pastures. The overall mean was 68.4%, indicating that establishment was relatively good. In some small areas, establishment was poor because the bermudagrass sod was particularly vigorous and competitive, and the cattle did not remove the entire existing bermudagrass canopy adequately prior to seeding.

The percentages of basal cover, bermudagrass, and other species in our experimental pastures (Table 1) were affected by evaluation date (P < 0.001), but not by grazing system (P > 0.46) or the interaction of grazing system and evaluation date (P > 0.14). Basal cover ranged from 36.3 to 47.7%, and was lowest (P < 0.10) on the November 2000 and June 2001 evaluation dates. Percentage of bermudagrass was the lowest (P < 0.10) on the June 2000 and June 2001 evaluation dates, but the overall range across all dates was relatively narrow (29.2 to 39.0%). The grazing system x evaluation date interaction affected (P = 0.08) the percentage of desired cool-season species in each pasture. Generally, the endophyte-free and endophyte-infested tall fescue remained stable over the entire study (Table 2). For endophyte-free tall fescue, both rotation systems had similar (P > 0.10) percentages of endophyte-free tall fescue on the June 2000 and November 2002 evaluation dates. In both endophyte-free tall fescue systems, the percentage of fescue was greater than 55% on all dates after grazing was initiated (Table 2). Through June of 2002, the orchardgrass systems maintained at least as high a percentage of orchardgrass as observed on the initial evaluation date (November 1999); however, the percentage in pastures rotated twice monthly declined sharply (P < 0.10) from 34.1 to 14.7% between June and November 2002.

The sampling date main effect affected forage availability (P < 0.0001), but grazing system and the interaction of grazing system and sampling date did not (P > 0.12). Seasonal trends for forage availability are shown in Figure 1. Extra grazing cows were used to control the flush of spring forage growth (Table 3). There were no differences (P > 0.10) across grazing systems for animal grazing days, initial weight, final weight, or final body condition score. The total weight gain per grazing animal was greater (P < 0.10) for the orchardgrass systems than for endophyte-infested fescue or endophyte-free fescue rotated twice weekly. Extra grazers on both orchardgrass systems gained approximately twice as much weight as cattle grazing endophyte-infested pastures (151 or 146 vs. 72 lb/head). The respective average daily gains for cattle grazing orchardgrass pastures managed with twice weekly and twice monthly rotations were 3.1 and 2.9 lb/head/day, which were greater (P < 0.1) than gains observed for extra grazers consuming endophyte-infested pastures (1.3 lb/head/day). The average daily gain for all cattle was greater (P < 0.1) in 2000 (3.2 lb/head/day) than for either 2001 or 2002 (2.2 and 1.6 lb/head/day, respectively).

Implications

Endophyte-free tall fescue overseeded into common bermudagrass sods has persisted well over a three-year period, regardless of rotation schedule. Orchardgrass pastures maintained stands that were at least comparable to initial levels through June 2002, but stands appeared to decline in late 2002.

Literature Cited

Owensby, C.E. 1973. J. Range Manage. 26:302-303.

Table 1. Percentage of basal cover, bermudagrass, and other species for pastures at Batesville, AR, from November 1999 through 2002.[1]

	Evaluation date							
Item	Nov 99	June 00	Nov 00	June 01	Nov 01	June 02	Nov 02	SE
Basal cover	44.5^{ab}	45.2^{ab}	36.3^{c}	36.8^{c}	47.7^{a}	42.5^{b}	43.9^{ab}	1.6
Bermudagrass	36.9^{a}	31.5^{b}	37.7^{a}	29.2^{b}	36.3^{a}	38.7^{a}	39.0^{a}	1.8
Other species	21.8^{a}	12.7^{cd}	18.1^{b}	18.3^{b}	14.4^{c}	9.2^{d}	12.9^{c}	1.5

^{a,b,c} Means in a row without common superscripts differ (P < 0.1).

[1] Data were determined by the modified step-point method (Owensby, 1973). Grazing system and the grazing system x evaluation date interaction did not affect (P > 0.14) any of these response variables.

Table 2. Percentage of desired cool-season grasses within the sward at Batesville, AR, from November 1999 through 2002.[1]

	Evaluation date							
System[2]	Nov 99	June 00	Nov 00	June 01	Nov 01	June 02	Nov 02	SE
OG - HM	36.9[c]	52.1[ab]	32.9[c]	50.4[ab]	52.9[ab]	56.9[a]	42.7[bc]	4.7
OG - LM	36.3[ab]	48.6[a]	34.4[b]	40.7[ab]	31.9[b]	34.1[b]	14.7[c]	5.8
FF - HM	45.1[b]	63.5[a]	55.4[ab]	60.3[a]	64.1[a]	58.1[ab]	61.3[a]	5.8
FF - LM	53.0[b]	68.8[a]	59.1[ab]	72.5[a]	67.2[a]	64.7[ab]	68.5[a]	5.8
IF - LM	49.0	52.6	54.6	54.2	48.6	46.9	53.4	4.1

[a,b,c] Means in a row without common superscripts differ (P < 0.1).

[1] Data were determined by the modified step-point method (Owensby, 1973). The grazing system x evaluation date interaction affected species composition at P = 0.08.

[2] Abbreviations: OG, orchardgrass; FF, endophyte-free tall fescue; IF, endophyte-infested tall fescue; HM, cattle rotated to fresh paddocks twice-weekly; and LM, cattle rotated to fresh paddocks twice-monthly.

Table 3. Performance of extra grazing cows added to control spring forage growth at Batesville, AR, from 2000 through 2002.

Main effect	Extra grazing days[1]	Total Initial weight	Final weight	Initial BCS[2]	Final BCS	Total weight gain	Average daily gain
System[3]	Days	------- lb -------				lb/head	lb/head/day
OG - HM	252	1082	1234	5.5[b]	7.0	151[a]	3.1[a]
OG - LM	206	1078	1224	5.5[b]	7.0	146[ab]	2.9[ab]
FF - HM	203	1145	1244	5.7[ab]	6.9	100[cd]	2.0[bc]
FF - LM	170	1107	1217	6.1[a]	7.1	110[bc]	2.2[abc]
IF - LM	198	1120	1192	6.0[a]	7.0	72[d]	1.3[c]
SE	26	30	30	0.2	0.1	13	0.4
Year							
2000	267[a]	1092	1272	5.8	7.1[a]	180[a]	3.2[a]
2001	115[b]	1117	1188	5.9	7.1[a]	71[b]	2.2[b]
2002	236[a]	1110	1207	5.6	6.8[b]	97[c]	1.6[b]
SE	16	34	37	0.2	0.1	9	0.3

[a,b,c,d] Means within a column and main effect without common superscripts differ (P < 0.1).

[1] Grazing days by extra cows to control spring growth.

[2] BCS = body condition score (1 = emaciated, 9 = obese).

[3] Abbreviations: OG, orchardgrass; FF, endophyte-free tall fescue; IF, endophyte-infested tall fescue; HM, cattle rotated to fresh paddocks twice-weekly; and LM, cattle rotated to fresh paddocks twice-monthly.

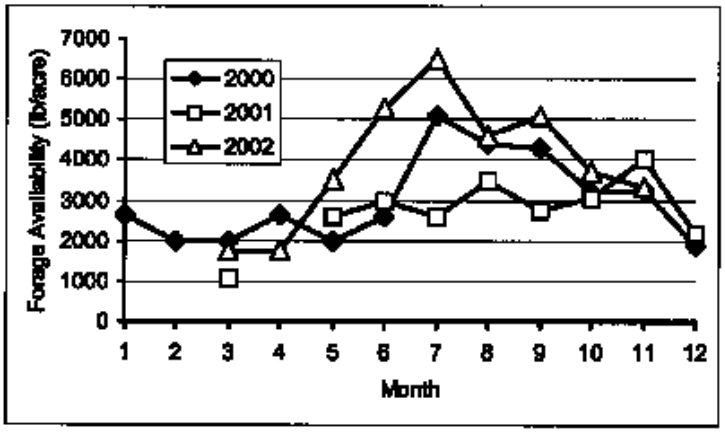

Figure 1. Forage availability (SE = 189 lb/acre) for Batesville pastures.