Using Orchardgrass and Endophyte-Free Fescue Versus Endophyte-Infected Fescue Overseeded on Bermudagrass for Cow Herds: Final Four-Year Summary of Cattle Performance

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Story in Brief

A trial was initiated on January 11, 2000 to 1) evaluate endophyte-free tall fescue (FF; *Festuca arundinacea* Schreb.) or orchardgrass (OG; *Dactylis glomerata* L.) overseeded into dormant common bermudagrass [*Cynodon dactylon* (L.) Pers.] sods for spring-calving cows, and 2) compare these forage systems with mixtures of endophyte-infected tall fescue (IF) and bermudagrass that are observed commonly throughout the southern Ozark region. Two management systems were evaluated in an effort to help the OG and FF forages persist; these include rotations to new paddocks twice weekly (2xW) or twice monthly (2xM). Actual weaning weight, adjusted 205-d weaning weight, total gain from birth to weaning, and average daily gain from birth to weaning were greater ($P \leq 0.083$) for calves on non-toxic forages (FF or OG) than for those on IF pastures. Calves raised on OG-2xW, OG-2xM, and FF-2xM exhibited a 47 to 59-lb advantage in actual weaning weight over those on IF pastures. It is not clear why calves raised on FF-2xW pastures exhibited only a 21-lb numerical advantage. Cows grazing OG and FF pastures exhibited higher ($P \leq 0.035$) body weights and body condition scores (BCS) at calving, breeding, and weaning than cows grazing IF pastures; however, BCS for cows grazing IF pastures remained within an acceptable range (6.1 to 6.7). Cow-calf performance was improved marginally by including non-toxic, perennial cool-season grasses in bermudagrass pastures, but establishment costs and additional management requirements, relative to those necessary for mixtures of IF and bermudagrass, may limit the acceptability of this approach.

Introduction

Many cow-calf enterprises in the Ozarks are maintained on pasture systems that are mixtures of endophyte-infected tall fescue (IF) 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. Dilution with other forages is a commonly accepted management practice designed to limit the effects of the toxins produced by this fungus, and to improve animal performance. Unlike IF pastures in the northern part of the fescue region, many southern Ozark pastures that appear to be dominated by IF contain both IF and bermudagrass; in reality, these pastures often contain 60% IF or less. A trial was initiated in January 2000 to evaluate the effectiveness of overseeding endophyte-free tall fescue (FF) or orchardgrass (OG) into dormant common bermudagrass sods for spring-calving cows. Our objectives were to 1) evaluate FF or OG overseeded into dormant common bermudagrass sods for spring-calving cows, and 2) compare these forage systems with mixtures of approximately 50% IF and bermudagrass that are typical throughout the southern Ozark region.

Experimental Procedures

Cattle Management. Detailed descriptions of the establishment of FF and OG forages and all forage management practices are found in a companion report (Coblentz et al., 2004). Sixty-five spring-calving cows (1,208 ± 150 lb) were stratified by weight, age, and breeding and assigned to one of the 13 ten-acre pastures (five cows per pasture) on January 11, 2000. For pastures managed with a twice weekly (2xW) rotation frequency, cattle were rotated to fresh paddocks twice each week at intervals of approximately 3.5 d. For pastures managed with the twice monthly (2xM) rotation frequency, each 10-acre pasture was subdivided into two 5.0-acre paddocks, and cattle were rotated to fresh paddocks at approximately 15-d intervals. The OG and FF pastures were managed with both 2xW and 2xM rotation schedules, but the IF control pastures were managed with the 2xM rotation frequency only. Initially, at least one cow per pasture had a Hereford sire and Brahman x Angus dam; the balance of the cows were purebred Angus. Cows and calves were not supplemented other than with bermudagrass hay when forage was limiting, but a commercial mineral mix was offered free choice throughout the trial. From mid-May through mid-July of each year, one Gelbvieh bull was assigned to each pasture. Cows were weighed and evaluated monthly for body condition score (BCS) on a scale of 1 to 9 (1 = emaciated, 9 = obese). Calves were weighed monthly and weaned in early October. Actual and 205-d adjusted weaning weights were obtained and analyzed as response variables. Milk production was evaluated by the weigh-suckle-weigh method in May and July of each year and blood was drawn from the cows in June of each year to quantify levels of serum prolactin.

Cows initially assigned to a specific pasture remained on their assigned pasture continuously throughout the trial in order 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 live calves at the

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end of the calving season (May 1) were replaced with a primiparous cow and her calf, and these data were included in the statistical analysis for each year. All data presented are 4-year averages.

Extra Grazing Cows. 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 with the five permanently assigned cows and rotated to fresh paddocks as a single group. Additional grazing days, weight gains, and BCS for these extra cows were tabulated for each pasture and analyzed as response variables.

Statistics. Data were analyzed as a split-plot design with forage system (OG-2xW, OG-2xM, FF-2xW, FF-2xM, and IF) as the whole-plot term and year as the repeated measures term. While there was some year-to-year variability in the responses of cows, calves, and extra grazing cows, generally there were few interactions of main effects. Therefore, to concisely summarize results, only 4-year means for each forage system are presented and discussed. Four-year least-squares means were compared with four contrast statements that evaluated: 1) IF vs. non-toxic forages (FF and OG); 2) FF vs. OG; 3) 2xW vs. 2xM (excluding IF); and 4) the interaction of #2 and #3. Significance was reported at $P < 0.10$), unless otherwise indicated.

Results and Discussion

Calf Performance. Birth weight of calves (Table 1) was not affected by grazing system ($P > 0.10$). Actual weaning weight, adjusted 205-d weaning weight, total gain from birth to weaning, and average daily gain from birth to weaning were greater ($P \leq 0.083$) for calves raised on non-toxic forages (OG and FF) than for those on IF pastures. No other contrast was significant ($P > 0.10$) for any of these response variables. Calves raised on OG-2xW, OG-2xM, and FF-2xM pastures exhibited a 47 to 59-lb advantage in actual weaning weight over those on IF pastures. It is not clear why calves raised on FF-2xW pastures exhibited only a 21-lb numerical advantage. Overall, actual weaning weights for calves raised on all non-toxic pastures exhibited a statistical advantage ($P = 0.083$) of about 45 lb over weaning weights for calves raised on IF. Generally, calves raised on IF pastures with approximately 50% dilution exhibited a level of performance (actual weaning weight = 508 lb) that may be quite acceptable to the many part-time producers operating in northern Arkansas, but this performance was clearly poorer than observed for calves raised on the non-toxic forage systems.

Cow Performance. Cow weights and BCS (Table 2) at calving, breeding, and weaning were lower ($P < 0.035$) for cows grazing IF pastures than for those grazing OG or FF pastures; however, BCS for cows grazing IF pastures remained within an acceptable range (6.1 to 6.7) throughout the trial. At breeding, BCS were higher ($P = 0.028$) for cows grazing non-toxic pastures managed as 2xM compared to those managed with the higher rotation frequency, but all cows grazing OG and FF maintained a high BCS (7.0 to 7.4).

The mean age of cows did not differ ($P > 0.100$; Table 3) across forage systems. Milk production in May was higher ($P = 0.011$) by 2.2 lb/d for cows grazing non-toxic forages than for cows grazing IF, but milk production on non-toxic forages did not differ ($P > 0.10$) from that of IF in July. For both May and July evaluation periods, there was an interaction ($P \leq 0.032$) between non-toxic forages and rotation frequencies. For OG, milk production was numerically higher with the 2xW rotation frequency, while the inverse relationship occurred for FF. Concentrations of serum prolactin, which are normally low in cows consuming IF forages, were higher ($P = 0.005$) for cows grazing non-toxic pastures compared to those grazing IF (179 vs. 90 ng/mL). Pregnancy rate did not differ ($P > 0.10$) between nontoxic and IF forage systems, nor did any other contrast differ ($P > 0.10$) for this response variable. Overall, the mean pregnancy rate for the entire 4-year study was 85.9%.

Performance of Extra Grazing Cows. The extra grazing cows were effective at controlling spring forage growth, but this technique also was beneficial because the condition of these cows was improved. Final weights for extra cows leaving the experimental pastures and total grazing days did not differ ($P > 0.10$; Table 4) between non-toxic and IF forage systems, nor were any other contrasts significant ($P > 0.10$) for these response variables. However, there were consistent numerical advantages ($P > 0.10$) in final weight for cows grazing non-toxic pastures compared to those grazing IF; over the entire study, this advantage was about 57 lb (1,210 vs. 1,153 lb). Total gain, BCS change, and average daily gain were greater ($P \leq 0.049$) for extra cows grazing non-toxic pastures than for those grazing IF pastures. These advantages for non-toxic pastures were 59 lb, 0.3 BCS unit, and 1.17 lb/d, respectively, compared to extra cows grazing IF pastures. In addition, total gain, BCS change, and average daily gain were all greater ($P \leq 0.044$) for extra cows on OG pastures compared to those grazing FF pastures.

Implications

Over 4 years, cattle performance on non-toxic forage systems was better than observed for cattle grazing IF pastures with approximately 50% dilution; however, these differences were somewhat marginal. Based on the returns demonstrated by this study it remains unclear whether cow-calf producers will make the commitments necessary to establish and maintain these non-toxic forages. The excellent performance of extra grazing cows that were added to control the flush of spring growth may partially offset some of the cost of these management commitments.

Literature Cited

Coblentz, W. K. et al. 2004. Arkansas Animal Science Department Report 2004. 522:45.

Table 1. Growth performance of calves weaned from orchardgrass (OG), endophyte-free tall fescue (FF), or endophyte-infected tall fescue (IF) pastures managed with twice weekly (2xW) or twice monthly (2xM) rotation frequencies at Batesville, Ark. (January 2000-October 2003).

Grazing system	Birth weight	Actual weaning weight	205-d adjusted weight	Total gain	Average daily gain
	lb				lb/d
OG (2xW)	82.9	567	554	485	2.29
OG (2xM)	82.2	562	557	479	2.32
FF (2xW)	80.7	529	519	448	2.14
FF (2xM)	81.8	555	553	474	2.29
IF (2xM)	80.0	508	496	428	2.03
SE[1]	1.92	26.7	22.5	25.4	0.101
Contrasts					
IF vs. OG + FF	NS[2]	0.083	0.032	0.081	0.028
FF vs. OG	NS	NS	NS	NS	NS
2xW vs. 2xM[3]	NS	NS	NS	NS	NS
Interaction[4]	NS	NS	NS	NS	NS

[1] Standard error of the 4-year grazing-system mean when n = 2 pasture replications.

[2] NS = nonsignificant, P > 0.100.

[3] Contrast excludes IF pastures.

[4] Interaction of FF vs. OG and 2xW vs. 2xM contrasts.

Table 2. Summary of weights and body condition scores (BCS; 1 = emaciated, 9 = obese) for cows grazing orchardgrass (OG), endophyte-free tall fescue (FF), or endophyte-infected tall fescue (IF) pastures managed with twice weekly (2xW) or twice monthly (2xM) rotation frequencies at Batesville, Ark. (2000-2003).

System	Calving weight	Breeding weight	Weaning weight	BCS calving	BCS breeding	BCS weaning
	lb					
OG-2xW	1394	1292	1314	6.8	7.0	7.1
OG -2xM	1477	1391	1409	7.0	7.2	7.2
FF-2xW	1455	1327	1321	7.1	7.0	7.0
FF-2xM	1464	1383	1369	7.2	7.4	7.2
IF-2xM	1343	1147	1125	6.7	6.5	6.1
SE[1]	28.2	45.9	43.2	0.08	0.15	0.16
Contrasts						
IF vs. FF and OG	0.011	0.035	0.027	0.021	0.011	0.005
FF vs. OG	NS[2]	NS	NS	NS	0.028	NS
2xW vs. 2xM[3]	NS	NS	NS	NS	NS	NS
Interaction[4]	NS	NS	NS	NS	NS	NS

[1] Standard error of the 4-year grazing-system mean when n = 2 pasture replications.

[2] NS = nonsignificant, P > 0.10.

[3] Contrast excludes IF pastures.

[4] Interaction of FF vs. OG and 2xW vs. 2xM contrasts.

Table 3. Summary of age, milk production, pregnancy rates, and serum prolactin levels for cows grazing orchardgrass (OG), endophyte-free tall fescue (FF), or endophyte-infected tall fescue (IF) pastures managed with twice weekly (2xW) or twice monthly (2xM) rotation frequencies at Batesville, Ark. (2000-2003).

System	Mean age	Milk production (May)	Milk production (July)	Serum prolactin[1]	Pregnancy rate
	years	lb/d		ng/mL	%
OG-2xW	4.7	15.5	10.0	197	81.7
OG -2xM	4.7	14.0	8.7	166	92.5
FF-2xW	5.0	12.3	7.6	127	87.5
FF-2xM	5.1	15.1	10.7	227	90.0
IF-2xM	4.9	12.0	8.8	90	82.5
SE[2]	0.4	0.82	0.89	27.4	8.9
Contrasts					
IF vs. FF and OG	NS[3]	0.011	NS	0.005	NS
FF vs. OG	NS	NS	NS	NS	NS
2xW vs. 2xM[4]	NS	NS	NS	NS	NS
Interaction[5]	NS	0.026	0.032	NS	NS

[1] Data from 2000 through 2002 only.

[2] Standard error of the 4-year grazing-system mean when n = 2 pasture replications.

[3] NS = nonsignificant, P > 0.10.

[4] Contrast excludes IF pastures.

[5] Interaction of FF vs. OG and 2xW vs. 2xM contrasts.

Table 4. Summary of cattle performance for extra grazing cows on orchardgrass (OG), endophyte-free tall fescue (FF), or endophyte-infected tall fescue (IF) pastures managed with twice weekly (2xW) or twice monthly (2xM) rotation frequencies at Batesville, Ark. (2000-2003).

System	Initial weight	Final weight	Total gain	BCS Change	Average daily gain	Total grazing days
	lb				lb/day	day
OG-2xW	1041	1226	186	1.3	3.07	270
OG -2xM	1032	1204	173	1.3	2.87	251
FF-2xW	1078	1215	138	1.1	2.14	245
FF-2xM	1054	1193	140	0.8	2.25	224
IF-2xM	1054	1153	100	0.8	1.41	244
SE[1]	35.5	37.9	10.8	0.16	0.309	18.5
Contrasts						
IF vs. FF and OG	NS[2]	NS	0.001	0.049	0.003	NS
FF vs. OG	NS	NS	0.016	0.044	0.043	NS
2xW vs. 2xM[3]	NS	NS	NS	NS	NS	NS
Interaction[4]	NS	NS	NS	NS	NS	NS

[1] Standard error of the 4-year grazing-system mean when n = 2 pasture replications.

[2] NS = nonsignificant, P > 0.10.

[3] Contrast excludes IF pastures.

[4] Interaction of FF vs. OG and 2xW vs. 2xM contrasts.