Impact Of Rotation Frequency and Weaning Date on Performance by Fall-Calving Cow-Calf Pairs Grazing Endophyte-Infected Tall Fescue Pastures

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Story in Brief

A 3-year study was initiated in April 2000 to investigate the impact of rotational management (2x monthly vs. 2x weekly) program and weaning date (mid April vs. early June) on production of fall-calving cow-calf pairs grazing *Neotyphodium coenophialum*–infected tall fescue overseeded with legumes and crabgrass. During the first two calving cycles, rotation frequency did not substantially impact ($P > 0.10$) cow weight, calf birth weight, or actual or adjusted weaning weights. However, cows rotated twice monthly had 0.3 units higher ($P < 0.05$) body condition score at the time of breeding than cows rotated twice weekly. Calves weaned later (early June) had higher ($P < 0.05$) actual weaning weight, but 205-d adjusted weaning weights did not differ ($P > 0.10$) across weaning dates. Total weight loss during a simulated transport and sale, as well as the days required to regain the lost weight, were lower ($P < 0.05$) by early-weaned calves than by later weaned calves. Percentage shrink did not differ ($P > 0.10$) across weaning dates or rotation frequencies. Therefore, after two calf cycles of the experiment, there appears to be little advantage for animal performance to more rapid rotation programs, and weaning fall-born calves grazing endophyte-infected tall fescue pastures at approximately 188 d of age appears to be detrimental to animal performance compared with delaying weaning until 243 d of age. The study is presently in its third and final year.

Introduction

Toxic compounds produced by the endophytic fungus *N. coenophialum* are blamed for tall fescue toxicosis, a syndrome in which cattle have elevated temperatures, eat less, and grow at a slower rate. Numerous studies have demonstrated that dilution of *N. coenophialum*-infected tall fescue with other forages, particularly legumes, is beneficial to animal performance. Also, based on previous work (Coffey et al., 2001), it appears that much of the negative impact of consuming tall fescue toxins occurs during the last month of spring. The goal of this project is to reduce the long-term impacts of tall fescue toxicosis on cattle through rotational grazing management and by reducing exposure of calves during times of highest toxin concentrations.

Experimental Procedures

Sixty pregnant (confirmed by rectal palpation) cows and heifers of predominantly Angus breeding were stratified by age and weight and allocated randomly to one of 11 pasture groups in early April of 2000. The groups of cows were then allocated to one of 11 pastures with established stands of endophyte-infected tall fescue that ranged between 10 and 16 acres in size. The number of cows per group was determined to set an initial stocking rate of 2.5 acres/cow. The pasture area was located on a 190-acre block of Clarksville very cherty silt loam; characterized as being deep, somewhat excessively drained, and having moderate to steep slopes. It is one of the predominant soil types in the Ozark Highlands and is not adapted to tillage.

Pastures were allocated randomly to one of four pasture or calf management treatments in a 2 x 2 factorial treatment arrangement (Table 1). Treatments consisted of dividing each pasture area into either two or eight sections and rotating cows to a new section area either twice weekly or twice monthly. Within each of the rotation schedules, calves were weaned either in mid-April (188 d of age) or early June (243 d of age).

Broadcasting techniques were used to overseed the entire pasture area with a mixture of 2 lb/acre ladino clover, 6 lb/acre red clover, and 12 lb/acre lespedeza in late February and early March of 2000. Crabgrass seed was broadcast at a rate of 4 lb/acre in May. Legumes and crabgrass were overseeded again in the spring of 2002.

Cows were fed corn-based supplements to meet NRC (1996) requirements during the breeding season. Endophyte–infected tall fescue hay harvested from another field on the research station was fed as needed during the winter when forage availability was low.

The forage fertility program consisted of applications of 40 lb N/acre in early June and late August. Phosphorus and potassium were applied per soil test recommendation in late August, and 1 to 2 lb boron/acre were applied each year in the spring to enhance legume growth. Available forage was estimated on a monthly basis using a calibrated disk meter.

The weaning program consisted of vaccination against respiratory infection at 4 wk followed by a booster vaccination 2 wk prior to being weaned. Calves from each treatment were removed from their dams, weighed, then transported approximately 30 miles to a sale auction and were handled according to routine auction procedures. Calves were weighed at the auction facility between 8:00 and 9:30 pm to determine sale value. Calves were then held overnight at the sale barn and transported back to the University of Arkansas facilities. Upon return to the University of Arkansas cattle facilities, calves were weighed, blood samples were gathered via jugular puncture and calves were housed in a drylot facility for 21 days and fed alfalfa hay ad libitum along with 2 lb of ground corn daily. Calves were observed three times daily for sickness over the 3-week period following weaning. Calves diagnosed as having respiratory illness were treated with Micotil® initially and with Nuflor® if a second treatment was necessary.

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Statistical analyses were conducted using SAS (SAS Inst., Inc., Cary, NC) procedures for a repeated measures experiment with a 2 x 2 factorial treatment arrangement. The pasture group was considered the experimental unit for all measurements.

Results and Discussion

Cow performance during the first 2 yr is shown in Table 2. Cow BW at calving, breeding and weaning, and cow BW change between the different production periods did not differ ($P > 0.10$) between cows rotated 2x monthly and those rotated 2x weekly. Body condition scores (BCS) at breeding were 0.3 units higher ($P < 0.05$) for cows rotated 2x monthly than for those rotated 2x weekly. Cow BW and BCS did not differ ($P > 0.10$) due to calf weaning date, but cow BW change from calving or breeding to weaning was greater ($P < 0.05$) from cows whose calves were weaned later. The amount of hay offered during the winter and milk production did not differ ($P > 0.10$) among treatments. Calving rates tended to be higher ($P < 0.10$) from cows rotated 2x monthly with calves weaned in April and those rotated 2x weekly with calves weaned in June than from cows rotated 2x monthly with their calves weaned in June. However, calving rates were greater than 90% from all treatment combinations, and differences represent a difference of only one open cow per treatment.

Calf birth weight did not differ ($P > 0.10$) among rotation and weaning treatments (Table 3). Calves weaned early were 142 lb lighter ($P < 0.05$) at the time of weaning than those weaned late, but pasture rotation frequency did not affect ($P > 0.10$) actual weaning weights (Table 3). Actual BW on the early weaning date was greater ($P < 0.05$) from early weaned calves rotated twice monthly than late weaned calves rotated twice monthly or early weaned calves weaned twice weekly. Actual BW on the late weaning date ($P > 0.10$) was 89 lb heavier ($P < 0.05$) from calves weaned late compared with those weaned early. Adjusted 205-d weaning weights did not differ ($P > 0.10$) across rotation schedules or weaning dates.

Actual weight loss during transport to the local auction facility, and total weight loss during the day calves were removed from their dams, transported to the auction facility, then returned to the experiment station was higher ($P < 0.05$) from calves weaned late (Table 4). However, since those calves were also heavier at this time, calf shrink expressed as a percentage did not differ ($P > 0.10$) among treatments during this time. Daily gain during the 21-d receiving period did not differ ($P > 0.10$) among treatment combinations, but calves weaned in early June required almost 10 d more ($P < 0.05$) to recover their weight that was lost during transport to the local auction facility.

Implications

Fall-born calves grazing endophyte-infected tall fescue prior to weaning should not be weaned in mid April. Such early weaning appears to provide no benefits to the cow, and may have negative effects on calves that are not overcome when calves are placed on non-infected forages following weaning.

Literature Cited

Coffey, K.P., et al. 2001. Prof. Anim. Sci. 17:166-173.

NRC. 1996. Nutrient Requirements of Beef Cattle. 7th ed. National Academy Press, Washington, DC.

Table 1. Treatment structure for an experiment to evaluate the impact of rotation frequency and weaning date on cow and calf production and forage species composition changes.

Forage management	No. pastures	Weaning date	Grazing duration	Rest duration
2-cell	3	mid-April	14 days	14 days
2-cell	3	early-June	14 days	14 days
8-cell	2	mid-April	3 to 4 days	24 to 25 days
8-cell	3	early-June	3 to 4 days	24 to 25 days

Table 2. Performance of cows grazing endophyte–infected tall fescue pastures managed as a twice weekly or twice monthly rotation with calves weaned in mid-April or early June.

	2 rotations/month		2 rotations/week			
Item	April	June	April	June	SE	Effect[a]
Cow weight, lb						
Initial	1090	1091			0.5	
At calving[b]	1338	1303	1300	1271	26.7	NS
At breeding[c]	1257	1228	1199	1197	29.8	NS
At weaning	1127	1170	1079	1141	53.0	NS
Cow weight change, lb						
Calving to breeding	-81	-75	-101	-74	22.2	NS
Breeding to weaning	-33	-44	-11	-50	19.9	W
Calving to weaning	-114	-27	-112	-28	34.7	W
Body condition score						
At calving	7.2	7.0	7.0	7.1	0.12	NS
At breeding	6.6	6.6	6.1	6.4	0.39	R
At weaning	6.1	6.3	5.6	6.1	0.49	NS
Body condition score change						
Calving to breeding	-0.8	-0.6	-1.1	-0.9	0.16	R
Breeding to weaning	0.0	0.2	0.0	0.2	0.30	NS
Calving to weaning	-0.8	-0.4	-1.1	-0.8	0.35	NS
Hay offered, lb/cow	3021	2847	2882	2851	273.2	NS
Milk prod, lb/d[d]	12.2	11.5	11.9	13.9	1.20	NS
Calving rate, %	97[x]	91[y]	92[xy]	97[x]	2.12	R x W

[a] W = weaning date effect (P < 0.05); R = rotation frequency effect (P < 0.05); r = rotation frequency effect (P < 0.10); R x W = rotation frequency by weaning date interaction (P < 0.05).

[b] Last weight prior to the start of the calving season.

[c] Beginning of breeding season.

[d] Milk production measured by the weigh-suckle-weigh technique when the calves averaged 2 months in age.

[xy] Means within the same row without a common superscript letter differ (P < 0.10).

Table 3. Performance of calves grazing endophyte–infected tall fescue pastures managed as a twice weekly or twice monthly rotation with calves weaned in mid-April or early June.

	2 rotations/month		2 rotations/week			
Item	April	June	April	June	SE	Effect[a]
Birth wt, lb	75	74	74	79	7.8	ns
Actual weaning wt, lb	496	589	430	621	25.0	W
Wt at April weaning, lb	496[x]	458[yz]	430[z]	487[xy]	12.7	R x W
Wt at June weaning, lb	546	589	486	621	25.1	W
Adjusted 205-d wt, lb	561	509	506	535	24.1	NS
Age at weaning, d	190	242	185	244	3.5	W

[a] W = weaning date effect (P < 0.05); R = rotation frequency effect (P < 0.05); R x W = rotation frequency by weaning date interaction (P < 0.05).

[xyz] Means within a row without a common superscript letter differ (P < 0.05).

Table 4. Weaning performance of calves grazing endophyte-infected tall fescue pastures managed as a twice weekly or twice monthly rotation with calves weaned in mid-April or early June.[a]

	2 rotations/month		2 rotations/week			
Item	April	June	April	June	SE	Effect[a]
Wt loss, lb						
To sale barn	23	28	20	29	1.7	W[b]
Sale to farm	10	14	8	18	2.8	W
Total	34	42	28	47	4.0	W
% Shrink						
To sale barn	4.8	4.8	4.7	4.6	0.17	NS
Sale to farm	2.1	2.5	1.8	3.0	0.46	NS
Total	6.7	7.2	6.4	7.5	0.45	NS
ADG, receiving period, lb	2.1	1.7	2.1	2.1	0.29	NS
Recovery time, d	7.9	18.1	5.7	15.2	3.88	W
Hay offered, lb	183	211	187	216	8.5	W

[a] At weaning, calves were removed from their dams, transported directly to a local auction facility and held without feed or water, weighed at approximately 9 pm, held overnight in pens with water, and transported back to the research station.

[b] W = weaning date effect ($P < 0.05$); w = weaning date effect ($P < 0.10$).