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Effects of Interseeding Ladino Clover into Tall Fescue Pastures of Varying Endophyte Status on Grazing Performance of Stocker Steers

Abstract

Tall fescue, the most widely adapted cool-season perennial grass in the United States, is grown on approximately 66 million acres. Although tall fescue is well adapted in the eastern half of the country between the temperate north and mild south, presence of a fungal endophyte results in poor performance of grazing livestock, especially during the summer. Until recently, producers with high-endophyte tall fescue pastures had two primary options for improving grazing livestock performance. One option was to destroy existing stands and replace them with endophyte-free fescue or other forages. Although it supports greater animal performance than endophyte-infected fescue, endophyte-free fescue has been shown to be less persistent under grazing pressure and more susceptible to stand loss from drought stress. In locations where high-endophyte tall fescue must be grown, the other option was for producers to adopt management strategies that reduce the negative effects of the endophyte on grazing animals, such as diluting the effects of the endophyte by incorporating legumes into existing pastures or providing supplemental feed. In recent years, new tall fescue cultivars have been developed with a non-toxic endophyte that provides vigor to the fescue plant without negatively affecting performance of grazing livestock. Interseeding legumes into tall fescue cultivars with the non-toxic endophyte should be an effective way of increasing gains of cattle grazing tall fescue. However, these cultivars lack the competitiveness of high-15 endophyte Kentucky 31 and their competitiveness with legumes could be a potential problem. Objectives of this study were to evaluate forage availability, stand persistence, and performance of stocker steers grazing tall fescue cultivars with non-toxic endophyte and high- and low-endophyte Kentucky 31 with and without ladino clover.

Keywords

tall fescue, grazing, ladino clover, interseeding, stocker, endophyte, steers, stocker cattle

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Effects of Interseeding Ladino Clover into Tall Fescue Pastures of Varying Endophyte Status on Grazing Performance of Stocker Steers

L.W. Lomas and J.L. Moyer

Summary

In 2016 and 2017, 128 yearling steers grazing tall fescue pastures were used to evaluate the effects of fescue cultivar and interseeding ladino clover on available forage, grazing gains and subsequent finishing performance. Fescue cultivars evaluated were high-endophyte 'Kentucky 31,' low-endophyte Kentucky 31, 'HM4,' and 'MaxQ.' In 2016, steers that grazed pastures of low-endophyte Kentucky 31, HM4, or MaxQ gained significantly more ($P < 0.05$) and produced more ($P < 0.05$) gain/a than those that grazed high-endophyte Kentucky 31 pastures. Gains of cattle that grazed low-endophyte Kentucky 31, HM4, or MaxQ were similar ($P > 0.05$). In 2017, steer gains were similar ($P > 0.05$) among all cultivars. High-endophyte Kentucky 31 pastures had more ($P < 0.05$) available forage than low-endophyte Kentucky 31, HM4, or MaxQ pastures during both years. Steer gains and gain/a were similar ($P > 0.05$) between pastures fertilized with nitrogen (N) in the spring and those interseeded with ladino clover during both 2016 and 2017. Fescue cultivar or legume treatment had little effect on finishing performance or carcass characteristics of steers grazed in 2016. Steers that grazed high-endophyte Kentucky 31 had lower ($P < 0.05$) final finishing weight and lower ($P < 0.05$) carcass weight than those that grazed low-endophyte Kentucky 31, HM4, or MaxQ.

Introduction

Tall fescue, the most widely adapted cool-season perennial grass in the United States, is grown on approximately 66 million acres. Although tall fescue is well adapted in the eastern half of the country between the temperate north and mild south, presence of a fungal endophyte results in poor performance of grazing livestock, especially during the summer. Until recently, producers with high-endophyte tall fescue pastures had two primary options for improving grazing livestock performance. One option was to destroy existing stands and replace them with endophyte-free fescue or other forages. Although it supports greater animal performance than endophyte-infected fescue, endophyte-free fescue has been shown to be less persistent under grazing pressure and more susceptible to stand loss from drought stress. In locations where high-endophyte tall fescue must be grown, the other option was for producers to adopt management strategies that reduce the negative effects of the endophyte on grazing animals, such as

diluting the effects of the endophyte by incorporating legumes into existing pastures or providing supplemental feed. In recent years, new tall fescue cultivars have been developed with a non-toxic endophyte that provides vigor to the fescue plant without negatively affecting performance of grazing livestock. Interseeding legumes into tall fescue cultivars with the non-toxic endophyte should be an effective way of increasing gains of cattle grazing tall fescue. However, these cultivars lack the competitiveness of high-endophyte Kentucky 31 and their competitiveness with legumes could be a potential problem. Objectives of this study were to evaluate forage availability, stand persistence, and performance of stocker steers grazing tall fescue cultivars with non-toxic endophyte and high- and low-endophyte Kentucky 31 with and without ladino clover.

Experimental Procedures

Sixty-four mixed black yearling steers were weighed on two consecutive days and allotted to sixteen 5-acre established pastures of high-endophyte Kentucky 31 or low-endophyte Kentucky 31, HM4, or MaxQ tall fescue (4 replications per cultivar) on March 30, 2016 (535 lb) and March 28, 2017 (597 lb). 'HM4' and MaxQ are cultivars with a non-toxic endophyte. Two pastures of each cultivar had been interseeded with 5 lb/a of 'Will' ladino clover on February 22, 2016. Four steers were assigned to each pasture. Pastures without clover were fertilized with 80 lb/a of N on February 10, 2016, and February 16, 2017. All pastures were fertilized with 40 lb/a of N and P₂O₅ and K₂O as required by soil test on September 13, 2016 and September 11, 2017.

Pasture was the experimental unit and weight gain was the primary measurement. No implants or feed additives were used. Cattle were weighed and forage availability was measured every 28 days with a disk meter calibrated for tall fescue. Cattle were treated for internal and external parasites before being turned out to pasture and later vaccinated for protection from pinkeye. Steers had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. Four steers were removed from the study for reasons unrelated to experimental treatment and replaced with grazers to maintain equal stocking rates. Pastures were grazed continuously until November 29, 2016 (244 days) and December 6, 2017 (253 days) when steers were weighed on two consecutive days and grazing was terminated.

After the grazing period, cattle were moved to a finishing facility, implanted with Synovex-S (Zoetis, Kalamazoo, MI), and fed a diet of 80% whole-shelled corn, 15% corn silage, and 5% supplement (dry matter basis) to determine the effect of grazing treatment on subsequent finishing performance. Cattle that grazed in 2016 were fed a finishing diet for 98 days and were then slaughtered in a commercial facility, and carcass data were collected on each individual steer. Cattle that were grazed during 2017 were being finished for slaughter at the time that this report was written.

Results and Discussion

Grazing and finishing performance for 2016 is pooled across legume treatment and presented by tall fescue cultivar in Table 1 and pooled across fescue cultivar and presented by legume treatment in Table 2. There were no significant interactions ($P > 0.05$) between fescue cultivar and legume treatment for cattle performance. However, there was

a significant ($P < 0.05$) fescue cultivar \times legume interaction for average available forage dry matter (DM). Steers that grazed low-endophyte Kentucky 31, HM4, or MaxQ were heavier ($P < 0.05$) at the end of the grazing period, had greater ($P < 0.05$) grazing gain, greater ($P < 0.05$) daily gain, and produced greater ($P < 0.05$) gain/a than steers grazing high-endophyte Kentucky 31. Average available forage DM of high-endophyte Kentucky 31 pasture was greater ($P < 0.05$) than that of low-endophyte Kentucky 31, HM4, or MaxQ. MaxQ pasture had greater ($P < 0.05$) available forage DM than low-endophyte Kentucky 31. Average available forage DM of HM4 pasture was similar ($P > 0.05$) to that of low-endophyte Kentucky 31 and MaxQ pastures. Steer gains were similar ($P > 0.05$) between pastures fertilized with an additional 80 lb/a of N and those interseeded with ladino clover. Pastures with clover had less ($P < 0.05$) available forage DM than those without clover for all cultivars except high-endophyte Kentucky 31 where available forage DM of pastures with and without clover were similar ($P > 0.05$).

Fescue cultivar had no effect ($P > 0.05$) on finishing gain, dry matter intake, or feed:gain ratio. However, steers that had previously grazed high-endophyte Kentucky 31 had lower ($P < 0.05$) weight at the end of the finishing phase and lower ($P < 0.05$) hot carcass weight than those that had previously grazed low-endophyte Kentucky 31, HM4, or MaxQ. The weight differential between cattle that grazed high-endophyte Kentucky 31 and those that grazed low-endophyte Kentucky 31, HM4, or MaxQ was similar at the end of the grazing phase (156 lb) and the end of the finishing phase (155 lb). Therefore, the weight advantage of cattle that grazed low-endophyte Kentucky 31, HM4, or MaxQ occurred during the grazing phase and was maintained during the finishing phase. Cattle that grazed high-endophyte Kentucky 31 did not exhibit any compensatory gain during the finishing phase. Backfat thickness of steers that grazed high-endophyte Kentucky 31 or HM4 was similar ($P > 0.05$) and lower ($P < 0.05$) than that of steers that grazed low-endophyte Kentucky 31 or MaxQ. Yield grade of steers that grazed high-endophyte Kentucky 31 was numerically lower ($P < 0.05$) than that of steers that grazed low-endophyte Kentucky 31 or MaxQ and similar ($P > 0.05$) to that of steers that grazed HM4. Fescue cultivar had no effect ($P > 0.05$) on ribeye area, marbling score, or percent of carcasses that graded USDA Choice. Overall gain of steers that grazed high-endophyte Kentucky 31 was lower ($P < 0.05$) than that of steers that grazed low-endophyte Kentucky 31, HM4, or MaxQ, and overall gain of steers that grazed low-endophyte Kentucky 31, HM4, or MaxQ was similar ($P > 0.05$). Legume treatment had no effect ($P > 0.05$) on finishing performance or carcass traits.

Grazing performance for 2017 is pooled across legume treatment and presented by tall fescue cultivar in Table 3 and pooled across fescue cultivar and presented by legume treatment in Table 4. Fescue cultivar and legume treatment had no effect ($P > 0.05$) on grazing performance. However, average available forage DM of high-endophyte Kentucky 31 pastures was greater ($P < 0.05$) than for low-endophyte Kentucky 31, HM4, or MaxQ. This was likely due to lower forage intake by cattle grazing the high-endophyte Kentucky 31 pastures. Average available forage DM of low-endophyte Kentucky 31, HM4, and MaxQ pastures were similar. Pastures fertilized with nitrogen in the spring had greater ($P < 0.05$) average available forage DM than those that were interseeded with ladino clover.

Table 1. Effects of cultivar on grazing and subsequent finishing performance of steers grazing tall fescue pastures, Southeast Agricultural Research Center, 2016

Item	Tall fescue cultivar			
	High-endophyte Kentucky 31	Low-endophyte Kentucky 31	HM4	MaxQ
Grazing phase (244 days)				
Number of head	13	16	16	15
Initial weight, lb	533	535	535	537
Ending weight, lb	770a	920b	931b	924b
Gain, lb	238a	385b	396b	387b
Daily gain, lb	0.97a	1.58b	1.62b	1.59b
Gain/a, lb	190a	308b	310b	310b
Average available forage dry matter, lb/a ¹	7,365a	5,944b	6,139bc	6,300c
Finishing phase (98 days)				
Beginning weight, lb	770a	920b	931b	924b
Ending weight, lb	1219a	1374b	1366b	1386b
Gain, lb	449	454	435	462
Daily gain, lb	4.58	4.63	4.44	4.71
Daily dry matter intake, lb	26.2	27.4	28.3	28.3
Feed:gain	5.74	5.91	6.41	6.05
Hot carcass weight, lb	756a	852b	847b	859b
Backfat, in.	0.47a	0.60b	0.55a	0.60b
Ribeye area, sq. in.	12.7	12.8	12.7	12.9
Yield grade	2.3a	3.0b	2.9ab	3.0b
Marbling score ²	627	669	623	616
Percentage USDA grade choice	100	100	100	100
Overall performance (grazing plus finishing; 342 days)				
Gain, lb	687a	839b	831b	849b
Daily gain, lb	2.01a	2.45b	2.43b	2.48b

¹There was a significant ($P < 0.05$) fescue cultivar \times legume interaction.

²600 = modest, 700 = moderate.

Means within a row followed by the same letter do not differ ($P < 0.05$).

Table 2. Effects of interseeding ladino clover on grazing and subsequent finishing performance of steers grazing tall fescue pastures, Southeast Agricultural Research Center, 2016

Item	Legume treatment	
	No legume	Ladino clover
Grazing phase (244 days)		
Number of head	30	30
Initial weight, lb	534	536
Ending weight, lb	868	905
Gain, lb	334	369
Daily gain, lb	1.37	1.51
Gain/a, lb	267	295
Average available forage dry matter, lb/a ¹	6,888a	5,986b
Finishing phase (98 days)		
Beginning weight, lb	868	905
Ending weight, lb	1320	1353
Gain, lb	453	448
Daily gain, lb	4.62	4.57
Daily dry matter intake, lb	27.4	27.6
Feed:gain	5.97	6.09
Hot carcass weight, lb	819	839
Backfat, in.	0.55	0.56
Ribeye area, sq. in.	12.8	12.8
Yield grade	2.8	2.8
Marbling score ²	619	649
Percentage USDA grade choice	100	100
Overall performance (grazing plus finishing; 342 days)		
Gain, lb	786	817
Daily gain, lb	2.30	2.39

¹There was a significant ($P < 0.05$) fescue cultivar \times legume interaction.

²600 = modest, 700 = moderate.

Means within a row followed by the same letter do not differ ($P < 0.05$).

Table 3. Effects of cultivar on performance of steers grazing tall fescue pastures, Southeast Agricultural Research Center, 2017

Item	Tall fescue cultivar			
	High-endophyte Kentucky 31	Low-endophyte Kentucky 31	HM4	MaxQ
Grazing phase (253 days)				
Number of head	16	16	16	16
Initial weight, lb	597	597	597	597
Ending weight, lb	901	1029	986	1007
Gain, lb	304	432	389	411
Daily gain, lb	1.20	1.71	1.54	1.62
Gain/a, lb	244	346	311	328
Average available forage dry matter, lb/a	5,179a	4,728b	4,812b	4,808b

Means within a row followed by the same letter do not differ ($P < 0.05$).

Table 4. Effects of interseeding ladino clover on performance of steers grazing tall fescue pastures, Southeast Agricultural Research Center, 2017

Item	Legume treatment	
	No legume	Ladino clover
Grazing phase (253 days)		
Number of head	32	32
Initial weight, lb	597	597
Ending weight, lb	951	1011
Gain, lb	354	414
Daily gain, lb	1.40	1.64
Gain/a, lb	283	331
Average available forage dry matter, lb/a	5,215a	4,548b

Means within a row followed by the same letter do not differ ($P < 0.05$).