Effects of Previous Implant Status and Rate of Gain or Implant Status During Summer Grazing on Performance of Stocker Steers

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Story in Brief

To determine if the effects of a previous implant varied with implant status or rate of gain during summer grazing, 125 steers (217 ± 25 kg) with or without a Synovex-S implant during winter grazing (Dec to Mar) were utilized in two studies during summer grazing (Apr to Sept). In April, steers (240 ± 22 kg) in Exp. 1 received Synovex-S, or no implant, while all steers (238 ± 22) in Exp. 2 were implanted and managed at two rates of gain by stocking pastures at 100 AUD/ha with no supplemental feed or parasite control, or at 60 AUD/ha with supplementation and parasite control. In Exp. 1, summer ADG and gross return were greater for steers implanted during summer grazing than those without a summer implant. Previously implanted cattle had reduced summer ADG compared to steers that had not been implanted during winter. Across winter and summer grazing, summer-implanted steers had greater gross return and ADG, while winter implant status did not alter gross return or ADG. In Exp. 2, high gain steers with or without a winter implant had a similar final body weight, summer, and overall ADG. Previously implanted low gain steers had greater final weight, overall ADG, and gross returns than did cattle without an implant during winter grazing. It appears that when summer gains are relatively high, the most effective time to implant is summer, and may be as effective as implanting during both winter and summer. Steers implanted during winter grazing with a reduced rate of summer gain maintained their bodyweight gain advantage over the total grazing period.

Key Words: Beef Cattle, Implants, Carryover Effects, Winter, Summer, Grazing

Introduction

Many stocker operators purchase cattle in the fall and graze them during the winter for economic reasons (to avoid seasonal highs in the cattle cycle) and for production reasons. The common belief is that cattle will *"grow frame"* during winter and when combined with the nutritional restriction that occurs during winter grazing, they will get some form of *"compensatory gain"* during summer grazing. Kuhl (1997) suggested that it may be difficult to observe a weight gain response to estrogenic implants by steers managed at these low rates of gain. However, recent work has shown that steers grazing dormant native tallgrass prairie with a Synovex-S implant (Paisley et al., 1997) and steers grazing dormant Old World bluestem with a combination estrogen-TBA implant (Revalor-G; Ackerman et al., 1997) have increased performance. As a result, the objectives of this study were to determine if steers grazing dormant Old World bluestem would respond to an estrogenic implant and to determine if the carryover effects of a winter implant varied as a result of summer implant status or rate of summer gain.

Materials and Methods

One-hundred-twenty-five spring-born, fall-weaned, mixed breed (English x Continental), steers (217 ± 25 kg) from a single ranch were received at the OSU Bluestem Research Range in

November, 1999, allowed to graze dormant Old World bluestem, and supplemented with 1 kg/steer at each of three weekly feedings with a 38% CP cube. In December, 1999, steers were processed (vaccinated, treated for parasites, branded, dehorned, castrated, and eartagged) and randomly assigned to implant treatment. Steers were allowed to graze 81 ha of dormant Old World bluestem for the duration of the winter grazing period (December to March; 93 d) and were fed 2 kg of a 30% CP cube/steer at each feeding (three times per week).

Treatments and Animals in Experiment 1. In April, 2000, 84 steers used in Exp. 1 were randomly assigned to receive either a Synovex-S implant or no implant for the summer grazing period (151 d, April to September). Steers grazed at a common stocking rate (60 AUD/ha) in four native tallgrass prairie pastures and were managed with supplementation (2 kg/steer of a mid-protein 3/4" range cube fed at each of three weekly feedings) and parasite control. Each pasture contained equal numbers of all treatment combinations.

Treatments and Animals in Experiment 2. In April, 2000, 82 steers utilized in Exp. 2 were implanted with Synovex-S, and randomly allotted to eight native tallgrass prairie pastures managed at either 100 AUD/ha without supplemental feeding, or parasite control, or at 60 AUD/ha with supplementation (2 kg/steer of a mid-protein 3/4" range cube fed at each of three weekly feedings) and parasite control. Each pasture contained equal numbers of steers on each winter implant treatment. Increased grazing pressure (100 vs 60 AUD/ha) was used to reduce animal performance.

Sample Collection in Experiments 1 and 2. All weights were taken following an overnight removal of access to feed and water. Forage mass was estimated from 80 clipped .1 m^2 quadrats at the initiation, mid-point, and completion of summer grazing (Table 1). Clipped samples collected from the native tallgrass pastures during the summer grazing season were separated into green and dead fractions, dried, ground, and crude protein was determined as an indicator of forage quality available to the animals. Gross return as a result of the implant was calculated using the method described by Paisley et al. (1999).

Statistical Analyses of Experiments 1 and 2. Experimental design for both studies was a completely randomized design with a 2 x 2 factorial arrangement of treatments with steer considered the experimental unit and included in the model as a random variable. Fixed effects included in the model for Exp. 1 were winter implant treatment, summer implant treatment, and their interaction, while in Exp. 2, the fixed effects included winter implant treatment, summer rate of gain, and their interaction. Response variables were analyzed using PROC MIXED (SAS Inst. Inc., Cary, NC). Means were calculated using LSMEANS and separated using least significant difference.

Results and Discussion

No interactions were detected ($P>.40$) between winter and summer implant status for any of the measured variables in Exp. 1, while an interaction ($P<.10$) between winter implant status and summer rate of gain was present in Exp. 2 for summer and overall gain and ADG, as well as for final body weight. During the winter, forage availability was adequate so that it would not have been expected to be the primary limitation to animal performance, however, forage quality of the dormant Old World bluestem was very low (Bodine et al., 2001). During the summer, forage available to steers in Exp. 1 was adequate for the observed levels of gain, while in Exp. 2, steers at the low rate of gain had reduced availability to forage by the conclusion of grazing (Table 1).

Table 1. Forage mass and crude protein of clipped samples of tallgrass prairie taken during summer grazing and separated into green and dead fractions for Exp. 1 and 2

		Early summer		Late summer	
Summer grazing, Exp. 1 & 2[1]	Clipped fraction	HIGH[2]	LOW[2]	HIGH[2]	LOW[2]
Forage mass, kg/ha	Green	1592	2845	1352	1682
	Dead	4052	3610	3551	2140
CP, %	Green	9.9	8.9	5.2	5.8
	Dead	2.8	3.5	3.1	3.6

[1]Samples taken at the initiation, mid-point and completion of summer grazing and averaged to represent early and late summer grazing; HIGH samples represent average of pastures on Exp. 1 and the pastures managed to achieve a high rate of summer gain in Exp. 2.

[2]HIGH = pastures managed for high rate of gain (60 AUD/ha) during the early and late summer; LOW = pastures managed for low rate of gain (100 AUD/ha) during the early and late summer

Experiment 1. Initial summer steer body weights (Table 2) were similar (P>.29). Steers that had not been implanted in the winter had greater gain and ADG (Table 2) during summer grazing, which resulted in similar (P>.67) final body weights at the completion of the trial (Table 2). This suggests that winter implanted steers managed to achieve relatively rapid rates of summer gain and underwent a form of compensatory gain that allowed them to reach a similar end-point in body weight at the completion of summer grazing. As a result, overall (winter plus summer) gain and ADG were similar (P>.40) between winter implanted and non-implanted steers (Table 2). Summer implanted steers had greater (P<.10) final body weight at the end of the summer than non-implanted cattle (Table 2). Implanting during the summer increased (P<.05) gain and ADG (Table 2). This resulted in an improvement in gross return of $11.80 (Table 2). The use of an implant in steers grazed on tallgrass prairie during the summer increased overall gain and ADG, resulting in an improvement in gross return of $11.70 (Table 2). The similarity in gross returns to an implant given during summer grazing between the summer and overall periods, suggests that if cattle are managed to attain relatively rapid rates of summer weight gain, the most effective time to use an implant is during summer grazing. Steers with an implant during the winter had a 7.5% increase in ADG as a result of a summer implant and cattle that were not implanted in the winter had a 6.6% increase in ADG when given an implant during summer grazing. This suggests that increased animal performance as a result of the summer implant did not vary as a result of previous implant status, which is supported by the lack of an interaction between winter and summer implant status.

Table 2. Weights, daily gain, total gain, and gross return to implant during summer and overall (combined) grazing periods by steers in Experiment 1 with or without Synovex-S implants during the winter and summer

Summer grazing (Apr-Sept)	[1]Winter +	[1]Winter -	[1]Summer+	[1]Summer -	SE[2]	Effect[3]
Number of steers	42	42	42	42	--	--
Initial weight, kg	241	235	239	236	3.7	.29
Final weight, kg	376	379	385[x]	371[y]	5.1	SUM
Summer ADG, kg/d	.90[x]	.96[y]	.96[a]	.90[b]	0.02	WIN, SUM

Summer gain, kg	137[x]	146[y]	146[a]	137[b]	2.9	WIN, SUM
Gross return, $/steer	--	--	$11.80	--	--	--
Overall grazing, (Dec-Sept)	[1]Winter +	[1]Winter -	[1]Summer+	[1]Summer -	SE[2]	Effect[3]
Overall ADG, kg/d	0.61	0.62	0.63[x]	0.60[y]	0.01	SUM
Overall gain, kg	164	167	170[x]	161[y]	3.1	SUM
Gross return, $/steer	--	--	$11.70	--	--	--

[1]Treatment: Winter + = Synovex-S implant during winter, Winter - = no implant during winter, Summer + = Synovex-S implant during summer, Summer - = no implant during summer

[2]Standard error of the means

[3]Effect of winter implant status (WIN), summer implant status (SUM), or their interaction (INT) at ($P<.10$)

[a,b,c]($P<.05$)
[x,y]($P<.10$)

Experiment 2. Steers with a Synovex-S implant during winter grazing had increased ($P<.07$) ADG, which resulted in greater body weight at the end of winter grazing. As a result, steer body weights (Table 3) at the initiation of the summer grazing period were greater ($P<.09$) for steers that had received a winter implant. However, this difference was small (8 kg) and would not be expected to contribute to differences in summer performance, especially since equal numbers of previously implanted and non-implanted steers grazed each pasture. The greater body weight of winter implanted steers was maintained ($P<.07$) for those cattle at the low rate of gain, while steers at the high rate of summer gain had similar ($P>.88$) body weight at the completion of grazing regardless of winter implant status (Table 3). This pattern was also observed numerically in summer weight gain and daily gain, as well as being noted at a statistically significant level for overall weight gain and daily gain (Table 3). Using an estrogenic growth-promoting implant increased weight and daily gain during grazing of low-quality, dormant forage, resulting in an increase in live body weight. This increased weight gain was maintained when cattle grazed at a low rate of gain during the summer, and was sufficient to result in an increased body weight, weight gain, and daily gain at the completion of the entire grazing trial. However, when cattle had access to adequate forage and were managed to have a higher rate of gain, they had similar body weights, weight gain, and daily gain at the completion of the grazing season. This indicates that summer gains were adequate to compensate for lower animal performance by steers without implants during winter grazing. When summer gains are expected to be adequate, due to management choices such as stocking rate, grazing system, supplementation, and parasite control, the summer grazing period may be the most effective time to implant, since steers only implanted during summer grazing at the high rate of gain had similar performance as those implanted during both the winter and summer grazing periods.

Table 3. Weights, daily gain, and total gain during summer and overall (combined) grazing periods by steers implanted with Synovex-S during summer grazing in Experiment 2 with or without a Synovex-S implant during winter grazing and managed at two rates of summer gain

Summer grazing, (Apr-Sept)	[1]HIWin+	[1]LOWin+	[1]HIWin-	[1]LOWin-	SE[2]	Effect[3]
Number of steers	21	20	21	20	--	--
Initial weight, kg	244[a]	245[a]	235[b]	236[b]	5.1	IMP
Final weight, kg	384[a]	348[bx]	385[a]	331[by]	6.8	INT

Summer ADG, kg/d	.93[a]	.68[b]	.99[a]	.63[b]	.03	INT
Summer gain, kg	141[a]	104[b]	151[a]	95[b]	4.5	INT
Overall grazing, (Dec-Sept)	[1]HIWin+	[1]LOWin+	[1]HIWin-	[1]LOWin-	SE[2]	Effect[3]
Overall ADG, kg/d	.62[a]	.47[bx]	.64[a]	.43[by]	.02	INT
Overall gain, kg	166[a]	127[bx]	172[a]	115[by]	3	INT

[1]Treatment: HIWin+ = Synovex-S implant during winter and high rate of gain during summer, HIWin- = no implant during winter and high rate of gain during summer, LOWin + = Synovex-S implant during winter and low rate of gain during summer, LOWin - = no implant during winter and low rate of gain during summer

[2]Standard error of the means

[3]Effect of winter implant status treatment (IMP), summer rate of gain (GAIN), or their interaction (INT) at (P<.10)

[a,b,c](P<.01)
[x,y](P<.07)

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