Response by Mexican crossbred stocker steers to implant type and monensin feeding status during winter grazing of dormant forages

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Story in Brief

One-hundred-ninety-nine crossbred (*Bos indicus ´ Bos taurus*) steers (247 ± 27 kg) of Mexican origin were processed in a commercial backgrounding yard in Canyon, TX and fed for approximately one week. The steers were transported to the Bluestem Research Range and offered ad libitum access to prairie hay and 1.25 kg/(steer·d) of a 40% CP supplement for 21 d. Steers were randomly assigned to implant treatments of Revalor-G, Synovex-S, or no implant on Jan. 4, 2002, and grazed 12 dormant Old World bluestem pastures (104 ha total, n = 111 steers) or 8 dormant native tallgrass prairie pastures (224 ha, n = 88 steers), until April 16. Steers in half of the pastures of each grass type received 3 kg/feeding every other day of a cottonseed meal, wheat middlings based 34% CP supplement containing monensin [165 mg/(steer×d)] while the remaining pastures received the same amount of a similar supplement without monensin. Forage type did not affect winter weight gain or final body weight. Monensin feeding increased steer performance by 77% [.13 kg/(steer·d)] and implanting increased gains 46% [.08 kg/(steer×d)] with no difference observed between implant types. Responses to monensin and implanting did not interact and were additive, averaging 141% greater average daily gain than non-implanted steers fed no monensin. Use of monensin and growth-promoting implants are efficacious methods to increase animal performance in winter grazing scenarios where cattle are grazing low-quality forages with relatively slow rates of gain.

Key Words: Animal Performance, Beef Cattle, Implants, Monensin, Winter Grazing

Introduction

Stocker steers imported from Mexico are frequently grazed in Oklahoma, often being wintered on dormant, standing forages prior to grazing summer grass. The use of implants during the winter phase is infrequent, especially with Mexican cattle, since the common perception exists that these cattle are frequently exotic crossbreeds having greater physiological maturity than typical stocker cattle. Previous research conducted at Oklahoma State has shown a rate of gain response to different implant types (estrogenic and trenbolone acetate[**TBA**]/estrogenic) during winter grazing (Ackerman et al., 1997; Paisley et al., 1997), however, at the expense of advanced skeletal maturity upon harvest (Paisley et al., 1999). The inclusion of monensin in a winter protein supplement also occurs infrequently, even though previous research has shown it to be effective at low rates of gain (Horn et al., 1980; Gardner et al., 1999; Horn et al., 2000). The objectives of this study were to determine if Mexican steers grazing dormant forages would respond to growth-promoting implants or monensin, and if there was an interaction between implants and monensin. A secondary objective was to determine how these responses compared to our previously conducted research utilizing steers grazing either dormant Old World bluestem pastures or dormant native tallgrass prairie pastures (Ackerman et al., 1997; Paisley et al., 1997; Bodine et al., 2001).

Materials and Methods

Mixed breed (*Bos indicus* x English x Continental) Mexican steers (n=199; 247 ± 27 kg) were received (vaccinated for respiratory disease, treated for parasites, branded, dehorned, castrated, and eartagged) in a commercial backgrounding yard in Canyon, TX, and were fed there for approximately one week. The steers arrived at the OSU Bluestem Research Range on December 10 and 11, 2001. Upon receiving, steers were offered ad libitum access to prairie hay and fresh water, were fed 1.25 kg/(steer×d) of a 40% CP range cube, and were individually weighed and tagged. Approximately three weeks later, steers were randomly assigned to implant treatments of Revalor-G (**Rev-G**, Hoechst-Roussel Agri-Vet, 8 mg estradiol-17beta and 40 mg trenbolone acetate), Synovex-S (**Syn-S**, Fort Dodge Animal Health, 200 mg progesterone and 20 mg estradiol benzoate), or no implant (**None**), and allowed to graze one of either 12 Old World bluestem (OWB) pastures (104 ha total, n = 111) or 8 native tallgrass prairie (TGP) pastures (224 ha, n = 88). Weights were taken on December 10 and 11, 2001, January 4, March 13, and April 16, 2002, following the removal of access to feed and water of approximately 10 h (overnight). Steers were fed supplements (Table 1) in groups within each pasture in feed bunks with a cottonseed meal, wheat middlings-based range cube (3/4") that contained approximately 34% CP and 86% TDN (Table 2), and was fed every other day at a rate of 3 kg/steer at each feeding (1.5 kg/d). Half of the pastures of each forage type received a supplement containing 110 mg of monensin/kg (Rumensin 80, Elanco Animal Health), resulting in 165 mg of monensin being offered to each steer daily. The remaining pastures received the same amount of a similar supplement without monensin. Pastures of both forage types were stocked based on forage availability to achieve stocking rates similar to those that had previously resulted in similar rates of gain between OWB and TGP pastures during winter grazing (Ackerman et al., 1997). Forage availability (Table 2) was determined from 20 visual obstruction measurements per pasture prior to the initiation and at the completion of the trial. Diet quality (Table 2) was estimated from masticate samples collected using the ruminal evacuation technique on Feb. 20. Experimental design was a randomized complete block, with a 2 ´ 3 factorial arrangement of treatments (monensin ´ implant) blocked by the two forage types. Steer was considered the experimental unit for implant treatment and included in the model as a random variable. Pasture was considered the experimental unit for monensin treatment and included in the model as a random effect using the interaction of monensin and experimental pasture effect. Fixed effects included in the model were implant and monensin treatment, and their interaction. Response variables were analyzed using PROC MIXED (SAS Inst., Inc., Cary, NC). Means were calculated using the LSMEANS option and separated by least significant difference.

Table 1. Feedstuff composition of supplements, % as fed[a].

Ingredients	Control (0 mg monensin)	Monensin (110 mg/kg)
Cottonseed Meal	49.025	49.0125
Wheat middlings	27.55	27.50
Soybean hulls	15.00	15.00
Cane molasses	5.00	5.00
Limestone	1.80	1.80
Fine mixing salt	.50	.50
Rumensin 80[b]	0	0.0625
Urea	1.00	1.00
Trace mineralized salt	.05	.05

Vitamin A-30,000[c]	.075	.075

[a]Fed as a ¾" pellet at the rate of 1.5 kg/(steerday) on an every other day basis.

[b]0 or 568 g/908 kg (0 or 1.25 lb/ton) to provide 0 or 110 mg of monensin/kg of supplement (0 or 50 mg/lb).

[c]To provide 22,520 IU of Vitamin A/kg of supplement.

Table 2. Forage and supplement characteristics, DM basis.

Item	Supplement	TGP[a]	OWB[b]
Forage Mass[c]	---	3559	1906
Forage Availability[d]	---	34.8	6.9
Organic Matter, %	93.0	89.8	95.1
IVOMD, %[e]	---	57.8	59.4
Ash-free NDF, %[f]	32.1	71.7	82.3
Ash-free ADF, %[f]	18.9	46.1	50.2
Crude Protein, %	34.3	6.2	3.6
DIP, % of CP[g]	---	45.1	43.5
UIP, % of CP[g]	---	54.9	56.5

[a,b]TGP = dormant native tallgrass prairie (n=8 pastures, 224 ha, 88 steers), OWB = dormant Old World bluestem (n=12 pastures, 104 ha, 111 steers).

[c]kg of DM/ha, mean across all pastures of each forage type.

[d]kg of forage mass DM/kg of mean steer body weight.

[e]IVOMD = in vitro organic matter disappearance.

[f]NDF and ADF = Neutral and Acid Detergent Fiber, on an ash-free basis.

[g]DIP and UIP = Degradable and Undegradable Intake Protein, as a percentage of crude protein.

Results and Discussion

Rate of gain prior to trial initiation (1.12 kg/d) and steer body weight (247 kg) at trial initiation (Table 3) did not differ (P>.62) between implant or monensin treatments, forage type, pasture, or any of the interactions. Steer weight gain during the trial did not differ (P>.78) between OWB and TGP (23 vs 22 kg), similar to reports of Ackerman et al. (1997). Forage quality was low (Table 2) and similar to that reported by Ackerman et al. (1997). There were no interactions observed (P>.25) between monensin feeding and implant use or type in any of the measured variables. This agrees with previous research that has indicated that monensin and implants affect animal performance by different mechanisms, and are additive in their responses (Gardner et al., 1999; Horn et al., 2000). Feeding a supplement containing monensin [at a rate of 165 mg/(steer×d)] increased (P<.01) weight gain per steer and per day and resulted in heavier final body weight (Table 3) than steers that received a similar amount of a similar supplement without monensin. Previous research has indicated that monensin is effective in increasing animal performance at low rates of gain (Horn et al., 1980, Gardner et al., 1999, Horn et al., 2000). Use of a growth promoting implant increased (P<.01) steer performance (Table 3) with no difference (P>.75) between implant types. Observed rates of gain and increases in animal performance due to either estrogenic (Synovex-S) or combination estrogenic/androgenic (Revalor-G) implants were similar to our previously published results (Ackerman et al., 1997; Paisley et al., 1997; Bodine et al., 2001). The studies of Paisley et al. (1997) and Bodine et al. (2001) used cattle with *Bos indicus* breed influence and the study of Ackerman et al. (1997) utilized similar Mexican steers. Implant payout was not measured in this study, but steers were weighed March 13, after 69 d and again on April 16 (trial completion), and the responses to implant were similar at both weigh days. This suggests that payout of both implant types was still effective after over 100 d. When steers were not fed monensin, implanting resulted in a 67% increase in ADG, and feeding implanted steers monensin resulted in a 74% additional increase in animal performance compared to implanting alone, for a total increase in ADG for implanted, monensin-fed steers of 141%. When steers were not implanted, monensin feeding increased ADG by 105% and implanting monensin-fed steers resulted in an additional 36% increase in ADG compared with non-implanted monensin-fed steers for a total improvement in ADG of 141% by monensin-fed, implanted steers compared with non-implanted steers receiving no monensin. The use of either a monensin-containing protein supplement fed every other day or a growth promoting implant was efficacious in increasing the rate of weight gain for a 100-d grazing period by Mexican crossbred stocker steers grazing dormant forages with a level of expected gain of .11 kg/d. Effects of implants and monensin were additive and resulted in greater gain of body weight by steers than steers grazed without implants and not fed monensin.

Table 3. Main effects of monensin supplementation and implant type on performance by steers grazing dormant Old World bluestem or native tallgrass prairie pastures[a].

	Monensin, mg/(steer·d)[b]		Implant type[c]				P-value[d]		
Item	0	165	None	Rev-G	Syn-S	SEMe	Imp	Mon	Imp*Mon
Number of steers	103	96	66	67	66				
Steer Wts., kg									
Initial, Jan 7	248	246	247	246	247	3.7	.91	.67	.78
Mid, Mar 13	264	272	264	270	271	3.6	.33	.07	.94
Final, Apr 16	264	275	265	271	273	3.6	.26	.02	.94
Wt. Gain, 1/7-4/16 (100 d)									
kg/steer	16.3	29.0	17.3	24.9	25.7	2.7	.01	.01	.25
kg/d	.16	.29	.17	.25	.26	.3	.01	.01	.25

[a]Old World bluestem pastures n = 12, 104 ha total, 111 steers; native tallgrass prairie pastures n = 8, 224 ha total, 88 steers.

[b]Supplements with 0 or 165 mg monensin/steer daily, fed every other day to half of the pastures of each forage type.

[c]Implant types given at trial initiation were: None = no implant; Rev-G = Revalor-G (8 mg estradiol-17beta and 40 mg trenbolone acetate); Syn-S = Synovex-S (200 mg progesterone and 20 mg estradiol benzoate).

[d]IMP = main effect of implant type treatment; Mon = main effect of monensin feeding treatment; Imp*Mon = interaction between implant and monensin treatments.

[e]SEM = standard error of the means.

Implications

The use of either growth-promoting implants or protein supplements that contain monensin are efficacious technologies to increase animal performance of stocker steers grazing of low-quality, dormant, standing forages at relatively low rates of gain. The response is additive and should be evaluated by individual producers based on expected rates of gain, cost of implants and monensin, and the cost of delivery of these technologies in relation to the value of added gain.

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