Effects of implant and type of supplement on growth performance of steers grazing summer pasture

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STORY IN BRIEF

This study investigated the effects of implant and type of supplement on performance of steers grazing summer pasture using a split plot design. Supplement treatment served as whole plot and implant treatment served as sub-plot. Crossbred steers (n = 196; BW = 474 ± 7.87 lb) were ranked by weight and randomly assigned to 1 of 15 pastures. Supplement treatments were control (no supplement), distillers dried grains (DDGS; 30% CP), and cottonseed meal (CSM; 30% CP). Pasture served as the experimental unit (five pastures per treatment). Implant treatments were control (no implant), Ralgro® and Component TE-G®. Individual animal served as the experimental unit for implant treatments (range of two to six animals per implant treatment within a pasture). Supplement treatments were initiated on d 56; feed was delivered three times per wk at a level of 1 lb$\cdot$steer$^{-1}\cdot$d^{-1} (2.33 lb$\cdot$steer$^{-1}\cdot$feeding^{-1}). The implant by supplement type interaction for BW or ADG was not significant ($P > 0.10$). There was no difference in final BW due to implantation ($P = 0.32$). Implantation increased ADG 7.7% ($P < 0.01$) during the 126 d grazing season, however implant type did not influence ADG. Supplementation with CSM had no affect on BW, although DDGS increased BW compared to control (700 vs. 729 lb; $P < 0.05$). Supplementation resulted in increased ($P < 0.01$) ADG (1.77, 2.05 and 2.23 lb/d for control, CSM and DDGS respectively). Cattle supplemented with DDGS had greater ($P < 0.05$) ADG compared to cattle supplemented with CSM. This difference indicates that steers fed DDGS were able to utilize increased energy from DDGS as compared with CSM (87.0 vs. 69.4% TDN, respectively), resulting in 2.17 vs. 3.57 lb of supplement per pound of additional ADG for DDGS and CSM, respectively. Implantation and supplementation increased performance of steers grazing summer pasture.

Key Words: implants, supplementation, grazing steers

INTRODUCTION

Stocker cattle are a major component of the beef industry in the southern Great Plains. Within this industry, there are several technologies available to operators to improve efficiency and increase profits. Some of these management strategies include, but are not limited to, implants, protein supplementation, and the inclusion of ionophores in mineral or feed supplements. Implants consistently increase performance 10 to 15% (Kuhl, 1997). Ralgro®, an estrogenic implant (zeranol), is frequently used in the stocker industry. Kuhl (1997) reported that body weight gains of 26 lb were seen when Ralgro® was used (n = 4,188), but that it is only efficacious for approximately 90 d. Combination implants have been more highly promoted in recent years because of a potentially longer payout period. One of these implants is Component TE-G®, a TBA/estradiol implant for grazing cattle. Another commonly used management tool is protein supplementation during late summer, when forage maturity is increasing and forage quality is decreasing. During this period of time rumen ammonia-N is first-limiting, decreasing forage intake and digestibility (McCollum and Horn, 1990). The "Oklahoma Gold" program developed at Oklahoma State University was established on the basis that providing 1 lb of a protein supplement (38% CP) on alternate days can improve performance of grazing steers by 0.45 lb/d. This program was established using oilseed meals as a base commodity. In recent years these oilseed meals have increased in price relative to alternative protein sources. Therefore, the objectives of this study were to evaluate the effects of implant and type of supplement on performance of steers grazing summer pasture.

MATERIALS AND METHODS

This study was conducted at the OSU Crosstimbers-Bluestem Stocker Range about 16 miles West of Stillwater, OK.

Crossbred steers (n = 196) consisting of primarily Bos-Indicus breeds with an average initial body weight of 476 ± 7.78 (lb; SEM) arrived in late May and were stratified by weight and randomly allotted to one of three treatments. Treatments were then randomly assigned to 1 of 15 pastures. Cattle were assigned to treatments so that initial weight was uniform across all three implant treatments (474 ± 7.88 lb; SEM) and across all 15 pastures (474 ± 24.49 lb; SEM).

All cattle were dewormed with Ivermax® (5 mg ivermectin/ml; American Livestock Supply, Inc.) and individually identified with a treatment tag prior to the initiation of the experiment. Therapeutic treatments were administered whenever necessary for morbidity. Any animal exhibiting evidence of prior implantation, external signs of injury, disease, “cropped” or deformed ears, or any other abnormal condition during acclimation or experimental periods were excluded or removed from the study.

Treatments consisted of: 1) Control (no implant); 2) Ralgro (36 mg zeranol; Schering-Plough Animal Health Corp., Union, NJ 07083); and 3) Component TE-G® (40 mg trenbolone acetate, 8 mg estradiol USP, 29 mg tylosin tartrate; Ivy Animal Health, Overalnd Park, KS 66214). All implants were administered on d 1, in the middle third of the ear using the standard implanting device for the respective product. After implantation, each ear was palpated to verify proper implant placement. Prior to each implanting, the ear and the implant gun needle were disinfected. Implant sites were evaluated at d 98 for abnormalities and scored as follows: 1 = implant present, normal; 2 = implant present, abnormal; 3 = no implant present, normal; 4 = no implant present, abnormal. Cattle were maintained in treatment groups for a grazing period of 126 d (5/29/08 thru 10/2/08) and individually weighed on d 0, 56, 98 and 126. Cattle were observed regularly throughout the study for health problems.

On July 24, 2008 (d 56), pastures were randomly assigned to one of three supplement treatments so that each implant treatment had equal replications of each supplement. Supplements (Table 1; As-fed basis) were: 1) control (no supplement); 2) cottonseed meal (**CSM**; 30% CP); 3) dried distiller’s grains with solubles (**DDGS**; 30% CP). Supplements were fed at a rate of 1 $lb \cdot steer^{-1} \cdot d^{-1}$ and delivery occurred 3 d a week. The amount supplied was determined by multiplying the daily feeding rate by seven and dividing it by three (2.33 $lb \cdot steer^{-1} \cdot feeding^{-1}$). Supplements were fed for a 70-d period. Shrunk weights were obtained at the beginning of the supplementation period (d 56), the mid-point (d 98; 9/4/08), and the conclusion of the experiment (d 126; 10/2/08).

Table 1. Ingredients and chemical composition of cottonseed meal (CSM) and dried distillers grains with solubles (DDGS) supplements

	Supplement	
Ingredients (as-Fed)	CSM	DDGS
Cottonseed Meal (44% CP)	54.85	30.64
Dried Distillers Grains w/ Solubles	0.00	61.50
Wheat Middlings	37.99	0.00
Cane Molasses	5.00	5.00
Limestone	2.00	1.65
Dical	0.00	1.05
Rumensin 80	0.16	0.16
Chemical Composition, %		
CP	31.80	34.30
Fat	3.20	9.90
TDN[a]	69.40	87.00
Ca	1.08	0.94
P	1.04	1.12

[a]Calculated using a multiple-component model including CP, lignin, ash, ether extract, ADICP, NDICP, NDF, IVNDFD (Weiss, 1992)

Twelve pastures consisting of approximately 260 acres of old world bluestem (OWB) accommodated 163 steers at a stocking rate near 1.6 acres per steer. The remaining cattle grazed 240 acres of tallgrass native pastures (NR) at stocking rates of 6 to 8 acres per steer. Hand plucked forage samples from each pasture were collected in triplicate bi-weekly throughout the supplementation phase (8/6/08, 8/21/08, 9/4/08, 9/18/08, and 10/2/08) of the study. DM (oven drying at 55°C) was determined immediately following collection and after drying, samples were ground through a Wiley Mill grinder using a 2 mm screen and stored for future analysis. Forage samples were analyzed for CP (% N x 6.25; LECO Corporation, St. Joseph, MI 49085), NDF, ADF (Ankom Tech Corp, Fairport, NY), and ash (combusted 6 h in a muffle furnace at 500°C) and results are shown in Table 2.

Table 2. Composition of old world bluestem (OWB) and tallgrass native range (NR) forages during summer 2008

	DM		CP		NDF		ADF		Ash	
Date	OWB	NR	OWB	NR	OWB	NR	OWB	NR	OWB	NR
8/6	40.4[a]	46.2[b]	8.2[b]	5.8[a]	74.7	73.1	37.9	38.1	5.6[a]	6.2[b]
8/21	39.9	39.9	11.6[b]	6.0[a]	74.2	75.3	36.4[a]	39.7[b]	5.7[b]	5.0[a]
9/4	41.5	42.7	8.9[b]	5.9[a]	75.1	76.3	38.6[a]	41.2[b]	5.5[b]	4.9[a]
9/18	43.2[a]	57.0[b]	8.8[b]	5.4[a]	73.8	75.0	37.7[a]	40.8[b]	5.5	5.2
10/2	54.2	53.6	6.9[b]	4.7[a]	74.7	75.3	39.5[a]	41.4[b]	5.2[b]	4.5[a]

[ab]Means within the same row for each forage chemical component without a common superscript are different ($P < 0.5$)

Effects of implant and supplement on growth performance of steers were analyzed as a split-plot design using MIXED procedures of SAS (SAS Inc., Cary, NC) with $\alpha = 0.05$. Whole-plot was supplement treatment with pasture as experimental unit and Sub-plot was implant treatment with steer as experimental unit. Pasture type (OWB vs. NR) was a random variable for supplement while pasture served as the random variable for implant. Orthogonal contrasts were used to determine implant, implant type, supplement and supplement type on performance. Ear score differences were analyzed using FREQ procedures in SAS (SAS Inc., Cary, NC) and Chi Square calculations to separate mean percent differences. The tables included implant by ear score at d 98.

RESULTS AND DISCUSSION

The implant by supplement type interaction for BW or ADG was not significant ($P > 0.10$), therefore main effect means are presented (Table 3 and 4). Effects of supplementation on growth performance of steers are presented in Table 3. Supplementation with CSM had no affect on final BW, although DDGS increased BW compared to control (700 vs. 729 lb; $P < 0.05$). Supplementation resulted in increased ($P < 0.01$) ADG (1.77, 2.05 and 2.23 lb/d for control, CSM and DDGS respectively). Cattle supplemented with DDGS had greater ($P < 0.05$) ADG compared to cattle supplemented with CSM. This difference implies that steers fed DDGS were able to utilize the increased energy from DDGS as compared with CSM (87.0 vs. 69.4% TDN, respectively), resulting in 2.17 vs. 3.57 lb of supplement per lb of additional ADG for DDGS and CSM, respectively. Supplement containing monensin resulted in improved performance of stocker steers grazing summer grass and stocker steer performance was further enhanced when supplement contained DDGS.

Table 3. Performance of steers (n = 195) provided 1 lb·steer^{-1}·d^{-1} of a monensin containing cottonseed meal (CSM; 30% CP) or dried distillers grains with solubles supplement (DDGS; 30% CP) from July 24, 2008 until October 2, 2008

	Treatments				[2]*P*-Value		
	Control	CSM	DDGS	[1]SEM	Trt	CON vs SUPP	CSM vs DDGS
BW, lb							
Initial	576	569	572	5.12	0.64	0.41	0.68
Final	700^{a}	712^{ab}	729^{b}	6.91	0.04	0.03	0.13
ADG, lb							
D 56-91	1.77^{a}	2.06^{b}	2.22^{b}	0.07	<0.01	<0.01	0.11
D 91-126	1.76^{a}	2.04^{ab}	2.25^{b}	0.11	0.02	0.01	0.19
D 56-126	1.77^{a}	2.05^{b}	2.23^{c}	0.05	<0.01	<0.01	0.03

[1]Standard error of the mean.
[2]Probability of a greater F-statistic
[a,b]Means in the same row without a common superscript are different ($P < 0.05$)

Effects of implantation on performance of grazing steers during a 126 d period are presented in Table 4. There was no difference in final BW due to implantation ($P = 0.32$). Implantation increased ADG 7.7% (1.81 vs. 1.95 lb/d; $P < 0.01$) during the entire grazing period (126 d). However, implant type did not influence ADG over the entire grazing period, but there was a trend for improved ADG ($P = 0.15$), over the final 28 d, for Component TE-G® as compared to Ralgro®. This study was repeated in 2009, data pending, to increase observations and more confidently interpret this trend. Implants do improve performance of steers grazing summer range and Component® TE-G and Ralgro® improve performance similarly up to 90 d of grazing. During this time period the value of implanting was $5.32/steer with respect to value of gain from May to October, 2008.

Table 4. Performance of steers (n = 195) implanted with Ralgro® or Component TE-G® while grazing from May 29, 2008 until October 2, 2008

	Treatments				[2]*P*-Value		
	Control	Ralgro	Component	[1]SEM	Trt	CON vs IMP	Ralgro vs Component
BW, lb							
Initial	478	474	474	6.71	0.91	0.67	0.99
Final	706	716	723	8.18	0.32	0.16	0.56
ADG, lb							
D 0-98	1.76[a]	1.90[b]	1.92[b]	0.05	<0.01	<0.01	0.70
D 98-126	1.96	1.96	2.13	0.10	0.25	0.41	0.15
D 0-126	1.81[a]	1.92[b]	1.97[b]	0.04	<0.01	<0.01	0.26

[1]Standard error of the mean.
[2]Probability of a greater F-statistic
[a,b]Means in the same row without a common superscript are different ($P < 0.05$)

Ear palpation results are presented in Table 5. There was an increased presence of implants in cattle implanted with Component® TE-G at d 98 ($\chi^2 < 0.01$). However, there was not a difference in abnormalities due to implant or implant type. These data suggests that Component TE-G® has a slower release rate than Ralgro® and that abscesses in stocker cattle due to implantation may not be a problem, depending on technician and implantation procedure.

Table 5.Ear palpation score 98 d post implantation

	Treatments			$P>\chi^2$
	Control	Ralgro	Component	Trt
Ear Score[1]				
1	0.00[a]	3.03[a]	56.92[b]	<0.01
2	0.00	0.00	0.00	-
3	100.00[b]	95.45[b]	43.08[a]	<0.01
4	0.00	1.52	0.00	0.37

[a,b]Means in the same row without a common superscript are different ($P < 0.05$)
[1]1 = implant present, normal; 2 = implant present, abnormal; 3 = no implant present, normal; 4 = no implant present, abnormal

Value of supplementing protein with monensin to steers grazing summer grass was in excess of $0.40/ lb of added BW gain up to $350/ ton (Table 6). Substituting CSM with DDGS increased the net return on investment at the calculated value of gain by approximately $0.20/ lb of added BW gain. The increased cost of CSM, in combination with the decrease in supplement efficiency, makes substituting DDGS, depending on availability, an economically viable option. However, fat content of DDGS makes pelleting a challenge and even though this was pelleted, the pellet quality was much lower than CSM. DDGS was also more apt to bridge in bulk storage than CSM.

Table 6.Value of supplementing stocker steers grazing summer grass and the economics of substituting cottonseed meal (CSM) with dried distillers grains with solubles (DDGS)

	COG[1], $/lb			NROI[3] $/lb	
	CSM	DDGS	VOG[2], $/lb	CSM	DDGS
Feed Cost, $/ton					
200	0.35	0.22	1.04	0.69	0.82
250	0.44	0.27	1.04	0.59	0.77
300	0.52	0.33	1.04	0.52	0.72
350	0.62	0.38	1.04	0.42	0.66

[1]Cost of Additional Gain from Supplementation
[2]Value of Additional BW Gain
[3] Net Return on Investment of Supplement

In summary, implanting summer stocker steers with Component® TE-G has potential to lengthen the pay out period. Also, DDGS can be an effective and economic feed ingredient in a protein supplement for steers grazing OWB or NR.

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