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Summer vs. Winter Growth Promotant Strategies for Intact Yearling Heifers

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Growth promotant strategy by season interactions were not found for gain, efficiency of gain or carcass traits.

Summary

A winter and a summer trial were conducted to evaluate growth promoting strategies among season for yearling heifers fed feedlot finishing diets. Two hundred seventy Angus crossbred intact yearling heifers were used for each trial. Daily dry matter intake and daily water intake were recorded and average daily gain and feed efficiency were calculated. A growth promotant by season interaction was found for dry matter intake only. Performance was improved in both summer and winter when a growth promoting system was used. In the summer, adding melengestrol acetate to estrogenic and androgenic implants strategies tended to stimulate DMI, while in the winter DMI was suppressed by the addition of melengestrol acetate. Heifers had higher gains and intakes in the winter but more efficient gain in the summer.

Introduction

Growth promoting systems have been implemented by beef cattle producers for over 30 years. Approximately 96% of the finished beef cattle in the United States have received a growth promoting implant at least once in their lifetime. Estrogenic and androgenic implants have been reported to increase average daily gain 5 to 15% and improve feed efficiency 5 to 10%. Growth promoting strategies involving melengestrol acetate (MGA) and anabolic implants for both feedlot heifers and steers have been studied extensively by industry and university researchers. However, there is minimal research evaluating the efficiency of growth promoting systems across seasons.

The objective of this study was to evaluate the effect of growth promotant implant strategies with and without MGA on performance and carcass characteristics for intact yearling feedlot heifers in summer compared to winter.

Procedure

Winter Experiment

Two hundred seventy Angus crossbred, intact yearling heifers (mean BW = 745 lb) were purchased from western South Dakota in early November. Heifers were pregnancy checked prior to arrival at the University of Nebraska Northeast Research and Extension Center, Concord, Neb. Upon arrival, November, 1999, heifers were given free choice water and a receiving diet. The receiving diet contained chloratetracycline (CTC) administered at 2 g/head/day for 7 days. Heifers were processed two weeks after arrival and included: weighing, palpating for existing implants, vaccinating with Bar-Vac-7/Somnus® for clostridial organisms and Elite 4® (Boehringer Ingelheim Animal Health, Inc., St. Joseph, MO), deworming and treating for external parasites (Cydectin®; Fort Dodge Animal Health, Overland Park, KS).

On Dec. 8, 1999, all heifers were weighed and sorted into their respective blocks. This weight was used to assign heifers randomly to pens (9 head/pen) within block. Blocks 1, 2 and 3 were different alleys in the feedlot and are designed with different airflow patterns. Block 1 consisted of 6 pens and blocks 2 and 3 consisted of 12 pens. Pens within blocks were assigned randomly to treatments; block 1 consisted of 1 pen/treatment and blocks 2 and 3 had 2 pens/treatment/block. Treatments were: control, estrogenic implant, E; (Compudose®; 24 mg Estradiol - 17β; Vetlife, West Des Moines, IA), androgenic implant, TBA (Finaplix-H®; 200 mg TBA; Intervet, Inc., Millsboro, DE), E + TBA; ET, (Compudose® in one ear and a Finaplix-H® implant in the other ear), MGA (MGA®200 Premix; Pharmacia Animal Health, Kalamazoo,

Table 1. Step-up and Finishing Diets for Winter and Summer Trials and Diet Composition.

	Dry Matter Basis				
	1	2	3	4	5[a]
Ingredients, %					
Alfalfa Hay	40.0	28.0	15.5	10.0	5.0
Corn Silage	12.0	12.0	15.0	10.0	5.0
Dry Rolled Corn	42.5	54.5	61.0	77.5	81.5
Soybean Meal	—	—	—	2.0	2.0
Dry Supplement	1.0	1.0	2.0	2.0	2.0
Liquid Supplement	4.5	4.5	4.5	4.5	4.5
Composition					
Dry Matter, %	69.3	70.0	67.8	72.8	78.5
Crude Protein, %	14.6	13.6	13.6	13.2	12.8
Calcium, %	1.15	0.99	0.84	0.76	0.67
Phosphorus, %	0.29	0.31	0.33	0.33	0.34
NE_m, Mcal/lb	0.75	0.80	0.85	0.88	0.91
NE_g, Mcal/lb	0.50	0.55	0.59	0.62	0.65[a]

[a]5 was the finishing ration.

MI) and ET implant and fed MGA, ETM. Heifers were adapted to grain diets using 5 step-up rations (Table 1) with step 5 as the finishing ration. All heifers were on the finishing ration at the start of the trial and were fed once a day at 0800 throughout the experiment. Two dry supplements, in pellet form, were used in the trial one with MGA formulated to be fed at .45 mg/head/day and one supplement without. The dry supplements contained Rumensin 80® at 25 g/T and Tylan 40® at 8.33 g/T (Elanco Animal Health, Indianapolis, IN). On Dec. 9 heifers in blocks 1 and 2 were weighed, implanted and sorted to their respective trial pens. Heifers assigned to Block 3 were weighed, implanted, bled (4 heifers/pen) and sorted on Dec. 10. Heifer non-shrunk initial weights were obtained by averaging the Dec. 8 and Dec. 9 individual weight for Blocks 1 and 2, and by averaging the Dec. 8 and Dec. 10 individual weight for Block 3. Individual full weights were obtained at day 35, 70 and 104, the day before harvest.

Water intake was recorded daily when bunks were read, prior to feeding. On the day of harvest, hot carcass weight (HCW), and liver scores were recorded. USDA quality grade, marbling score, USDA yield grade, 12th – rib fat thickness, kidney, pelvic and heart fat percentage (KPH) were recorded after a 24-hour chill. Fill differences among treatment groups were corrected by adjusting final weights and corresponding performance to a common dressing percentage, 63%.

Summer Experiment

In early spring, 270 Angus crossbred, intact yearling heifers (mean BW = 745 lb) were received from western South Dakota and were of similar type and kind as used in the winter trial and managed similar to heifers described in the winter experiment. On June 13, 2001 heifers were allotted randomly to 30 pens (five pens/treatment; nine heifers/pen) and pens were assigned randomly to treatments, as described in the winter experiment. Non-shrunk initial weights were the average of consecutive weights taken over a two-day period. Individual full weights were taken on day 34, 68 and 104 (day prior to harvest). Heifers were stepped up on feed as explained in the winter trial (Table 1). All heifers were fed monensin and tylosin throughout the trial.

During the summer experiment one heifer died on day 74 and was not included in statistical analysis. On the day of harvest, HCW and liver scores were recorded as described in the winter trial. Carcass data were collected after a 24-hour chill using procedures outlined in the winter experiment.

Statistical Analysis

Performance, and carcass characteristics were analyzed using Mixed Models procedures of SAS. Means were separated using least square means. Quality grade and liver abscess scores were analyzed using Chi-Square analysis.

Table 2. Main effects of season on feedlot heifer performance and water intake.

	Winter	Summer	SE
Weight, lb.			
Initial	845	846	1.26
Day 35	990[c]	953[b]	2.72
Day 69	1111[c]	1053[b]	3.91
Final[a]	1168[e]	1138[d]	3.94
Average daily gain, lb/day			
0 - 35	4.13[c]	3.14[b]	0.08
0 - 69	3.80[c]	3.05[b]	0.06
0 - 104	3.11[c]	2.81[b]	0.04
Feed:gain			
0 - 35	5.80[b]	6.38[c]	0.14
0 - 69	6.30	6.40	0.07
0 - 104	7.60[c]	7.29[b]	0.08
Water intake, gal/day			
0-35	5.01[b]	8.48[c]	0.24
0-69	4.76[b]	8.33[c]	0.25
0-104	4.74[b]	8.24[c]	0.27

[a]Adjusted to a common dressing percent of 63%.
[b,c]Means are different $P < 0.01$
[d, e]Means are different $P < 0.05$

Table 3. Main effects of season on feedlot heifer dry matter intake, lbs.

	Winter	Summer	SE
0 - 35	23.68[b]	19.55[a]	0.17
35 - 69	24.00[b]	19.20[a]	0.17
0 - 69	23.84[b]	19.36[a]	0.16
69 - 104	22.86[d]	22.33[c]	0.16
0 - 104	23.57[b]	20.41[a]	0.15

[a,b]Means are different $P < 0.01$
[c,d]Means are different $P < 0.05$

Results

There were no ($P > 0.05$) growth promotant by season interactions for performance and water intake of yearling heifers. Initial weights were not different ($P > 0.05$) for winter and summer-fed heifers (Table 2). Heifers fed during the winter trial finished 29 lb heavier ($P < 0.05$) than summer-fed heifers (Table 2). When compared to summer-fed heifers, average daily gain was greater ($P < 0.01$) for winter-fed heifers for each period, with the exception of the final 35 days on feed (Table 2). The last 35 days on feed summer-fed heifers gained 0.68 lb/day more than winter-fed heifers. During both seasons, feed efficiency declined for the last 35 days on feed. During this period heifers fed in the summer were more efficient ($P < 0.01$) than winter-fed heifers. Water intake by period was consistently 3.50 gal/day greater ($P < 0.01$) for summer-fed heifers than for winter-fed heifers (Table 2). Heifers fed in the

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winter had higher ($P < 0.01$) DMI than summer-fed heifers (Table 3). Even so, during the last 35 days on feed summer-fed heifers increased DMI (19.36 to 22.33) while winter-fed heifers decreased DMI (23.84 to 22.86; Table 3).

Initial weights were the same ($P > 0.05$) across all growth promotants treatment groups (GP) (Table 4). Heifers not receiving GP had comparable final weights to E and TBA implanted heifers and lower ($P < 0.05$) final weights than all other GP (Table 4). Estrogen and TBA combination treated heifers had the same ($P > 0.05$) final weight as ETM heifers and a higher ($P < 0.05$) final weight than all other GP (Table 4). Control heifers had the lowest ($P < 0.05$) ADG and ET and ETM had the highest ($P < 0.05$; Table 4). Overall, control heifers were the least ($P < 0.05$) efficient in feed converstion (Table 4). Estrogen and TBA combination, MGA and ETM had the most ($P < 0.05$) efficient gains while E and TBA were intermediate (Table 4).

Mean water intake was 6.49 gal/day and was not different ($P > 0.05$) across GP (Table 4). Dry matter intake 0 to 104 was not different ($P > 0.05$) across GP (Table 5). However, during the last 35 days on feed ET and ETM had greater DMI ($P < 0.05$) than control and MGA groups (Table 5). There were a GP by season interactions ($P = 0.12$) for DMI from 0 to 104 days (Table 5).In the summer, adding MGA to ET tended to stimulate DMI while, in the winter DMI was suppressed by the addition of MGA (Table 5).

There were no GP by season inter–actions for carcass characteristics. Both hot carcass weight, and marbling score were greater ($P < 0.01$) in the winter when compared to summer (Table 7). However, winter-fed heifers had 0.04 in. less ($P < 0.05$) rib fat than summer fed heifers(Table 7). There was no difference ($P > 0.05$) in liver abscess score across growth promotant strategy or season. Percentage kidney, pelvic and heart fat were not different ($P > 0.05$) between seasons (Table 7) or among GP (Table 8). Marbling score was least ($P < 0.01$) for ET heifers and feeding MGA to ET implanted heifers (ETM) improved marbling score when compared to marbling

Table 4. Effects of growth promotants on feedlot heifer performance and water intake.

	Control	E	TBA	ET	MGA	ETM	SE
Weight, lb.							
Initial	845	846	848	844	845	845	2.18
0 - 35	958[b]	964[bc]	974[cde]	979[de]	966[bcd]	986[e]	4.71
0 - 69	1065[b]	1075[bc]	1086[cd]	1093[cd]	1080[bcd]	1096[d]	6.77
0 - 104[a]	1130[b]	1150[bd]	1148[bc]	1172[e]	1151[cd]	1169[de]	6.82
Average daily gain, lb/day							
0 - 35	3.28[b]	3.43[b]	3.65[bc]	3.89[c]	3.50[b]	4.07[d]	0.15
0 - 69	3.19[b]	3.32[b]	3.45[bc]	3.60[c]	3.39[b]	3.62[b]	0.10
0 - 104	2.74[b]	2.93[c]	2.89[cd]	3.15[e]	2.94[cd]	3.12[de]	0.06
Feed : gain							
0 - 35	6.84[d]	6.59[cd]	5.98[bc]	5.59[b]	6.14[cb]	5.41[b]	0.24
0 - 69	6.88[d]	6.58[cd]	6.26[bc]	6.09[b]	6.28[cb]	6.00[b]	0.13
0 - 104	8.00[e]	7.55[c]	7.59[c]	7.09[b]	7.34[bc]	7.12[b]	0.14
Water intake, gal/day							
0-35	6.72	7.01	6.74	6.97	6.44	6.60	0.42
0-69	6.36	6.96	6.72	6.56	6.23	6.45	0.44
0-104	6.22	6.84	6.71	6.66	6.18	6.32	0.46

[a]adjusted to a common dressing percentage of 63%.
[b,c,d,e]Means are different $P < 0.05$.

Table 5. Effects of growth promotants on feedlot heifer dry matter intake, lb.

	Control	E	TBA	ET	MGA	ETM	SE
0 - 35	21.86	21.85	21.54	21.66	21.09	21.68	0.30
35 - 69	21.66	21.68	21.42	22.07	21.20	21.59	0.30
0 - 69	21.75	21.77	21.48	21.86	21.13	21.62	0.28
69 - 104	22.08[a]	22.59[ab]	22.60[ab]	23.13[b]	22.12[a]	23.06[b]	0.28
0 - 104	21.91	22.09	21.92	22.34	21.51	22.16	0.26

[ab]Means are different $P < 0.05$.

Table 6. Growth promotant x season interaction on feedlot heifer dry matter intake, lb.

	Control	E	TBA	ET	MGA	ETM	SE
Summer	20.04[a]	20.35[a]	20.12[a]	20.65[ab]	20.10[a]	21.23[b]	0.52
Winter	23.78[abc]	23.94[bc]	23.71[abc]	24.03[c]	22.92[a]	23.10[ab]	

Interaction $P = 0.12$
[abc]Means are different $P < 0.10$.

Table 7. Main effects of season on carcass characteristics in feedlot heifers.

	Winter	Summer	SE
HCW, lb	736[b]	717[a]	2.42
KPH, %	2.31	2.34	0.02
Rib fat, in	0.46[a]	0.51[b]	0.01
Marbling[e]	588[b]	561[a]	5.3
Yield Grade	2.30[c]	2.42[d]	0.04
Choice >, %[f]	86	81	

[a,b]Means are different $P < 0.01$.
[c,d]Means are different $P < 0.05$.
[e]400 = slight 0, 500 = small 0.
[f]Chi Square analysis.

Table 8. Effects of growth promotants on carcass characteristics in feedlot heifers.

	C	E	T	ET	MGA	ETM	SE
HCW	712[a]	724[b]	723[ab]	738[c]	725[b]	737[c]	4.19
KPH, %	2.32	2.34	2.31	2.34	2.38	2.25	0.04
Rib fat, in	0.489	0.489	0.477	0.494	0.479	0.482	0.02
Marbling [f]	579[e]	580[e]	594[e]	535[d]	581[e]	578[e]	9.1
Yield grade	2.36	2.39	2.29	2.30	2.46	2.39	0.07
Choice >, %[g]	83.3	84.3	81.1	73.0	86.7	86.4	

[a,b,c]Means are different $P < 0.05$.
[d,e]Means are different $P < 0.01$.
[f]400 = slight 0, 500 = small 0.
[g] Chi Square analysis ($P = 0.07$).

score of ET heifers (Table 8). Growth promoting strategies with both estrogenic and androgenic (ET and ETM) activity had the heaviest ($P < 0.05$) HCW (Table 8). Rib fat, USDA yield grade and percentage USDA choice were not different ($P > 0.05$) among GP (Table 8).

Yearling heifers fed in the winter had heavier final weights and higher ADG and DMI. However, summer-fed heifers were more efficient in feed conversions. Growth promoting systems for yearling fed heifers improved ADG, DMI and overall efficiency. Feeding MGA to heifers implanted with estrogenic and androgenic combinations was found to be beneficial in preventing marbling score depletion. Feeding MGA in combination with implant strategies using estrogenic implants and TBA implants enhance DMI in summer fed yearling heifers but not in winter-fed yearling heifers.

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