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Effect of Dietary Cottonseed Meal Concentration on Feedlot Performance and Carcass Characteristics of Cull Beef Cows[1]

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Abstract

Cull beef cows (n = 232, initial BW = 450 ± 6 kg) stratified by body condition score and number of permanent incisors were used in a randomized complete block design (8 pens/treatment, 9 to 11 cows/pen) to evaluate graded levels of supplemental cottonseed meal during a 57-d feeding period. Basal 92% concentrate diets were formulated to contain 0.9% urea and were based on unprocessed corn. Supplemental cottonseed meal and tallow replaced corn in isocaloric (NE_g) test diets formulated to contain dietary CP of 11.5, 13.0, or 14.5% of DM (0, 4, and 8% of diet DM; degradable intake protein = 7.01, 8.52, and 10.02% of diet DM). Cows were adapted to diets by offering a restricted amount of the 92% concentrate diet on d 1, and DMI was gradually increased until ad libitum access was achieved (by d 30). Overall DMI (9.2, 9.3, 9.5 ± 0.15 kg/d) increased linearly (P=0.08) as dietary cottonseed meal increased. Live ADG (1.23, 1.24, and 1.36 ± 0.07 kg/d) tended to increase linearly (P=0.14), whereas live ADG:DMI (133, 133, and 143 ± 7 g/kg), carcass-adjusted ADG (1.27, 1.25, and 1.38 ± 0.07 kg/d), and carcass-adjusted ADG:DMI (138, 134, and 145 ± 7 g/kg) did not differ (P>0.22) among treatments. Hot carcass weight, fat thickness, longissimus area, internal fat percentage, average yield grade, lean and fat color, and carcass conformation did not differ (P>0.18) among treatments. Carcass maturity and quality-grade distributions were not statistically analyzed because of prior stratification of animals by chronological age. However, overall carcass maturity (includes lean and bone maturity) averaged across treatments was 2.63% A, 4.39% B, 40.79% C, 52.19% D, and 0% E. The distribution of carcass quality grades averaged across treatments was 0.44% Choice, 1.32% Select, 5.70% Standard, 5.70% Commercial, 78.07% Utility, and 8.77% Canner. The incidence of A–, A, or A+ liver abscesses responded quadratically (P=0.07; 13.7, 21.8, and 11.7% for 0, 4, and 8% cottonseed meal, respectively), but liver abscess severity was not analyzed because of limited observations in each category. The incidence of other hepatic defects (distoma, telangiectasis, cirrhosis) did not differ (P=0.24) among treatments. Increasing dietary CP using cottonseed meal increased feed intake and tended to increase live BW gain of feedlot cull beef cows.

(Key Words: Cull Cows, Degradable Protein, Nitrogen, Realimentation.)

Introduction

Cull beef cows represent approximately 10% of the U.S. federally inspected steer, heifer, and beef cow slaughter (NASS, 2001). Although cull beef cows are typically considered nonfed, previous data suggest that efficient BW gain can be realized by feeding cows a high-concentrate diet for approximately 60 d before harvest (Garnsworthy et al., 1986; Pritchard and Burg, 1993; Spire et al., 1998). However, data describing nutrient requirements of feedlot cull cows are not available. Boleman et al. (1996) evaluated carcass traits and palatability of beef from cull beef cows fed for 0 to 84 d at one of two dietary CP concentrations (10.2 or 12.8%), but feedlot performance data were not reported. The objective of the present study was to determine the effect of dietary cottonseed meal concentration on feedlot performance and carcass characteristics of cull beef cows.

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Materials and Methods

All experimental procedures were reviewed and approved by the Amarillo-Area Cooperative Research, Education, and Extension Triangle Institutional Animal Care and Use Committee (protocol no. 2001-02). Cull beef cows (n = 314) were purchased from auction barns and received between February 25 and March 31, 2001. An attempt was made to procure cows that lacked horns and displayed limited *Bos indicus* influence. Cows were processed on arrival: processing included individual identification with a numbered ear tag (Allflex, Brussels Agri Services, Brussel, Ontario, Canada); individual BW and body condition score (**BCS**) (1 to 9; Lowman et al., 1976) determination; treatment for internal and external parasites (Cydectin®; Fort Dodge Animal Health, Fort Dodge, IA); vaccination for clostridial antigens (Vision 7®; Bayer Animal Health, Shawnee Mission, KS); evaluation of dental pattern; and pregnancy determination by rectal palpation. Dentition scores were used to describe dental patterns by indicating 0, 2, 4, 6, or 8 permanent incisors (Lawrence et al., 2001) or 10 = "broken mouth." A cow was considered "broken mouth" if one or more of the eight permanent incisors were noticeably worn or absent.

Pregnant cows were given the labeled dosage of an abortificient (Lutylase®; Pharmacia and UpJohn, Kalamazoo, MI) when fetal age was estimated to be less than 100 d and these cows were considered eligible for the study. Of the original 314 cows, 35 received the abortificient, whereas 66 cows were excluded from the study because of advanced pregnancy and were sold as bred cows. Two cows died before the study began: one cow died of peritonitis from hardware, and a second cow died from polioencephalomalacia. An additional 14 cows were excluded from the study because of preexisting abscesses, excessive fatness (BCS >6), lameness, or other maladies and sold for slaughter (one carcass condemned). Thus, 232 cows were considered eligible for the study.

Cows were blocked by arrival date such that each replication was started on test when a sufficient number of cows eligible for the study had been received and processed. In addition, previous data suggest that age and initial BCS can influence feeding performance and carcass characteristics of cows (Graham and Price, 1980; Pritchard and Burg, 1993). Therefore, cows were stratified within block by dentition score, BCS, and BW and assigned randomly to receive a common basal diet supplemented with 0, 4, or 8% of dietary DM as cottonseed meal (8 pens/treatment, 9 to 11 cows/pen). Cows were offered 92% concentrate diets at 1.25% of BW on arrival plus 1.15 kg of alfalfa hay DM per day for 3 d. Before determining initial BW for the study, all cows within a block were fed a similar quantity of DM for a minimum of 3 d to minimize differences in gut fill.

Urea was included in the basal diet at 0.9% of DM to meet the expected degradable intake protein (**DIP**) requirement for ammonia N (Milton et al., 1997b; Shain et al., 998; Cooper et al., 2002). Cottonseed meal and tallow replaced unprocessed corn in isocaloric experimental diets (Table 1). Diet and ingredient samples were collected weekly, DM was determined, and as-fed diet composition was updated. Diet samples were composited to 28-d intervals and analyzed for CP, Ca, P (1), and ADF (Georing and Van Soest, 1970). The animal scale was validated before each day of use using certified weights and was calibrated as needed.

Cow DMI was gradually increased after determining initial BW until ad libitum access was achieved. Generally, daily DMI was 10 to 11 kg/cow on d 30 and peaked at approximately 11.5 kg/cow. Monensin and tylosin concentrations in the finishing supplement were selected to maintain daily intake below the legal limits of 360 mg of monesin/animal (CFR, 2001a) and 90 mg of tylosin/animal (CFR, 2001b) assuming an expected DMI of 12 kg/cow (24). Feed was withheld for 14 h before obtaining final BW. Cows were fed for an average of 57 d and were shipped to a commercial slaughter facility (Caviness Packing, Hereford, TX).

Data collected on the kill floor included hot carcass weight (rail-outs noted), liver weight, and presence and severity of liver abscesses (Brink et al., 1990). Railed-out carcasses are those that were temporarily segregated for further trimming before determining hot carcass weight. Carcasses were evaluated after a chilling period of 12 to 16 h for fat thickness over the 12th rib; longissimus area; percentage kidney, pelvic, and heart fat; yield grade; marbling score; skeletal maturity; lean maturity; quality grade (USDA, 1997); lean color (Herschler et al., 1995); fat color (AUS-MEAT, 1995); and conformation (USDA, 1965).

Hot carcass weight for railed-out carcasses was estimated by multiplying observed final live BW by the overall average dressing percentage. Estimated hot carcass weight was compared with the actual hot carcass weight, and the greater of the two values was used in subsequent analyses. Carcass-adjusted final BW for all cows was then determined by dividing hot carcass weight by the overall average dressing percentage. Diet NE was determined based on actual performance, assuming that animal $NE_m = 0.077 \times BW^{0.75}$ (Garrett, 1974) and $NE_g = 6.2$ Mcal/kg of ADG (Garrett, 1974; NRC, 1984).

Continuous data were analyzed using mixed model procedures (SAS Inst. Inc., Cary, NC). The model included the fixed effect of treatment and the random effect of block; pen served as the experimental unit. Because hot carcass weight could be influenced by initial BW, initial BW was evaluated as a covariate for hot carcass weight data and remained (P<0.001) in the final model. Nonparametric data were analyzed using CATMOD procedures (SAS Inst. Inc.).

TABLE 1. Ingredient and chemical composition of dietary DM.

Item	Dietary cottonseed meal, % of DM		
	0	4	8
Ingredient composition		(%)	
Corn, whole	84.2	79.6	75.0
Cottonseed meal, solvent (43% CP)	—	4.0	8.0
Supplement 1[a,d]	4.0	—	—
Supplement 2[b,d]	—	4.0	—
Supplement 3[c,d]	—	—	4.0
Molasses, cane	4.0	4.0	4.0
Tallow	1.8	2.4	3.0
Alfalfa hay	4.0	4.0	4.0
Cottonseed hulls	4.0	4.0	4.0
Chemical composition			
CP, %[e]	11.67	13.70	15.68
ADF, %[e]	9.3	10.0	10.3
Ca, %[e]	0.71	0.75	0.80
P, %[e]	0.27	0.29	0.32
DIP, % of DM[f]	7.01	8.52	10.02
UIP, % of DM[f]	4.66	5.18	5.66
NE_m, Mcal/kg[f]	2.03	2.03	2.03
NE_g, Mcal/kg[f]	1.37	1.37	1.37
Monensin, mg/kg[e]	28.7	28.7	28.7
Tylosin, mg/kg[e]	7.7	7.7	7.7

[a] Supplement 1 contained (DM basis): limestone, 24.3%; urea, 22.5%; rock salt, 6.25%; $(NH_4)_2SO_4$, 6.25%; Ca_2PO_4, 8.45%; KCl, 14.02%; MgO, 5.65%; trace mineral premix, 5.0%; ground sorghum grain, 7.08%; mineral oil, 0.5%.

[b] Supplement 2 contained (DM basis): limestone, 27.08%; urea, 22.5%; rock salt, 6.25%; $(NH_4)_2SO_4$, 6.25%; Ca_2PO_4, 2.25%; KCl, 11.35%; MgO, 4.34%; trace mineral premix, 5.0%; ground sorghum grain, 14.48%; mineral oil, 0.5%.

[c] Supplement 3 contained (DM basis): limestone, 28.4%; urea, 22.5%; rock salt, 6.25%; $(NH_4)_2SO_4$, 6.25%; KCl, 8.8%; MgO, 3.42%; trace mineral premix, 5.0%; ground sorghum grain, 18.88%; mineral oil, 0.5%.

[d] Premix contained (DM basis): $CoCO_3$, 0.022%; $CuSO_4$, 1.965%; $FeSO_4$, 2.289%; EDDI, 0.031%; MnO, 2.582%; $ZnSO_4$, 4.225%; vitamin A (30,000 IU/g), 3.75%; vitamin E (500 IU/g), 1.35%; Rumensin-80, 7.312%; Tylan-100, 1.575%; $CaCO_3$, 74.9%.

[e] Monensin and tylosin were calculated; the remaining constituents were determined analytically.

[f] NE_m and NE_g were based on tabular values (NRC, 1996). Diet degradable intake protein (DIP) was calculated from diet CP analysis assuming corn DIP = 44.67% of CP (NRC, 1996) and cottonseed meal DIP = 72% of CP (Barajas and Zinn, 1998). UIP = Undegraded intake protein.

The model included the effects of block and treatment and individual served as the experimental unit. Treatment sums of squares of all data were partitioned into the linear and quadratic effects of dietary cottonseed meal concentration. Statistical significance was declared as $P<0.10$, and a statistical trend or tendency indicated by $P<0.15$.

Results and Discussion

Four cows (three and one from 0 and 8% cottonseed meal treatments, respectively) were determined to be noncompetitive (inappettance, unthrifty appearance, limited BW gain) and were removed from the study during the first 28 d and sold for slaughter (one carcass condemned). Two of these cows displayed a slight BW gain, whereas the remaining two cows lost BW. Pen DMI for the pens affected by the two cows that lost BW was adjusted by deducting DMI to meet NE_m. Although the NRC (1996) suggests that 1 Mcal of mobilized tissue replaces 0.8 Mcal of diet NE_m, an attempt was not made to calculate tissue energy replacement of diet NE_m for these two cows because gut fill was not quantified. No other health problems during the feeding period were evident. Initial BCS averaged 4.15, 3.85, and 3.88 (Chi-square statistic, $P>0.15$) for 0, 4, and 8% dietary cottonseed meal, respectively. The distribution of dentition scores was: score 2, 0.9%; score 4, 2.6%; score 6, 5.3%; score 8, 74.6%; and score 10, 16.6%.

Performance responses during each 28-d interval of the feeding period are presented (Table 2) for illustrative purposes. Overall DMI increased linearly ($P=0.08$; Table 2) with increasing dietary cottonseed meal concentration. Live ADG tended to increase linearly ($P=0.14$), whereas carcass-adjusted ADG did not differ ($P=0.31$) among treatments. Although live ADG only tended to increase linearly, the numerical response may be biologically meaningful. Diet NE_m and NE_g were not influenced ($P>0.30$) by treatment. Neither live ADG:DMI ($P=0.22$) nor carcass-adjusted ADG:DMI ($P=0.41$) was influenced by dietary cottonseed meal concentration.

Overall DMI in the present study was less than expected. Pritchard and Burg (1993) fed cull beef cows a 92.5% concentrate diet based on unprocessed corn and used a similar

TABLE 2. Effect of dietary cottonseed meal concentration on feedlot performance of cull beef cows.

Item	Dietary cottonseed meal, % of DM 0	 4	 8	SE[a]	Contrast[b]
Number of pens	8	8	8	—	—
Number of animals	74	78	76	—	—
Initial BW, kg	447	451	452	10.6	—
d 28 BW, kg	483	487	491	7.5	—
Final live BW, kg	517	521	529	8.7	—
Adjusted final live BW, kg[c]	520	522	530	9.6	—
d 1 through 28					
DMI, kg/d	8.01	8.00	8.07	0.14	—
ADG, kg/d	1.25	1.30	1.38	0.14	—
ADG:DMI, g/kg	155.8	160.9	170.2	16	—
d 29 through 57					
DMI, kg/d	10.35	10.54	10.90	0.20	—
ADG, kg/d	1.20	1.18	1.33	0.08	—
ADG:DMI, g/kg	116.4	111.7	123.0	7.9	—
Overall					
DMI, kg/d	9.20	9.29	9.51	0.15	L1
ADG, kg/d	1.23	1.24	1.36	0.07	L2
Adjusted ADG[d]	1.27	1.25	1.38	0.07	NS
ADG:DMI, g/kg	132.5	132.7	142.7	6.8	NS
Adjusted ADG:DMI[d]	137.8	134.3	144.6	6.6	NS
Diet NE_m, Mcal/kg[e]	2.07	2.07	2.14	0.05	NS
Diet NE_g, Mcal/kg[e]	1.41	1.40	1.46	0.04	NS
Observed/expected					
NE_m	102.0	102.0	105.4	—	—
NE_g	102.9	102.2	106.6	—	—

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[a] Standard error of the least squares mean.

[b] L1 = Linear ($P<0.10$), Q1 = quadratic ($P<0.10$), L2 = linear trend ($P<0.15$), Q2 = quadratic trend ($P<0.15$), and NS = nonsignificant ($P>0.15$).

[c] Carcass-adjusted final live BW was calculated by dividing hot carcass weight by the overall mean dressing percentage. Hot carcass weight for railed-out carcasses was estimated by dividing observed final live BW by the overall average dressing percentage, compared with actual hot carcass weight, and the higher of the two values was used in data analyses.

[d] Carcass-adjusted final live BW was used to calculate ADG.

[e] Diet NE was determined based on actual performance assuming that animal $NE_m = 0.077 \times BW^{0.75}$ (Garrett, 1974) and NE_g = 6.2 Mcal/kg of ADG (Garrett, 1974; NRC, 1984).

diet adaptation method. These authors observed a daily DMI of 11.3 kg/cow over 50 d for cows fed an 11.3% CP diet with the supplemental CP derived from soybean meal and urea. Perhaps differences in geography and season in the present study compared with that of Pritchard and Burg (1993) contributed to the compartively lesser DMI. The DMI was increased approximately 3% for cows fed 8% compared with cows fed 0% cottonseed meal in the present study. This DMI increase was not concomitant with decreased formulated NE of the diet because a graded increase in supplemental fat concentration was used to maintain diet NE as cottonseed meal replaced unprocessed corn. In a review of 99 protein level comparisons of growing/finishing cattle, NRC (1984) indicated that increased feed intake was evident in 75% of the comparisons in which daily gain was increased by supplemental protein.

Healy et al. (1995) reported increased DMI and ADG by steers when soybean meal replaced urea at 33 or 67% of supplemental nitrogen in 13% CP diets (0, 0.6, 1.7, and 2.0% urea + 10.8, 7.0, 3.3, or 0% soybean meal, respectively). Barajas and Zinn (1998) indicated that DMI and ADG of finishing heifers fed dry-rolled corn diets supplemented with 0.8% urea [7.34% DIP and 4.41% undegraded intake protein (**UIP**), % of DM] were numerically greater than for heifers fed 0.8% urea + 10% cottonseed meal (33:67, supplemental N basis; 9.53% DIP and 5.85% UIP, % of DM). However, the lesser gain efficiency of heifers fed urea + cottonseed meal was attributed to decreased diet NE by replacing corn with cottonseed meal. Milton et al. (1997c) fed yearling steers diets based on dry-rolled corn and reported that carcass-adjusted ADG did not differ, whereas carcass-adjusted gain efficiency was greater for steers supplemented with 0.9% urea + 4.4% of DM as soybean meal (55:45 supplemental N basis; 8.23% DIP and 5.3% UIP, % of DM) compared with steers receiving 0.9% urea as the sole supplemental N source (7.0% DIP and 4.8% UIP, % of DM). These authors further reported that performance was not improved in a second study with yearling steers supplemented with 1% urea + 4.4% soybean meal (57:43 supplemental N basis; 9.26% DIP and 5.32% UIP, % of DM) compared with 1% urea alone (8.0% DIP and 4.8% UIP, % of DM). The ratios of N from cottonseed meal and urea in the present study were 42:58

TABLE 3. Effect of dietary cottonseed meal concentration on carcass characteristics of cull beef cows.

	Dietary cottonseed meal, % of DM				
Item	0	4	8	SE[a]	Contrast[b]
Hot carcass weight, kg[c]	290	290	294	2.0	NS
Liver mass, kg	7.22	7.25	7.40	0.2	NS
Dressing percentage	55.76	55.44	55.56	0.3	NS
Fat thickness, mm	5.5	5.4	4.8	0.5	NS
Longissiumus area, cm^2	72.6	73.1	72.8	1.6	NS
Internal fat, %	1.31	1.29	1.36	0.1	NS
Yield grade	2.12	2.09	2.11	0.1	NS
Marbling score[d]	313	311	300	8.0	NS
Lean color[e]	4.8	4.7	4.6	0.1	NS
Fat color[f]	3.4	3.5	3.5	0.2	NS
Conformation score[g]	3.4	3.5	3.4	0.1	NS

[a] Standard error of the least squares mean; n = 8.

[b] L1 = Linear ($P<0.10$), Q1 = quadratic ($P<0.10$), L2 = linear trend ($P<0.15$), Q2 = quadratic trend ($P<0.15$), and NS = nonsignificant ($P>0.15$).

[c] Initial BW was used as a covariate. Hot carcass weight for railed-out carcasses was estimated by dividing observed final live BW by the overall average dressing percentage, compared with actual hot carcass weight, and the higher of the two values was used in data analyses.

[d] Slight = 300 to 399, Small = 400 to 499, etc.

[e] Scoring system derived from Herschler et al. (1995).

[f] Scoring system derived from AUS-MEAT (1995).

[g] Scoring system derived from USDA (1997).

and 60:40 for 4 and 8% cottonseed meal diets, respectively. These ratios are within the range of oilseed meal:urea combinations (N basis) that can increase overall ADG and(or) DMI by yearling steers.

The magnitude of the trend for greater ADG at the greatest dietary CP (15.7%) and the lack of an increase in ADG with the first increment of cottonseed meal addition might suggest that metabolizable protein supply was deficient below 8% dietary cottonseed meal. Increased ADG early in the feeding period by yearling cattle fed high-concentrate diets based on dry-rolled corn and supplemented with soybean meal and urea to 14% CP has been noted (Trenkle, 1995). Although data describing the metabolizable protein requirements of cull beef cows during realimenation are not available, ruminal DIP status was evaluated using the NRC (1996). The control diet presumably met the DIP requirement for ammonia N based on previous data from yearling cattle (Milton et al., 1997b; Shain et al., 1998; Cooper et al., 2002). In the NRC (1996) Level 1 model, modifying microbial yield to 11% of TDN was necessary to achieve a predicted net DIP balance (+1.5 g/d) for the control diet (requirement = 643 g/d). Level 2 of NRC (1996) predicted a negative net N balance of 11 g/d (+15 g of bacterial N and –26 g of peptide N/d) for the control diet.

However, previous data suggest that duodenal flow of microbial N in the present study was likely increased with cottonseed meal supplementation. Milton et al. (1997a) reported increased duodenal microbial N flow and similar true ruminal OM digestion by steers fed a high-concentrate diet based on dry-rolled corn and supplemented with soybean meal (6.2% DIP and 5.5% UIP, % of DM) compared with an isonitrogenous diet supplemented with urea (7.1% DIP and 4.76% UIP, % of DM). Microbial N flow, but not ruminal OM digestion, also has been increased when diets based on dry-rolled corn were supplemented with 10% cottonseed meal + 0.8% urea compared with urea alone (Barajas and Zinn, 1998). Level 2 of NRC (1996) predicted a net ruminal N balance of 21 g/d (+ 28 g of bacterial N and –9 g of peptide N) for the 4% cottonseed meal diet, assuming that the DIP of cottonseed meal CP is 72% (Barajas and Zinn, 1998) for diets based on unprocessed corn. However, data were not obtained in the present study to verify microbial N flow with the diets tested.

Hot carcass weight adjusted using initial BW as a covariate (Table 3) did not differ among treatments (*P*=0.22). Of the 35 cows receiving an abortificient, 13 had evidence of pregnancy at slaughter; 4, 3, and 6 of the 13 pregnant cows received 0, 4, and 8% dietary cottonseed meal, respectively. No carcasses from cows completing the study were condemned, and individual dressing percentage ranged from 48.2 to 64.1%. Ten carcasses were railed-out: four, five, and one carcass from 0, 4, and 8% cottonseed meal treatments, respectively. Liver weight, dressing percentage, fat thickness, percentage of internal fat, longissimus area, yield grade, marbling score, lean color, fat color, and conformation score (Table 3) did not differ among treatments (*P*>0.15).

Liver weight was recorded in the present study because hepatic tissue samples were collected for a companion study evaluating cytochrome P450 enzyme response to gossypol. Boleman et al. (1996) reported that longissimus area increased with dietary CP concentration (source not

TABLE 4. Distribution of physiological maturity measurements of cull beef cows stratified by chronological age (dentition) and pooled across experimental treatments.

	Maturity score				
Item	A	B	C	D	E
Bone maturity, % of carcasses	1.31	3.95	15.35	34.65	44.74
Lean maturity, % of carcasses	27.63	58.77	13.16	0.44	—
Overall maturity, % of carcasses	2.63	4.39	40.79	52.19	—

specified) averaged across cows fed for 0, 28, 56, and 84 d. Pritchard and Burg (1993) reported an average marbling score equivalent to Standard (99% of carcasses were Utility or lower), fat thickness of 4.6 mm, and dressing percentage of 53.3% for cows fed for 50 d. Spire et al. (1998) indicated that fat thickness was 6.9 mm, and dressing percentage averaged 53% for cows fed for 56 d.

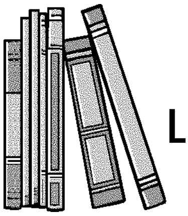
Cows were stratified in the present study by chronological age (dentition) because previous data (Pritchard and Burg, 1993) have indicated that age can influence feeding performance and dentition can be readily determined. However, data from Lawrence et al. (2001) suggest that this means of stratification precludes inference regarding the effect of treatments on measures of physiological maturity (bone and lean). In that report, approximately 1400 cattle were evaluated at the plant for dentition and lean and bone maturity. These authors reported that 40, 17, and 43% of carcasses from cattle with eight permanent incisors (corresponding to >45 mo of age) displayed a USDA overall maturity of A, B, and C, respectively. Given this disparity and because carcass maturity is factored into carcass quality grade (USDA, 1997), data for lean, bone, and overall maturity and carcass quality grade data were pooled across treatments.

Approximately 5% of carcasses displayed bone maturity of A or B (Table 4), and few carcasses had a lean maturity score greater than C. Approximately 7% of carcasses were classified as an A or B overall maturity; these carcasses would be eligible for the quality grades between Prime and Standard depending on marbling score (USDA, 1997) and if the slaughter facility merchandises carcasses of this type. The carcass quality grade distribution pooled across treatments was: 0.44% Choice, 1.32% Select, 5.70% Standard, 5.70% Commercial, 78.07% Utility, and 8.77% Canner.

The incidence of liver abscesses (A–, A, or A+) was increased (quadratic, *P*=0.07) for cows fed 4% cottonseed meal compared to the remaining treatments (13.70, 21.79, and 11.69%, respectively), whereas liver abscess severity was not analyzed because of limited observations in each category. As expected, liver abscess incidence was less in the present study than observed by Price and Berg (1981) for cows that did not receive tylosin during a 63-d feeding period (50%). Moreover, Price and Berg (1981) indicated that 29% of cows slaughtered directly after removal from pastures possessed liver abscesses. The incidence of other hepatic defects (distoma or fluke damage, telangiectasis, cirrhosis) in the present study did not differ (*P*=0.24) among treatments (18.06, 9.09, and 11.69% for cows receiving 0, 4, and 8% cottonseed meal, respectively). The response in live ADG for cows fed 4% dietary cottonseed meal might have been influenced by the presence of liver abscesses (Brink et al., 1990).

Implications

Increasing dietary CP intake of feedlot cull beef cows with cottonseed meal up to 8% of diet DM increased DMI (3%) and tended to increase live ADG (10%). The individual variation of BW gain, carcass yield, and presumably DMI by cull beef cows seems to be considerably greater than growing and finishing cattle. Further research is needed to develop management strategies for, and define nutrient requirements of, cull beef cows.



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