BEEF CATTLE RESEARCH UPDATE

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Impact of Grass/Forage Feeding vs. Grain Finishing on Beef Nutrients and Sensory Quality

Most reviews of the scientific literature regarding the nutrient profile of beef from "grass fed" cattle have either combined the results from studies conducted throughout the world, throughout Europe, or focused on those from one of several countries practicing primary fresh pasture feeding. Generalization of these results to beef from U.S. cattle may not be appropriate since available grass/forage variety and form as well as cattle breed have a significant impact on the nutritional profile of beef. A recent review (2014) summarized the nutritional characteristics of beef as reported from the limited number of studies comparing U.S. grass/forage-fed versus grain-finished cattle.[1]

Some of the important findings from this review were:

- Comparable lean beef cuts from cattle consuming mostly grass/forage appear to be lower in fat than those from grain-finished beef.
- In only one U.S. based study (four studies total) was grass/forage-fed beef lower in cholesterol than grain-finished beef.
- Regardless of feeding regime, approximately one-third of the saturated fatty acids (SFA) in beef is stearic acid, a fatty acid shown to be neutral with regard to plasma LDL cholesterol ("bad" cholesterol).
- U.S. grass-fed cattle produce beef with 30–70% less (monounsaturated fatty acids) MUFA, compared to beef from grain-finished cattle. Recent studies suggest that the higher MUFA content of grain-finished beef may be important for increasing plasma HDL cholesterol ("good" cholesterol) among beef consumers and that exclusive grass-feeding could shift the MUFA:SFA ratio of beef in a manner that significantly lowers HDL, increases triglycerides, and increases the density of LDL particles among consumers of grass-fed beef.
- Both U.S. grass/forage-fed beef and grain-finished beef contribute omega-3 fatty acids to the diet predominately as linoleic acid. The contribution of linoleic acid to cardiovascular health is debatable.
- The percentage polyunsaturated fatty acids (PUFA) in beef is increased by as much as 25% in response to grass-feeding. However, due to the lower total fat content of most grass-fed beef, the total estimated amount of PUFA in steak from U.S. grass/forage-fed cattle may be up to 75 mg lower per 100 g of beef than that of grain-finished beef, primarily as less linoleic acid.
- Lean beef from either feeding regime can make a modest contribution to the long-chain polyunsaturated fatty acids (LCPUFA) intake goals while contributing a limited amount of total fat to the diet. LCPUFA help prevent heart diesaese.
- Beef from both grass/forage-fed or finished and grain-finished cattle contributes a wide variety of important nutrients to the U.S. diet and consumption of either can be compatible with efforts to improve the cardiovascular health of Americans.
- Some studies, but not all, reported that steaks from grass/forage-fed beef are less tender than steaks from grain-finished beef.
- Most studies have found grass/forage- and grain-fed beef to be of similar juiciness.

These authors concluded that more U.S. studies are needed to better define the intake of various nutrients to be obtained in a larger variety of cuts from grass/forage-fed beef. Similarly, Texas Tech University and USDA-ARS researchers in a 2008 study concluded that although the fatty acid composition of grass-fed and conventional grain-fed beef was different that conclusions on the possible effects on human health cannot be made without further research.

Effects of Body Condition and Late Gestation DDGS Supplementation on Cow Performance

Many research trials have clearly shown that cow body condition score (BCS) at calving is among the most important factors affecting pregnancy rate.[2,3,4,5] As a result, it is recommended that cows have a BCS of 5 to 6 prior to calving to maximize reproductive performance. Oregon State University research evaluated the influence of cow BCS and dried distillers grains with solubles (DDGS) supplementation during late gestation on cow and calf performance.[6] In this study, Angus x Hereford crossbred cows were nutritionally managed to enter late gestation with a BCS of approximately 4 or 6. Thereafter, the cows were managed in a single herd and supplemented or not supplemented during late gestation (approximately January thru March). All cows received 28 lb/day of low quality hay (6.4% crude protein) and supplemented cows received the equivalent of 2 lb/day of DDGS (fed three times weekly). The cows started calving in mid-March. Bulls were placed with the cows in June 1 and remained with the herd for 60 days. The calves were weaned at approximately 140 days of age. Approximately 45 days after weaning, the steer calves were placed in a commercial growing lot for 61 days and then finished in a commercial feedlot.

The effects of cow BCS and supplementation during late gestation on cow and calf performance are shown in Table 1. The initial weight of BCS 6 cows was 137 lb heavier than the BCS 4 cows with BCS of 5.7 and 4.3, respectively for BCS 6 and BCS 4 cows. At both calving and weaning, weights and BCS were greater for BCS 6 cows than BCS 4 cows. As would be expected, the supplemented cows weighed more at calving and tended to weigh more at weaning compared to un-supplemented cows. In addition, the supplemented cows had greater BCS at both calving and weaning than un-supplemented cows. The percentage of live calves at birth (100 vs. 90%) and at weaning (99 vs. 88%) was greater for BCS 6 cows than BCS 4 cows. Supplementation did not influence the proportion of live calves at calving or weaning. After the 60 day breeding season, the pregnancy rate for BCS 6 cows was greater than that of BCS 4 cows (92 vs. 79%). Supplementation had no effect on cow pregnancy rate.

Calf birth weight was greater for BCS 6 cows than BCS 4 cows (5 lb greater) and calf weaning weight tended to be greater for BCS 6 cows (13 lb greater). However, daily gains from birth to weaning did not differ between groups. Due to the greater number of live calves at weaning for the BCS 6 cows compared to the BCS 4 cows, the weight weaned per cow was 58 lb greater (P = 0.004) for BCS 6 cows. Calf birth weights, weaning weights and daily gains to weaning were increased by approximately 3 to 4% with supplementation of the dams during late gestation. Supplementation had no effect on weight weaned per cow.

Table 1. Cow and calf performance relating to cow BCS and supplementation during late gestation.

Item	BCS 4	BCS 6	P-value	No Supp	Supp	P-value
Cow Data						
Initial weight, lb	1109	1246	<0.001	1180	1175	0.81
Calving weight, lb	1131	1222	<0.001	1138	1213	0.002
Weight at weaning, lb	1142	1206	<0.001	1164	1184	0.16
Initial BCS	4.4	5.7	<0.001	5.1	5.0	0.41
Calving BCS	4.4	5.3	<0.001	4.8	5.0	0.005
Weaning BCS	4.7	5.2	<0.001	4.9	5.0	0.08
Live calf at birth, %	90.0	100	0.003	96.7	93.3	0.28
Live calf at weaning, %	88.3	99.2	0.01	95.8	91.7	0.28
Pregnancy rate, %	79.3	91.6	0.05	85.2	85.6	0.94
Calf Data						
Birth weight, lb	85.6	91.3	0.001	86.7	90.0	0.04
Weaning weight, lb	406	419	0.12	404	421	0.02
ADG to weaning, lb	2.32	2.34	0.92	2.29	2.36	0.09
Weight weaned/cow, lb	357	415	0.004	386	386	0.98

Adapted from Bohnert et al., 2013.

Initial and final weights of calves entering the growing lot were approximately 22 and 24 lb greater, respectively for calves from BCS 6 cows than BCS 4 cows (P = 0.02, data not shown). In addition, the initial weight of calves entering the growing lot from supplemented cows tended to be 15 lb heavier (P = 0.10, data not shown). However, cow BCS or supplementation treatments had no effect on calf performance in the growing lot or feedlot or on carcass characteristics.

In summary, these data clearly illustrate the potential economic importance of managing cows to achieve a good BCS (≥ 5) prior to entering the last third of gestation. In this study, BCS 6 cows had about 10% more live calves at birth and weaning, and had an 11% greater pregnancy rate than BCS 4 cows. The supplementation of the cows with DDGS during late gestation had no effect on calving rate or pregnancy rate probably because these cows had an average of BCS of about 5 at the time of calving. However, it appeared that supplementation increased calf weaning weight.

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