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W. J. Costello
South Dakota State University

L. B. Embry

W. S. Swan

South Dakota State University
Brookings, South Dakota

Department of Animal Science
Agricultural Experiment Station

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An experiment reported in this publication under the title "Energy Level in Ration, Market Weight and Types of Cattle" provided material to observe the influence of the three factors listed on beef carcass characteristics. Details describing the cattle, rations and market weights are presented in that report.

Procedures

Limited personnel and facilities permitted evaluation of carcasses from only 31 of the original 128 crossbred steers. One sample animal was selected from each of the 16 pens at each of the two marketing dates. One side of the steer weighing closest to the breed-energy level average weight at marketing provided the data reported here. One carcass was lost before it was shipped to the university meat lab. The steers were Angus x Hereford (AH) or Charolais x Hereford (CH) crosses fed low energy or high energy rations to two slaughter weights for each breed.

One side of the selected steers was processed into semi-boneless retail product. The cuts were closely trimmed with a small amount of bone left only in the rib and short loin. Weights of each cut, lean trim, fat trim and bone were recorded. Percentage of the side weight was determined for edible product, fat and bone. Two steaks were cut from the loin end of the rib, frozen and later cooked for Warner-Bratzler shear tenderness and palatability evaluations. The eight member panel evaluating palatability was asked to score tenderness, flavor and juiciness of samples from one steak from each carcass. An eight point scale ranging from 1, extremely desirable, to 8, extremely undesirable, was used for each trait.

Results

Averages in the table for the three or four carcass sample in each breed-treatment group may vary somewhat from averages for the same trait in the nutrition experiment which included 15 or 16 steers per group. The small sample showed a quality grade advantage for the AH steers over the CH steers due to increased marbling levels which parallels results for the larger group. AH carcasses were fatter with smaller rib eyes in the sample as well as the large study. Weights for weight group 2 CH steers tended to be lower in the sample than in the large group.

Carcass quality grade varied directly with marbling since maturity and conformation factors did not vary sufficiently to influence grade. Increasing the weight of AH steers increased the marbling level and quality grade from average Choice to high Choice in low energy and to low Prime in high energy levels. Weight difference in CH steers was associated with marbling and quality grade difference when fed the high energy diet but not when fed the low energy diet. High energy CH steers averaged low Choice for weight 1 and average Choice for weight 2. However, marbling and quality grade averages for CH steers on the low energy diet decreased from average Choice in weight 1 to high Good in weight 2. The means from the nutritional experiment did not indicate a grade reduction on low energy but that the grade in both groups was approximately the same.

Yield grade means were increased (reducing cutability) in both breeds and at both energy levels by increasing weight. Higher yield grades were observed for AH carcasses in every comparison with CH carcasses except the weight group 1, low energy level. The CH steers in that weight-energy group measured greater fat thickness and therefore had slightly higher yield grades. Four factors utilized in determining yield grade are fat thickness, rib eye area, carcass weight and percent kidney, heart and pelvic fat. The order of listing indicates the relative degree of influence each factor exerts on yield grade. Although fat thickness has the greatest influence on yield grade, the low energy CH steers in weight group 2 accumulated a higher mean yield grade than weight group 1 with less average fat thickness. The explanation for that incongruity resides in the smaller mean rib eye area in carcasses averaging 60 lb. heavier.

Increasing weight on both high and low energy diets reduced the percent edible product and increased the percent fat in AH carcasses. Edible portion composition did not decrease as weight increased in CH steers. In fact, the heavier CH-low energy carcasses were higher in edible portion and lower in fat trim percentages than the weight 1 carcasses. Generally, AH steer carcass composition was slightly lower in percent edible portion, greater in percent fat and smaller in percent bone than those for CH carcasses. High energy diet resulted in the most dramatic increase in percent fat and decrease in percent edible portion associated with increased slaughter weight in AH carcasses.

Most of the 50 lb. difference in side weight between weight groups 1 and 2 from the high energy AH carcasses was accounted for by difference in fat weight. Edible portion and fat weights increased equally between weight 1 and weight 2 for both AH low energy carcasses and CH high energy carcasses. Weight 2 carcasses from the low energy CH steers contained less fat than weight 1 carcasses. Therefore, the 30 lb. increase in side weight was edible portion increase.

Shear tenderness values and panel scores indicated little difference in palatability among the eight groups in this experiment.

The limited carcass data reported here suggest that the AH type of cattle on high energy were fattening in the interval between weight 1 and weight 2 by an increase from mid-Choice to mid-Prime carcass grade, excess fat thickness accumulation, undesirable yield grade, relatively undesirable edible portion:fat relationship, and the small portion of the carcass weight increase as edible portion. More of the carcass weight difference between weights 1 and 2 for AH steers on low energy was in the form of edible product, but fat thickness was greater than optimum and yield grade was somewhat high. The difference in percent edible portion was not as large between the AH low energy weight groups as the yield grade parameters indicated. Charolais x Hereford steers on high energy appeared to have grown and fattened by the increase from low to average Choice, the 0.25 inch increase in fat thickness, and the addition of slightly more edible portion weight than fat trim weight. In contrast, the CH carcasses from the low energy diet indicated little fattening between the two weights since there was no increase in grade or fat thickness and all carcass weight increase was in the form of edible portion.

Summary

Beef carcass trait variation was evaluated in a small sample (31) of steer carcasses from animals varying in type (Angus x Hereford vs. Charolais x Hereford), diet (low energy vs. high energy) and weight (group 1 and group 2).

Increasing carcass weight in Angus x Hereford steers from 620 to 730 lb. produced an increase in fat on a high energy ration and produced an increase in lean and fat on a low energy ration. Carcass weight increases in Charolais x Hereford steers from approximately 680 to 785 lb. resulted in growth and fattening on a high energy ration and mainly growth on a low energy ration. Palatability was not influenced by the variables in this experiment. Because of the limited number of carcasses evaluated, the information reported here is only an indicator of what one might expect under production conditions.

Carcass Trait Means as Influenced by Energy Content of Diet, Market Weight and Type of Cattle

	High energy diet				Low energy diet			
	A x H[a]		C x H[a]		A x H		C x H	
	Wt. 1	Wt. 2	Wt. 1	Wt. 2	Wt. 1	Wt. 2	Wt. 1	Wt. 2
No. of carcasses	3	4	4	4	4	4	4	4
Live weight, lb.	1003	1167	1113	1238	1016	1234	1106	1297
Hot carcass wt., lb.	628	732	681	784	618	733	691	754
Marbling[b]	6.3	9.25	5.75	6.5	6.5	7.25	6.25	4.75
Quality grade[c]	20.0	22.75	19.25	20.5	20.0	21.25	20.0	18.5
Fat thickness, in.	0.70	1.19	0.40	0.67	0.55	0.93	0.64	0.54
Rib eye area, sq. in.	10.9	11.07	12.20	12.67	11.6	10.90	12.77	12.12
Kidney fat, %	3.1	3.1	3.0	3.0	3.2	3.7	3.5	3.75
Yield grade[d]	4.3	5.3	2.8	3.7	3.1	4.9	3.3	3.6
Edible portion, %[e]	51.5	45.9	53.0	52.2	51.4	50.6	53.0	56.3
Fat trim, %	35.6	41.7	33.0	33.3	33.9	36.4	33.3	29.0
Bone, %	12.9	12.4	14.0	14.7	14.7	12.9	13.6	14.7
Edible portion, lb./side	152.4	159.2	172.8	194.7	151.5	174.2	173.1	203.2
Fat trim, lb./side	105.4	144.7	107.3	125.2	100.3	125.4	109.1	104.6
Shear tenderness, lb.	16.6	14.4	15.5	14.5	16.0	16.4	15.2	16.3
Panel tenderness[f]	3.9	3.0	4.1	3.9	3.8	3.6	3.8	3.7
Panel flavor[f]	3.1	2.5	3.1	2.9	2.9	2.9	3.0	3.0
Panel juiciness[f]	4.3	2.6	4.2	4.0	3.4	3.9	3.9	3.8

[a] Angus x Hereford and Charolais x Hereford.
[b] Slight = 4, small = 5, modest = 6, moderate = 7, slightly abundant = 8, moderately abundant = 9.
[c] 17 = Good, 20 = Choice, 23 = Prime.
[d] 1 = trim muscular, 5 = excessively fat and/or poorly muscled.
[e] Weight of trimmed cuts ready for retail + lean trim/side weight x 100.
[f] Evaluated by panel, 1 = extremely desirable, 8 = extremely undesirable.