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Nutritional effects on beef palatability

D.E. Burson

Melvin C. Hunt

L.H. Hayward

Curtis L. Kastner

See next page for additional authors

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Abstract
We assigned 112 Angus yearling steers to 14 nutritional treatments including control. Submaintenance, and 12 different combinations of ration energy (low, medium or high) and feeding period (56,91, 119, 147, or 175 days). Boneless rib steaks were evaluated by a trained taste panel and Instron Warner-Bratzler shear. Average daily gains increased as energy level increased. Slaughter weight, and USDA quality and yield grades increased as both ration energy and days fed increased. Taste panel score were not significantly affected by ration energy level, but muscle fiber tenderness, juiciness, flavor and overall tenderness scores tended to increase as days fed increased. Peak shear force was no affected by ration energy level or days fed.

Keywords
Cattlemen's Day, 1979; Report of progress (Kansas State University. Agricultural Experiment Station); 350; Beef; Palatability; Average daily gain; Energy

Authors
D.E. Burson, Melvin C. Hunt, L.H. Hayward, Curtis L. Kastner, Donald H. Kropf, and Dell M. Allen

Nutritional Effects on Beef Palatability

D. E. Burson, M. C. Hunt, L. H. Hayward
C. L. Kastner, D. H. Kropf, and D. M. Allen

Summary

We assigned 112 Angus yearling steers to 14 nutritional treatments including control, submaintenance, and 12 different combinations of ration energy (low, medium or high) and feeding period (56, 91, 119, 147, or 175 days). Boneless rib steaks were evaluated by a trained taste panel and Instron Warner-Bratzler shear.

Average daily gains increased as energy level increased. Slaughter weight, and USDA quality and yield grades increased as both ration energy and days fed increased.

Taste panel scores were not significantly affected by ration energy level, but muscle fiber tenderness, juiciness, flavor and overall tenderness scores tended to increase as days fed increased.

Peak shear force was not affected by ration energy level or days fed.

Introduction

Economic and social pressures have focused interest on feeding beef cattle less grain and on consumers' acceptance of beef thus produced. This study relates ration energy (grain) inputs and days on feed to beef-eating quality as determined by a trained taste panel.

Procedure

We put 112 Angus yearling steers of similar background on feed after a 21-day adjustment period. Eight were randomly assigned to each of 14 nutritional treatments. The control group was slaughtered at the start of the experiment; another group (submaintenance) was fed prairie hay for 28 days, then slaughtered. The 12 remaining groups were fed low, medium, or high energy rations (Table 20.1) and slaughtered at a commercial packing plant) after 56, 91, 119, 147 (medium and high energy rations only), or 175 (high energy ration only) days on feed.

Ribs were delivered to Kansas State University Meats Laboratory and steaks were cut seven days postmortem.

Taste panel and shear evaluations of boneless rib steaks (longissimus muscle) were analyzed by American Meat Science Assocation guidelines.

Results

Slaughter weights, average daily gains, and USDA yield and quality grades increased with increasing ration energy (Table 20.2), but peak shear forces and muscle fiber tenderness, detectable connective tissue, juiciness, flavor and overall tenderness scores were not significantly affected by ration energy level.

Slaughter weights and USDA yield and quality grades increased with increasing days on feed (Table 20.3). Taste panel scores for muscle fiber tenderness, juiciness, flavor and overall tenderness, tended to improve with longer feeding time. Peak shear force differences were small and followed no consistent pattern related to days fed. Increasing days on feed did not greatly improve eating quality. However, meat from steers fed 56 days is not necessarily equivalent to that from steers fed 175 days, as ultimate consumer acceptance also depends on factors such as display color stability, muscle size, and, under the present marketing system, USDA quality grade.

Table 20.1. Ration components (% on as-fed basis).

Ingredient	Energy level[a]		
	Low	Medium	High
Corn	17.9	27.1	38.6
Wheat	17.9	27.1	38.6
Sorghum silage	16.8	16.5	16.3
Prairie hay	42.9	24.2	0
Supplement[b]	4.6	5.0	6.4

[a]Calculated to contain 35, 45, and 58 megacal NEp/100 lbs., respectively. Expected daily gains of 1.1, 2.2, and 3.3 lbs./day, respectively.

[b]Included soybean meal, ground limestone, dicalcium phosphate, salt, trace minerals, and vitamins.

Table 20.2. Taste panel, shear, carcass, and performance means for indicated ration energy level groups.

Criteria	Control	Submaintenance	Ration energy level Low	Medium	High
Slaughter weight (lbs.)	573.2	630.1	741.1	857.6	908.5
Average daily gain (lbs/day)		-0.46	1.78	2.60	3.00
USDA quality grade[a]	St^{65}	St^{40}	St^{60}	G^{24}	G^{60}
USDA yield grade	1.4	1.6	1.5	2.0	2.5
Taste panel trait[b]					
Muscle fiber tenderness	6.8	6.8	6.8	6.8	6.9
Detectable connective tissue	6.8	6.5	7.0	7.1	7.0
Overall tenderness	6.7	6.6	6.7	6.8	6.8
Juiciness	6.4	6.4	6.0	6.0	6.1
Flavor	6.5	6.8	6.4	6.4	6.5
Peak shear force (lbs.)	4.37	4.76	4.54	4.74	4.59

[a]St = Standard, G = Good; 01 - 33 = low, 34 - 66 = average, 67 - 100 = high.

[b]Scores based on an 8 point scale (1 = abundant connective tissue, extremely tough, dry, or bland flavor, 8 = no connective tissue, extremely tender, juicy, or intense flavor) for each factor.

Table 20.3. Taste panel, shear, carcass, and performance means for days on feed before slaughter.

Criteria	Days on feed[a] 56	91	117	147	175
Slaughter weight (lb)	744.9	793.0	863.8	991.6	1025.1
Average daily gains (lbs/day)	2.80	2.36	2.34	2.78	2.67
USDA quality grade[b]	St^{65}	G^{06}	G^{28}	G^{87}	C^{08}
USDA yield grade	1.3	2.0	2.0	2.9	3.4
Taste panel traits[c]					
Muscle fiber tenderness	6.9	6.8	6.8	6.7	7.2
Detectable connective tissue	7.0	7.1	7.0	7.0	7.1
Overall tenderness	6.8	6.8	6.8	6.7	7.1
Juiciness	5.9	5.9	6.0	6.1	6.4
Flavor	6.3	6.3	6.5	6.4	6.6
Peak shear force (lbs.)	4.21	5.05	4.67	4.96	3.79

[a]Means for low, medium and high energy levels except at 147 days (medium and high energy only) and 175 days (high energy only).

[b]St = Standard, G = good, C = choice; 01 - 33 = low, 34 - 66 = average, 67 - 100 = high.

[c]Scores based on an 8 point scale (2 = abundant connective tissue, extremely tough, dry or bland flavor; 8 = no connective tissue, extremely tender, juicy, or intense flavor) for each factor.