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Characteristics of beef finished on selected feeding regimes

Abstract

Thirty-eight crossbred steers of known background were randomly assigned to four feeding regimes. All initially were fed on a brome and bluestem pasture supplemented during winter with alfalfa and protein. Ten grass-fed animals were slaughtered directly off pasture at the end of summer. Ten steers were fed an additional 49 days (short-fed), and eight 98 days (long-fed) on 80 percent concentrate and 20 percent corn silage. In addition, ten silage-fed animals were fed 60 percent corn silage and 40 percent concentrate for 98 days. Carcass characteristics were evaluated along with shear force (tenderness) and taste panel responses.

Keywords

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Characteristics of Beef Finished on Selected Feeding Regimes

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Summary

Thirty-eight crossbred steers of known background were randomly assigned to four feeding regimes. All initially were fed on a brome and bluestem pasture supplemented during winter with alfalfa and protein. Ten grass-fed animals were slaughtered directly off pasture at the end of summer. Ten steers were fed an additional 49 days (short-fed), and eight 98 days (long-fed) on 80 percent concentrate and 20 percent corn silage. In addition, ten silage-fed animals were fed 60 percent corn silage and 40 percent concentrate for 98 days. Carcass characteristics were evaluated along with shear force (tenderness) and taste panel responses.

Marbling score and quality grade increased with length of feeding. Carcasses from grass-fed and short-fed cattle graded Good. Cattle fed for approximately 100 days on either a high grain or silage ration had an average quality grade of low Choice.

Carcass yield grade did not differ between grass-fed and short-fed cattle, or between silage-fed and long-fed cattle.

Taste panel scores generally supported differences in marbling and quality grade between feeding regimes. Taste panel scores for the grass-fed and short-fed groups were similar and were marginal for juiciness, tenderness, flavor, and over-all acceptability. Panel scores for steaks from the silage-fed and long-fed groups were significantly more desirable than for steaks from grass-fed cattle. Objective measurements of tenderness (shear force) did not differ significantly between feeding regimes.

Cattle fed approximately 100 days had an acceptable yield and quality grade and desirable juiciness, tenderness, and flavor.

Even though grass-fed beef was not evaluated as undesirable, it would probably not be widely accepted by consumers unless improved by processing innovations. The marginal desirability of the short-fed cattle likewise could be improved.

Introduction

Due to fluctuation in feed grain prices, interest has been focused on alternative feed sources and time on feed.

Type of feed and length of finishing influence carcass characteristics and product palatability. Because feeding practices may be altered in the future, we have characterized beef carcasses and are investigating ways of producing acceptable beef from a variety of feeding regimes.

This report includes a summary of carcass, shear force (tenderness), and taste panel characteristics as influenced by feeding regime.

Experimental Procedure

Thirty-eight crossbred steers of known background, obtained from the U.S.D.A. Meat Animal Research Center at Clay Center, Nebraska, were randomly assigned to four feeding regimes. All initially were on a brome and bluestem pasture supplemented in winter with alfalfa and protein. Ten grass-fed animals were slaughtered directly off pasture at the end of summer. Ten steers were fed an additional 49 days (short-fed), and eight 98 days (long-fed) on 80 percent concentrate and 20 percent corn silage. In addition, 10 silage-fed animals were fed 60 percent corn silage and 40 percent concentrate for 98 days.

Average age at slaughter for each group was approximately 18 months.

Beginning at approximately 1.5 hours post-mortem, the right side of each carcass was weighed and chilled at 36 F until 48 hours post-mortem; then evaluated for U.S.D.A. quality and yield grade characteristics.

Four muscles including the biceps femoris and semitendinosus from the bottom round, semimembranosus from the top round, and longissimus (loin eye) were removed at approximately 48 hours post-mortem. Steaks were removed from each muscle for shear-force evaluation. Only the longissimus (loin eye) was evaluated by the taste panel. All cuts were vacuum packaged, frozen, and stored at -15 F. Maximum frozen storage time was 3 weeks.

Steaks for taste panel and shear-force evaluations were thawed at 36 F for 24 hours, removed from the vacuum package, and modified oven broiled at 350 F to an internal temperature of 151 F. A six-member, trained taste panel evaluated warm loin eye samples on the basis of juciness, tenderness, flavor, and over-all acceptability. For Warner-Bratzler shear-force, six 0.5 inch diameter cores were taken from each muscle and sheared once.

Results and Discussion

Average carcass maturity was in the A range regardless of feeding regime. As expected, marbling increased with length of feeding (table 32.1). Carcasses from silage-fed and long-fed cattle had the most marbling; short-fed, intermediate; and grass-fed, the least. Quality of carcasses from grass-fed cattle graded lowest and those from silage-fed and long-fed cattle graded highest (table 32.1). Cattle fed approximately 100 days on either a high grain or silage ration had an average quality grade of low Choice.

Adjusted fat thickness was lowest for carcasses from grass-fed and short-fed cattle and highest for carcasses from silage-fed and long-fed cattle (table 32.2).

Rib eye area (table 32.2) of carcasses from grass-fed cattle was smaller than from short-fed and long-fed cattle, but did not differ from carcasses of silage-fed cattle.

Generally, hot carcass weights, kidney, pelvic, and heart fat, and yield grades increased with length of feeding (table 32.2). Kidney, pelvic, and heart fat percentages were lowest for carcasses from grass-fed and short-fed cattle and highest for carcasses from silage-fed and long-fed cattle.

Yield grades did not differ between carcasses from grass-fed and short-fed cattle or between carcasses from silage-fed and long-fed cattle. However, yield grade of carcasses from short-fed cattle tended to be lower than for carcasses from grass-fed cattle. The difference resulted from a larger rib eye area in the short-fed carcasses.

For each muscle, mean shear force (table 32.3) between feeding regimes did not differ. Apparently, quality grade and marbling differences were not enough to affect shear force of those four muscles.

However, mean taste panel scores (table 32.4) generally supported differences observed in marbling and quality grade between feeding regimes (table 32.1). Juiciness, tenderness, flavor, and over-all acceptability scores increased with marbling scores and quality grade.

Samples from grass-fed cattle were usually less juicy, tender, flavorful, and acceptable than samples from silage-fed and long-fed cattle. Considering the same traits, samples from short-fed cattle were frequently comparable to those from silage-fed and long-fed cattle. Grass-fed cattle were comparable to short-fed cattle considering quality grade, yield grade, shear force (tenderness), and taste panel responses (tables 32.1,2,3,4); however, that was not the case for grass-fed compared with silage-fed or long-fed cattle.

The results indicate that cattle fed approximately 100 days will yield a product of acceptable yield and quality grade and desirable juiciness, tenderness, and flavor. Grass-fed beef was not evaluated as undesirable; however, it would probably not be widely accepted by consumers unless improved by processing innovations. The marginal desirability of the short-fed cattle likewise could be improved.

Table 32.1. Mean carcass quality grade and quality grade factors by feeding regimes.

Trait	Grass-fed	Short-fed	Silage-fed	Long-fed
Maturity	A	A	A	A
Marbling[1]	Traces, 83[a]	Slight, 56[ab]	Small, 75[c]	Small, 49[bc]
Quality grade[2]	Good, 03[a]	Good, 53[ab]	Choice, 14[bc]	Choice, 03[c]

[1,2]Marbling and Quality Grade: 01-33 = Low, 34-66 = Average, 67-100 = High.

[abc]Means within same row with same letter superscript do not differ (P<.05).

Table 32.2. Mean carcass yield grade and yield grade factors by feeding regimes.

Trait	Grass-fed	Short-fed	Silage-fed	Long-fed
Adjusted 12th rib fat thickness, in.	.21[a]	.20[a]	.48[b]	.44[b]
Rib eye area, sq. in.	10.2[a]	11.6[b]	11.3[ab]	12.0[b]
Hot carcass weight, lb	578[a]	641[b]	730[c]	733[c]
Kidney-pelvic-heart fat, %	2.7[a]	2.8[ab]	3.5[c]	3.3[bc]
Yield grade	2.0[ab]	1.8[a]	2.9[c]	2.6[bc]

[abc]Means within same row with same letter superscript do not differ (P>.05).

Table 32.3. Mean shear force values for test muscles by feeding regimes.

Muscles	Grass-fed	Short-fed	Silage-fed	Long-fed
Longissimus	6.3	7.0	7.1	7.5
Semitendinosus	9.0	9.1	8.6	8.7
Biceps femoris	13.6	14.3	15.2	12.8
Semimembranosus	10.4	9.7	9.1	9.5

Means within same row do not differ (P>.05).

Table 32.4. Mean taste panel scores[d] for longissimus (loin eye) muscle by feeding regimes.

Trait	Grass-fed	Short-fed	Silage-fed	Long-fed
Juiciness	5.8[a]	6.2[a]	6.9[b]	6.4[ab]
Tenderness	4.8[a]	5.3[ab]	5.9[bc]	6.5[c]
Flavor	5.9[a]	6.2[ab]	6.9[b]	6.9[b]
Over-all acceptability	5.0[a]	5.7[b]	6.2[bc]	6.5[c]

[abc]Means within the same row with same letter superscript do not differ (P>.05).

[d]Juiciness, tenderness, flavor, and over-all acceptability evaluated on 9-point scale (9 = most desirable, 6 = slightly desirable, juicy, tender, flavorful, or acceptable).