

January 2017

Angus Ground Beef Has Higher Overall Consumer Acceptability than Grass-Fed Ground Beef

F. Najjar

Kansas State University, Manhattan, fnajar@k-state.edu

E. A. Boyle

Kansas State University, lboyle@ksu.edu

T. G. O'Quinn

Kansas State University, travisoquinn@ksu.edu

See next page for additional authors

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Recommended Citation

Najar, F.; Boyle, E. A.; O'Quinn, T. G.; Danler, R.; Stroda, S.; Drey, L. N.; Vierck, K. R.; and McCoy, G. D. (2017) "Angus Ground Beef Has Higher Overall Consumer Acceptability than Grass-Fed Ground Beef," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 1. <https://doi.org/10.4148/2378-5977.1364>

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Abstract

Ground beef is considered one of the major sources of animal protein in the U.S., accounting for approximately 40% of beef consumption per capita (USDA, 2011). Consumers' concern about animal welfare, sustainable production, and low fat products has influenced purchasing decisions, resulting in an increased demand for grass-fed ground beef (U.S. Department of Agriculture, Agricultural Marketing Service, 2007). Grass-fed cattle are fed natural based forages or grass-hay, thus resulting in a higher deposition of omega-3 fatty acids in meat. Meat from grain-fed cattle has a lower omega-3 content due to the saturated and monounsaturated fatty acid profile found in a grain based diet. Additionally, grass-fed ground beef contains three times more omega-3 fatty acids than traditional grain-fed ground beef; however, there is no evidence to support that grass-fed ground beef is a healthier choice for consumers than traditional ground beef (Smith, 2013). Several studies have looked at the flavor profile between grass-fed and grain-fed beef in order to identify whether the omega-3 fatty acids found in grass-fed ground beef play a key role on consumer flavor acceptability. A high content of omega-3 fatty acids accelerates oxidization of meat, and consequently causes potential adverse effects on meat palatability traits. Consumer sensory evaluation was conducted to evaluate consumer palatability ratings of grass-fed ground beef in comparison to Angus and commodity ground beef.

Keywords

ground beef, consumer, palatability

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Authors

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Introduction

Ground beef is considered one of the major sources of animal protein in the U.S., accounting for approximately 40% of beef consumption per capita (USDA, 2011). Consumers' concern about animal welfare, sustainable production, and low fat products has influenced purchasing decisions, resulting in an increased demand for grass-fed ground beef ([U.S. Department of Agriculture, Agricultural Marketing Service, 2007](#)). Grass-fed cattle are fed natural based forages or grass-hay, thus resulting in a higher deposition of omega-3 fatty acids in meat. Meat from grain-fed cattle has a lower omega-3 content due to the saturated and monounsaturated fatty acid profile found in a grain based diet. Additionally, grass-fed ground beef contains three times more omega-3 fatty acids than traditional grain-fed ground beef; however, there is no evidence to support that grass-fed ground beef is a healthier choice for consumers than traditional ground beef (Smith, 2013). Several studies have looked at the flavor profile between grass-fed and grain-fed beef in order to identify whether the omega-3 fatty acids found in grass-fed ground beef play a key role on consumer flavor acceptability. A high content of omega-3 fatty acids accelerates oxidization of meat, and consequently causes potential adverse effects on meat palatability traits. Consumer sensory evaluation was conducted to evaluate consumer palatability ratings of grass-fed ground beef in comparison to Angus and commodity ground beef.

Key words: ground beef, consumer, palatability

Experimental Procedures

Fresh grass-fed ground beef, Angus ground beef, and commodity 80/20 ground beef were obtained from local retail stores and a commercial meat processing facility. For each treatment 14 different production lots were used, and each lot contained five lb of ground beef. Upon arrival, the chubs were stored in a -40°F freezer for up to 14 days. All ground beef chubs were then thawed for 5 days at 35 to 39°C. Ground beef patties from all treatments were manually formed into 4 oz patties using a stainless steel and acrylic template, crust frozen, vacuum packaged with 2 patties per package, and stored frozen at -40°F for 8 days. Any remaining product was vacuum packaged and refrozen at -40°F for moisture, fat, and protein determination within one week.

Frozen ground beef patties were thawed for 2 days prior to cooking for consumer sensory panels. Patties were cooked to an initial internal temperature of 160°F using a clam shell grill (Cuisinart, East Windsor, NJ) and then held for approximately 5 minutes to allow for a post-cook rise in temperature to 165°F. Internal temperature was monitored using thermocouples. Following cooking, ground beef patties were cut into 4 wedge-shaped pieces, and then immediately served on paper plates to panelists. A total of 98 consumers evaluated ground beef patties for tenderness, juiciness, flavor liking, texture liking, and overall liking using continuous 100 point line scales on an electronic tablet, with anchors at each end and the midpoint. In addition, consumers rated each sample as either acceptable or unacceptable for each sensory trait assessed.

Results and Discussion

Moisture, fat, and protein content of commodity, grass-fed, and Angus ground beef used in this study was similar ($P>0.05$) as shown in Table 1. Consumers tended to rate grass-fed ground beef about 4% and 6% lower ($P=0.06$) for flavor and texture liking, respectively, than Angus and commodity ground beef (Table 2). Angus and commodity ground beef were rated higher ($P<0.01$) for overall liking compared to grass-fed ground beef. Consumers found tenderness and juiciness palatability ratings to be similar ($P>0.05$) for all three types of ground beef.

Overall, consumers preferred ($P<0.05$) Angus ground beef, with an overall acceptability of 94.9% compared to grass-fed ground beef with an overall acceptability of 82.5%, while commodity ground beef had similar ($P>0.05$) overall acceptability of 91.8% to Angus and grass-fed ground beef (Table 3). Consumers indicated no difference ($P>0.05$) for tenderness acceptability, juiciness acceptability, and texture acceptability among the three ground beef treatments. Commodity ground beef had the highest ($P<0.05$) flavor acceptability, while Angus and grass-fed ground beef had similar ($P>0.05$) acceptability percentages for flavor.

Implications

Angus and commodity ground beef were liked overall more than grass-fed ground beef, and Angus ground beef was more acceptable overall to consumers than grass-fed ground beef. Additionally, consumer's acceptability for ground beef flavor was higher for commodity ground beef than grass-fed ground beef. Ground beef palatability and acceptability are influenced by the source and diet of the beef.

Table 1. Moisture, fat, and protein content of Angus, commodity, and grass-fed ground beef

| Treatment | Fat | Moisture | Protein |
|------------------|-------------------|-------------------|-------------------|
| Angus | 19.8 ^a | 61.5 ^a | 18.0 ^a |
| Commodity | 19.8 ^a | 61.6 ^a | 17.6 ^a |
| Grass-fed | 15.7 ^a | 64.7 ^a | 18.7 ^a |
| SEM ¹ | 1.4 | 1.1 | 0.34 |
| P-value | 0.16 | 0.12 | 0.15 |

^aLeast squares means for the same product in the same column lacking a common superscript differ (P<0.05).

¹Pooled standard error of the least squares means.

Table 2. Consumer (n = 98) palatability ratings¹ for Angus, commodity, and grass-fed ground beef

| Treatment | Tenderness | Juiciness | Flavor liking | Texture liking | Overall liking |
|------------------|------------|-----------|---------------|----------------|-------------------|
| Angus | 64.7 | 69.7 | 59.9 | 63.2 | 65.3 ^a |
| Commodity | 66.5 | 68.0 | 61.2 | 61.6 | 66.2 ^a |
| Grass-fed | 64.0 | 65.9 | 54.1 | 57.2 | 56.4 ^b |
| SEM ² | 2.1 | 1.9 | 2.1 | 2.1 | 2.1 |
| P-value | 0.57 | 0.40 | 0.06 | 0.06 | < 0.01 |

^{ab}Least squares means in the same column lacking a common superscript differ (P<0.05).

¹Sensory scores: 0 = not tender/juicy, dislike flavor/texture/overall extremely; 50 = neither tough nor tender, neither dry nor juicy, or neither like or dislike flavor/texture/overall; 100 = very tender/juicy, like flavor/texture/overall extremely.

²Pooled standard error of the least squares means.

Table 3. Percentage of Angus, commodity, and grass-fed ground beef samples considered acceptable for palatability traits by consumers (n = 98)

| Treatment | Tenderness acceptability | Juiciness acceptability | Flavor acceptability | Texture acceptability | Overall acceptability |
|------------------|--------------------------|-------------------------|----------------------|-----------------------|-----------------------|
| Angus | 91.6 | 92.4 | 83.3 ^{ab} | 90.0 | 94.9 ^a |
| Commodity | 84.7 | 91.4 | 90.6 ^a | 83.8 | 91.8 ^{ab} |
| Grass-fed | 84.7 | 87.4 | 73.9 ^b | 83.8 | 82.5 ^b |
| SEM ¹ | 4.1 | 3.8 | 4.4 | 4.8 | 4.1 |
| P-value | 0.26 | 0.46 | 0.02 | 0.28 | 0.03 |

^{ab}Least squares means in the same column lacking a common superscript differ (P<0.05).

¹Standard error (largest) of the least squares means.