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# The Effects of Diet and Cooler Aging on Consumer Panel Scores for Beef

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## Summary

Crossbred steers ( $n = 64$ ) grazed warm- or cool-season grasses, without or with energy supplementation of wet distillers grains with solubles (WDGS), and were finished on a corn-based diet with or without 35% WDGS. Finishing cattle on WDGS, especially after being supplemented with WDGS, caused declines in flavor desirability scores of *L. dorsi* steaks. Conversely, grass type was more influential in *B. femoris* steaks with warm-season grasses generating lower consumer panel scores. Scores were not different from each other when supplementation was provided. It is recommended that producers provide WDGS supplementation and finish on an all-corn diet in order to create the most pleasurable eating experience for consumers.

## Introduction

When describing a pleasurable beef eating experience, flavor is often one of the most important attributes for consumers. If a product has great flavor, consumers will not only purchase it again but will also pay more for it. The diet fed to cattle can significantly affect beef flavor. When cattle are finished on wet distillers grains with solubles (WDGS) instead of an all-corn diet, off-flavors are more prevalent (2011 Nebraska Beef Cattle Report, pp. 96-99).

As meat ages, lipid oxidation creates unique flavors. When Smith et al. (Journal of Food Science, 1978, 43:823-826) dry aged meat up to 11 days,

flavor desirability was significantly increased. Campo et al. (Meat Science, 1999, 51:383-390) also found that flavor intensity increased as the length of wet aging increased up to 10 days.

This research was conducted to evaluate how consumer preferences are affected in two different muscles from cattle grazing different forages post-weaning, with or without supplemental energy, finished on either a corn or corn-with-WDGS diet, and aged for 7 or 28 days.

## Procedure

Crossbred steers ( $n = 64$ ) were allowed to graze for from April 17, 2012, until Oct. 10, 2012, (177 days) on warm-season grasses at the Barta Brothers Ranch in the Eastern Sandhills of Nebraska or on cool-season pastures near Ithaca, Neb., without or with energy supplementation of wet distillers grains with solubles WDGS (0.6% BW/ day). After the grazing period, cattle were finished on a corn-based diet with or without 35% WDGS for 119 days to an average live weight of 1,427 lbs. Cattle were harvested at Greater Omaha Packing Co., Omaha, Neb..

Six carcasses from each treatment ( $n = 48$ ) that graded USDA Choice or Select were identified and *Longissimus dorsi* (*L. dorsi*) and *Biceps femoris* (*B. femoris*) muscles from each side of each carcass were collected and aged under vacuum for 7 or 28 days. Upon fabrication after aging, two steaks were cut from each subprimal, placed on Styrofoam trays, wrapped with oxygen-permeable overwrap film, and placed under simulated retail display for seven days. At the end of retail display, steaks were vacuumed packaged and frozen until further use in consumer panels.

All consumer panels were approved by the Institutional Review Board and all panelists signed a consent form. Consumer panels were conducted in Houston, Tex., and Olathe, Kan., ( $n = 120$  per location). Consumers were recruited using existing consumer data banks and random phone solicitation. Consumers were selected who eat beef at least three times per week, range in age from 21 to 65, with an approximately equal balance of males and females, and a range in income.

In each city, consumer panels were conducted over two days, with the first day evaluating *L. dorsi* steaks and the second day evaluating *B. femoris* steaks. Different consumers evaluated each muscle type. Steaks from each animal were evaluated at both locations. Panels were conducted with three sessions per day and 20 consumers per session. Five consumers evaluated each steak. Treatment order was randomized and allocated to consumers using an incomplete block design. Each consumer evaluated eight steaks in a session.

Steaks were cooked on a Hamilton Beach Health Smart® grill (model 31605A, Hamilton Beach/ Proctor-Silex, Inc., Southern Pines, N.C.) to an internal temperature of 158°F. Consumers evaluated each sample using nine-point hedonic (1 = dislike extremely, 9=like extremely) and intensity scales (1 = none or extremely bland, 9 = extremely intense) for overall like, overall flavor like, beefy flavor like and intensity, and grilled flavor like and intensity.

Data were analyzed using the Mixed procedure in SAS (SAS Institute, Inc., Cary, N.C.) with differences determined at  $P \leq 0.05$ . Whenever there was a three- or four-

(Continued on next page)

way interaction, the LSmeans were reanalyzed using the GLIMMIX procedure with the slicediff option in order to more accurately study differences.

### Results

When supplementing on pasture with WDGS, finishing on corn without WDGS caused higher ( $P \leq 0.04$ ) scores for overall like, overall flavor like, and beefy flavor like of *L. dorsi* steaks than finishing on WDGS (Table 1). There were no differences in *L. dorsi* steak scores between finishing diets when no supplementation was given. The cattle finished on corn after being supplemented with WDGS received no WDGS during the finishing phase. In contrast, the cattle supplemented and finished on corn with WDGS had essentially been fed WDGS since weaning. The differences in consumer panel scores in the *L. dorsi* steaks are likely due to those cattle being fed WDGS for a longer length of time.

Beefy flavor intensity was significantly ( $P = 0.04$ ) affected by a three-way interaction between grass-type, supplementation, and aging period. When the means were separated out by aging period (Figure 1) there were no differences between the means within the same aging period. This would demonstrate the aging period is causing the interaction to be significant. Neither grill flavor like nor grill flavor intensity scores were affected by any combinations of feeding regimens and aging.

For *B. femoris* steaks overall like, overall flavor like, beefy flavor like, and beefy flavor intensity scores were significantly ( $P \leq 0.05$ ) influenced by the four-way interaction of grass type, supplementation, finishing diet, and aging (Table 2). Within the seven day aging period, grazing on warm-season grasses without supplementation and

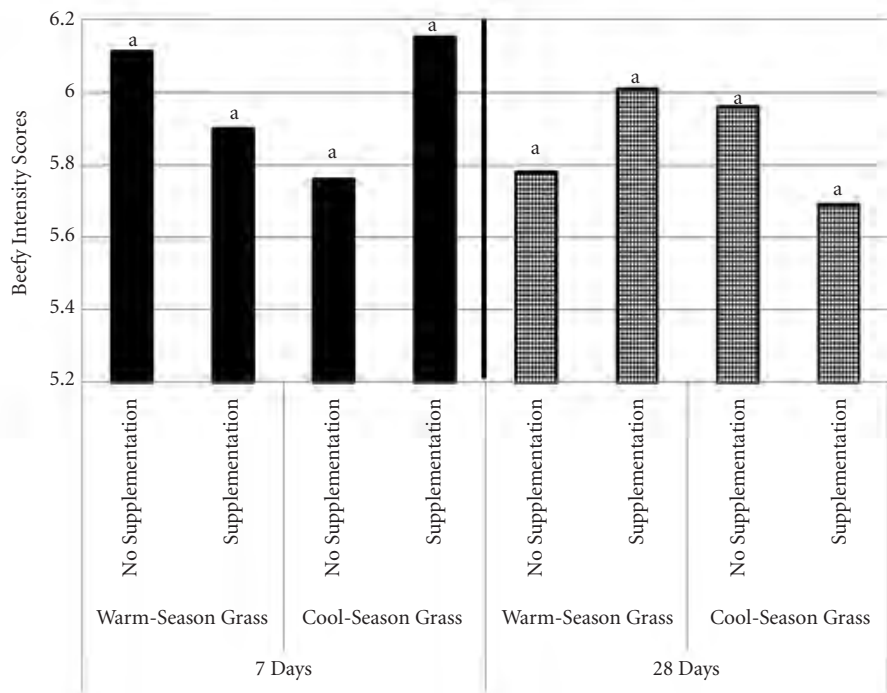
**Table 1. The effects of supplementation and finishing diet on the LS means of consumer panel scores for *L. dorsi* and *B. femoris* steaks.**

	No Supplementation		Supplementation		SEM	P-value
	Corn	WDGS <sup>1</sup>	Corn	WDGS		
<i>L. dorsi</i>						
Overall Like <sup>2</sup>	6.14 <sup>b</sup>	6.18 <sup>ab</sup>	6.52 <sup>a</sup>	5.98 <sup>b</sup>	0.13	0.03
Overall Flavor Like	6.06 <sup>ab</sup>	6.10 <sup>ab</sup>	6.34 <sup>a</sup>	5.84 <sup>b</sup>	0.14	0.04
Beefy Flavor Like	6.15 <sup>ab</sup>	6.24 <sup>ab</sup>	6.43 <sup>a</sup>	5.91 <sup>b</sup>	0.13	0.02
Beefy Flavor Intensity	5.85	5.96	6.10	5.77	0.14	0.11
Grill Flavor Like	5.78	5.87	5.93	5.64	0.13	0.13
Grill Flavor Intensity	5.33	5.30	5.49	5.27	0.14	0.50
<i>B. femoris</i>						
Overall Like	5.77	5.64	5.97	5.72	0.14	0.66
Overall Flavor Like	5.65	5.65	6.08	5.69	0.14	0.16
Beefy Flavor Like	5.85	5.87	6.15	5.90	0.14	0.31
Beefy Flavor Intensity	5.63	5.84	6.00	5.77	0.14	0.12
Grill Flavor Like	5.51	5.54	5.95	5.48	0.14	0.06
Grill Flavor Intensity	5.16	4.97	5.46	5.10	0.15	0.55

<sup>1</sup>WDGS = Wet distillers grains with solubles.

<sup>2</sup>1=dislike extremely, none, or extremely bland, 9=like extremely or extremely intense.

<sup>ab</sup>Means within the same row with different superscripts are different ( $P \leq 0.05$ ).



<sup>a</sup>Means within the same aging period with the same superscript are not significantly ( $P > 0.05$ ) different.

**Figure 1. The effect of grass type, supplementation, and aging period on the LS means of beefy flavor intensity consumer panel scores when separated by aging period in *L. dorsi* steaks ( $P = 0.04$ ).**

**Table 2. The effect of grass type, supplementation, finishing diet, and aging period on the LS means of consumer panel scores when separated by aging period for *B. femoris* steaks.**

	Warm-season Grass				Cool-season Grass				SEM	P-value
	No Supplementation		Supplementation		No Supplementation		Supplementation			
	Corn	WDGS <sup>1</sup>	Corn	WDGS	Corn	WDGS	Corn	WDGS		
<b>7 Days</b>										
Overall Like <sup>2</sup>	6.12 <sup>a</sup>	5.02 <sup>b</sup>	5.89 <sup>a</sup>	5.78 <sup>ab</sup>	5.92 <sup>a</sup>	6.25 <sup>a</sup>	6.02 <sup>a</sup>	6.17 <sup>a</sup>	0.29	<0.01
Overall Flavor Like	6.06 <sup>a</sup>	5.13 <sup>b</sup>	6.04 <sup>a</sup>	5.64 <sup>ab</sup>	5.83 <sup>ab</sup>	6.19 <sup>a</sup>	6.24 <sup>a</sup>	5.96 <sup>a</sup>	0.31	0.01
Beefy Flavor Like	6.08 <sup>ab</sup>	5.44 <sup>b</sup>	6.02 <sup>ab</sup>	6.05 <sup>ab</sup>	6.08 <sup>ab</sup>	6.41 <sup>a</sup>	6.43 <sup>a</sup>	6.17 <sup>ab</sup>	0.29	0.01
Beefy Flavor Intensity	6.11 <sup>a</sup>	5.55 <sup>a</sup>	5.88 <sup>a</sup>	5.72 <sup>a</sup>	6.11 <sup>a</sup>	6.10 <sup>a</sup>	6.24 <sup>a</sup>	5.98 <sup>a</sup>	0.32	0.05
Grill Flavor Like	5.85	5.22	5.81	5.59	5.59	5.71	6.12	5.55	0.28	0.23
Grill Flavor Intensity	5.38	4.65	5.60	5.16	5.03	5.02	5.41	4.91	0.31	0.06
<b>28 Days</b>										
Overall Like	5.18 <sup>cd</sup>	5.48 <sup>bcd</sup>	6.28 <sup>a</sup>	4.91 <sup>d</sup>	5.85 <sup>abc</sup>	5.80 <sup>abc</sup>	5.71 <sup>abc</sup>	6.02 <sup>ab</sup>	0.29	0.005
Overall Flavor Like	5.08 <sup>c</sup>	5.48 <sup>bc</sup>	6.38 <sup>a</sup>	5.19 <sup>c</sup>	5.64 <sup>abc</sup>	5.81 <sup>abc</sup>	5.66 <sup>abc</sup>	5.95 <sup>ab</sup>	0.31	0.01
Beefy Flavor Like	5.39 <sup>b</sup>	5.65 <sup>b</sup>	6.50 <sup>a</sup>	5.47 <sup>b</sup>	5.84 <sup>ab</sup>	6.00 <sup>ab</sup>	5.66 <sup>b</sup>	5.92 <sup>ab</sup>	0.29	0.01
Beefy Flavor Intensity	4.88 <sup>c</sup>	5.73 <sup>ab</sup>	6.36 <sup>a</sup>	5.49 <sup>bc</sup>	5.41 <sup>bc</sup>	5.96 <sup>ab</sup>	5.52 <sup>bc</sup>	5.90 <sup>ab</sup>	0.32	0.05
Grill Flavor Like	5.14	5.28	6.03	5.21	5.47	5.96	5.85	5.56	0.28	0.23
Grill Flavor Intensity	4.73	4.87	5.77	4.96	5.49	5.35	5.06	5.37	0.31	0.06

<sup>1</sup>WDGS = Wet distillers grains with solubles.

<sup>2</sup>1 = dislike extremely, none or extremely bland; 9 = like extremely or extremely intense.

<sup>abcd</sup>Means within the same treatment and the same row with different superscripts are different ( $P \leq 0.05$ ).

finishing on WDGS caused the greatest number of differences with the lowest numerical, and sometimes significant ( $P \leq 0.05$ ), scores for overall like, overall flavor like, beefy flavor like, beefy flavor intensity, grill flavor like, and grill flavor intensity scores than all other dietary combinations. When supplementation was given, finishing diets were not different from each other or other dietary treatment combinations, including cool-season grasses. This implies that supplementing cattle while grazing will prevent any differences in consumer scores caused by grass type. This is in contrast to *L. dorsi* scores which showed feeding WDGS for the lifespan of the animal decreased consumer scores.

For beef aged 28 days, supplementation and finishing on corn caused higher ( $P < 0.05$ ) overall like, overall flavor like, beefy flavor like, and beefy flavor intensity (6.36) scores than all other supplementation and finishing

diet combinations within warm-season grass grazing. For most traits, consumer scores were not different between warm- and cool-season grass grazing. The lack of differences between grass types could be due to the fact that samples were aged for 28 days. The longer aging period could have caused any negative flavor influences present in warm-season grasses to dissipate, as seen in the seven-day samples. Any differences present were only seen within warm-season grasses between supplementation and finishing diet, so aging effects are not completely dismissed.

None of the diet regimen and aging combinations influenced grill flavor like or grill flavor intensity scores ( $P > 0.05$ ). There was a tendency ( $P = 0.06$ ) for the interaction between supplementation and finishing diet to influence grill flavor like scores and for an interaction between grass type, supplementation, finishing diet, and

aging period to influence grill flavor intensity scores ( $P = 0.06$ ).

These data suggest that desirable beef flavor is best established with cool season grasses, feeding WDGS as an energy supplement during grazing and finishing on corn. However, for a majority of the scores, finishing on corn with WDGS was not very different from finishing on corn without WDGS. Aging also plays a key role in flavor development. For the most part, longer aging periods tend to dissipate any differences in consumer panel scores that previously existed. Due to these facts, a longer aging period of beef is recommended.

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