US CONSUMER ASSESSMENT OF TOP LOIN BEEF FROM TWO NEW ZEALAND FORAGE FINISHING SYSTEMS COMPARED TO US GRAIN FED BEEF

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Abstract – Consumer sensory analysis was conducted to determine differences in beef palatability between three finishing diets (fodder beet, non-fodder beet, grain) when beef was selected for low or high expected eating quality and then aged for 21 or 35 d. Extending postmortem aging positively influenced New Zealand beef, but either had a slightly negative or no impact on US grain fed beef. When focusing on the high eating quality samples, consumers did not discriminate between finishing systems when samples were aged 35 d. Ultimately, finishing beef cattle using fodder beet in New Zealand can be a viable option to supply high quality beef during winter months, while maintaining the eating quality expectations associated with "grass- fed" beef.

Key Words – cattle diet, eating quality, fodder beet

I. INTRODUCTION

In New Zealand (**NZ**), a branded beef program with proprietary thresholds involving marbling, ossification, 12th rib fat, pH, meat color, and fat color has been developed based on predicted eating quality. As demand continues to grow, the use of alternative finishing systems has been explored to supply beef cattle during winter months, when historically, cattle numbers and beef quality taper off due to limited grass supply. Due to the growing popularity of wintering dairy heifers on fodder beet (**FB**), beef researchers have adapted and tailored this feeding system to finish beef cattle to help meet the demand for high quality beef in NZ. The purpose of this portion of the study was to determine how consumers perceived beef from cattle finished on FB directly before slaughter compared to traditional forage finishing and US grain finished cattle.

II. MATERIALS AND METHODS

Several beef producers in NZ participated in a nationwide feeding trial to finish beef steers using FB during winter months. Cattle enrolled in the FB feeding system and selected for eating quality assessment were on crop an average of 81 d (range 63-98 d) immediately prior to slaughter. Carcasses from non-FB fed cattle were also selected from the same processing facility as carcasses from cattle finished on FB on each collection day. Strip loins were obtained over a series of nine collection days, spanning over a 28-d period in July and August to sample strip loins from as many participating finishers as possible (9 of 17). Within each finishing system, 60 strip loins representing expected low and high eating quality (based on eligibility for the branded program) were selected resulting in the following 6 treatments: FB low quality (**FBL**), FB high quality (**FBH**), non-FB low quality (**NFBL**), non-FB high quality (**NFBH**), USDA Select (**SEL**), Top (upper 2/3) USDA Choice (**TCH**). Carcass data were collected by trained Texas Tech personnel using USDA standards [1]. Prior to 21 d postmortem, strip loins were fabricated into 2.5-cm steaks for use in compositional analysis and consumer testing. All consumer steaks were vacuum packaged and frozen at 21 or 35 d postmortem. A Latin-square design was utilized to balance the order and presentation of the 6 treatments aged either 21 or 35 d. Steaks were cooked on a Silex clamshell grill (Model S-143K, Silex Grills Australia Pty Ltd., Marrickville, Australia) with a temperature set at 225°C. A strict and detailed time schedule was followed to ensure all steaks were prepared identically [2] targeting a medium degree of doneness. Consumers (n = 1,140) scored palatability traits [tenderness (**TEN**), juiciness (**JUC**), flavor liking (**FL**), and overall liking (**OL**)] on 100-mm line scales verbally anchored at 0 (not tender, not juicy, dislike extremely) and 100 (very tender, very juicy, like extremely). Data were analyzed using the GLIMMIX procedure of SAS with treatment and postmortem aging as the fixed effects.

III. RESULTS AND DISCUSSION

Treatment and postmortem aging interacted to influence ($P \leq 0.05$) each palatability trait. Adding 14 d of aging improved TEN ($P < 0.01$) of all NZ treatments, but had no influence ($P > 0.05$) on TEN of US beef. Non-FB (low and high) samples aged 35 d were more liked than 21 d, but FL and OL of TCH decreased with additional aging. Within each diet there was a general trend for greater ($P < 0.05$) scores from the high vs. the low expected eating quality samples, regardless of aging period. Exceptions to this trend were noted for FL and OL of 21-d aged FB samples, as well as TEN and JUC of 35-d aged FB samples. Ultimately, one of our goals was to determine if consumers can distinguish between FB and NFB, as both can be labeled and marketed as "grass-fed." When samples were aged 35 d, consumers could not distinguish ($P > 0.05$) between FB and NFB for TEN, JUC, FL, or OL within the high or low expected eating quality classification. When samples were aged 21 d, consumers did not differentiate ($P > 0.05$) between FB and NFB of the high eating quality samples, but actually scored FBL as more tender with greater FL and OL than NFBL ($P < 0.05$).

Table 1 Effects of diet and postmortem aging on consumer (n = 1140) sensory scores for eating quality traits

Treatment	Tenderness	Juiciness	Flavor Liking	Overall Liking
21 d				
Fodder Beet Low	58.0^{de}	65.7^{de}	59.6^{e}	59.7^{ef}
Fodder Beet High	63.2^{c}	69.7^{abc}	62.0^{cde}	62.3^{cde}
Non-Fodder Beet Low	52.9^{f}	62.7^{ef}	55.4^{f}	54.7^{g}
Non- Fodder Beet High	61.2^{cd}	66.3^{cd}	59.6^{e}	60.5^{ef}
Select	52.8^{f}	66.0^{de}	55.8^{f}	57.4^{fg}
Top Choice	70.8^{a}	72.5^{a}	69.0^{a}	69.7^{a}
35 d				
Fodder Beet Low	63.5^{bc}	68.4^{bcd}	61.1^{de}	62.1^{de}
Fodder Beet High	67.5^{ab}	70.8^{ab}	65.3^{bc}	66.0^{abc}
Non-Fodder Beet Low	61.9^{cd}	66.6^{cd}	60.3^{de}	61.8^{e}
Non- Fodder Beet High	68.0^{a}	71.1^{ab}	66.4^{ab}	67.9^{ab}
Select	54.7^{ef}	61.5^{f}	54.1^{f}	55.8^{g}
Top Choice	71.1^{a}	70.7^{ab}	63.5^{bcd}	65.6^{bcd}
SEM	1.5	1.3	1.3	1.4
P-value (Treatment)	< 0.01	< 0.01	< 0.01	< 0.01
P-value (Aging)	< 0.01	0.16	0.03	< 0.01
P-value (Treatment x Aging)	0.05	< 0.01	< 0.01	< 0.01

$^{a-g}$ Within a column, LS means without a common superscript differ ($P < 0.05$)

IV. CONCLUSION

Extending postmortem aging by 14 d improved TEN scores of all NZ-sourced beef, and improved JUC, FL, and OL of NFB, but had no positive impact on eating quality of US beef. When focusing on the high eating quality samples, consumers did not discriminate between finishing systems when samples were aged 35 d, scoring TCH, FBH, and NFBH similarly for all palatability traits. FBL and NFBL were always scored similarly or with a slight advantage over SEL, regardless of aging period. Ultimately, finishing beef cattle using fodder beet in New Zealand seems to be a viable option to supply beef cattle during winter months and meet demand for high quality beef, while maintaining the eating quality expectations associated with grass fed beef.

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