Meat and Muscle Biology™

Effect of Enhancement of Two Beef Muscles with Phosphate or Alternative Functional Ingredients on the Eating Quality of US Beef

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Objectives

Consumers are increasingly searching for more natural and healthier foods that avoid ingredients like phosphates ("clean label"). The objective of this study was to determine the effects of enhancement ingredients and quality grade on the eating quality of *longissimus lumborum* and *semitendinosus*.

Materials and Methods

Strip loins (n = 36) and eye of rounds (n = 31) were collected from beef carcasses to equally represent USDA Prime, Average Choice, and Select quality grades at a commercial packing facility in Omaha, NE. Subprimals were shipped under refrigeration (0 to 2°C) to the Texas Tech University for processing. Subprimals were trimmed of all accessory muscles, external fat, and connective tissue, leaving *longissimus lumborum* (LL) and *semitendinosus* (ST). Each subprimal was equally portioned into 6 sections. One section served as a non-enhanced control (CON), while the remaining 5 sections were injected with 112% of green weight with water, salt, and either sodium tripolyphosphate (STP), native potato starch (NPS), sodium carbonate (SC), sodium bicarbonate (SB), or beef flavoring (BF). Sections were cut into steak pieces (5 × 5 × 2.5-cm thick) and frozen at 40 d postmortem. Steak pieces were cooked to a targeted medium degree of doneness on a clamshell grill using a fixed time cooking schedule. Each sample was portioned and served warm to 2 consumer panelists. Panelists (n = 1380) rated each sample for tenderness, juiciness, flavor, and overall liking on an anchored 100-mm line scale. During a session, panelists evaluated 6 samples representing each treatment combination, arranged in a predetermined, balanced order. Data were analyzed using PROC GLIMMIX (SAS) with fixed effects of muscle, enhancement, quality grade, and their interactions (α = 0.05).

Results

No two-way or three-way interactions were detected for any palatability trait ($P > 0.05$). Enhancement ingredients influenced tenderness, juiciness, flavor, and overall liking ($P < 0.01$), regardless of muscle or quality grade. Samples from SC and SB had greater ($P < 0.05$) tenderness scores than samples enhanced with any other ingredient, except PS. Meanwhile, CON samples were the least tender, and STP was scored lowest for tenderness of the enhanced treatments ($P < 0.05$). Samples enhanced with BF, SC, and SB were rated juicier than STP and all enhanced samples were rated juicier than CON ($P < 0.05$). Samples enhanced with BF, SC, SB, and NPS were all similarly rated with greater flavor and overall liking than STP ($P < 0.05$), which was intermediate, and CON had the lowest flavor and overall liking compared to all other treatments ($P < 0.05$). Quality grade also affected tenderness, juiciness, flavor and overall liking ($P < 0.05$). Prime samples received the greatest ratings for all traits, over Average Choice, which was intermediate, and Select samples were scored lowest for all palatability traits. Lastly, muscle influenced all palatability traits ($P < 0.01$). *Longissimus lumborum* samples were more tender, juicier, more flavorful, and liked more than *semitendinosus* samples ($P < 0.01$).

Conclusion

Results showed consumers liked alternative functional ingredients over enhancement with phosphate and non-enhanced beef. This shows clean label ingredients are not only effective in increasing palatability but had superior eating quality over enhancement with phosphate.