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Meat and Muscle Biology™

Effect of Enhancement on Three Beef Muscles with Phosphate or Alternative Functional Ingredients on the Eating Quality of Australian Beef

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Objectives

Imported meat products are commonly used in the value-addition sector of the US meat industry. Non-meat ingredients, such as sodium tripolyphosphate (STP), are often introduced into imported subprimals by the processor to mitigate potential palatability issues. Although STP can positively affect palatability attributes, its use in meat products can be concerning to some consumers. Our objectives were to determine the effects of enhancement with phosphate or alternative functional ingredients on the palatability of three imported Australian beef subprimals.

Materials and Methods

Ribeye rolls, strip loins, and eye of rounds were collected from carcasses (N = 69) at two commercial abattoirs in Australia. Subprimals were shipped under vacuum in a commercial refrigerated vessel at 0 to 2°C to the USA, where they were transported to Texas Tech University for processing. External fat, connective tissue, and accessory muscles were removed from subprimals, leaving the *longissimus thoracics* (LT), *longissimus lumborum* (LL), and the *semitendinosus* (ST). Muscles were then portioned into six equal sections. One section served as a non-enhanced control (CON), while the remaining five were injected to 112% of green weight with water, salt, and 1 of 5 ingredients: STP, sodium bicarbonate (SBC), sodium carbonate (SC), native potato starch (PS), or beef flavoring (BF). Sections were cut into steak pieces (5 × 5 × 2.5-cm thick) and frozen at 90 d postmortem. Thawed samples were cooked on a clamshell grill using a fixed time cooking schedule targeting a medium degree of doneness, cut into 2 equal portions, and served warm to 2 consumers. Panelists (n = 1380) evaluated each sample for tenderness, juiciness, flavor and overall liking on anchored 100-mm lines scales. Each consumer evaluated 6 test samples from the treatment combinations arranged in a predetermined, balanced order. Sensory data were analyzed using the GLIMMIX procedure of SAS using muscle, ingredient, and their interaction as fixed effects and abattoir as a random effect ($\alpha = 0.05$).

Results

No interactions were detected between muscle and ingredient ($P \geq 0.44$); however, both muscle and ingredient affected ($P < 0.01$) consumer sensory ratings. The LL and LT similarly ($P > 0.05$) scored more tender, with greater flavor and overall liking ($P < 0.05$) than the ST. The LT was juicier than LL, which was intermediate, and ST was the least juicy ($P < 0.05$). Samples that were not enhanced were scored lower ($P < 0.05$) for all measured palatability attributes compared to all other treatments, except STP and CON had similar tenderness scores ($P > 0.05$). Of the injected samples, STP resulted in lower ($P < 0.05$) consumer sensory scores than all other treatments. Consumers rated SBC, SC, and PS as the most tender samples ($P < 0.05$). Samples enhanced with SBC and SC were juicier ($P < 0.05$) than all other treatments except PS. The flavor of SC was liked more ($P < 0.05$) than all other treatments except SBC and PS. Samples from SBC, SC, and PS had greater ($P < 0.05$) overall liking than STP and CON, but PS and BF were similar ($P > 0.05$).

Conclusion

Ultimately, these results revealed that several alternative functional ingredients can be used to improve palatability scores of imported Australian beef while generating eating quality outcomes that are similar or superior to injection with STP.