Meat and Muscle Biology™

Establishing the Relationship Between Mineral Content and Palatability Attributes of Ribeye Steaks from Savannah-Fed Brahman-Influenced Cattle

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Objectives

Combination of eating qualities of beef plays an important role in beef consumer satisfaction; however, it is not well-understood how those eating attributes could be influenced by individual mineral components. The objective of this study was to examine the multivariate relationships between mineral profile and palatability attributes determined by consumers of Venezuelan Brahman-influenced cattle (Brahman).

Materials and Methods

Steers and bulls ($n = 33$) of Brahman cattle were raised under similar extensive and feeding conditions (native grass pasture) and slaughtered at 19 and 24 mo of age (MOA). Ribeye steaks (2.54-cm thick) were removed from the longissimus thoracis muscle (posterior end) from the right side of each carcass at 48 h post-mortem. All samples were vacuum-packaged and immediately frozen at -30°C for Warner-Bratzler shear force (WBSF), mineral content (ash, Na, K, Mg, P, Ca, Cu, Mn, Zn, Fe; mg/100 g fresh tissue) and consumer sensory evaluation ($n = 137$; 9-point hedonic scale for overall, flavor liking, flavor intensity and tenderness liking). Principal component analysis was performed to identify the influence of the measured attributes.

Results

Correlations coefficients did not reveal strong relationship among the variables measured. The total variance was distributed into 15 principal components (PC). The factor analysis showed that the first five PC with eigenvalues greater than 1 explained 67.24% of the standardized variance; PC1 explained 21.28%, PC2 16.82%, PC3 12.88%, PC4 8.68%, and PC5 7.59% of the total variance. The set of variables for the first PC included mineral components mainly Na, K, Mg, Ca, Cu, Mn, and Fe (based on the largest loading values). Next, PC2 was related to overall liking, tenderness liking, flavor liking, Ca and Zn. Principal component 3 had a large loading for ash, Na, P, Mn, WBSF, and flavor intensity. The fourth PC had ash and Fe; while PC5 K, Ca, WBSF and tenderness liking, flavor liking, and flavor intensity. Results obtained after plotting the first two PC showed segregation of ribeye steaks from animals slaughtered at 19 MOA and 24MOA (regardless of sex classes); younger animals tended to have more Ca, P, Fe, Mn, Mg, Cu, and less Na and K; and their samples had more desirables scores in overall liking, tenderness liking, flavor liking than older ones. In the second plotting (PC1 × PC3), WBSF and P were located in the positive side of PC1 along with 19MOA Brahman steaks; while ash, Zn, Na, and K on the PC1 negative side along with 24MOA Brahman steaks and closely associated with flavor intensity. Further results plotting (PC1 × PC4; PC1 × PC5) reaffirmed and showed a closely association between minerals and treatments previously mentioned.

Conclusion

These results indicate sensory attributes are weak to moderate influenced by individual mineral content in beef. Content of individual minerals can affect the degree of liking more than overall ash content. Additionally, Ca, P, Fe, Mn, Mg, Cu content were positively associated to overall liking, tenderness liking, and flavor liking; in contrast ash, Zn, Na, and K were negative associated to such sensory attributes; but not to flavor intensity.