

RELATIONSHIP OF VOLATILE COMPOUNDS AND CONSUMER SENSORY TRAITS FROM NEW ZEALAND GRASS-FED AND AMERICAN GRAIN-FED BEEF STRIP LOINS VARYING IN MARBLING LEVEL AND WET AGING TIME

T. J. Tilton^{1*}, L. W. Lucher¹, T. G. O'Quinn², J. F. Legako³, J. C. Brooks³, and M. F. Miller³,

¹*Agricultural Sciences, West Texas A&M University, Canyon, TX, USA,*

²*Animal Sciences and Industry, Kansas State University, Manhattan, KS, USA,*

³*Animal and Food Sciences, Texas Tech University, Lubbock, TX, USA,*

*llucher@wtamu.edu

I. OBJECTIVES

Cattle diet, marbling, and wet aging can drastically affect eating quality and consumer preference of beef. Volatile compound analysis has been reported to be related to beef flavor. The objective of this study was to assess the relationship of cooked volatile compounds and consumer sensory traits of New Zealand grass-fed strip loin steaks in comparison to United States grain-fed strip loin steaks from 5 different USDA quality grades, wet-aged for 7, 21, and 42 d.

II. MATERIALS AND METHODS

Beef strip loins ($n=200$; 20 per USDA quality grade/fed cattle type) representing 5 USDA quality grades (USDA Prime, Top Choice, Low Choice, Select, and Standard) and 2 fed cattle types (New Zealand grass-finished and US grain-finished) were used in the study. Steaks were cooked to a target internal temperature of 71°C using a clamshell grill (Cuisinart Griddler Deluxe, East Windsor, NJ). Consumer panelists ($n=600$; 120 per 5 different cities in the US) evaluated 8 samples for juiciness, tenderness, flavor liking, and overall liking. Immediately following cooking, the steak for volatile analysis ($n=600$) was trimmed to remove external fat and connective tissue, cubed, submerged in liquid nitrogen, and homogenized. Five grams of the homogenate and ten microliters of internal standard (1,2-dichlorobenzene; 0.801 mg/mL) was used for extraction of volatile compounds. Quantitation was performed by an internal standard calibration with authentic standards. Statistical analyses were conducted using the procedures of SAS (version 9.3; SAS Institute Inc., Cary, NC). PROC CORR was used for calculating and determining significance ($P<0.05$) of all Pearson correlation coefficients. Principal component analysis (PCA) was conducted on volatile compounds and consumer sensory results using the FACTOR procedure of SAS.

III. RESULTS

No lipid-derived volatile compounds were significantly correlated to flavor liking ($P>0.05$); however, there was a positive correlation between dodecanal and overall liking ($r=0.093$; $P<0.05$). Of the Maillard-derived volatile compounds, the only volatile compounds positively correlated to flavor liking were phenylacetaldehyde ($r=0.119$), methyl-pyrazine ($r=0.094$), 2,5-dimethylpyrazine ($r=0.110$), trimethylpyrazine ($r=0.091$), and 2-ethyl-3, 5/6-dimethylpyrazine ($r=0.087$) ($P<0.05$). Methional was negatively correlated with flavor liking ($r=-0.139$; $P<0.05$). A PCA showed relationships of volatile compounds, treatments, and consumer ratings. PC1 explained 17.17% of the variation and PC2 explained 10.96% of the variation. Consumer flavor liking was most closely associated with ethanol and treatments grass and grain Prime aged 42 d. The majority of the alcohols and n-aldehydes were associated with the 7-d grain treatments including grain Top Choice, Low Choice, and Select.

The Maillard-derived compounds were grouped together and most associated with grass Top Choice 42 d and the consumer attributes. Methional was closest to many grass treatments, including grass Top Choice 7 d, Low Choice 7 d, Standard 7 d, and Prime 7 d in addition to Standard 21 d.

IV. CONCLUSION

Although associations were evident between volatile compounds and consumer sensory attributes in the PCA, they were not strongly related in this study.

Keywords: consumer, flavor, grain-fed, grass-fed, volatile compounds