Published April 25, 2019

2018 Reciprocal Meat Conference – Meat and Poultry Quality and Composition- Measurement and Prediction

Meat and Muscle Biology™

Influence of Cook Method and Degree of Doneness on Aromatic Volatiles in Flap and Skirt Steaks

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Keywords: beef, outside grill, pan grill, pan-fry, volatiles
Meat and Muscle Biology 2(2):25 **doi:10.221751/rmc2018.022**

Objectives

It has been well established that cooking method, marbling level and cooked internal temperature endpoint affect beef flavor also, beef flavor has been shown to be the most important driver of consumer acceptance. But beef cuts respond differently to cooking method and cooked internal temperature endpoint based on their inherent chemical characteristics. The objective of this study was to determine the relationship between descriptive flavor attributes and volatile flavor compounds of major beef cuts as affected by cooking method and internal cooking endpoint.

Materials and Methods

In this study, 3 beef cuts (outside skirt, inside skirt, and flap), 2 Quality grades (USDA Choice and Select), 3 cooking methods (pan fry, pan grill, and outside grill), and 3 internal cook temperature endpoints (58, 70, and 80°C) were evaluated by an expert descriptive sensory attributes panel and volatile flavor aroma compounds were determined using gas chromatography-mass spectrometry-olfactory (GC–MS-O). Meat sources were purchased as subprimals in 6 reps for each cut and were fabricated into 10.16 cm wide steaks. Partial least squares regression biplots were used to show relationships.

Results

Eighty volatile aromatic compounds were reported by cuts. Most flap treatments were clustered near butanoic acid, benzeneacetaldehyde, phenyl acetaldehyde, and 2,6-dimethyl-pyrazine, generally sweet, rancid, and floral aromas, respectively. Choice flap steaks pan-fried to 58°C were closely related to 3-ethyl-benzaldehyde, 3-dodecen-1-al, (E)-2-heptenal, and 1-octanol. Select flap steaks pan-grilled to 80°C were closely related to 2-methyl-butanal, a malty, green, fruity, musty aroma. Generally, inside skirt treatments were related to acetic acid, sulfur dioxide, methyl-benzene, and 1-heptanol, sour, sulfur, and fruity aromas, respectively. Select inside skirt steaks pan-fried to 70°C were closely related to nonanal, styrene, carbon disulfide, tetradecanal, 2-octenal, trans-2-undecenal, and 2,4-decadienal. Choice inside skirt steaks pan-fried to 80°C were closely related to octane, pentanal, heptane, 2-ethyl-6-methyl-pyrazine, trimethyl-pyrazine, and 3-ethyl-2,5-dimethyl-pyrazine. Outside skirts are clustered around aromas such as dl-limonene, 2-acetyl-2-thiazoline, carbon disulfide, and undecanal– citrus, soapy, and buttery aromas, respectively. Select outside skirt steaks outside grill to 70°C were closely related to methyl thioacetate, 3-methyl-butanal (malty aroma), 2-methyl-pyrazine (nutty, brown, musty, and roasted aroma), and 2-heptanone volatile aromatic compounds. Choice steaks pan-fried to 70°C were closely associated with benzeneacetaldehyde, 2-ethyl-6-methyl-pyrazine and buttery volatile aromatic compounds and flavor attribute.

Conclusion

Beef flavor has been identified as a key driver for consumer acceptability, so understanding the factors that attribute to flavor is essential. This research showed that volatiles differed across various cuts, cooking methods, marbling levels, and cooked internal temperatures and were associated with descriptive beef flavor attributes.

