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Sensory attributes of beef round cuts across cooking methods and cut size (#323)

Rhonda Miller[1], Paige Smith[1], Cassandra Pena[1], Chris Kerth[1], Hannah Laird[1], Dale Woerner[2], Gordon Carstens[1]

[1] Texas A&M University, Animal Science, College Station, US; [2] Texas Tech University, Animal and Food Science, Lubbock, US

Introduction

Cooking method, marbling level and cooked internal temperature endpoint affect beef sensory characteristics. Beef cuts respond differently to these attributes due to differences in live animal muscle function. Beef round cuts have been problematic. US beef has improved in tenderness over 30 years**;** however, round cut tenderness has not improved. Fully elucidating the effects of cut size, cooking method and degree of doneness for beef round cuts is needed to provide consumers methods to maximize tenderness and flavor.

Methods

USDA Top Choice and Select bottom round (BR), eye or round (ER), and inside round (IR) subprimals were purchased, aged 14 d, and sliced into 0.6 cm, 1.9 cm cuts, or 0.9 kg roasts. IR were sliced into 0.6, 1.9 or 5.1 cm cuts. Cuts were cooked, 177°C temperature, using stir fry (SF), pan grill (PG), stew (SW) or roast (RS) methods. SF slices were cut across the grain into 2.5 cm strips. Marinated SW cuts were marinated for 12 h (118 ml water, 90 ml lemon juice, 30 ml canola oil, 5 ml salt, 2.5 ml pepper). SF, PG and RS cuts were cooked to 58, 70 or 80°C internal temperatures. SW cuts were cooked for 30 min, 1.5 hr or 3 hr. SF cuts were cooked with 14 ml of canola oil. SW cuts were cooked with 28 ml of canola oil, browned, drippings discarded, 750 ml water were added, and cooked on low heat in a covered Dutch oven. Internal temperatures were monitored by iron-constantan thermocouples or probes. Cuts were evaluated by an expert trained flavor/texture descriptive attribute panel using 16-point scales (0=none;15=extremely intense). Panelists seated in individual booths with red lights evaluated 15 samples per day. Sparkling water and unsalted saltine crackers were used as palette cleansers. Data were analyzed using Proc GLM procedures of SAS (n=12 per subclass) at alpha of $P < 0.05$. Sensory day and order were defined as random variables. Least squares means were calculated and differences determined using the Fishers method. Principal component analysis was conducted.

Results

Choice BR cuts had higher fat-like flavor than Select BR. For PG, thicker BR cuts had greater levels of beef identity, browned, bloody/serumy, fat-like, metallic, umami, sweet, and lower levels of roasted, liver-like, cardboardy, musty earty, and astringenty. PG 1.9 cm BR cuts were juicier, more tender and had slightly less connective tissue amount (CT). As internal temperature increased for 0.6 and 1.9 cm BR cuts, browned, roasted, fat-like, and umami flavor increased and bloody/serumy, musty earthy, astringent, juiciness and tenderness flavor/texture decreased. RS BR cuts had lower levels of brown, cardboardy, heated oil, musty earthy, and higher levels of roasted and CT when compared to PG BR cuts. As BR roast internal temperature increased, beef identity, browned, roasted, liver-like, umami, cardboardy, astringent and CT increased and bloody/serumy, metallic, sour, juiciness, and muscle fiber tenderness decreased . When 0.6 cm BR strips were SF, flavor and texture were similar with PG, 0.6 inch cuts. SW, 1.9 cm, non-marinated BR cuts had higher beef identity, browned, roasted, metallic, umami, sweet flavors; lower cardboardy, heated oil, and astringent flavors; and were tougher. When BR cuts were marinated, flavor was similar for 0.6 and 1.9 cm cuts. However, the 0.6 cm marinated BR cuts had lower beef identity, browned, fat-like, umami, sweet, cardboardy, heated oil, peppery, astringent; higher metallic, sour, salty, and bitter; and were juicier and more tender with less CT. Results for ER and IR cuts were similar. Biplot for BR are presented (Fig. 1) . For BR, beef identity, umami, brown, sweet, and fat-like flavors were clustered and negatively associated with astringent, muscle fiber tenderness, bitter, salty, sour and peppery. Bloody/serumy, juiciness and buttery were closely related and positively related to beef identity, umami, brown, sweet and fat-like. The 1.9 cm PG and RS BR cuts were related to buttery, bloody serumy and juiciness. The thinner PG BR cuts and thicker non-marindaded SW BR cuts, and 0.6 cm SF cuts were clustered with beef identity, umami, liver-like, brown, heated oil, cardboardy, roasted and musty earthy humus flavors. Heated oil, cardboardy, roasted and musty earthy humus were clustered and negatively related to smoky charcoal, burnt, green and metallic. Marinaded cuts were clustered with muscle fiber tenderness, astringent, peppery, bitter, sour and salty; non-marinade cuts were associated with cardboardy, heated oil, roasted and musty earthy humus. Biplots for ER and IR cuts were similar (data not presented).

Conclusion

Cooking method and internal cook temperature endpoint or cooking time impacted beef flavor to a greater extent than USDA Quality grades. For PG, thicker cuts had more positive flavor attributes. Cooking to higher internal temperatures for RS resulted in more beef identity, roasted, and umami flavors and less serumy/bloody flavors, but tenderness decreased, especially in IR roasts. Marination of round cuts was most effective in improving tenderness of thinner cuts. Increased cooking time improved tenderness but increased levels of off-flavor development.

Notes

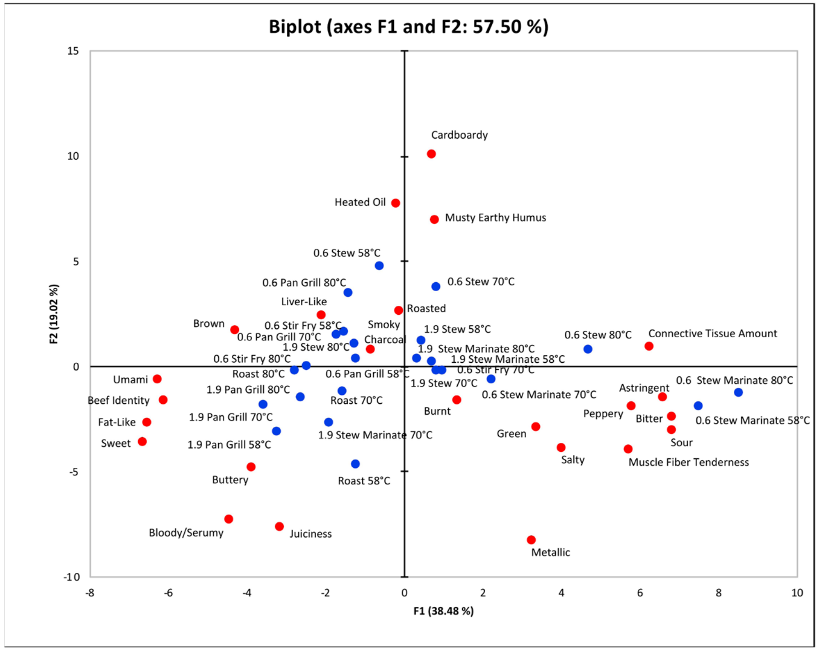

Figure 1.
Bottom round principal component biplot by treatments and descriptive sensory attributes.

Notes