



Ground Beef Particle Size and Patty Thickness Effects on Flavor and Aroma

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Objectives

To measure flavor and aroma on ground beef patties with different particle sizes and patty thicknesses. Approved as IRB2015-0507M.

Materials and Methods

Beef trimmings, 80% lean-20% fat, were ground through a 0.95 cm plate, 0.64 cm plate, or bowl chopped at high speed (4000 RPM) for 6 revolutions. Two replications of patties were hand-pressed in triplicate to either a 0.64 cm or 2.54 cm thickness, crust frozen, vacuum packaged and frozen until day of sensory testing. Patties ($n = 18$) were thawed 24 h before testing. Prior to cooking, internal temperature and weight were recorded. Patties were placed on a flat electric grill set at 177°C, and the time was recorded. Patties were turned on reaching an internal temperature of 35°C, using a probe thermometer and were removed when the internal temperature reached 70°C. Final temperature, time and cooked weight were recorded. Patties were cut into 6 pie-shaped pieces and served to the trained sensory panel. Patties were evaluated for flavor and texture attributes. A portion of each patty was frozen in liquid nitrogen and stored at -80°C for GC analysis. Samples for GC analysis were placed in glass jars with a Teflon cover and allowed to thaw in a 70°C water bath. A SPME was inserted into each jar and the headspace was collected for 2 h. The SPME was injected into a multi-dimensional GC/MS/Olfactory machine and aroma compounds were separated, identified, and smelled. Cook and sensory data was analyzed using analysis of variance with

an α set at 5% and LSD was used for mean comparisons. Volatile data from the GC/MS was log transformed to normalize variance and analyzed, using analysis of variance with grind and thickness of patty set as fixed effects.

Results

Cook time was greater ($P < 0.001$) for 2.54 cm thick patties than 0.64 cm patties; however, cook yield did not differ ($P > 0.05$). Brown roasted and fat-like flavors were both greater ($P > 0.024$) for 2.54 cm than 0.64 cm patties, but no differences ($P > 0.05$) were found for beef flavor, bloody serummy, metallic, umami, overall sweet, sour, salty, bitter, minor attributes, burnt, buttery, cardboard, smoky charcoal, hardness, springiness, cohesiveness of mass, and particle size. A total of 160 aroma volatiles were present across all treatments. Percentage of volatiles present were greater ($P < 0.001$) in bowl chop (28.88%) and 0.64 cm fine grind (28.10%) than in 0.95 cm coarse grind (18.63%). Percentage of volatiles present were greater ($P < 0.031$) in 2.54 cm thickness than 0.64 cm thickness patties. We concluded that to produce the greatest amount of volatile, aroma events, patties should be prepared to have the greatest particle surface area.

Conclusion

Therefore, patties should be either ground through a 0.64 cm plate or bowl chopped to reduce particle size, and patties should be formed to a 2.54 cm thickness to increase the exposure time to the grill, producing a greater number of volatiles.