Published April 25, 2019

2018 Reciprocal Meat Conference – Meat and Poultry Processing, Ingredient Technology and Packaging

Meat and Muscle Biology™

Natural Hardwood Smoked Sugar Improves Oxidative and Flavor Stability of Naturally Cured, Aerobically Packaged, Food Service Bacon

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Keywords: frozen storage, lipid oxidation, naturally cured bacon, naturally smoked sugar, sensory
Meat and Muscle Biology 2(2):51 **doi:10.221751/rmc2018.044**

Objectives

The purpose of this study was to determine the effectiveness of adding naturally smoked sugar into a curing brine to prevent lipid oxidation and maintain flavor in naturally cured, frozen, aerobically packaged, food service bacon.

Materials and Methods

Fresh pork bellies (6.3 to 7.2 kg) were trimmed and cut in half yielding an anterior and posterior belly section. Within each belly, each section was randomly assigned to 1 of 2 treatments with a targeted 12% pump: a control brine or a curing brine with added natural hardwood smoked sugar (n = 15/treatment). Final target concentrations for control brine ingredients in the raw belly were 1.6% salt, 1.0% cane sugar and 0.8% cultured celery juice. Raw belly sections assigned to the naturally smoked sugar brine targeted 1.6% salt, 0.8% cane sugar, 0.8% cultured celery juice, and 0.6% smoked sugar (RA12032, Red Arrow Products, Manitowoc, WI). After injection, bellies were smoked and cooked to an internal temperature of 53°C using a standard bacon processing schedule. After cooking, bellies were chilled for 12 h. at 0 to 2°C then sliced 1.5 mm thick with a horizontal slicer from the anterior to posterior end. Slices were randomly selected from the sliced belly and laid out onto food service bacon sheet paper. Sheets of bacon slices were randomly assigned to 4 sensory frozen storage periods (0, 40, 80, and 120 d) or 7 thiobarbituric acid reactive substances (TBARS) frozen storage times (0, 20, 40, 60, 80, 100, and 120 d). All boxed bacon slices were stored aerobically at –18 ± 2°C for the designated storage period. After the appropriate frozen storage time, trained sensory panelists evaluated saltiness, smoke intensity, bacon flavor, oxidized flavor intensity, and other off-flavor intensity. The distillation method for TBARS analysis was utilized to measure lipid oxidation. Sensory and TBARS analysis were analyzed as a split-plot design with repeated measures with the whole plot consisting of the half belly and treatment with the split-plot consisting of storage day.

Results

There was a Treatment × Day interaction ($P < 0.001$) for oxidized flavor intensity. Control bacon had increased ($P < 0.001$) panelist scores for oxidized flavor intensity from d 0 to 120. However, bacon manufactured with naturally smoked sugar had oxidative flavor intensity scores that remained constant ($P > 0.936$) over the 120 d of frozen storage. Additionally, trained panelists scored bacon samples manufactured with the naturally smoked sugar higher ($P < 0.001$) for saltiness, smoke intensity, and bacon flavor intensity compared to control samples. In confirmation of the oxidized flavors found during sensory evaluation, there was a Treatment × Day ($P < 0.001$) interaction found for TBARS values. The TBARS values for the control treatment displayed increased TBARS values from d 20 to d 120 ($P < 0.001$). Bacon formulated with naturally smoked sugar exhibited static TBARS values throughout the 120 d frozen storage period ($P > 0.196$).

Conclusion

The ability of naturally smoked sugar to function as an antioxidant in sliced naturally cured bacon was confirmed with both sensory evaluations and objective measurement of lipid degradation products. Also, aerobically packaged, frozen, naturally cured bacon formulated without added antioxidants had significant challenges in flavor stability due to increased lipid oxidation as frozen storage length increased.

