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Use of Iodine Value to Predict Commercial Slicing Yield and Shelf-Life of Bacon

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Objectives

Typically, commercial slicing yield and shelf-life of bacon is thought to be reduced as the iodine value (IV) of fat increases, but little data exists to substantiate that hypothesis. Therefore, the objectives were to establish the relationship of IV with slicing yields and the development of lipid oxidation in bacon during 90 d of storage under food-service-style conditions.

Materials and Methods

Bellies ($N = 84$) were selected from 2 populations of pigs fed diets formulated to induce a large range of IV. Bellies were then allotted to 1 of 4 treatments based on IV: Low (IV 60 to 70, $\bar{x} = 66.11$, $n = 24$), Med (71 to 80, $\bar{x} = 74.64$, $n = 24$), Hi (81 to 90, $\bar{x} = 85.74$, $n = 16$), VeryHi (91 to 100, $\bar{x} = 94.24$, $n = 20$). Fresh bellies were evaluated for initial weight, length, width, thickness, and flop, and a sample of adipose tissue was excised from the belly to evaluate IV. Bellies were manufactured into bacon and sliced at a commercial processing facility. Sliced bacon was transported to the University of Illinois. Sliced bacon slabs were weighed to calculate slicing yield. Center slices from each slab were randomly allotted to storage times of 0, 30, 60, or 90 d. Sliced bacon was stored at -40°C without an atmosphere barrier to simulate food service storage conditions. Uncooked bacon slices were evaluated for thiobarbituric acid reactive substances (TBARS) and cooked samples were rated by trained sensory panelists for oxidized odor and flavor at each time point. Shelf life data were analyzed as a 1-way ANOVA repeated in time; whereas, step-wise regression was used to predict bacon slicing yield based using non-invasive measures of belly quality.

Results

Iodine value ranged from 61.7 to 98.6 in this population. Commercial bacon slicing yields decreased linearly ($P < 0.0001$; 90.4, 83.6, 67.6, 60.0%) concomitant with a linear increase in IV from the Low to the VeryHi treatment ($P < 0.0001$). The step-wise regression equation to predict bacon slicing yield calculated from initial weight was: $\text{yield} = 230.24 - (0.502 \times \text{length, cm}) - (1.025 \times \text{width, cm}) - (1.125 \times \text{IV})$; and explained 62.5% ($P < 0.0001$) of the variability in commercial bacon slicing yield. In this equation, IV alone accounted for 60% of the variation in slicing yield. Lipid oxidation did not differ between Low and Med at any time ($P > 0.22$), though Hi and VeryHi had greater ($P < 0.05$) TBARS than Low and Med at 30 d and thereafter. There was no difference in TBARS between Hi and VeryHi until 90 d, where VeryHi had 0.7 mg/kg-MDA less ($P < 0.01$) than VeryHi. Panelists' evaluation of oxidized odor and flavor both followed a similar pattern to TBARS, with Hi and VeryHi having greater ($P < 0.05$) oxidized odor than Low and Med at 30 d and thereafter, but Low and Med did not differ ($P > 0.05$) at any time, nor did Hi and VeryHi differ ($P > 0.65$). Oxidized flavor of Hi and VeryHi were greater ($P < 0.03$) than Low and Med at all time points, but did not differ ($P > 0.11$) from each other. Med had greater ($P < 0.04$) oxidized flavor than Low at 60 d and 90 d.

Conclusion

Non-invasive measures of belly quality were able to predict 62.5% of variability in slicing yield and increasing IV resulted in discernable differences in lipid oxidation during 90 d of food-service-style storage. Overall, IV and fresh belly characteristics may be effective predictors of the shelf-life and slicing yield of commercially processed bacon.