2016 Reciprocal Meat Conference – Meat and Poultry Processing, Ingredient Technology and Packaging

Meat and Muscle Biology™

Effects of Salt and Nitrite Concentration on the Shelf Life of Deli-Style Ham

R. E. Stanley*, C. G. Bower, and G. A. Sullivan

Animal Science, University of Nebraska-Lincoln, Lincoln, NE, USA

Keywords: Ham, Nitrite, Salt, Shelf Life
Meat and Muscle Biology 1(2):27 **doi:10.221751/rmc2016.026**

Objectives

To meet changing consumer demands, the segment of processed meats with perceived health benefits has grown. Reduced sodium and curing methods are among the areas of focus, however product quality and shelf life can be impacted. Deli-style hams were manufactured to measure the effects of salt and nitrite concentration on shelf life and physicochemical characteristics.

Materials and Methods

Three replications of deli-style ham treatments were manufactured in a 3 × 4 factorial arrangement of salt concentration (0.7, 1.4, or 2.1%, meat block basis) and nitrite concentration and source (0, 100 or 200 ppm sodium nitrite, SN, or 100 ppm sodium nitrite equivalent from pre-converted celery juice powder, CP; Veg Stable 506, Florida Food Products). In addition to salt and nitrite, all treatments contained 1% sugar, 0.35% sodium phosphate (Brifisol 85 Instant, BK Giulini Corporation), and either 495 ppm sodium erythorbate or 440 ppm of ascorbic acid from cherry powder (Veg Stable 515, Florida Food Products) with the balance as water to achieve a 25% extension. After thermal processing and chilling, samples were sliced and vacuum packaged, and stored at 3°C. Salt concentration, water activity, cook yield, and texture profile analysis (TPA) were measured on d 0. Color (L*, a*, b*, ΔE, a/b ratio, hue angle), pH, residual nitrite, and aerobic plate counts (APC) were measured on weeks 0, 2, 4, 6, 8, 10, 12, 14, and 16. Data were analyzed using the Proc GLIMMIX procedure in SAS (SAS Inst. Inc., Cary, NC) for interactions and main effects. Means separation was conducted using Tukey's adjustment ($P \leq 0.05$).

Results

A nitrite by salt interaction ($P \leq 0.05$) was found for a*, a/b ratio, ΔE, and hue angle. For a* values and a/b ratio, all 0 ppm nitrite treatments were the lowest. Little separation among other treatments was observed for a*. The a/b ratios were greater with increased salt. The 2.1% salt and 100 ppm CP treatment had a greater ΔE value than all treatments except 0 ppm and 0.7% salt, and 0ppm and 2.1% salt. Hue angle was greater in treatments with 0 ppm, and decreased as salt increased among all other treatments. An interaction of nitrite and week ($P < 0.001$) was identified for residual nitrite. Residual nitrite values of 0 ppm treatments did not change throughout storage, whereas all other treatments declined with increased storage. Main effects for salt concentration were identified for all traits not involved in the above interactions ($P \leq 0.05$). As salt concentration increased, TPA hardness, gumminess, cohesiveness, chewiness, and aerobic plate counts decreased whereas salt concentration, yield, pH, residual nitrite, and TPA springiness values increased. Treatments with 2.1% salt had lower APC than 0.7% salt ($P = 0.033$) and 1.4% salt was similar to both. As nitrite concentration increased, APC was significantly less than the previous nitrite concentration ($P < 0.001$) regardless of source. Overall, 100 ppm CP and SN were only different for a*, b*, a/b ratio, and hue angle. The 100 ppm CP had lower a* values and a/b ratio, but had higher b*, and hue angle values, than 100 ppm SN.

Conclusion

This study suggests 200 ppm SN provides greatest shelf life to deli-style ham. Additionally, 0.7% salt resulted in inferior product quality in many traits compared to 1.4 or 2.1% salt ($p \leq 0.05$) and it is therefore suggested to use amounts greater than 0.7% salt when formulating deli-style ham.