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

Meat and Muscle Biology™

Effect of Starter Culture and Encapsulated Lactic Acid on the Quality and Storage Stability of Nutrient Multicomponent Dry Chicken Sausages

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Keywords: encapsulated lactic acid, shelf stability, starter culture
Meat and Muscle Biology 1(2):35 **doi:10.221751/rmc2016.034**

Objectives

There is a need to develop safe, nutritious, and shelf stable meat products that can be stored without refrigeration, especially in energy deficient countries. To achieve safe and shelf stable foods pH and water activity (a_w) targets must be achieved. Lowering product pH can be accomplished through the use of acidulants (encapsulated lactic acid) or through fermentation with starter cultures. The objectives of this study were: to compare the effect of encapsulated lactic acid (ELA) and starter culture (SC) acidulation on the qualities of multicomponent dry chicken sausage, and to investigate its stability at 25 and 50°C.

Materials and Methods

Chicken sausages were manufactured using fresh chicken breasts and thighs, 156 ppm NaNO2 (ingoing), incorporating an Indian-based spice blend, walnuts and dried dates. The product was manufactured by blending all ingredients and chopping to the desired particle size, and then stuffed into cellulosic casings (27 mm). ELA or SC were added directly during mixing. Sausages made with SC (Saga 200, 1% addition of dextrose) were fermented for 10 h at 37.8°C. Acidulation and drying were optimized to achieve a target pH ≤ 5.2 and a_w ≤ 0.85. After thermal processing to an internal temperature of 73.9°C, drying and chilling, casings were removed and the sausages were vacuum-packaged. Sausages were stored at either 25 or 50°C for evaluation on d 0, 7, 14, and 28. On each storage day, moisture, protein, moisture protein ratio (MPR), water activity (a_w), pH, thiobarbituric acid reactive substances (TBARS), instrumental color (L*, a*, b*) values were measured. Kramer shear values (SFV) were determined on d 0 samples. The experiment was replicated three times.

Results

Greater ($P < 0.05$) product yield was recorded for sausages made with ELA (61.35%) compared to SC (59.39%) due to differences in product pH after processing (5.3 versus 4.5) although the ELA sausage pH decreased over storage time. The ELA sausages had a higher ($P < 0.05$) MPR, a_w (0.85), pH (5.31), and L* color values compared to SC sausages which can be attributed to product pH differences. A significant ($P < 0.05$) storage temperature × storage day interaction was observed for moisture and protein content, MPR, aw (varied from 0.85 to 0.83), pH (4.93 to 4.56), color and TBARS values. The interaction of acidulation method and storage temperature was significant ($P < 0.05$) for pH (5.31 to 4.44), a*, and b* values. The TBARS values increased significantly ($P < 0.05$) from d 0 to 28 (0.19 mg/kg malonaldehyde compared to 0.36, respectively). SFV of the sausages were significantly ($P < 0.05$) higher for SC (11.41 N/g) than for ELA (10.03 N/g).

Conclusion

Multicomponent dry chicken sausages prepared with either ELA or SC both maintained acceptable shelf stability and product quality during extended storage at either 25 or 50°C. However for countries or regions with food security issues (lack of refrigeration) the production of vacuum packaged dried chicken sausages using ELA may be preferred since it does not require refrigeration or controlled fermentation temperatures to acidulate product. Future research will investigate the safety and consumer acceptability of dried chicken sausages prepared with both ELA and SC.

