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The Potential Role of Nitrite-Embedded Film Technology in Extending the Color Stability and Shelf Life of a Cured, Cooked Meat Product

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Objectives

Alternatively-cured meats often contain lower amounts of nitrate and/or nitrite in the formulation, which can lead to decreased color stability and reduced shelf life. Alternatively-cured meats rely on natural sources of nitrate and/or nitrite which are primarily derived from vegetable sources, but these natural sources can result in vegetable-like flavors; thus, processors often decrease the relative ingoing level of nitrite and/or nitrate. This reduction can potentially lead to decreased color stability and negatively affect the product's shelf life. Furthermore, consumer perception of natural sources of nitrite has led to consideration of other nitrite alternatives. The objective of this study was to determine the efficacy of nitrite-embedded film (NEF) in extending the color stability and shelf life of all-beef bologna, a cured and cooked meat product.

Materials and Methods

Three different product formulations were manufactured with 5 treatments of all-beef bologna. The treatments consisted of a vacuum-packaged, conventionally-cured (sodium nitrite with sodium erythorbate) control (CON), and 2 alternatively-cured (nitrite from cultured celery juice powder with cherry powder) treatments, with 1 treatment packaged in vacuum packages (CJP) and the second treatment packaged in NEF pouches (CJP-NEF). An additional 2 alternatively-cured (Natpre T-10 EML Plus S supplied by Wenda Ingredients, Inc.) treatments included 1 treatment packaged in vacuum packages (WEN) and the second packaged in NEF pouches (WEN-NEF). After thermal processing and chilling, the bologna was sliced to 6.35 mm thick and 4 slices were packaged in either traditional vacuum packages or NEF pouches. For the duration of the study, all treatments and replications were subsequently stored at 1°C under simulated, continuous retail display conditions using fluorescent lights. Color (HunterLab L*, a*, b*) of external and internal slice surfaces were measured, as was external and internal residual nitrite and nitrate on d 1, 6, 13, 27, 41, 55, 69, 83, and 97 post-packaging. Microbial analysis was conducted on d 0, 7, 14, 30, 60, 90, and 120 for both aerobic and lactic acid bacteria populations with a detection limit of 5 CFU/g. Results were statistically analyzed using a mixed linear model. Significance was determined at a *P*-value of 0.05.

Results

The results for external package color a* values (redness) indicate that WEN was significantly lesser compared to all other treatments ($P < 0.05$), and WEN-NEF was significantly greater than WEN ($P < 0.05$). CJP was not significantly different from CON at any storage point ($P > 0.05$). External and internal color a* value increased significantly in WEN-NEF over the first 27 d of storage ($P < 0.05$). External and internal residual nitrite values were significantly lesser in both WEN and WEN-NEF compared to all other treatments ($P < 0.05$). Results show increased external and internal redness for low nitrite-containing products (WEN-NEF) packed in NEF without significantly affecting residual nitrite levels ($P > 0.05$). Bacterial growth counts indicated no difference ($P > 0.05$) between treatments.

Conclusion

Therefore, results showcase promise of using NEF technology for increasing the color stability in alternatively-cured meat products.

