



Evaluating the Quality and Shelf Life Attributes of a Multicomponent Meat Product

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Objectives

Nutrition and energy bars that use meat as the major protein source combined with fruits, nuts, vitamins, minerals or other functional ingredients are considered intermediate moisture meat products since their water activity (a_w) is lowered by either processing or ingredients or both. These products may provide a reasonably priced nutrient dense food for populations with less than desirable food security (lack of refrigeration). The objectives of this study were to evaluate the shelf life quality attributes of a shelf stable multicomponent meat product exposed to high temperature storage conditions.

Materials and Methods

The multicomponent meat based product formulation was developed from Halal beef, dried dates, walnuts and nonmeat ingredients. Chopping and extrusion created rectangular-shaped bars with 156 ppm NaNO_2 (ingoing), pH 5.0 (encapsulated citric acid) and a water activity of 0.85. Product was cooked to 70°C and chilled to 2°C prior to packaging. Product was placed in either Styrofoam trays and overwrapped with oxygen permeable film (a major packaging method in developing countries) or vacuum packaged, subjected to 25 or 50°C storage temperatures and evaluated for the following properties at d 1, 7, 14, and 28 d of storage: pH, water activity (A_w), surface color ($L^*a^*b^*$), thiobarbituric acid reactive substances, cooked product yield, proximate composition and Lee Kramer shear force. A factorially arranged randomized complete block design was used to evaluate the differences between packaging and storage temperature for quality, shelf-life and sensory attributes. Differences between treatments were determined using the Least Significant Difference procedure at $P \leq 0.05$ level. The experiment was replicated 3 times.

Results

A three-way interaction (packaging \times temperature \times day) was observed for percent moisture. Moisture decreased (8%) for 50°C stored vacuum product compared to a 22% moisture loss for tray wrapped product. A packaging \times storage temperature interaction was observed for water activity, TBARS values, color surface values and pH. Tray wrapped product had lower A_w compared to vacuum packaged product exhibiting 0.28 A_w at 28 d of storage (50°C). Vacuum packaged product at both storage temps and all storage times exhibited TBARS values below 1.0. L^* values tended to decrease at 50°C storage temperatures as did a^* values, whereas b^* values for 50°C product tended to either decrease (vacuum packaged) or increase (Tray overwrap). pH values tended to decrease at both storage temps over each storage day, with product stored at 50°C exhibiting the lowest pH values during storage. Vacuum packaged product had shear forces values averaging 10.56 N/g of sample. Overall cook loss of product prior to packaging and storage was 32.80%. Oxygen permeable film used for tray wrapped product negatively impacted surface color, TBARS, percent moisture and water activity values.

Conclusion

For developing countries with food security issues (lack of refrigeration) vacuum packaged multicomponent intermediate moisture meat based protein bars exhibited little quality or shelf life deterioration when stored at either 25 or 50°C compared to tray wrapped oxygen permeable product. Future research will investigate the safety and consumer acceptability of these products.