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Evaluation of the Incorporation of β-Glucans in Whole Muscle Chicken Breast

S. M. Vasquez Mejia[1,2], A. de Francisco[2], R. Sandrina[2], T. da Silva[2], and B. M. Bohrer[1]*

[1]Food Science, University of Guelph, Guelph, Ontario, Canada;
[2]Food Science and Technology, Federal University of Santa Catarina, Santa Catarina, Brazil
*Corresponding author. Email: bbohrer@uoguelph.ca (B. M. Bohrer)

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Objectives

The use of soluble fiber (β-glucans) incorporated into whole muscle meat products is still unexplored and needs clarification on a number of factors including 1) if incorporation can be achieved, 2) possible levels of incorporation, 3) stability and bioavailability under conditions of storage and cooking, and 4) influence on the quality characteristics of the meat. Therefore, this study evaluated the incorporation of soluble fiber (β-glucans) in whole muscle chicken meat and identified changes in physical-chemical, textural, and microbiological properties during 9 d of storage under refrigeration at 4°C.

Materials and Methods

Barley β-glucan solutions were incorporated by injection into whole muscle chicken breast 48 h after slaughter. Three chicken breast samples were injected with a handheld injector with target pump uptake of 20% for each treatment. Treatments were injected at 4°C and included 1) a salt solution (2% NaCl and 0.2% sodium tripolyphosphate (STPP); Treatment A), 2) a β-glucan solution (1.5% of β-glucan; Treatment B), and 3) a combination of salt and β-glucan solution (2% NaCl, 0.2% STPP, and 1.5% of β-glucan; Treatment C). Three independent replications were produced for each treatment. The treatments were injected at 4°C into the chicken breast samples. The samples were stored under refrigeration and evaluated at d 1, 6, and 9 for pH, cooking loss, instrumental color, shear force, microbiology, and thermal behavior by differential scanning calorimetry (DSC). One-way ANOVA analysis and means separation using a Duncan test comparison adjustment were performed using Statistica version 7.0. Statistical significance was assumed at $P < 0.05$.

Results

Absorption of treatments was 8.15 ± 1.38% (m/m) without a significant difference among treatments, indicating a low absorption capacity of the samples. The maximum amount of β-glucan concentration remaining in the chicken breast after injection was 0.59 ± 0.1%. Cooking loss was less ($P < 0.05$) in Treatment C on d 6 and 9 compared with Treatment A and Treatment B. Shear force values were between 18 and 25 Newton (N) during storage. Shear force values were less ($P < 0.05$) in Treatment C samples (d 1 and 6) and Treatment A samples (d 9) when compared with other treatments on given days. No differences ($P > 0.05$) among treatments were observed in microbiology analyses. Coliforms decreased and psychrotrophic bacteria increased in all treatment groups during the storage period. After cooking, the maximum amount of β-glucan concentration that remained in the chicken breast was less than 0.1%, indicating that soluble fiber concentration is greatly impacted by cooking of whole muscle products injected with both β-glucans alone and in combination with a salt solution.

Conclusion

The application of β-glucans in whole muscle chicken breast did not present advantages in cooking loss with respect to samples injected with salt alone. Under the conditions evaluated, incorporation of β-glucans into whole muscle chicken did not present detrimental effects to product quality or safety. However, after cooking, the fiber concentration in the final product was reduced to levels where it would not be sufficient for health benefits or for the product to be declared as a source of dietary fiber. Therefore, challenges to increase the concentration of dietary fiber in whole muscle meat products continues.

