ADDITION OF DIETARY FIBER IN COOKED RESTRUCTURED PORK SHOULDER WITH SALT REDUCTION

Caroline Silva Pinto[1], Elisa R. B. Bellucci[1], Tiago Barretto*[1,2], Andrea C. S. Barretto[1]

[1] Department of Food Technology and Engineering, UNESP-São Paulo State University, Cristovão Colombo street 2265, São José do Rio Preto, SP, Brazil

[2] Federal Institute of São Paulo – IFSP, C-1 avenue 250, Barretos, SP, Brazil.

*Corresponding author email: andreasb@ibilce.unesp.br

Abstract – The study evaluated the effect of the addition of dietary fiber (resistant starch and alpha cyclodextrin) on partial and total replacement of starch in cooked restructured pork shoulder with salt reduction. Four treatments with these dietary fiber added were made and two controls treatments (C1- without salt reduction; C2 - with salt reduction). Centesimal composition, colour and restructured product stability (RPS) were evaluated during storage. Starch and dietary fiber blends improved the RPS and colour in cooked restructured pork shoulder. The use of blends of dietary fibers and starch was feasible in the processing of cooked restructured pork shoulder with salt reduction.

Key Words – Sodium reduction, restructured product stability, starch.

I. INTRODUCTION

Several studies have been directed to the production of foods with higher dietary fiber content and lower salt content due to the correlations with various chronic non-communicable diseases. The cooked restructured pork shoulder represents one of the most popular meat products in Brazil. Brazilian Legislation [1] allows the addition of 2% of starch in this meat product. Reducing salt in meat products is a challenge as the salt collaborates with the extraction of myofibrillar proteins and increases the capacity of water retention, influencing important parameters of acceptance such as flavor and texture [2]. For this reason, the objective of this work was to evaluate the effects of the dietary fibers in the physicochemical characteristics in cooked restructured pork shoulder with salt reduction.

II. MATERIALS AND METHODS

Pork Shoulder, cut into 20 mm discs, was added to the brine, composed of the homogenization of all other ingredients. The standard formulation was: 62.6% pork shoulder, 1.7% soy isolate protein (Bremil, Brazil), 0.94% condiments without sodium (Fego, Brazil), 0.02% cochineal carmine dye (Christian Hansen), 0.19% sodium erythorbate, 0.24% carrageenan (Kraki, Brazil), 0.28% curing salt (Kraki, with 10% sodium nitrite and 90% sodium chloride). Six treatments of cooked restructured pork shoulder were produced (C1, C2, T1, T2, T3 and T4). In each treatment other ingredients were added to the standard formulation: C1 (30% water; 1.5% NaCl; 2% potato starch), C2 (30.75% water; 0.75% NaCl; 2% potato starch), T1 (30.75% water; 0.75% NaCl; 1% potato starch; 1% resistant starch), T2 (30.75% water; 0.75% NaCl; 2% resistant starch), T3 (30.75% water; 0.75% NaCl; 1% potato starch; 1% alpha cyclodextrin) and T4 (30.75% water; 0.75% NaCl; 2% alpha cyclodextrin). After mixing the standard ingredients with the water, each treatment was massaged in a tumbler for 60 minutes (15 rpm). The mixture was kept at 4°C for 60 minutes for the curing process. Subsequently, the other ingredients were added and mixed manually. Portions of 0.6 kg of each treatment were put into plastic casings, caliber 95 (Viscofan, Brazil) and tied with string. The samples were cooked in the cooking tank until they reached 72°C in their geometric center, being removed and cooled. The samples were stored at 4°C until the beginning of the evaluations. The processing occurred in duplicate. Moisture, protein, ash [3] and lipid [4] analyses were performed. Carbohydrates were obtained by difference. The instrumental color was obtained in a Colorflex 45/0 spectrophotometer (HunterLab, Reston, VA, USA) and was expressed in L*, a* and b*. The RPS was obtained by collecting the exudate from each piece when the package was opened and was expressed as a percentage of the drained part of the exudate over the total weight of the piece. Color and RPS analyses were carried out during refrigerated storage of the product (0, 30 and 60 days). The analysis was performed in triplicate. The data were analyzed using analysis of variance ($p<0.05$) and the means obtained were compared using the Tukey test. The statistical software used was MINITAB v.16.

III. RESULTS AND DISCUSSION

The content of moisture and protein (Table 1) were similar ($p>0.05$) for all the treatments. The difference ($p < 0.05$) for lipids was probably due to the raw material. The carbohydrates are in accordance with Brazilian Legislation [1].

Table 1 Composition and RPS of treatments.

	Ash (%)	Protein (%)	Moisture (%)	Lipids (%)	Carbohydrates (%)	RPS (%)
C1	$2.60^{a} \pm 0.19$	$14.54^{a} \pm 0.70$	$75.28^{a} \pm 0.01$	$5.21^{b} \pm 0.25$	2.37	$100.00^{a} \pm 0.00$
C2	$1.86^{b} \pm 0.08$	$14.36^{a} \pm 0.82$	$72.73^{a} \pm 0.04$	$6.46^{ab} \pm 0.05$	4.59	$99.65^{ab} \pm 0.58$
T1	$2.12^{ab} \pm 0.10$	$13.74^{a} \pm 0.65$	$73.46^{a} \pm 0.01$	$7.25^{a} \pm 0.06$	3.43	$99.96^{a} \pm 0.03$
T2	$1.90^{b} \pm 0.15$	$14.92^{a} \pm 2.18$	$72.03^{a} \pm 0.02$	$7.05^{a} \pm 0.22$	4.1	$98.82^{b} \pm 0.46$
T3	$1.96^{b} \pm 0.04$	$14.48^{a} \pm 0.19$	$75.93^{a} \pm 0.01$	$5.38^{b} \pm 0.32$	2.28	$99.63^{ab} \pm 0.05$
T4	$2.09^{ab} \pm 0.40$	$14.23^{a} \pm 0.72$	$75.41^{a} \pm 0.01$	$6.75^{a} \pm 0.40$	1.52	$98.75^{b} \pm 0.38$

Averages followed by the same letter in the same column do not show significant difference ($p>0.05$) in the Tukey test.

C1 showed good RPS due to higher salt concentration in this treatment. This result agrees with Ramírez et al. [5] who evaluated that holding water capacity in cooked ham was decreased when salt was decreased.

C2, T1 and T3 are similar ($p>0.05$) to C1 for RPS. The addition of 2% potato starch, or 1% potato starch and 1% of resistant starch, or 1% potato starch and 1% alpha cyclodextrin in cooked restructured pork shoulder with salt reduced increased the RPS.

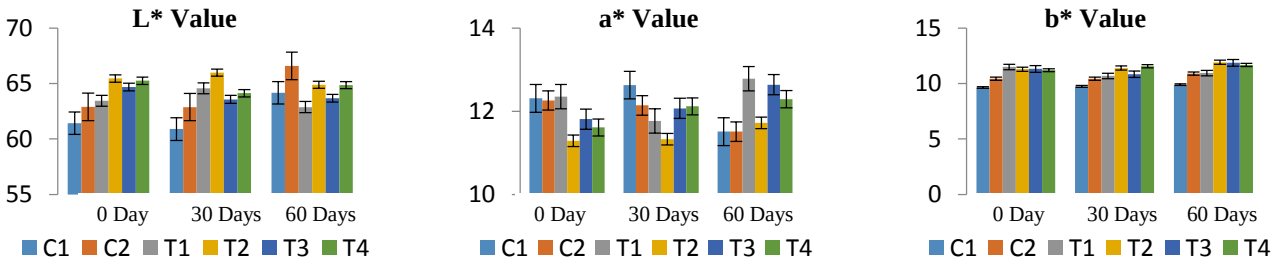

Figure 1. Colour (L*, a*, b*) of cooked restructured pork shoulder during the storage.

The highest L* value was T2 after 0 and 30 days of storage (Fig. 1). The alpha cyclodextrin increased the L* value and decreased the a* value in cooked restructured pork shoulder with reduced salt. C1 and C2 showed higher a* values after 0 and 30 days of storage, indicating that salt and potato starch contributed to this parameter.

IV. CONCLUSION

The partial replacement of potato starch was possible in cooked restructured pork shoulder with reduced salt, providing a healthier meat product. The total replacement of potato starch with the addition of alpha cyclodextrin or resistant starch negatively affected the physicochemical parameters of this meat product.

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