INNOVATIVE CRYO-SMOKING PROCESS FOR THE PRODUCTION OF SMOKED SALMON

Ana C. A. S. Pinheiro*[1], Fabio D'Elia[1], Gianfranco Picone[1], Silvia Tappi [1,2], Francesco Capozzi [1,2], Pietro Rocculi [1,2]

[1] Department of Agricultural and Food Sciences, *Alma Mater Studiorum*, University of Bologna Viale Giuseppe Fanin, 40127 Bologna, BO, Italy
[2] Interdepartmental Centre for Agri-Food Industrial Research, Alma Mater Studiorum, University of Bologna Campus of Food Science, Via Quinto Bucci 336, 47023 Cesena, FC, Italy
Email: anacristin.deaguiar2@unibo.it

Introduction

The demand for seafood has increased greatly due to their attractive nutritional properties but its rapid perishability remains the greatest challenge to its preservation. Therefore, an increasing number of emerging strategies are being considered to complement or even replace traditional preservation methods to ensure food safety and extend shelf-life (Tsironi, et al. 2020). Smoked salmon is an important added value 'ready-to-eat' food. It is estimated that about 40-50% of farmed Atlantic salmon reaches the final consumer as a cold-smoked product (Lakshmanan et al. 2003). The smoke contains several phenolic compounds that impart flavor to the product, the absorption of which depends on the temperature and smoking time (Arvanitoyannis and Kotsanopoulos 2012). The purpose of the present study was to evaluate an innovative cryogenic smoking technology to obtain ready-to-eat smoked salmon.

Materials and methods

Salmon (*Salmo salar*) used in the present study came from the Salmar farm (Kverva, Norway) where they were reared for approximately 12 months in floating cages in the open sea. After catching, fish were placed inside containers with polystyrene, stored in super-chilling and sent by plane to Italy. After 48 hours, they were filleted, vacuum-packed and frozen at -40°C and maintained at this temperature until salting and smoking procedures were performed. Thawed fillets were salted with a mixture consisting of 70% NaCl and 30% sucrose in a proportion equal to the weight of the fillet, vacuum-packed, and stored in cold storage at 4 ± 2°C for 24 hours. Dry-salted Atlantic salmon fillets were smoked using an innovative nitrogen-based prototype working at different temperatures (5, 20 and 45 °C) for 2 hours. Textural and colorimetric properties, NaCl content, water activity, water content, pH and polycyclic aromatic hydrocarbon (PAH) levels were determined. In addition, ^{1}H-NMR was used to monitor freshness-related parameters (e.g., K-index, trimethylamine content, biogenic amine content).

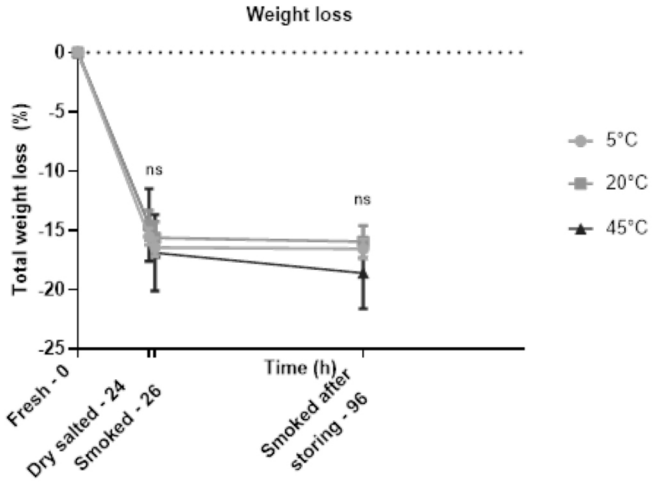

Fig. 1 - Kinetics of percentage weight loss of salmon fillets, fresh (0h), dry salted (after 24h), smoked at 5, 20 and 45°C for 2h and after 96h of vacuum-packed refrigerated storage.

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Results

For most of the parameters evaluated, the group of samples smoked at 45°C differed significantly from those obtained at 5 and 20°C. In particular, they were characterized by a greater weight and water loss, higher salt content, higher pH, lower shear force, increased lipid oxidation index, and a greater color change during the process with an increase in the red component. Between the samples smoked at 5 (cryo-smoking) and 20°C (cold-smoking), the only slight difference found was less weight loss of the samples during the process at the lower temperature (Figure 1).

An increase in TBARS values with the temperature rising has been evidenced, although the differences between the groups treated at 5 and 20°C were not significant.

The results allowed samples to be discriminated based on smoking temperature, and the innovative smoking process showed great potential for the preparation of high-quality smoked salmon product with high nutritional characteristics. The metabolomic approach provided a better understanding of the effect of smoking temperature on the quality of the final product. From a technological point of view, cryo-smoking is therefore promising for industrial application considering the lower weight loss of the product during the process. Further studies are needed concerning the shelf-life and microbiological quality of the final product. Moreover, it is advisable to investigate the organoleptic properties by sensory analysis in order to have a complete view of how the innovative treatment affects the quality of the finished product.

References

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