EFFECT OF PROTEOLYSIS INDEX ON THE VOLATILE COMPOUNDS PROFILE OF DRY-CURED HAM

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Abstract – The effect of the proteolysis index on the profile of volatile compounds of dry-cured ham was studied. Two hundred samples classified in three batches according to the percentage of proteolysis [low (<33%), medium (33-36%) and high (>36%)] were analyzed. In all cases, hydrocarbons were the main compounds (41-49%), followed by alcohols (23-29%) and aldehydes (14-15%). The compounds that mostly influenced the aroma of dry-cured ham were the esters, which did not show significant differences among groups. Dry-cured ham with high proteolysis index presented the lowest amount of total volatile compounds (showing 1575, 1337 and 997 AU x 10^6/g, for low, medium and high proteolysis index, respectively). According to these results, it is not clear how much the proteolysis index affects the final quality of dry-cured ham and more work is needed.

Key Words – Hydrocarbons, salt content, solid-phase microextraction

I. INTRODUCTION

The addition of salt is essential to obtain dry-cured ham with acceptable quality. In this regard, the amount of salt is directly related to the proteolysis index because of the action of the proteolytic enzymes in the muscle. Nowadays, there is a trend to reduce the salt content in meat products because an excessive sodium intake contributes to raise blood pressure in some consumers [1]. However, excessive reduction of salt implies the occurrence of texture defects caused by the excessive rupture of the protein structure due to the action of endogenous enzymes. The proteolysis process results in small peptides and free amino acids [2], which give to ham odors and flavor. Thus, the objective of this work is to determine how different proteolysis indexes affect the volatile composition of dry-cured ham in order to know the consequences on the organoleptic properties.

II. MATERIALS AND METHODS

Two hundred raw hams with a pH<5.5 were obtained from a commercial slaughterhouse supplied by animals with crosses of Large white and Landrace breeds. All hams were dry-salted according to the traditional pile system. In order to obtain different rates of proteolysis, the hams were submitted to different salting times (4, 6, 8 and 11 days). During drying hams, they were kept at 30ºC during 30 days to induce proteolysis. After this time, hams continued the drying process and later kept again at 30ºC during 30 days and dried again until the end of process. The dry-cured hams were classified in three batches according to the proteolysis index (IP, calculated as the ratio (NNP/NT)•100): Low (<33%), Medium (between 33 and 36%) and High (>36%). The extraction of the volatile compounds was carried out using solid-phase microextraction (SPME) and the quantification was performance using GC-MS technique following the chromatographic conditions described by Domínguez *et al.* [3]. The effect of proteolysis index on volatile compounds profile was examined using a one-way ANOVA with IBM SPSS Statistics 19.0 program software package.

III. RESULTS AND DISCUSSION

Most of the volatile compounds of dry-cured ham come from lipid oxidation and only a small part from the proteolytic processes. There were significant (P<0.001) differences on the total volatile compounds among groups. However, the highest concentration was observed in the group with low IP (<33%). The volatile compounds were classified into five chemical families (Figure 1). The hydrocarbons were the main family in the three groups studied (41-49%), followed by alcohols (23-29%) and aldehydes (14-15%). Hydrocarbons originate in meat products from fat degradation and chemical auto-oxidation [4], and are generally considered to have no substantial impact on flavor because of their high odor threshold values. This finding is in disagreement with those reported by Bermudez *et al.* [5] who found that the esters were the compound family that registered the highest percentage in the headspace of Celta ham. On the other

hand, there were significant differences (P<0.001) in the alcohol content among groups, showing the highest content in samples with the highest proteolysis index (28%, 27% and 23% for high, medium and low IP, respectively). Alcohols, because of their low odor threshold, contribute to the aroma of ham, with fatty, woody and herbaceous notes [6].

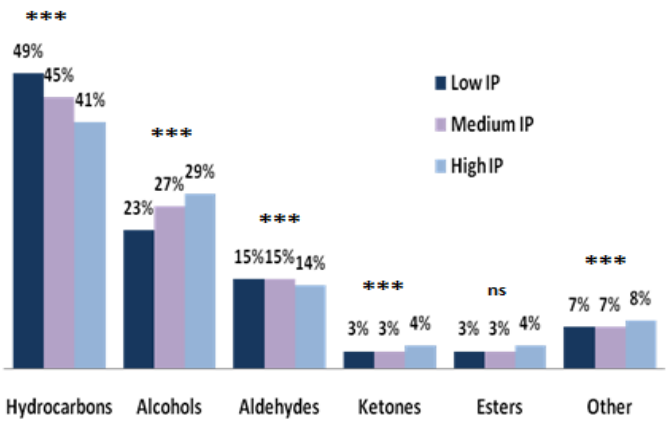

Figure 1. Distribution of volatiles in percentage according different families based on IP
Significance: n.s.: not significant; *** (P<0.001)

Significant differences were found in the aldehyde content (P<0.001), reaching the lowest values in dry-cured ham with high IP. Of the four aldehydes found, the hexanal was the majority in the group of lower IP. In this regard, previous studies showed that hexanal increases when salting time was increased, possibly because salt reduces the activity of proteolytic enzymes favoring lipid oxidation [7].

IV. CONCLUSION

The aroma (volatile compounds) is the first characteristic that consumer perceives. Proteolysis index influenced the amount of volatile compounds of dry-cured ham. There is an increase of volatile compound when decreasing proteolysis index. According to these results, further studies should elucidate how the proteolysis index affects the final quality of dry-cured ham.

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