Improving redness in nitrite-free pâté using ZnPP-rich ingredients

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Introduction: The color of meat products is a consumer requirement that is typically achieved by adding nitrites and/or nitrates. In these products the pigment responsible for the characteristic red color is nitrosylheme. However, in non-nitrified dry-cured hams, the characteristic red and stable pigment is Zn-protoporphyrin IX (ZnPP) (Wakamatsu et al., 2004). This pigment has recently received attention because it could be used as a coloring agent in the development of nitrite-free meat products. Its formation implies the replacement of Fe(II) in the heme moiety by Zn(II) where the enzyme ferrochelatase (FECH) plays a crucial role (Taketani et al., 2007). This pigment formation has been optimized in pork liver homogenates to obtain a ZnPP-rich ingredient by means of Response Surface Methodology. This ingredient can be concentrated by centrifugation as it mainly remains in the insoluble protein fraction. However, their potential use in the development of meat products without the addition of nitrifying agents needs to be studied.

This study is aimed to assess different formulations of pâté using two potential ZnPP-rich ingredients and without the addition of nitrite to obtain a final product with optimal red color.

Materials and methods: The pork liver homogenate ingredient was obtained under controlled conditions after 24h of incubation and containing 3% protein and 42 mg/Kg ZnPP (fresh weight basis). This ingredient can be used directly (whole ZnPP ingredient; W/ZnPP) or concentrated by centrifugation to obtain a ZnPP-protein rich ingredient (C/ZnPP) with 12% protein, 93% of moisture, and 209mg/Kg ZnPP (fresh weight basis). Based on a standard pâté formulation, eight formulations were manufactured (n=2). These formulations involved: 1) +control with 0.02% nitrite; 2) -control without nitrite; 3) the full replacement of water by the W/ZnPP together with the 16% of the liver; 4) the 40% substitution of the liver by the C/ZnPP; 5) the 60% substitution of the liver by the C/ZnPP; and 6) the inclusion of antioxidants (0.05% sodium ascorbate) in all the treatments except the controls. The ZnPP content (Bou et al., 2020) has been studied in pâté after the sterilization process (day 0) and storage (3, 6, and 11 months) at room temperature. The instrumental CIE-Lab color space was also determined over the course of the storage. Sensory analysis and Texture Profile Analysis (TPA) were studied at the end of the storage. An ANOVA was carried out to explore the differences between the pâté formulations. A Principal Components Analysis and Pearson correlations between parameters were also studied.

Results: The amount of ZnPP was higher in those pâtés in which the percentage of liver replacement was increased. In all cases, the ZnPP content remained unchanged over the storage indicating that the pigment is stable. Pâtés containing the W/ZnPP have more intense redness than those containing the C/ZnPP ingredient regardless of the level of substitution and ascorbic acid addition. The highest redness was found in the + control. However, pâtés containing the W/ZnPP showed similar values to + control followed by the 60% and 40% C/ZnPP treatments which, in turn, were higher than the - control. In all cases, sodium ascorbate showed no effect on color stability. These findings explained the lack of correlation between ZnPP content and redness. The observed higher redness values of pâtes containing the W/ZnPP suggested that some liver proteins of the whole fraction may have an important role in the appearance, sensory and textural properties of studies pâtés.

Conclusions: It is possible to elaborate pâtés with reddish colors by using ZnPP-rich ingredients thus representing an interesting clean label alternative to commercial ones containing nitrites.

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Literature:

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