

PORCINE RESEARCH

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Research article

Characterization of nitrate, nitrite and physico-chemical parameters of different pork products

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Abstract. Nitrates and nitrites are mainly used in meat products for shelf life extension, to improve flavor and for color fixation. High content of nitrite and nitrate in food can raise concern regarding its undesirable effects on consumer health. In our study the lowest value for NO₃⁻ content was found in pork sausages, with values ranging from 35.16 mg/kg to 39.82 mg/kg and the lowest value for NO₂⁻ content was evidenced in summer sausages, with values between 1.3 mg/kg and 1.42 mg/kg.

Key Words: Food safety, food additives, protein, fat, meat products.

Introduction. Nitrates in meat preparations and nitrites are used to preserve, for color fixing, inhibiting the growth of undesirable microorganisms and getting an enhanced taste. Some studies report a high incidence of gastric cancer due to the consumption of products with high nitrate concentration (Duncan et al 1997; Townsend & Olson 1987; Pegg 2004). The presence of residual nitrite in the product during preservation leads to the formation of nitrosamines (Avasilcăi & Cuciureanu 2011). High levels of residual nitrite cause an adverse effect on consumer health (Zahran & Kassem 2011). Hsu et al (2009) considered it necessary to monitor nitrates and nitrites in food for a period of time in order to estimate their food intake. Processes such as smoking, salting, marinating, commonly used as a method of preservation for a long time in order to avoid meat spoilage (Pegg & Shahidi 2005). Various studies report the nitrite effects such as preservative in meat products, as undesirable microorganisms development stopper, including *Clostridium botulinum*, and as a food additive in order to stop the oxidation of lipids (EFSA 2010; Sindelar & Milkowski 2011; Sebranek & Fox 1985); flavor enhancer (Wirth 1991). The use and control of nitrate and nitrite in meat products processing are described by Honikel (2008), and is presented as flavor enhancer in fermented dry sausages (Marco et al 2006).

The aim of this study was to assess the content of nitrates, nitrites and some physico-chemical parameters of meat preparations (summer sausage, salami and smoked pork bacon).

Material and Method. The studied meat products were: ham salami, summer sausage and pork sausages, purchased from local markets in Cluj County, Romania. These products have been studied on the intake of nitrates and nitrites. They were analyzed and physico-chemical parameters, namely: fat, protein, nitrogen readily hydrolysed and collagen/protein ratio. We have analyzed a total of 15 samples of each product considered.

Results and Discussion. Nitrates and nitrites are used in meat products to maintain reddish pink color, for bacteriostatic effects and for flavor enhancement, namely color stabilizers and preservatives (Coroian 2014). The obtained values was at a range of

64.11-65.33 mg/kg for NO_3^- in the ham salami; between 61.22-62.65 mg/kg in summer sausage, and with lower values observed in pork sausages, respectively, 35.16-39.82 mg/kg (Figure 1).

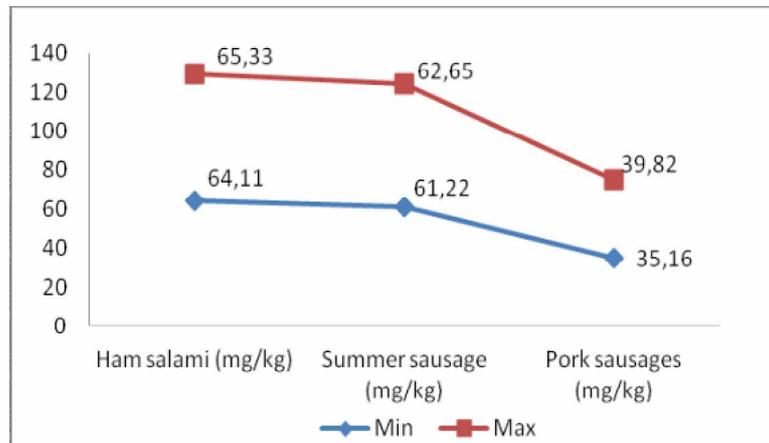


Figure 1. Minimum and maximum values for NO_3^- (mg/kg) of ham salami, summer sausage, pork sausages.

The lowest values were obtained for NO_2^- in summer sausage, between 1.3 and 1.42 mg/kg followed by ham salami, with values ranging from 3.08 to 3.14 mg/kg. The highest values were obtained in pork sausages, between 3.38 and 3.66 mg/kg (Figure 2). According to Archer (2002), the nitrite amount is twice higher in the sausages than in vegetables. The nitrite intake via animal products is estimated between 1.5-2.0 mg/person/day (EFSA 2008, 2009). Mean values for protein ranged as follows: ham salami 20.18%, summer sausage 15.12% and the lowest was obtained for pork sausages (Figure 3).

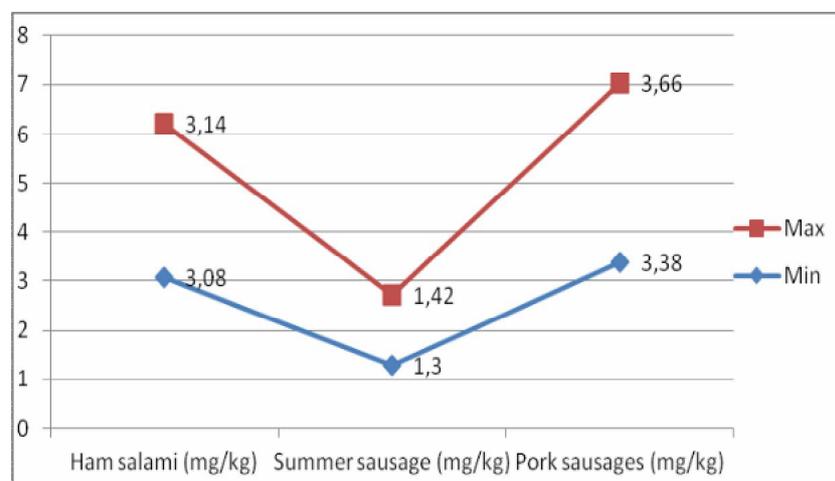


Figure 2. Minimum and maximum values for NO_2^- (mg/kg) ham salami, summer sausage, pork sausages.

The lowest fat content was evidenced in ham salami 7.11%, followed by summer sausage 31.66%, and the highest content was found in pork sausages 41.02% (Figure 3). Nitrogen readily hydrolyzed ranged as follows, the lowest was in summer salami 19.05 %, followed by ham salami with 21.02 % and smoked pork sausages 21.08 % (Figure 4).

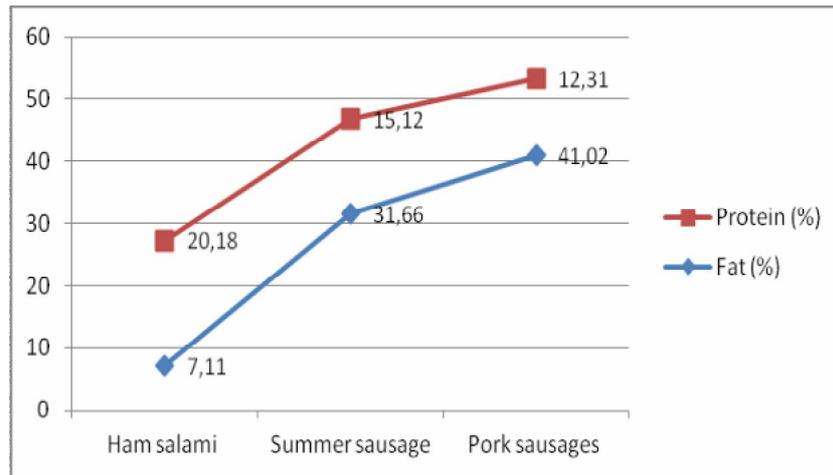


Figure 3. Fat and protein content (%) of ham salami, summer sausage and pork sausage.

Collagen/protein ratio was the lowest in ham salami 6.13 %, followed by the summer sausage 10.32 % and the highest value was obtained in pork sausages 22.34 % (Figure 4). Drăghici et al (2008) relates values of 6.72 mg/100 g for summer sausage residual nitrite and 3.44 mg/100 g for ham salami. Eleftheriadou et al (2002) studied the food intake of nitrate administered to animals, the meat and water and the reported values was the following: 9.3-13.4 mg/kg nitrate in food, 7.5-15.7 mg/kg in meat, and from 28.0 to 65.2 mg and nitrate/L in water. The contribution of dietary intake is given by exogenous nitrite via consumption of vegetables, fruits, water and meat. Particular attention should be paid to this aspect due to the number of meat products sold and consumed. Yalcin & Yalcin (1998) reported a level of nitrates and nitrites in meat products higher than regulated concentrations food additives. In the daily food intake is found a significant amount of nitrates and nitrites, due to their presence in both animal and vegetable products (Sindelar & Milkowski 2012).

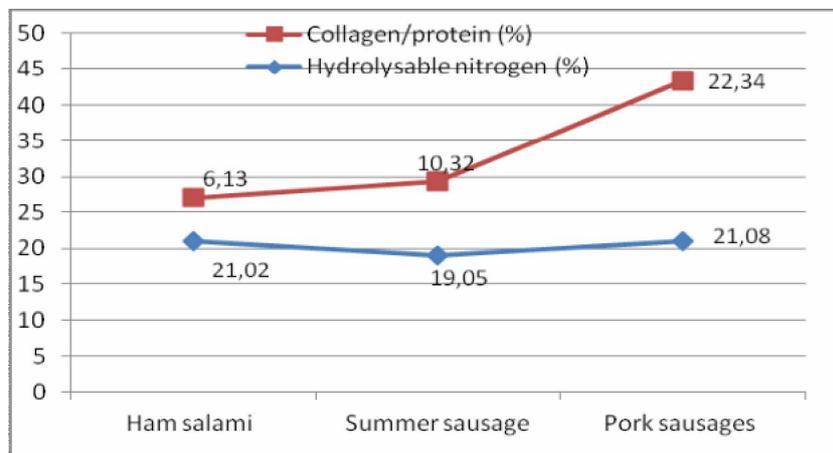


Figure. 4 Easily hydrolysable nitrogen content (%) and collagen/protein ratio (%) of ham salami, summer sausage and pork sausages.

Conclusions. Nitrate and nitrite content of meat products analyzed are within the limits set by the European Food Safety Authority (EFSA 2010). The content of protein, fat, easily hydrolysable nitrogen and collagen/protein ratio, within the values established for the product standard.

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