INCLUSION OF SEAL MEAT IN EMULSIFIED PRODUCTS

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SUMMARY

Mechanically separated seal meat (MSSM) and seal protein hydrolyzates (SPH) were used to replace a portion of comminuted chicken meat in the preparation of salami products. Formulations involving 10 or 20% MSSM had a more intense colour than the control sample, as reflected in their Hunter L values, but SPH at 1 or 2% addition level did not affect the colour of the products to any great extent. Meanwhile, the exterior surface of the smoked products containing MSSM had a much darker colour than their unsmoked counterparts. The sensory characteristics and Kramer shear tests indicated that presence of 20% MSSM in the formulations inferred a much softer texture to the products; scanning electron microscopy supported this. All samples except the one containing 20% MSSM received equal acceptability by untrained panelists. The content of N-nitrosamines in products so prepared, as such, or further heated by boiling, frying or microwaving was not affected by the presence of MSSM, SPH or the processing conditions.

INTRODUCTION

Production of mixed emulsified meat products containing comminuted muscle tissues from different species is commonplace. In addition, a wide variety of non-meat protein extenders are added to meat formulations to improve functionality, processing yield and production cost. Nutritionally-speaking, meat from harp seal *(Phoca groenlandica)* is equivalent or superior to other sources of muscle foods in terms of its protein content, lipid fatty acids profile, minerals and vitamin content and presence of low levels of undesirable compounds such as nucleic acids and cholesterol (e.g. Shahidi and Synowiecki, 1991; 1993).

Mechanically separated seal meat (MSSM) and seal protein hydrolyzates (SPH) have been produced in our laboratories. While the general nutritional quality and properties of MSSM are similar to those of seal meat prior to deboning, SPH are protein rich (> 85% protein content), colourless and flavourless products. The present study examines the effect of incorporation of MSSM and SPH in production of chicken-based salami formulations. Colour characteristic, texture and sensory properties and presence of N-nitrosamines in products as affected by the presence of MSSM and SPH is investigated.

MATERIALS AND METHODS

Mechanically separated chicken meat (MSCM) and MSSM were prepared at the Newfoundland Farm Product Corporation (NFPC), St. John's, NF, using a Poss Deboner (Poss, Toronto, ON). Salami formulations, given in Table 1, were prepared and processed according to conventional procedures at NFPC. Seal protein hydrolyzate was prepared from MSSM (Shahidi et al., 1993) and used at 1 or 2% levels in the formulations.

Ingredients were chopped 1-2 min before addition of seasonings and continued for 10-12 min. The mixture was then removed from the chopping machine and was packaged into cellulose casings. Some samples were smoked in a commercial smoking kiln.

The tristimulus colour parameters, namely Hunter **L, a, b** values of samples were recorded using a Colorant colorimeter (Instrumar Engineering Ltd., St. John's, NF). A white colour plate with specifications **L** = 94.5, **a** = -1.0 and **b** = 0.0 was used for calibration of the equipment.

The texture of samples was measured using an Ottawa Texture Measuring System (OTMS) equipped with a Kramer-compression cell modified to a four-blade rather than the full ten blade size. Texture was measured using a Daytronic Digital rupture of the samples were then recorded (Kramer and Peters, 1981).

Sensory evaluation of samples was carried out by a 30-member untrained panelists using a nine-point hedonic scale (9 = liked extremely, 1 = disliked extremely and 5 = neither liked nor disliked). Individual samples of each product were placed inside glass Petri dishes and coded with three-digit random numbers.

During each evaluation session, two different products were assessed. All evaluations were conducted in partitioned booths, under fluorescent lighting at 21°C and a relative humidity of 50%.

The content of protein and moisture in samples was determined by the AOAC (1980) procedures. Total lipids were quantified as described by Bligh and Dyer (1959). All experiments were replicated between three and six times with mean values and standard deviations recorded.

For the analysis of N-nitrosamines in products 20-25 g homogenized sample was used as reported elsewhere (Synowiecki et al., 1992). Most determinations were based on single runs as the recovery of the internal standard in all cases examined was > 80%.

RESULTS AND DISCUSSION

Table 1 summarizes ingredient composition of salami products. While inclusion of MSSM in products was set at 10 or 20%, SPH were added to formulations at a 1 or 2% level. The proximate composition of products (not reported) indicated that all unsmoked samples contained 59.5-60.1% moisture and that in smoked products was 57.1-60.5%. The protein content of unsmoked and smoked products was 13.5-14.9 and 14.1-15.2%, respectively. Corresponding values for fat content of samples were 13.6-17.2 and 14.8-17.4%.

The Hunter **L, a, b** colour values of the exterior surface of products (Table 2) indicates that samples containing MSSM were darker (ie. lower **L** value) than the control, but those containing SPH were not affected. There was also a slight increase in redness (ie. a higher **a** value) of products containing MSSM, but Hunter **b** values were affected to a lesser extent. Although the relative trends in Hunter colour values of samples in each series was similar, the surface colour appearance of smoked products was darker (ie. lower **L** value), more red (ie. higher **a** value) and generally more yellow (ie. higher **b** value) than those in the unsmoked products. The interior colour of salami products (results not shown) showed a similar trend, but no significant ($P < 0.05$) difference was evident between the smoked and unsmoked series. The darker and more red appearance of products containing MSSM may be attributed to the presence of high content of hemoproteins (up to 10%) in seal meat (Synowiecki et al, 1992).

The results of sensory evaluation of salami products are given in Table 3. In general, smoked samples were preferred, except for the formulation that contained 20% MSSM (SM-20). With the exception of the SM-20 samples, all other products were equally acceptable. Unsmoked and smoked SM-20 products were liked by 66.7 and 46.7% of the panelists, respectively, whereas the smoked control was liked by 96.7% of the panelists. All other products were liked by 80.0 to 86.7% of the panelists. These sensory results were correlated (Corr. Coff. 0.93 and 0.87, respectively) closely with textural scores (results not shown) for unsmoked and smoked samples, respectively. These results are in agreement with those of Lee et al. (1987) who reported good correlations ($r > 0.80$) between textural properties and sensory attributes of various frankfurters (1987).

The content of N-nitrosodimethylamine (NDMA) in salami products was 0.33-0.52 μg/kg for unsmoked and 0.31-0.43 μg/kg for smoked products. While the lowest amount of NDMA was found in the control sample, the values were not much different in test products (Shahidi et al., 1994). Smoking of samples as well as their further heating by boiling, frying or microwaving only marginally affected these results. Additionally, trace amounts of N-nitrosopyrrolidine (NPYR), N-nitrosopiperidine (NPIP) and N-nitrosomorpholine (NMOR) were present in some samples. The presence of NPYR and NPIP in samples may be due to the interaction of nitrites with amines in the spices. However, the exact origin of NMOR is not known.

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