DEVELOPMENT OF FAT OPTIMIZED SAUSAGES: INFLUENCE ON SENSORIAL AND NUTRITIONAL PROPERTIES

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Abstract

The popular liver sausage with an average fat content of 40% was modified in fat content and fat composition using lean meat and Tuna Oil. Focussed on the sensory profile, the reformulated product showed no significant differences in appearance, colour, odour, composition and taste throughout shelf life of three weeks. Consistency distinctions were analysed but assessed to be acceptable.

Key Words: liver sausage, DHA, reformulation, tuna oil

I. INTRODUCTION

In Germany nearly 1500 different types of sausages do exist, which are well consumed in any kind of processing. 47 % of the male and 22 % of the female German population consumes meat and products thereof multiple times a day[1]. Central Germany, especially the federal states of Saxony, Thuringia and Saxony-Anhalt are defined as states with the highest consumption of sausages. With 170 g per day by males, and 90 g by females, these federal states form the top meat and sausage consumers of Germany[2].
Traditionally boiled sausages, such as liver sausage ("Leberwurst") are one of the most popular types, with 1.7 kg per household per year.
Corresponding to the amount a high quantity of fatty acids is picked up. "Leberwurst" is respectively characterised with a volume of 12g/100g saturated fatty acids (SFA), 14g/100g monounsaturated fatty acids (MUFA), 3.5g/100g poly unsaturated fatty acids (PUFA) and 0.12g/100g Cholesterol[3]. From the nutritionally point of view primarily the SFAs are responsible for cardiovascular diseases whereas PUFAs are health promoting. SFAs should be consumed with a maximum of 10 % of the daily intake[4].
Fatty sea fish, like *Thunnus,* contains high quantities of PUFAs, especially of long chained $n-3$ (e.g. Docosahexaenoic acid – DHA, Eicosapentaenoic acid – EPA) and $n-6$ fatty acids in an optimal ratio, which offer sustainable health promoted effects.
Regarding the lipid fraction, reformulation has been used to reduce the fat content and to optimize fat profile using *Thunnus* oil as a functional ingredient on basis of nutritional and sensory aspects.

II. MATERIALS AND METHODS

2.1 Sausage formulation and processing

Liver sausage a type of traditional German boiled sausages, was produced according to the German guidelines for sausages. Batches of about 7 kg each, were prepared. The control batch was produced using pork head, pork dewlap, pork liver, pork jowl, pork leaf fat, kettle stock, fresh onions, sodium chloride, emulsifier (mono- and diglycerides), herbs and spices (e.g. roasted, marjoram, black pepper, ginger).
The modified batch was made by substituting 15% of the pork fat (leaf fat and dewlap) with 11 % of kettle stock and 5 % of pork head meat. 3.3 % of Tuna oil was added to reach the optimum level of 1g DHA/ EPA per 100g sausage.
Thunnus oil, species "Skipjack" and "Yellow Thin", (IOI) is a natural, non-winterized triglyceride oil, rich in DHA with 25 %. The oil reaches lower oxidation levels than other DHA oils (Peroxide value ≤ 3 meq/ kg)[5].
All main ingredients per batch each were cooked at 98°C (apart from liver) and grinded up in the meat mincing machine by 3 mm. Herbs, spices and remaining ingredients were added manually and mixed by a Talsa Mixing

machine and filled afterwards in 40- 43mm cattle intestine (“Kranzdarm”). Sausages were infused in 82°C hot water for 45 min, cooled down and stored overnight by maximum temperature of 5°C. Cold smoking (24°C, 20 min) was used to finish them up the next day. Storage temperature did have a maximum level of 7°C during shelf life of three weeks.

2.2 Sensory, texture, optical and microbiological analysis

Sensory analysis was performed by an evaluated sensory panel (n= 10) throughout shelf life. Members of the German Agricultural Society (“DLG”) were involved and “DLG 5-point test schemata®” were used. Focussed on appearance, odour, texture and taste, the reformulated batch was compared to the standard.
Brookfield Texture Analyzer CT3, Konia Minolta Spectrophotometer CM-600d and WTW pH 340i were used to evaluate tasted texture, colour and pH with the measured profile.
Additionally microbiological data referring to the parameters of DGHM[6] were analysed.

III. RESULTS AND DISCUSSION

Thunnus oil showed good technological performances. Formulated batches were homogeneous and comparable to standards in parameters colour, pH and microbiology. The sensory panel did not recognize any off flavour throughout shelf life. An average of 4,9 out of 5 points was given and therefore sensory acceptability was proved. The difference in hardness approved by texture analysis was mentioned manually, but did not cause any negative impression. Microbiological results have been found far under reference values.
Finally pork fat was reduced up to 15 %, resulting in a final fat reduction up to 7 %.

IV. CONCLUSION

In conclusion, the optimized formulation with *Thunnus* oil is an effective fat replacer for texture and bite, without negative influence on other sensory properties. Fatty acids analyses will be done as well as a consumer acceptance study to validate the results. Similar applications with increasing amounts and different PUFA of animal or plant origin will complete possible approaches in liver sausages.

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