INHIBITION OF LIPID OXIDATION IN DRY FERMENTED SAUSAGES USING ROSEMARY EXTRACTS

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Introduction

The lipids of the dry fermented sausages show distinct inclination to oxidation when attacked by atmosphere oxygen during the process of drying and ripening (Kaloyanov and Brachkova, 2004). The proteolysis processes running during ripening of the dry fermented sausages are simultaneously developing with lipid oxidation (Simov and Ivanov, 2006). The lipid oxidation is the main reason for significant decrease of the nutritional value, the negative changes of the colour, aroma and flavour of the dry fermented sausages (Dimitrov et al., 2004). To delay the oxidation processes the temperature decrease and the limitation of the light access are recommended (Chirreti et al., 1997). Methods for lipid oxidation inhibition in dry fermented sausages by addition of different antioxidants were searched for. The rosemary extracts, containing phenolic compounds, are shown as efficient antioxidants for sausages. Coronado et al. (2002) have investigated the effect of rosemary extracts in frankfurters. The objective of the study is to determine how does the addition of three types of rosemary extracts influence the lipid oxidation inhibition during drying and ripening of the dry fermented sausages?

Materials and Methods

The experiments are carried out with a model system of dry fermented sausage The raw-materials used for production of filling mass for model system of dry fermented sausage (control sample - without addition of antioxidants) are: beef (round or shoulder) CL 95 - 60 kg/100 kg meat: pork, half-fatted CL 50 - 20 kg/100 kg meat: dorsal bacon- 20 kg/100 kg meat; salt - 2.300 kg/100 kg meat; sodium nitrate - 0.050 kg/ 100 kg meat: ground black pepper *(Piper nigrum L)* - 0.200 kg/100 kg meat; ground cumin *(Cuminum cyminum L.)* - 0.600 kg/100 kg meat: and dry red pepper/paprika/ *(Caspicum annuum)* -0.200 kg/100 kg meat.

The control sample has no addition of antioxidants. To the experimental samples 1, 2 and 3 0.2 g/kg extracts from rosemary are added *(Rosemarinus officialis).* The sample 1 is with addition of 40 % solution of rosemary in propyl glycol. The sample 2 is with addition of 60 % solution of rosemary in alcohol. The sample 3 is with addition of 50 % powder concentrate of rosemary. Samples for examination are taken from the filling mass (0 d), after second press (15 d), and from the final dried product (30 d). The oxidative stability of the lipids of the samples was determined by the method of Ranfft et al. (1988). Using the apparatus "Metrohm 679 Rancimat" (Metrohm AG, CH-9100, Swiss). The lipid oxidation of the lipids of the samples was defined by means of the thiobarbituric acid (TBA) method, and was expressed as TBA-reactive substances or TBARS (mg MDA/kg of meat) (Schmedes and Holmer. 1989). Nine repetitions were implemented for each of the samples. Data from the three trials was analyzed using the General Linear Procedure, and two-way analysis of variance (ANOVA) was performed to determine the significant differences between compared indicators of the dry fermented samples of sausages. The average values obtained from ANOVA tables were further analyzed for comparison by means of Least Significant Difference procedures.

Results and Discussion

Lipid oxidation. The TBARS analysis revealed distinct differences in rate and extent of malone aldehyde, reflecting the rate of lipid oxidation among four samples of dry fermented sausages during the drying and ripening ($P < 0.05$). The control samples were most susceptible to lipid oxidation, followed by the sample 1, when compared with samples 2 and 3 (Figure 1). By the end of the drying (30 d) the lowest statistically significant TBARS values were evaluated in sample 2 with addition of 0.2 g/kg of 60 % ro-semary extract in alcohol solution ($P < 0.05$). Probably, the higher concentration of rosemary extract from the fraction soluble in alcohol contains more phenolic compounds, proving to be strong antioxidants. The antioxidant in comparatively low concentrations distributes unevenly, when it is added in powder form (sample 3) during cutting of the filling mass, in comparison with liquid state (Figure 1).

Oxidative stability of lipids The statistically significant differences ($P < 0.05$) among values of the lipids' induction period of the four samples of dry fermented sausages with addition of different types rosemary extracts, were determined (Figure 2). The lipids of the sausages are the most stable when 0.2 g/kg 60 % alcohol rosemary extract is added.

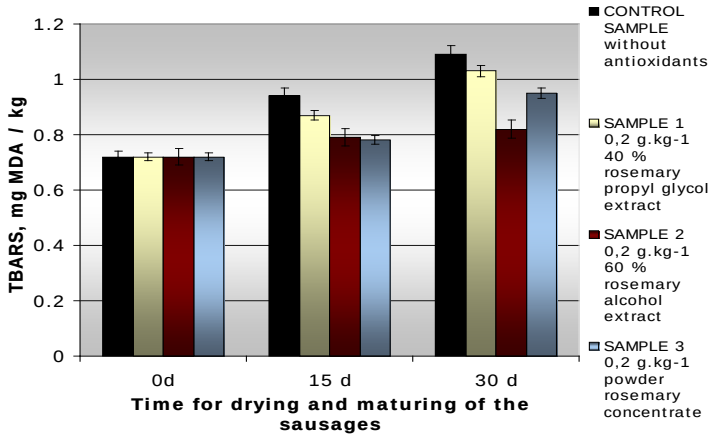

Figure 1. TBARS concentration in lipids, extracted from raw-dried sausage with addition of rosemary extracts, during drying and maturing.

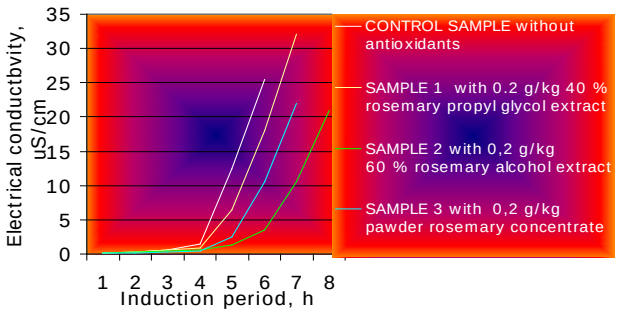

Figure 2. Oxidative stability of lipids, extracted from dry fermented sausage with addition of rosemary extracts, during drying and maturing

Conclusions

The type of solvent and concentration of rosemary extracts are the two main factors, which influence the inhibition of lipid oxidation during drying and ripening of the dry fermented sausages. The most significant inhibition of the lipid oxidation was found out in the sample with 0.2 g/kg 60 % alcohol rosemary extract.

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