THE DEGREE OF LIPOLYSIS IN SLOW FERMENTED SAUSAGES IS AFFECTED BY THE ADDITION OF NITRITE AND NITRATE.

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Introduction

The curing process is different among European regions, in Northern Europe, the curing process is short, using only nitrite as curing agent, and including a smoking stage. By contrast, in the Mediterranean area longer curing times are used, involving both nitrite and nitrate as curing agents and generally, without smoking process. The lipolysis process contribute to flavour development through the generation of free fatty acids. These fatty acids with unsaturations will act as substrates for oxidation to form volatile compounds with aroma properties. Few studies have compared the effect of either nitrite or nitrate in a slow process without fermentation (Navarro et al., 2001, Marco et al., 2006). The aim of this study was to determine the individual effect of these curing salts on a slow fermentation process, focusing on the lipolysis and its possible effect on the typical dry-cured flavour.

Materials & Methods

Dry fermented sausages. Two different batches containing nitrate (NO_3^-) or nitrite (NO_2^-) were manufactured as described by Marco *et al.* (2006). Four sausages were collected at days 0, 14, 31, 45 (finished sausage) and 105 (vacuum stored) for the different analyses.

Lipid Analyses. Total lipids were extracted from 5 g of minced sausage using dichloromethane:methanol (2:1) as solvent. All the lipid analyses are described in Marco et al., (2006). Total lipids were fractionated into neutral and polar lipids and in each fraction the fatty acids were methylated. Triglyceride content (TG) was calculated as the difference between neutral lipids and free fatty acids (FFA). Analysis of the fatty acid methyl esters (FAME) was carried out as described by Navarro et al., (2001) using a Fisons 816 gas chromatograph (GC) equipped with a flame ionisation detector. The individual fatty acids were identified comparing their retention times with those of standard fatty acid methyl esters. For the quantification, the response factors of the standard FAME respect to the internal standard were used.

Results & Discussion

The effect of the processing time on the various lipid fractions was as expected. FFA showed an increase during the processing as reported by Navarro et al (1997) and Zanardi et al. (2004). Phospholipids (PL) decreased during the ripening process as Johansson et al., (1994) and Navarro et al., (1997) indicated. With respect to TG, this fraction showed a high release of FA because it is the most abundant fraction in the sausage fat. In general, considering the amount of FA released from PL and TG at the end of the process, the majority of FFA were derived from the TG fraction, as reported Molly et al., (1996).

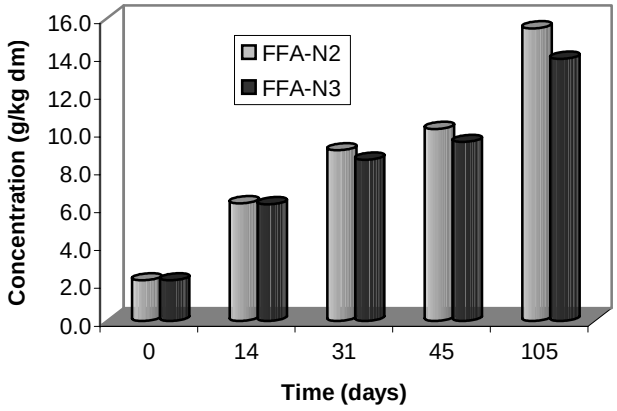

Figure 1. Generation of free fatty acids (FFA) during the processing of dry fermented sausages with added nitrite (N2) or nitrate (N3).

The effect of the addition of nitrite and nitrate produced a higher concentration ($p<0.01$) of FFA in the nitrite added batch as indicated Navarro et al. (2001). The lipolysis of PL was significantly higher ($p<0.001$) in the nitrates samples during the drying process. However, this tendency was inverted during the vacuum packing. The lipolysis of TG was higher ($p<0.001$) in the nitrites samples. These results differ from those reported by Navarro et al. (1998), for rapid fermented sausages where no significant differences where found in the lipolysis between batches with nitrite or nitrate. Also, Stahnke (1995) and Zanardi et al. (2004) reported no significant differences in the degree of lipolysis for sausages made with different amounts of nitrite and nitrate.

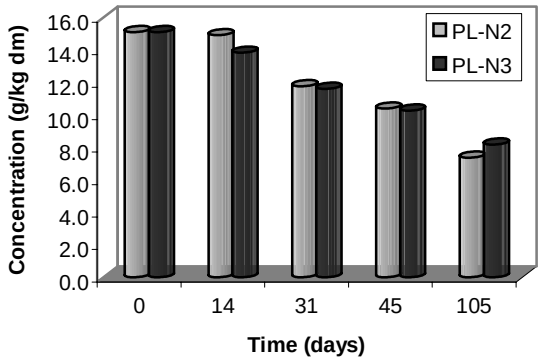

Figure 2. Evolution of phospholipids (PL) during the processing of dry fermented sausages with added nitrite (N2) or nitrate (N3).

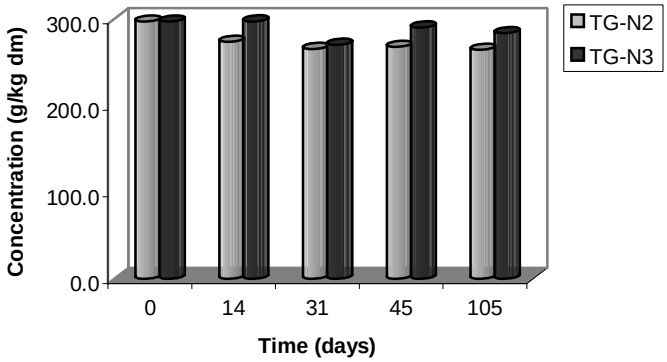

Figure 3. Evolution of triglycerides (TG) during the processing of dry fermented sausages with added nitrite (N2) or nitrate (N3).

Conclusions

The degree of lipolysis during the processing of dry fermented sausages is affected by the addition of nitrite and nitrate however, it is highly affected by the fermentation stage. The highest concentration of FFA in the nitrite added batch would increase the generation of lipid oxidation volatile compounds that would affect the aroma of the sausage.

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