

AROMA CHANGES DURING VACUUM STORAGE OF NITRATE REDUCED FERMENTED SAUSAGES

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I. INTRODUCTION

Consumers demand healthier meat products with additive reduction such as nitrite. The actual trend is focused on the use of nitrite at the minimum level needed to achieve the technological purpose. In addition to their safety function by inhibiting *C. botulinum*, nitrite has several functions in meat products including the development of characteristic cured aroma. Thus, the reduction of nitrifying agents would affect volatile compounds production in dry fermented sausages [1]. Moreover, the exclusive use of nitrate (250 ppm) without added nitrite in traditional slow fermented sausages with maturation period of at least 30 days is allowed in EU Regulation (1333/2008). Nitrate slow fermented sausages have a preferred flavor than those made with nitrite [2] as the long process and mild fermentation allows the exclusively use of nitrate as a nitrite reservoir. Furthermore, vacuum packed is widely used to extend the shelf-life of dry fermented sausages producing changes in the volatile profile but nothing is known about its effect on aroma perception [1]. Thus, the objective of this work is to establish the effect of vacuum storage and nitrate reduction on the aroma profile of slow fermented sausages.

II. MATERIALS AND METHODS

Three batches of dry fermented sausages were manufactured with different sodium nitrate content (250 ppm control sausage (C) or reduced in 15 % (RN15, 212.5 ppm) and 25 % (RN25, 187.5 ppm) and submitted to a slow fermentation process as described by Perea-Sanz et al. [3]. Three replicates of the experiment were carried out. At the end of ripening, sausages were vacuum packed and stored at 18-20°C and samples were taken after 1, 2 and 3 months for analysis. The volatile compound analysis was carried out by solid phase micro extraction (SPME) in a gas chromatograph (Agilent HP 7890) with a mass spectrometry detector (MS 5975C) (Agilent, Santa Clara, CA, USA), and the aroma analysis (GC-O) was carried out by SPME in a gas chromatograph (Agilent 6890) equipped with a FID and sniffing port detectors (ODP3, Gerstel, Mülheim an der Ruhr, Germany) [3]. The effects of storage time and nitrate reduction were evaluated by two factor ANOVA analysis (XLSTAT 2011, v5.01, Addinsoft, Barcelona, Spain).

III. RESULTS AND DISCUSSION

The aroma profile of dry fermented sausages determined by GC-O had different aroma notes such as vegetable, fruity-sweet-floral, sulfur-unpleasant, green, cheese-lactic and acid-sour odors. The chemical compounds responsible for these aroma notes are indicated in table 1.

Table 1. Classification of volatile compounds according to their aroma properties determined by GC-olfactometry.

Vegetable	Fruity-sweet-floral	Sulfur-unpleasant	Green	Cheese-lactic	Acid-sour
Methional	2-Butanone	Methanethiol	Hexanal	1-Hexanol	Acetic acid
1-Octen-3-ol	3-Hydroxy-2-butanone	Dimethyl disulfide	Heptanal		
Ethyl octanoate	2,3-Pentanedione	2-Methylfuran			
	2-Heptanone	2-Pentylfuran			
	Ethyl butanoate				
	Ethyl-2-hydroxypropanoate				
	Ethyl-3-methylbutanoate				
	Octanal				

During sausage shelf-life under vacuum storage (Fig. 1), fruity-sweet-floral aroma compounds decreased as a result of the lowest production of ester compounds. However, sulfur-unpleasant and green compounds increased, related to the increase in compounds derived from lipid oxidation, such as aliphatic aldehydes [4]. Nitrate reduction also affected the aroma (Fig. 1) with a decrease in vegetable and sulfur-unpleasant aroma at the highest reduction (25%) and an increase in acid-sour aroma due to the increase in acid compounds. In addition, green odor also decreased with nitrate reduction. This decreased was produced by the aliphatic aldehydes that were significantly lower than the concentration observed in control sausages that contained a highest fat content.

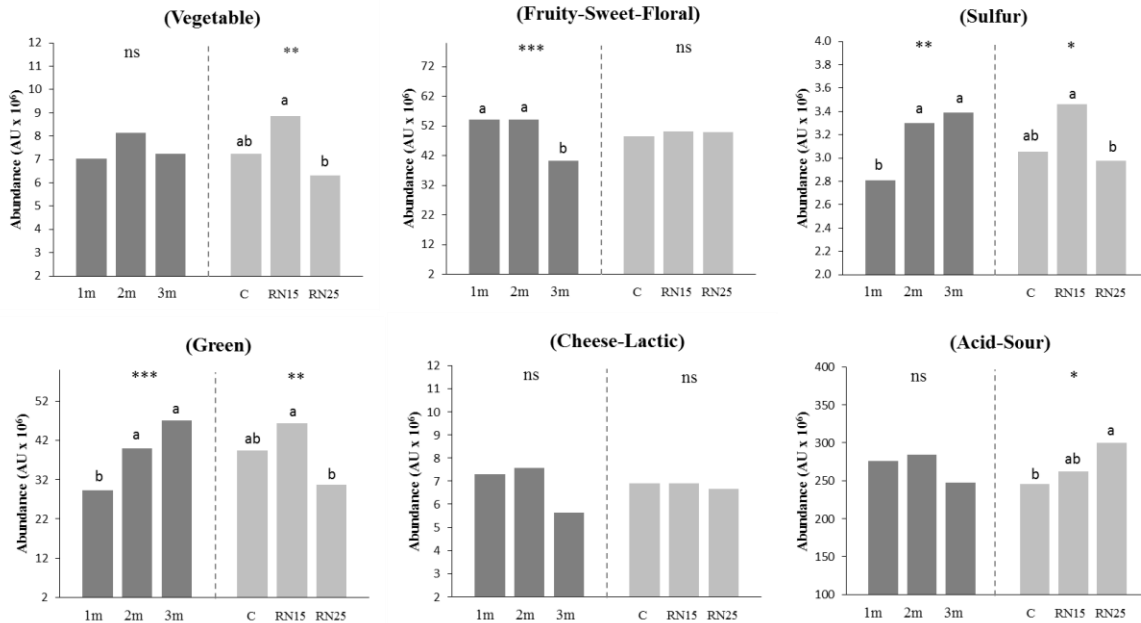


Figure 1. Abundance of aroma compound groups according to storage time (1, 2, 3 m) and nitrate reduction in fermented sausages (Control C 250ppm; nitrate reduction: 15% RN15 212.5ppm; 25% RN25 187.5 ppm).

IV. CONCLUSION

Vacuum storage and nitrate reduction affect volatile compounds responsible for odor notes. In general, nitrate reduction produced a decrease in aroma notes in contrast to the increase observed during vacuum storage. The observed changes produced by nitrate reduction and vacuum storage may explain the sensory differences among products during shelf-life.

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