ROSEMARY EXTRACT EFFECT ON FRESH SAUSAGES PRESERVATION TO REPLACE SULPHITES

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Abstract – The aim of this study was to evaluate the effect of rosemary extract on fresh sausages quality stored 15 days at 4 ºC in order to eliminate the sulphites from the formulation. Three treatment were assigned: Sulphites (SU), Rosemary (RO) and Sulphites + Rosemary (SU+RO). Microbiological determinations (total viable count), lipid oxidation and colour (CIELab coordinates) were evaluated. Rosemary addition did not significantly vary the microbial growth in samples being the lowest microbial counts in SU group. For the RO group not significant differences were described along storage for the lipid oxidation process. SU and SU+RO group showed the most intense antioxidative effect after 5 days storage. L* and b* were not affected by treatment or storage. The a* coordinate was more stable in both groups that contained sulphites. In conclusion, rosemary extract at 120 ppm dose used in the present study was not enough to replace sulphites effect as respect colour and microbiological counts, but higher oxidative stability was described in rosemary samples group (RO).

I. INTRODUCTION

Although the use synthetic additives to control spoilage changes in food have been highly considered in meat product, at present, there is a tendency to restrict their use (1). This is due, in part, to the adverse reactions described in sensitive individuals after consuming certain foodstuffs i.e. those contain sulfites (2). The increase of concern on consumer health involved the refusing to use synthetic additives, with the incorporation of natural additives to extend shelf life and/or improve food safety (3). Rosemary (*Rosmarinus officinalis* L.) extracts have exhibited potent antioxidant activity and are widely used in the food industry (4). Lipid oxidation, which translates to rancidity, is one of the major reasons of meat products' quality deterioration. (3) that contributes to the development of unacceptable organoleptic characteristics (3), what is especially important because appearance of meat products is one of the major determinants to consider by consumers at purchasing time (5). For all these reasons, the aim of this research was to investigate the use of rosemary extracts to improve oxidative and sensory stability on two meat products manufactured without any artificial additive in fresh sausages.

II. MATERIALS AND METHODS

A powder rosemary extract, was used for fresh sausages elaborations (174.2 g/kg carnosic acid and 28.4 g/kg carnosol). Pork sausages were formulated with 40% fat and 60% meat. The meat was blended with a commercial mixture based on: salt, dextrose, vegetable fiber, spices, starch, corn dextrin, preservative E-224, antioxidant E-301 and colorant E-120 (40 g/kg meat). There were three treatment groups: SU–(control, with 450 ppm of sulphites), RO (without sulphites with 120 ppm of rosemary extract) and SU + RO (with 450 ppm of sulphites and 120 ppm of rosemary extracts). The meat was minced (5 mm) using a P3298 cutter (Braher International, San Sebastian, Spain). All ingredients were homogenized and then were stuffed into collagen casings, weighting 40 g each sample. The samples were packaged in clear trays of crystal polystyrene (B5-37 aerpack, ALIGA and Ortiz. SL, Spain), over-wrapped with a permeable film (MICAL® professional, Miquel Alimentació Group S.A.U, Vilamalla, Spain.) and stored for 15 days at 4 °C in a display cabinet illuminated with white fluorescent light (620 lux) simulating retail display conditions. Two packs were opened for subsequent analysis for each

treatment on days 0, 5, 9 and 15 of storage. The entire experiment was duplicated.

Total viable counts (TVC) was determined by pour plate methods in Plate Count Agar, using conventional dilution procedures. The plates were incubated for 48 h at 37 ºC. Lipid oxidation was assessed through determination Malondialdehyde (MDA) content in accordance to described by Botsoglou *et al.* (6). Colour was measured using a CR-400 Chroma Meter (Minolta Ltd., Milton Keynes, United Kingdom) calibrated against a standard white tile (8 mm diameter aperture, d/0 illumination system, D65 illuminant and a 2º standard observer angle). All data were analysed by using the SPSS.19 statistical package.

III. RESULTS AND DISCUSSION

Table 1 Quality parameters from fresh sausages with rosemary extract stored during 15 day at 4°C

	Storage time (day)	Treatment SU	ROS	SU + ROS	
Total viable counts	0	5.9±0.2	5.9±0.9	5.1±0.5	NS
	5	4.8±0.6^{ab}	6.2±0.2 ^{b}	4.7±0.1^{a}	*
	9	4.7±0.2^{a}	7.1±0.1 ^{b}	4.8±0.1 ^{a}	**
	15	4.6±0.2	6.9±0.6	5.8±2.0	NS
		NS	NS	NS	
TBARS	0	0.1±0.18^{ax}	0.0±0.0^{ab}	0.1±0.0^{ax}	NS
	5	0.3±0.0^{bxy}	0.1±0.1^{a}	0.0±0.0^{ax}	**
	9	0.3±0.02^{xy}	0.2±0.1	0.2±0.0^{xy}	NS
	15	0.4±0.1 ^{y}	0.3±0.1	0.4±0.2^{y}	NS
		*	NS	*	

NS: no significative; *: P<0.05; **: P<0.01 ;***:0.001; a. b: treatments group effect. x. y: storage effect.

Table 1 shows the quality parameters for the different sausages batches. The TVC values were higher for RO group than SU and SU + RO groups (P<0.01), on day 5 and 9, reaching higher levels than established by EU legislation 1141/2007. Although rosemary has non-polar components such as phenolic diterpenes, responsible for the antimicrobial properties (3), the antibacterial effect of rosemary was lower to that of sulphites. In contrast, a previous study in fresh chicken sausages (3) described a light reduction of total viable count when rosemary was added at 500, 1000 and 1500 ppm, however in this study authors did not add sulphites but rosemary extracts doses were higher than in the present research.

Table 2 Colour parameters from fresh sausages with rosemary extract stored during 15 day at 4°C

	Storage time (day)	Treatment SU	ROS	SU + ROS	
L*	0	46.0±2.2^{x}	44.6±3.5^{x}	43.2±3.7	NS
	5	51.2±1.5^{xy}	45.9±4.0	44.3±1.4	NS
	9	54.2±1.8^{y}	53.1±2.7^{y}	54.1±5.3	NS
	15	50.4±4.6^{axy}	45.0±0.9^{abx}	43.7±1.4^{b}	*
		*	***	NS	
a*	0	20.9±0.6^{abx}	19.0±1.3^{ax}	22.2±1.3^{b}	**
	5	18.5±1.3^{axy}	17.6±1.1^{ax}	21.1±0.9^{b}	**
	9	23.1±2.0 ^{by}	17.4±0.7^{ax}	21.9±1.5^{b}	**
	15	18.8±1.9^{axy}	13.1±0.9^{by}	21.0±2.1^{a}	***
		**	**	NS	
b*	0	5.4±0.4	5.7±0.9	5.8±0.7	NS
	5	5.6±0.1	5.3±0.6	5.2±0.5	NS
	9	7.4±1.2	5.9±1.0	6.3±1.0	NS
	15	5.1±1.2	4.3±0.5	5.6±0.8	NS
		NS	NS	NS	

NS: no significative; *: P<0.05; **: P<0.01 ;***:0.001; a. b: treatments group effect. x. y: storage effect.

In general there were not variations as respect the MDA levels in any of the groups by storage time, although a higher oxidative stability was described for RO samples by time. Oxidation stability was higher for RO and SU+RO groups during 5 days of storage. At the end of the storage, all the groups had similar values of MDA content (P>0.05). It is probably that both antioxidants, ascorbic acid (included in the commercial formula) and rosemary extracts, had enough capacity to prevent the rancidity processes development. Lee *et al.* (7) evaluated the oxidative stability in chicken sausages obtained similar results. These authors also based their result on the presence of substance with antioxidants activity in the formulation.

For the L* and b* coordinates not significant differences between treatments groups were observed along storage (Table

2). The a* coordinate was lower in RO group than SU and SU+RO group. In addition, both groups with sulphites added manintaned the colour at the end of storage. Similar results were found by Sebranek *et al.* (8) in fresh refrigerated pork sausage elaborated with different rosemary concentration.

Therefore It can be concluded that the only addition of rosemary extracts could not to preserve the colour stability of samples during storage.

IV. CONCLUSION

Rosemary extracts at 120 ppm used in the product in absence of sulphites could maintain the oxidative stability along storage but had not showed any effect on colour protection and spoilage development. For that reason the rosemary extract dose used in the present study was not enough to replace sulphites in fresh pork sausage stored during 15 days.

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