APPLICATION OF AN ANTIOXIDANT ACTIVE PACKAGING SYSTEM TO EXTEND THE SHELF-LIFE OF FRESH VEAL MEAT

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I. INTRODUCTION

Preserving food to extend its shelf life, whilst ensuring its safety and quality, is one of the main concerns of the meat industry. In the same way, the use of antioxidants is an interesting strategy to reduce lipid oxidation and may be effective in controlling the spoilage of meat products [1]. Additionally, consumers tend to prefer natural ingredients due to the synthetic compounds, including antioxidants as butylated hydroxytoluene (BHT), have been linked to health risks [2]. Natural antioxidants, which have phenolic structure, have been reported to play an important role in protecting the tissues against free radical damage, among which is included the eugenol [3], and even can present stronger antioxidant activity than that of synthetic antioxidants [4]. The aim of this study was to employ a film containing eugenol as an antioxidant active system, investigating its effects on physico-chemical properties of veal steaks during storage time.

II. MATERIALS AND METHODS

II.1. Active film

A polyethylene (PE) based film containing 2% eugenol was used.

II.2. Meat packaging

Steaks from fresh veal meat kindly supplied by Portalconsa S.L. (O Porriño, Spain) were packaged in direct contact with the active PE films. The trays were sealed at 146 ˚C under a modified atmosphere (80% CO_2 and 20% O_2) and were stored at refrigeration temperatures (0-4 ºC) up to 18 days. Control samples were packaged without active film.

II.3. Physico-chemical analysis at different storage times

- pH and color parameters were measured following the previously indicated by Lorenzo et al. [2]
- Lipid oxidation. The lipid stability was evaluated according to Lorenzo et al. [2], expressing the thiobarbituric acid reactive substances (TBARS) values as mg MDA/kg sample.
- Textural profile was carried out as reported by Lorenzo et al. [5].

III. RESULTS AND DISCUSSION

The effect of active films on changes in physico-chemical attributes of veal meat packed under MAP is shown in Table 1. The pH data were similar in all the analyzed samples, showing acceptable values for the meat. The color parameters remained stable over time when the film containing the antioxidant was used. On the contrary, in the control group there was a greater increase in brightness (L*) and a decrease in the red intensity (a*), which is evident after 18 days of storage, with mean value close to 7. A similar trend was reported by Lorenzo et al. [1] who noticed that the use of 2% oregano active film in package of fresh foal meat gave rise to a significant ($P < 0.001$) decrease of color loss compared to control batch. Finally, the TBARS determined in the samples packed with the films incorporating eugenol were significantly lower than in the control over the storage time (Table 1). It has been reported that an index of 1.5 is closely related to perceptible and unacceptable off-odor of meat [6]. In our study samples with 2% eugenol active film showed level of 0.16 mg MDA/kg at the end of storage time, whereas control samples reached upper values after 7

days of refrigerated period. This finding is in agreement with those reported by Lorenzo el al. [1] who found lower TBARS values in samples with 1% green tea active film.

Table 1. Effect of active films on changes in physico-chemical attributes of veal meat packed under MAP (80% O_2 + 20% CO_2) during storage

Parameter	Treatment	Days of storage					SEM	Sig.
		0	4	7	11	18		
pH	Control	5.43^{a}	5.39^{a}	5.59^{b}	5.68^{c}	5.60^{b}	0.029	***
	Eugenol		5.47^{a}	5.57^{b}	5.68^{c}	5.58^{b}	0.028	**
L*	Control	46.04^{a}	48.53^{b}	48.89^{b}	52.14^{c}	49.45^{b}	0.591	**
	Eugenol		47.93	49.70	47.95	49.17	0.352	ns
a*	Control	15.82^{b}	18.10^{b}	15.49^{b}	13.44^{b}	7.73^{a}	1.109	*
	Eugenol		16.12	17.13	15.98	15.35	0.262	ns
b*	Control	14.51^{a}	17.66^{b}	17.09^{b}	18.00^{b}	16.78^{b}	0.420	*
	Eugenol		17.04^{a}	18.35^{b}	16.89^{a}	17.36^{a}	0.216	*
Shear force (N)	Control	44.85^{a}	38.51^{b}	32.43^{c}	28.01^{d}	21.08^{e}	2.775	***
	Eugenol		37.16^{b}	27.36^{c}	23.70^{d}	22.65^{e}	1.552	***
TBARs	Control	0.16^{a}	0.93^{ab}	1.11^{ab}	1.90^{b}	3.51^{c}	0.327	***
	Eugenol		0.18	0.11	0.55	0.16	0.095	ns

$^{a-e}$Values in the same row differ significantly (Duncan test, P <0.05); Sig: Significance; ns: not significant; *P<0.05; **P<0.01; ***P<0.001; SEM: standard error of mean.

IV. CONCLUSION

The use of eugenol active packaging system combined with MAP showed a preservative effect in veal meat, exerting a protective effect on lipid oxidation and consequently maintaining good red color.

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