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Effect of active packaging with green tea and oregano oil on the shelf-life of cooked ham (#300)

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Introduction

One of the main concerns of the meat industry is protecting meat products to increase its shelf life as well as ensuring its safety and quality. To achieve this goal, over the last years there has been an increasing interest in the bio-based packaging materials as edibles films and coatings as packaging materials for preserving meat products quality [1]. In a previous studies, the use of rosemary active film [2], green tea film and oregano oil film [3] resulted in enhance oxidative stability of fresh meat, hence it could be interesting know their effects on manufactured cooked meat products. Thus, the aim of this study was to evaluate the effect of active packaging with incorporation of green tea extract and oregano oil on main physicochemical parameters during shelf-life (0-21 days) of sliced cooked ham

Methods

Fresh pieces of pork legs were purchased at local market. The whole pieces were deboned and cleaned of connective tissue in order to facilitate the brine penetration. Then pork legs were injected with 2% brine solution containing sodium chloride (10.8%), dextrose (3%), polyphosphates (1.8%), carrageenan (1.8%), ascorbic acid (0.6%), ham aroma (0.6%), sodium nitrite (0.3%) and color additive (0.05%). Injection was performed using a injector machine at 2-4 bars and 7 ºC. After the injection process a short period of time was necessary in order to obtain an adequate brine homogenization inside the piece. Afterward, a maceration process for 5 hours (temperature controlled of 5 ºC and cycles of movement each 20 min) was carried out. Then, ham pieces were packed on vacuum plastic bags and cooked in a cooking kettle until reach an internal temperature of 75 ºC. Finally, after the cooking stage, cooked ham was refrigerated until reach an internal temperature of 6 ºC for 12 hours.

Cooked ham pieces were cut in slices and stored in polystyrene tray. Samples were randomly divided into three batches. The first batch (control) was packaged without active film; the second batch was packaged with active film contained green extract (1%) and the third batch was packaged with active film contained oregano essential oil (2%). The active packaging was prepared by ARTIBAL, S.A. (Sabiñánigo, Spain) under European Patent EP 00380302.4. All cooked ham slices were packaged with a gas mixture of 70% N_2 /30%CO_2 supplied by PRAXAIR (Madrid, Spain).

The pH values (digital portable pH-meter equipped with a penetration probe), color parameters (portable colorimeter to estimate cooked ham color in the CIELAB space), water activity (aw), TBARs (mg MDA/Kg sample), chemical composition and textural parameters (TPA) were determinate according to Pateiro et al. [4]. An ANOVA using the GLM was performed for all variables considered in the study and LSM were separated using Ducan's test ($p<0.05$) using the IBM-SPSS Statistics 23.0 program.

Results

The chemical composition of cooked ham was only determinate on the first day: 77.66% moisture, 2.31% intramuscular fat, 14.14% protein and 3.04% ashes. All pH values of three batches during shelf-life ranged between 6.12 and 6.56, which is a normal range for cooked ham, while the average content for water activity was 0.97. There was no significant effect ($p\geq0.05$) of the natural antioxidants used in the active films for pH and aw parameters. Lipid stability was evaluated using TBARs index and all values were <0.01 even the last day (21 day) which could be due to the low fat content the cooked ham samples. In addition this level of oxidation was insignificant and below the threshold for rancidity (2mg MDA/kg) proposed by Campo et al. [5]. The textural parameters of the three cooked ham batches during their shelf-life are shown in Table 1. At 21 day all determinate textural parameters showed significant differences ($p<0.05$), except the cohesiveness. The control batch presented higher values the hardness (N), springiness (mm), gumminess (N) and chewiness (N.mm) than batches stored with active package composed by green extract and oregano oil, respectively. There was no a clear pattern in the evolution of textural parameters among batches, probably due to high variability on samples of sliced cooked ham. When color parameters L*, a* and b* were assessed during shelf-life, no significant differences ($p<0.05$) were observed among batches (Figure 1). These results could be explained in part by the fact that color stability in cooked meat products is higher than in raw meat, at least during the storage time evaluated in this study, indicating the null effect of natural antioxidants respect to control.

Conclusion

The use of active film contained both green tea extract and oregano oil did not show a preservative effect during shelf-life of cooked ham. Therefore, further work need to be done to establish whether concentration is optimum as well as explore other conditions in order o test the film active packaging capacity to prolong the shelf-life of cooked ham and to preserve its quality.

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Notes

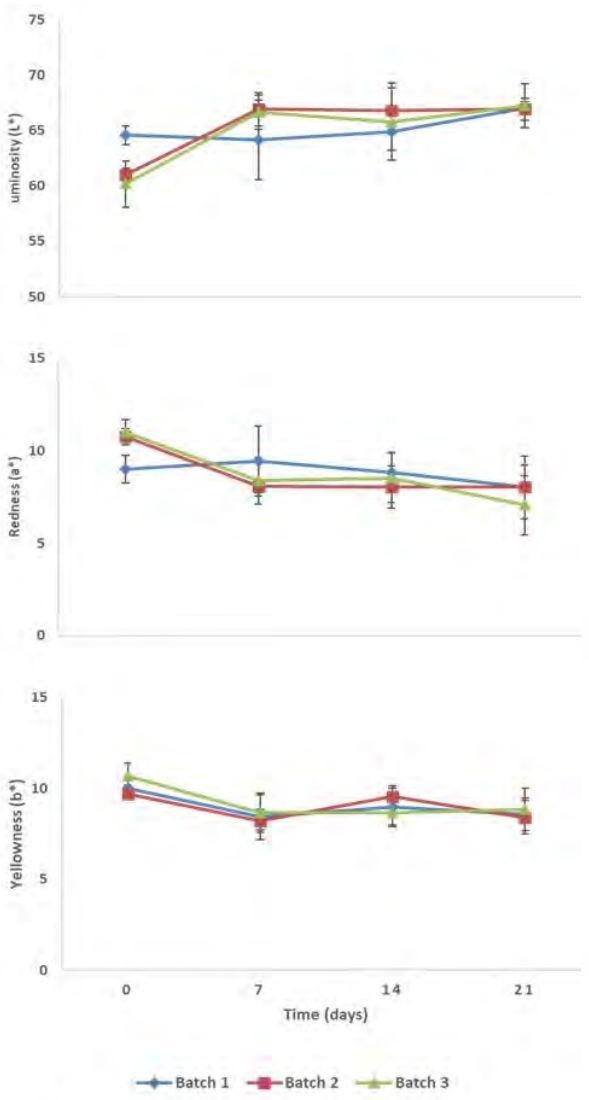

Figure 1. Effect of active packaging with green tea and oregano oil on color parameters.

Figure 1

Table 1. Effect of active packaging with green tea and oregano oil on textural parameters

		BATCH 1	BATCH 2	BATCH 3	*SEM*	Sig.
Hardness (N)	**0**	29,68	35,63	39,24	1,79	ns
	7	51,75	53,51	45,71	2,47	ns
	14	29,68	35,63	39,24	1,79	ns
	21	40,69^{a}	27,47^{b}	28,84^{b}	2,04	***
Springiness (mm)	**0**	0,76^{b}	0,84^{a}	0,87^{a}	0,02	*
	7	0,88	0,90	0,88	0,01	ns
	14	0,76^{b}	0,84^{a}	0,87^{a}	0,02	*
	21	0,90^{a}	0,80^{b}	0,81^{b}	0,02	*
Cohesiveness	**0**	0,39	0,39	0,41	0,01	ns
	7	0,46	0,45	0,42	0,01	ns
	14	0,39	0,39	0,41	0,01	ns
	21	0,42	0,45	0,36	0,02	ns
Gumminess (N)	**0**	11,50	13,76	16,04	0,88	ns
	7	23,64	24,35	19,01	1,37	ns
	14	11,50	13,76	16,04	0,88	ns
	21	17,49^{a}	11,94^{b}	10,23^{b}	1,28	*
Chewiness (N.mm)	**0**	8,73	11,70	14,00	0,10	ns
	7	20,65	21,80	16,68	0,12	ns
	14	8,73	11,70	14,00	0,10	ns
	21	15,89^{a}	9,52^{b}	8,29^{b}	0,13	*

*SEM: Standar error of the mean Sig: Significance: *** ($p \leq 0.001$), * ($p < 0.01$); ns (not significant)*

Table 1

Notes

References
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References

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