OUR STUDY OF SPANISH " SALCHICHON " DURING FERMENTATION AND RIPENING

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Colour parameter evolution during "Salchichón" process were evaluated, CIE L*a*b*, pigment nitrosation and pigment olouration were measured for different diameters and zones, no statistically significants differences were found between diameters and es except to L*, "Salchichón" process can be divided by colour parameters in two well defined phases except for a*. At the end of the day of fermentation phase the best nitrosopigments formation takes place .

TRODUCTION

"Salchichón" is a Spanish dry fermented sausage that has a similar process to Salami. This product is more typical from editerranean regions, but the most popular dry fermented sausage in Spain is "Chorizo" In Spain this product present different omination depending on the casing diameter (Fuet or Salchichón , Salchichón present the bigger diameter > 40 mm) The aim of this rk is to study the influence of diameters and zones in the evolution of colour parameters during the process in a Spanish raw fermented sage "Salchichón".

ATERIALS AND METHODS

The "Salchichón" samples were prepared in a commercial meat plant according to usual practice. Both, meat (lean pork) and fat ck fat) were ground and thoroughly mixed with the other ingredients in a bowl chopper. Each " Salchichón ", contained 65.59 % lean rk meat, 27.90 % pork back fat, 2.16% salt, 1.88% Lactose, 0.94 % Dextrose, 0.6 %whole black pepper, 0.28 % phosphates, 0.188 % hydrate garlic, 0.188% white pepper, 0.09% potassium sorbate, 0.06 % Nutmeg, 0.056% sodium glutamate, 0.047 % sodium corbate, 0.02% potassium nitrate, 0.009 % sodium nitrite. The mixture was stored at 2ºC for 12 h and then was filled in artificial casings ith diameters of 55 and 65 mm, each sample was divided in two zones (core and outer), for each different diameter the core had 25 mm. he weight of each "Salchichón" samples were 500 g approximately. The "Salchichón" were collected at different times : 0, 0.5, 1, 1.5, 2, 13, 20, 26 days after stuffing. The colour parameters under study were: CIE L*a*b* (10º, D65),L* (Lightness), a* (redness), b* yellowness), C* (Chroma), Hue* (hue), S* (saturation). RSI (pigment discolouration), NI (pigment nitrosation), were measured by eflectance RSI (R570/R650), NI (R560/R500), RSI and NI measure (Fe II/ Fe III pigments) and (Myoglobin / Nitrosomyoglobin) spectively. All of these parameters were evaluated by a Minolta CM1000 R Spectrophotometer. The measurements were conducted as osely as possible in the absence of light.

ESULTS AND DISCUSSIONS

This study was divided in two phases (fermentation and ripening). The statistical analysis was made for the general process and for ach phase but taking in account the differences diameters and zones. Tables 1 and 2 show the results for each colour parameter during all e process. Statistically significant differences were found between fermentation phase and ripening except for a*, but for diameters and nes only L* shows statistically significant differences in ripening. L* value during ripening increased, this phenomena can be explained the chemical transformation of myoglobin (Myo) to metmyoglobin (Metmyo) and nitrosomyoglobin (Myo-NO) but other authors ention that L* can be influenced by other physicochemical parameters "(PALOMBO, et al 1989)", "(CAMPO, et al 1991)", the evolution f L during all process is showed in figure 1. The a* evolution can be observed in figure 2. The b* values decreased during fermentation ase. In this phase the lipolytic action takes place on fats by lactic acid bacteria "(SARASIBAR, et al 1989)", "(DEMEYER, et al 1986)", (WISMER-PEDERSEN, 1988)", "(VERPLAETSE, et al 1989)", "(ZERT, 1982)". The evolution of b* can be observed in figure 3. Chemical transformation and dry cured process makes the C* value decrease "(PALOMBO, et al 1989)" during the process, this phenomena is showed in figure 4. Hue* decreased during the process, this can be observed in figure 5. At the end of the ripening the hue was red (30º). The S* values present a strong decrease during the fermentation phase and the evolution is showed in figure 6. The eflectance pigment analysis showed a decrease in NI and RSI at the end of the first day. This decrease in NI indicates that the best onvertion of Myo-NO takes place. The principal causes of this are: the excellent condition to the growth nitrate reductase flora , lactic acid formation, and reduction conditions by indigenous and added reductants and it's effects on the nitrates and nitrites.for the Myo-NO formation."(RONCALES, et al 1989) ", "(GIDDEY, 1966)" "(ZERT, 1982)","(POTTHAST, 1987)", "(BALDINI, et al, 1981) "(SHAHIDI, 1989)". The mechanism to produce Myo-NO need Metmyo "(POTTHAST, 1987)", this can be explained the increase Metmyo concentration, at the end of the first day. of fermentation phase. From 2 to 5 day after the stuffing Metmyo reduced i concentration and then the RSI value reached Myo + Myo-NO / Metmyo equilibrium.

CONCLUSIONS

No statistically significant differences were found for all parameters under study except for L* between diameters and zones. T colour evolution of Salchichón process presents two well defined stages fermentation phase and ripening except for a*. Dry cured proc in Salchichón tends to red hue values. Reflectance analysis allows to determine the time in which nitrosation takes place.

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Table 1.- Evolution of colour parameters in " Salchichón " with diamater of 55 mm during fermentation phase and ripening

	time	zone		L*	a*	b*	C*	Hue*	S*	NI	RSI
FERMENTATION	0	core	X	40.68	7.79	10.77	13.33	54.33	0.33	0.71	0.39
			s.e.	2.02	0.85	0.44	0.65	3.08	0.03	0.02	0.03
		outer	X	40.20	8.78	12.46	15.33	55.63	0.39	0.69	0.40
			s.e.	2.42	1.80	0.74	1.56	4.32	0.06	0.04	0.07
	0.5	core	X	39.34	7.14	9.63	12.17	55.08	0.32	0.67	0.31
			s.e.	4.37	2.13	0.54	1.65	6.70	0.07	0.01	0.03
		outer	X	39.10	7.55	10.99	13.38	55.79	0.35	0.76	0.42
			s.e.	3.39	0.95	0.29	0.54	3.39	0.04	0.03	0.04
	1	core	X	36.11	10.37	12.47	16.25	50.71	0.45	0.77	0.39
			s.e.	1.39	1.45	0.66	1.42	2.65	0.05	0.01	0.01
		outer	X	39.63	8.30	11.55	14.27	54.73	0.37	0.81	0.44
			s.e.	2.54	1.18	0.45	1.04	3.01	0.05	0.02	0.03
	1.5	core	X	42.44	7.65	8.92	11.75	49.59	0.28	0.81	0.47
			s.e.	2.63	0.87	0.59	1.01	1.40	0.04	0.01	0.01
		outer	X	41.49	7.32	9.52	12.02	52.37	0.29	0.81	0.43
			s.e.	2.40	0.48	0.74	0.78	2.01	0.02	0.01	0.02
RIPENING	2	core	X	38.76	8.38	6.95	10.89	39.67	0.28	0.81	0.40
			s.e.	1.27	0.15	0.14	0.18	0.58	0.01	0.01	0.02
		outer	X	41.66	8.19	7.82	11.33	43.80	0.27	0.68	0.36
			s.e.	1.74	0.66	0.40	0.75	1.01	0.03	0.02	0.04
	5	core	X	46.00	8.27	7.51	11.18	42.21	0.24	0.68	0.37
			s.e.	2.11	0.67	0.61	0.88	1.00	0.03	0.03	0.04
		outer	X	41.32	8.45	6.94	10.94	39.41	0.27	0.69	0.37
			s.e.	2.23	0.04	0.06	0.01	0.40	0.01	0.03	0.04
	13	core	X	47.25	7.38	5.58	9.26	37.02	0.19	0.75	0.42
			s.e.	1.34	0.34	0.40	0.51	0.97	0.01	0.01	0.02
		outer	X	44.56	7.84	5.83	9.77	36.78	0.22	0.80	0.42
			s.e.	1.74	0.92	0.51	1.04	1.08	0.03	0.02	0.03
	20	core	X	45.78	8.22	6.23	10.34	37.28	0.23	0.84	0.43
			s.e.	1.18	0.05	0.27	0.25	2.80	0.01	0.01	0.01
		outer	X	44.21	8.46	6.25	10.54	36.77	0.24	0.81	0.44
			s.e.	1.72	0.96	0.45	0.98	2.37	0.02	0.01	0.03
	26	core	X	45.83	9.55	6.10	11.33	32.56	0.25	0.81	0.43
			s.e.	0.20	0.95	0.65	1.14	0.87	0.02	0.02	0.03
		outer	X	42.69	8.56	5.33	10.09	31.88	0.24	0.81	0.42
			s.e.	0.44	0.25	0.27	0.34	0.82	0.01	0.01	0.01

X= mean, s.e. = standard error

Table 2.- Evolution of colour parameters in " Salchichón " with diameter of 65 mm during fermentation phase and ripening

	time	zone		L*	a*	b*	C*	Hue*	S*	NI	RSI
FERMENTATION	0	core	X	40.49	5.70	9.70	11.31	60.59	0.28	0.70	0.43
			s.e.	2.61	1.33	0.80	1.32	4.43	0.05	0.04	0.06
		outer	X	40.28	7.07	9.38	11.78	52.92	0.29	0.72	0.42
			s.e.	0.26	0.66	0.88	0.92	3.03	0.02	0.01	0.02
	0.5	core	X	40.79	7.95	11.30	13.87	55.64	0.35	0.68	0.38
			s.e.	2.44	1.54	0.71	1.45	3.65	0.06	0.02	0.05
		outer	X	35.58	10.70	10.98	15.33	45.75	0.43	0.67	0.30
			s.e.	0.58	0.40	0.17	0.15	0.36	0.01	0.02	0.01
	1	core	X	40.36	6.86	9.72	11.93	55.24	0.30	0.68	0.40
			s.e.	1.42	1.06	0.43	0.94	3.04	0.03	0.01	0.03
		outer	X	36.62	9.28	11.20	14.57	50.16	0.40	0.65	0.32
			s.e.	0.72	0.40	1.02	-0.93	2.37	0.03	0.01	0.01
	1.5	core	X	38.11	9.24	10.32	13.86	48.16	0.36	0.71	0.32
			s.e.	1.20	0.32	0.23	0.19	1.42	0.01	0.01	0.02
		outer	X	35.77	11.40	11.51	16.20	45.21	0.46	0.68	0.29
			s.e.	0.55	0.33	0.65	0.66	1.06	0.02	0.01	0.01
RIPENING	2	core	X	41.74	8.82	7.32	11.47	39.76	0.28	0.80	0.41
			s.e.	0.44	0.42	0.10	0.35	1.28	0.01	0.01	0.01
		outer	X	41.93	8.63	7.31	11.31	40.28	0.27	0.79	0.38
			s.e.	0.10	0.90	0.01	0.07	0.30	0.01	0.01	0.02
	5	core	X	45.38	8.06	7.23	10.84	41.83	0.24	0.81	0.45
			s.e.	2.79	0.29	0.47	0.38	2.14	0.01	0.01	0.02
		outer	X	45.89	5.92	6.10	8.54	45.09	0.19	0.83	0.50
			s.e.	2.99	0.31	1.06	0.97	3.64	0.03	0.01	0.05
	13	core	X	53.17	6.99	5.58	8.95	38.57	0.17	0.82	0.50
			s.e.	1.82	0.74	0.60	0.91	1.74	0.02	0.01	0.03
		outer	X	45.29	8.03	6.33	10.22	38.26	0.23	0.82	0.44
			s.e.	1.96	0.72	0.60	0.91	1.20	0.03	0.01	0.03
	20	core	X	49.64	7.24	6.46	9.74	41.92	0.20	0.83	0.48
			s.e.	0.85	0.68	0.39	0.50	3.48	0.01	0.01	0.02
		outer	X	42.23	7.66	5.40	9.39	35.19	0.23	0.82	0.44
			s.e.	3.54	0.27	0.29	0.11	2.33	0.02	0.01	0.02
	26	core	X	47.81	8.5	5.69	10.27	33.54	0.22	0.80	0.43
			s.e.	1.71	0.95	0.71	1.15	1.,45	0.03	0.01	0.03
		outer	X	40.86	7.28	5.38	10.74	30.36	0.29	0.80	0.39
			s.e.	2.48	0.68	0.08	0.55	2.26	0.03	0.02	0.03

X= mean, s.e. = standard error

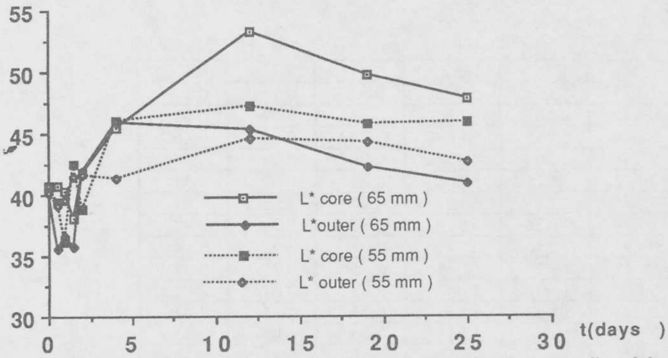

Fig. 1 .- Evolution of L* in " Salchichones " with diameters of 55 and 65 mm

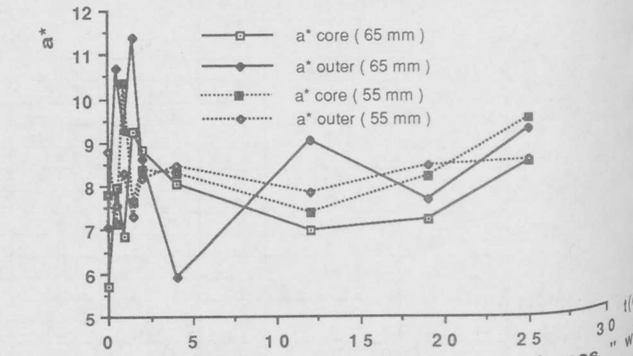

Fig. 2.- Evolution of a* in " Salchichones " with diameters of 55 and 65 mm

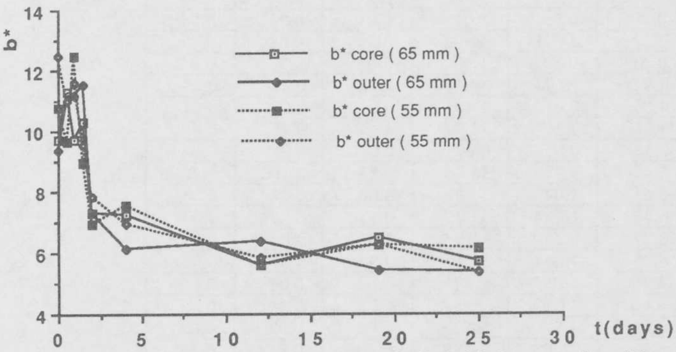

Fig. 3.- Evolution of b* in " Salchichones " with diameters of 55 and 65 mm

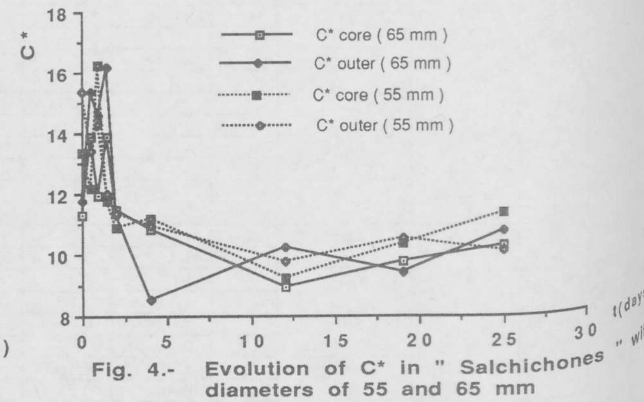

Fig. 4.- Evolution of C* in " Salchichones " with diameters of 55 and 65 mm

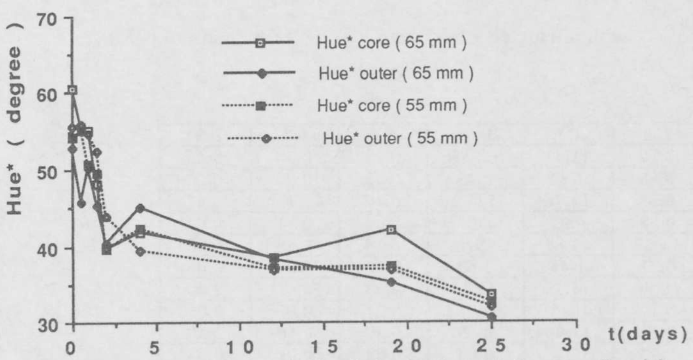

Fig. 5.- Evolution of Hue* in " Salchichones " with diameters of 55 and 65 mm

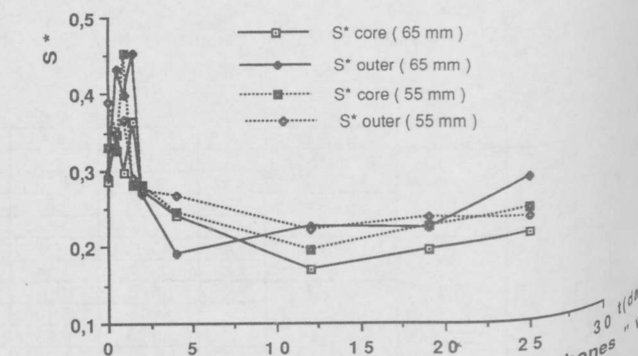

Fig. 6.- Evolution of S* in " Salchichones " with diameters of 55 and 65 mm

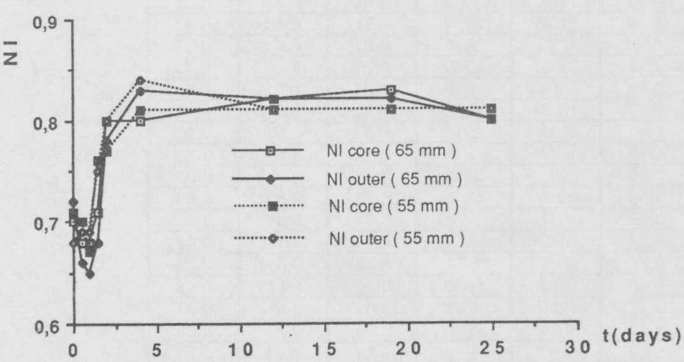

Fig 7.- Evolution of NI in " Salchichones " with diameters of 55 and 65 mm

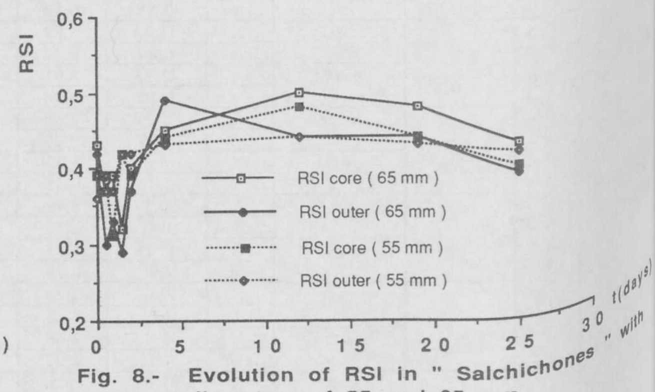

Fig. 8.- Evolution of RSI in " Salchichones " with diameters of 55 and 65 mm