

SPLEEN PROTEIN CONCENTRATE UTILIZATION IN FRANKFURTERS
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SUMMARY: A spleen protein concentrate (SPC) is utilized as meat extensor at a level of 18% in frankfurters, allowing for saving in pork meat. The frankfurters presented quality specifications in accordance with established norms. There were no significant differences in yield during the heat treatment and at the end of the storage period with respect to the control sample. The texture parameters evaluated differ between the experimental samples and the control, even though all products received a general acceptance of "I like it very much".

INTRODUCTION: Among meat extensors widely used in the elaboration of different derivatives, have been used successfully, flours, soy concentrates and isolates, blood and its constituents, as well as other products from cattle sacrifices at slaughter-houses have been also object of study for this purpose. The objective of the present study is the elaboration of a frankfurter sausage, utilizing a spleen protein concentrate (SPC) as meat extensor, as well as determination of the main quality attributes of this product.

MATERIALS AND METHODS: A SPC obtained by Lantero et al (1985) was utilized in the elaboration of the sausages. After three adjustment experiments, the formula was selected with maximum level of substitution of 18% SPC, instead of pork meat. Two levels of addition of wheat flour were used in order to improve the texture. The sausages were elaborated in accordance with established commercial formulae, and stored during 8 days. Characterization of the products was made through the following determinations:

-Physico-chemical determinations: proteins (NC 79 09-08:82); nitrites, chloride and humidity (NC 79 06:81); fat (NC 79 09-05:83); pH (NC 76 09-03:82); acidity (% lactic acid) (NC 76 09:82).

-Microbiological determinations: total of aerobic mesophile microorganisms and facultative anaerobic (NC 76 04-1:82); coliform organisms (NC 76 04-4:82); Salmonella (NC 76 04-8:82) and toxigenic staphylococcus (NC 04-9:82).

-Sensorial evaluation: through a 7 points hedonic scale applied to over 100 panelists.

-Yield was determined during heat treatment and storing. Texture profile: was evaluated for hardness, elasticity, cohesivity, gumminess and chewiness (Bourne, 1978) in an universal Instron testing machine, model 1140.

-Water activity (a_w): was determined in an electronic hygrometer Novasina.

Determination of pH and acidity, as well as microbiological and sensorial determinations were made on the fresh product and after 4 and 8 days of storage. Yields was calculated

after 24 hours and after 3,5 and 8 days. Results were statistically processed.

RESULTS AND DISCUSSION: Table 1 shows the chemical composition of the sausages, observing that the experimental sausages do not show great differences with respect to the control. Results obtained respect the main quality specifications are in accordance with the norms for this type of product, which establish a minimum of 11% proteins; pH between 5,7-6,7; a maximum value of 125 mg/kg of nitrite and between 1,5-3 % of chloride. Variation in acidity with time (Table 2) shows similar characteristics for all the products, eventhough it should be considered that the microflora of SPC may present metabolic characteristics that determine the accumulation of products with different influence on acidity. Results of the sensorial evaluation (Table 3) allow to classify the products in the category of " I like it very much " in terms of the scale used. The statistical difference between the control and the B sausages, eventhough small, owes itself fundamentally to the texture of the experimental sausages, wich were less firm than the controls'. During conservation, the products were favorably accepted by the panelists, maintaining in all cases the classification of " I like it very much ". Nevertheless mean value of the sensorial criteria showed a tendency to diminish with time, and in the opinion of the panelists, this was related to changes in the texture of the product, more than to the taste of the same.

The sausages' sanitary quality was satisfactory (Table 4). Ledesma (1988) obtained sausages extended with protein concentrates of rice bran with levels of 10 microorganisms/g in the just elaborated product, in spite of utilizing substitution percentages which were notably lower. Statistical analysis of weight differences during the heat treatment and storage showed no significant differences among the various formulations during the heat treatment and storage periods. Incorporation of SPC into the sausages as meat extensor does not lead to yield disminution, with values being in the established levels for this product. Likewise there are no significant differences among yield values obtained after 8 days of storage, eventhough it should be pointed out that the obtained values for the experimental formulation are somewhat superior. Theses result are mainly influenced by the functional characteristics of the spleen proteins after their obtention as a proteic concentrate. In accordance with Lantero, et al. (1988) the SPC shows the capacity to form gel and stable emulsions, being the set as a whole of its functional properties which determines the behavior in the system under study.

Texture parameters evaluated (table 5.) showed among themselves highly significant differences among the different formulations. The sample taken as control shows superior values in all parameters, which coincide with those reported by De Hombre et al (1986) for sousages of the some type. Also, the classified samples as B, showed superior values of

the texture indicators with respect to the A samples. This maybe related with a larger content of wheat flour. The a in the control and the A and B sousages showed 0.9450, 0.9561 and 0.9492 respectively. Roca (1983) reports a value of 0.972 in sausages with similar characteristics as the control.

Table.1 Sausages' chemical composition (%) and chemical quality index (1)

Chemical composition	Sausage		
	Control	A	B
Humidity (%)	58,8 ± 0,2	58,1 ± 2,7	59,8 ± 1,5
Fat (%)	10,58 ± 0,1	14,7 ± 0,5	14,1 ± 14,09
Ashes (%)	3,7 ± 0,4	3,2 ± 0,5	3,6 ± 0,6
Proteins (%)	16,4 ± 0,1	14,7 ± 0,5	14,1 ± 0,9
pH	5,9 ± 0,4	5,8 ± 0,3	5,9 ± 0,2
Nitrite (%) (mg/kg)	101,3 ± 1,9	92,9 ± 5,4	98,9 ± 3,7
Solt content (%)	3,4 ± 0,20	3,87 ± 0,10	2,90 ± 0,5

(1) Mean values ± SD

Table. 2 Sausages' pH and acidity behavior during storage

Parameter	Time (days)	Control	A	B
Acidity	0	1,3 ± 0,5	1,1 ± 0,3	1,1 ± 0,2
	4	1,3 ± 0,5	1,2 ± 0,3	1,1 ± 0,2
	8	1,1 ± 0,2	1,2 ± 0,4	1,2 ± 0,4
pH	0	5,9 ± 0,4	5,8 ± 0,3	5,9 ± 0,2
	4	5,9 ± 0,4	5,8 ± 0,3	5,9 ± 0,2
	8	5,8 ± 0,3	5,5 ± 0,1	5,6 ± 0,4

(1) Mean values ± SD

Table. 3 Sensorial evaluation during storage (1)

Time (days)	Control	A	B
0	5,85 (d)	5,74 (e)	5,84 a (f)
4	5,82	5,70 ab	5,82 a
8	5,79	5,65 b	5,73 b

(1) Mean values from more than 100 consumers
Diferente letters in each column indicate significant differences at $p < 0,05$.

Diferent letterstot= 0 means significant difference at $p < 0,05$

diference at $p < 0,05$

Mean values without letters in common differ at $p < 0,05$

Table. 4 Sausages' microbiological characteristics during storage (1)

Bacterial Groups	Time (days)	Control	A	B
Mesophilic aerobes and facultative anaerobes/g	0	0.26.10	1.4.10	3.1.10
	4	1.8.10	2.8.10	3.3.10
	8	8.1.10	9.7.10	5.4.10
	0	< 10	< 10	< 10
Coliforms/g	4	< 10	< 10	< 10
	8	< 10	< 10	< 10
	0	0	0	0
Coagulase-positive staphylococci	4	0	0	0
	8	0	0	0
	0	0	0	0
Salmonella	4	0	0	0
	8	0	0	0

(1) Means values from three experiments

Table. 5 Sausages' texture profile

Textural property	Control	A	B	F	Sig
Hardness	13,3 a	5,4 c	7,1 b	399,06	***
Elasticity	7,6 a	6,0 c	6,8 b	20,58	***
Cohesiveness	0,33 a	0,22 c	0,26 b	20,43	***
Gumminess	4,5 a	1,2 c	1,9 b	344,86	***
Chewinesss	31,6 a	7,5 c	13,0 b	551,6	***

*** Mean values without letter in common differ at $p < 0,05$

CONCLUSION: Technological feasibility to substitute pork meat for SPC in a frankfurter type sausage is revealed up to 18% substitution. The product quality were generally accepted in the category of " I like it very much " and are apt for consumption within a period of 8 days. the sausages' texture differs significantly from the control, finding differences between the experimental samples, which favor the B samples. The a allows to classify them in the category of semiperishable

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