

THE ACTION MECHANISM OF THE SOY PROTEIN IN THE DRY SAUSAGE

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SUMMARY

The soy protein employed at the 0.6% and 0.9% levels in the isolated form has stimulated the microbial flora growth (microorganisms mesophyll aerobic), which surpasses the 10^9 ufc/g on 7th day of processing. In concentrated form, the soy protein, besides stimulating a little more growth of this microbial flora, has determined a greater dehydration level of salami (relation between humidity and protein equal to 1.44 - 1.0) and a greater conversion rate of pigments into nitrous pigments with a consequently color intensification. This complementary behavior of soy protein when in concentrated form is probably due to the carbohydrates which normally accompany the process. The use of soy protein in salamis should be a recommended practice since besides not only reducing the time of stay in the meat industry, permits the manufacture of a product with better appearance as it intensifies the color and avoids the formation of the dehydration ring.

INTRODUCTION

For many years the soy protein was used in the sausage industry because of its emulsifying, gelling and stabilizing properties. Now, it is possible that its most important use is as meat extender. All of these forms of application are aimed at obtaining food at low cost while maintaining its nutritional value. It is estimated that in Europe alone more than 17,000 tons of soy protein was used in cooked sausages and fermented sausages (KADANE, 1979).

In dry sausages, the soy protein, besides facilitating the attainment of a very good texture, is used to reduce the manufacturing time by more than 30% (TERRA & MARTINS, 1986). VANDEKERCKHOVE & DEMEYER (1978), working with the isolated soy protein in the manufacturing of sausage justified the reduction in manufacture time because of the existence of a growth factor. This growth factor would cause a rapid growth of microbial flora with a reduction in pH and removal of moisture from the sausage.

This work intends to employ isolated soy protein (90% protein) and soy protein concentrate (PS-60, 60% protein) in the manufacture of dry sausage (Italian type sausage) and to study the mechanism responsible for the time reduction in that manufacturing process.

MATERIAL AND METHODS

The Italian type of salami was prepared observing six different formulations. The difference was only in the soy protein quantity and the vehicle for that. The vehicle

was isolated soy protein and soy protein concentrate.

All formulations had an outside enclosure of a 60 mm cellulosis and all were treated identically.

The conditions of ripening period was 28°C, 85-90% RH during four days and the dehydration period was 16-18°C, 75% RH during twenty days. Immediately after the enclosure in the cellulosis casing samples were taken every hour in order to determine the pH (pHmeter Digimed, Mod. DMPH-2, BUEGE & CASSENS, 1980), and every three days for the microbiological control. This microbiological control consisted of the quantification of total microorganisms mesophyll aerobic (Agar Plate Count, 29-31°C, 48 ± 3 hours), total coliforms (Caldo BRILLA, 35-37°C, 24-48 hours), fecal coliforms (Caldo BRILLA and Triptone Water, 44°C ± 0.1°C), total *Staphylococcus* (Agar Baird Parker, 35-37°C, 30-48 hours) and *Staphylococcus aureus* (Agar Baird Parker, 35-37°C, 30-48 hours), following the description of RATTO (1982). After twenty days (ripening period + dehydration period) when the dry sausage manufacturing was completed (considered resistant to compression, with color and flavor) there were taken representative samples in order to determine the moisture content (Heating at 100-102°C; KONIECKO, 1979), total protein (Kjeldahl method; KONIECKO, 1979), pH (reading in pH meter Digimed; BUEGE & CASSENS, 1980), nitroso pigment (extraction with acetone and lecture at 540 nm in spectrophotometer Perkin Elmer, mod. 295 E; KONIECKO, 1979), total pigment (extraction with acidified acetone and lecture at 640 nm in spectrophotometer Perkin Elmer, mod. 295 E; KONIECKO, 1979), nitrite (sulfanilic acid method; KONIECKO, 1979), and nitrate (xylenol method; KONIECKO, 1979).

RESULTS AND DISCUSSION

The results are presented at Tables 2, 3, 4 and Figures 1 and 2.

The soy protein when under isolated conditions speeds up the salami making process both by means of flora stimulation and by the flow of inner moisture to the outside of the piece, thus avoiding the formation of a dehydration ring.

The soy protein when under concentrate conditions, accelerates the salami making process, especially due to the quick reduction in pH value with approximation of the isoelectric point of the meat proteins and consequent loss of moisture.

The concentrate soy protein has caused a higher conversion of the pigments into nitrous pigment thus improving the color of the final product.

The soy proteic isolate has a growth factor which acts mainly on the microbial flora that is non acidifying.

The soy protein did not stimulate the growth of either coliforms or *Staphylococcus aureus*.

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Table 3. Moisture-protein ratios for Italian type salami

Formulation	Moisture-Protein
I (control)	1,49 to 1
II	1,49 to 1
III	1,57 to 1
IV	1,59 to 1
V	1,44 to 1
VI	1,44 to 1

Table 4. Meat pigments and conversion to cured pigment in Italian type salami

Formulation	Pigment		Conversion* (%)
	nitrous (ppm)	total (ppm)	
I (control)	151,6	297,6	50,9
II	164,8	318,5	51,7
III	149,5	336,5	44,4
IV	162,6	310,0	52,4
V	135,8	281,8	48,2
VI	143,5	270,5	53,0

Table 1. Formulations of Italian type salami (kg)

Item	Formulation					
	I	II	III	IV	V	VI
Pork	60,0	60,0	60,0	60,0	60,0	60,0
Beef	20,0	20,0	20,0	20,0	20,0	20,0
Lard	20,0	20,0	20,0	20,0	20,0	20,0
Salt	3,0	3,0	3,0	3,0	3,0	3,0
Glucose	0,5	0,5	0,5	0,5	0,5	0,5
Sucrose	0,5	0,5	0,5	0,5	0,5	0,5
Curing mix	0,3	0,3	0,3	0,3	0,3	0,3
White pepper	0,2	0,2	0,2	0,2	0,2	0,2
Garlic	0,5	0,5	0,5	0,5	0,5	0,5
Nutmeg	0,02	0,02	0,02	0,02	0,02	0,02
Antioxidant mixture	0,25	0,25	0,25	0,25	0,25	0,25
Isolated soy protein (90% protein)	-	-	1,0	-	0,66	-
Soy protein concentrate (60% protein)	-	5,0*	-	1,0	-	1,5

* PS- 60 gel (1 part PS-60 + 4 parts water).

Table 2. Some characteristics of Italian type salami (completed product) obtained with the different formulations

Formulation	Moisture (%)	Protein (%)	pH	Pigment		Nitrite (ppm)	Nitrate (ppm)
				nitrous (ppm)	total (ppm)		
I (control)	38,25	25,65	4,6	151,6	297,6	6,2	80,0
II	38,94	26,13	4,6	164,8	318,5	7,2	75,0
III	41,26	26,13	4,9	149,5	336,5	8,0	70,0
IV	39,96	25,07	4,7	162,6	310,0	6,5	73,0
V	35,72	24,80	4,5	135,8	281,8	9,0	73,0
VI	37,11	25,60	4,8	143,5	270,5	8,5	75,0

