8 - 12 ON THE UTILIZATION OF SOME PROTEIN ADDITIVES IN MEAT PRODUCTS

Dany Pérez
Mercedes Lindres

Food Industry Research Institute, Havana
Cuba

INTRODUCTION

Many different protein products are used at present as extenders and/or functional additives in meat products (Pearson et al, 1965; Johnson, 1970; Mattil, 1971; Hermansson and Akesson, 1975), on account of their functional properties.

This paper presents results obtained in the evaluation of the functional properties of the following protein additives: soy protein isolate (SPI), sodium caseinate (SC), soy protein concentrate (SPC), non-fat dry milk (NFDM) and a whey protein concentrate (WPC), in order to use them as meat extenders in comminuted meat products.

MATERIALS AND METHODS

Samples of 2 brands of SPI, 2 brands of SC, and one each of SPC, NFDM and WPC were analyzed for crude protein, fat (ether extract) and moisture (AOAC, 1980) pH of the 10% aqueous dispersion and water holding capacity (WHC) (Smith et al, 1973), soluble protein (Eklund and Fortuin, 1969), and emulsifying capacity and emulsion stability (Hörmendy, I.)

The effect of 5 levels of pH (3,0; 5,0; 7,0; 8,0 and 10,0) over protein extraction was studied in 3 of the additives: 1 brand of SPI, 1 brand of SC, and NFDM. Emulsifying properties of these additives were evaluated at 3 levels of pH. Frankfurter formulae were prepared at lab scale, with either 2% SPI or SC substituting for 10% of the meat, and 2% NFDM substituting for 5% of the meat. Identical batches of the formulae with SPI and SC were prepared, using 0% and 0,35% tetrasodium pyrophosphate to raise the pH of the emulsion. A control all-meat formula was also prepared.

The products were sampled for sensory and chemical analysis, as well as color evaluation in a Hunterlab tristimulus colorimeter D25-2 delta L, Hunterlab I, a, b results were expressed as lightness, I, saturation, ($S = \sqrt{a^2 + b^2}$) and hue ($H = \arctan b/a$)

RESULTS AND DISCUSSION

Tables 1 and 2 show the results of chemical analysis and functional properties. Moisture content is generally above normal, which could be due to non-hermetic sealing in packaging. Soluble protein content is rather low for both SPI products and WPC, although the latter formed moderately stable emulsions. The very poor emulsifying properties of both SPI products at low pH is also evident. On the other hand, both SC samples exhibited a relatively low WHC as compared to SPI, but excellent emulsifying capacity and emulsion stability, even under heat treatment.

Figure 1 shows the effect of pH on protein solubility. This effect was more pronounced with one of the SPI samples. These results correspond well with those in Table 3, wich show very good stability of emulsions at pH 10,4.

No significant differences were found between the extended frankfurters and the control, either organoleptically or in proximate composition (Tables 4 and 6)

Total color difference (ΔE; Table 5) was larger in products with SPI and SC without pyrophosphate, although always rather small from the organoleptic point of view.

CONCLUSIONS

1.- The soya isolates showed good over-all WHC, but only exhibited good emulsifyin properties at high pH.

2.- Caseinates showed a relatively low WHC, but excellent emulsifying properties.

3.- Non-fat dry milk exhibited its best emulsifying capacity at pH 5,2, wich makes it good for use in meat products.

4.- The whey protein concentrate was only moderately good as emulsifier

5.- The solubility of all protein products tested was pH-dependent, particularly for PSI.

6.- The extended frankfuters prepared were similar to the control, both in organoleptic properties and proximate composition.

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Additive	%Fat	%Moisture	%Protein	%Soluble Protein	pH	WHC
PSI Brand A	3.99	9.44	80.41	20.83	7.05	4.7
PSI Brand B	3.55	10.66	84.26	36.63	7.07	6.0
SPC	0.36	9.49	75.37	16.89	6.81	4.4
NFDM	0.67	4.44	36.59	31.25	6.67	-
Sodium Caseinate A	0.26	8.61	82.41	81.17	7.03	1.6
Sodium Caseinate B	0.02	11.69	78.71	71.32	7.09	1.7
WPC	0.24	7.81	62.32	4.05	5.05	2.3

-very soluble in water

Table 1 Proximate composition and functional properties

Additive	T°C/	Proportion Fat:Additive:Water	5 : 1 : 5 cold	5 : 1 : 5 hot	5 : 2 : 5 cold	5 : 2 : 5 hot	10 : 1 : cold	10 : 1 : hot
PSI Brand A	80		3	4	3	4.5	3	5
	100		2	4	3	4.5	2	3
PSI Brand B	80		3	4	-	-	3	5
	100		1	4	-	-	2	4
NFDM	80		3	5	5	5.5	-	-
	100		3	4.8	4.5	5	-	-
Sodium Caseinate A	80		6	6	-	-	-	-
	100		6	6	-	-	-	-
Sodium Caseinate B	80		6	6	-	-	-	-
	100		6	6	-	-	-	-
WPC	80		3	5	3	5	1	4
	100		2	4.5	3	4.5	1	3
SPC	80		1	4.5	1	4	1	4.5
	100		1	4.5	1	4	1	4.5

Table 2 Emulsifying capacity and emulsion stability

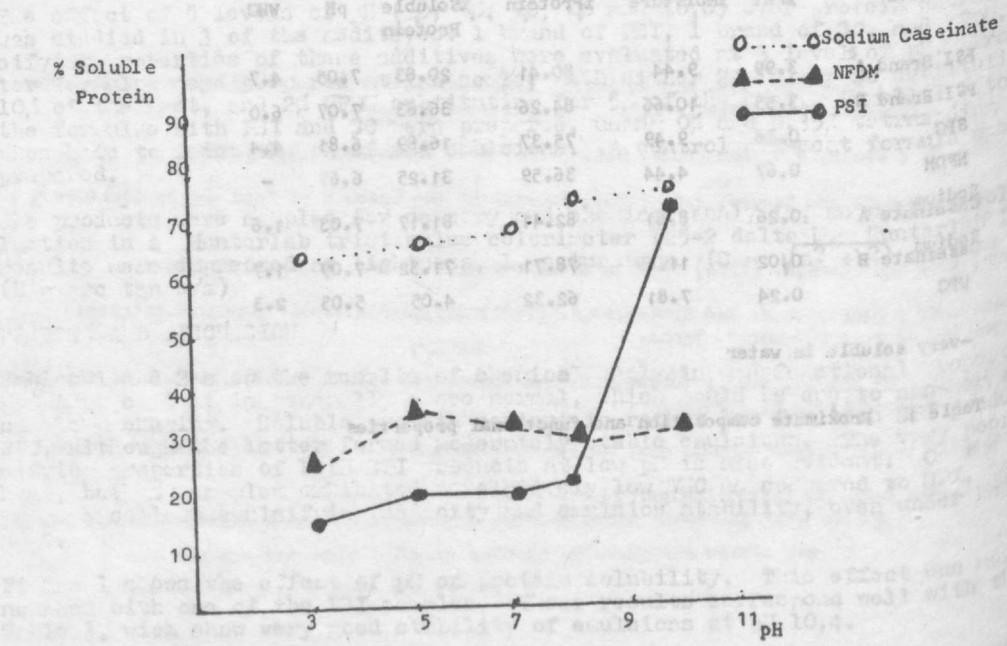

Fig.1. Effect Of pH on protein solubility

Additive	pH	5: 1: 5 80°C	5: 1: 5 100°C	5: 2: 5 80°C	5: 2: 5 100°C
PSI Brand A	5,2	3	4	-	-
" "	7,0	4	4	-	-
" "	10,4	6	6	-	-
Sodium Caseinate B	5.2	6	6	-	-
" "	7,0	6	6	-	-
" "	10,4	6	6	-	-
NFDM	5,2	5,5	5	5,8	5,6
"	7,0	5	4,8	5,6	5

Table 3 . Effect of pH on emulsifying capacity of 3 additives.

Additive	N°judges	N°Preferring control	N°Preferring extended	N°Preferring extended+ pyrophosphate	Minimum n°of judges to estabish sig nificant difference
PSI Brand A	12	8	4	-	10
" + pyr.	12	-	8	4	10
Sodium Cas.B	12	6	6	-	10
" + pyr.	12	-	5.5	6.5	10
NFDM	12	7	9	-	10

Table 4 . Results of the paired comparison test.

Additives	ΔL	ΔS	ΔH	ΔE
PSI Brand A	1,8(0,4)	0,5(0.2)	13,4(0,8)	1,8(0,4)
" + pyr.	0,6(0,5)	0,6(0,0)	4,9 (0,7)	0,7(0,5)
Sodium Cas. B	-1,7(0,4)	0,8(0,1)	5,0(1,5)	2,2(0,3)
" + pyr.	-1,4(0,3)	0,4(0,1)	-0,4(1,1)	-1,4(0,7)
NFDM	0,0(0,2)	-2,1(0,1)	-2,1(0,7)	0,1(0,2)

Table 5. Color Measurement . Mean values (Std. dev.)

Product	% Protein	% Moisture	% Fat	% Chloride
Control	9,98	56,99	22,50	2,65
PSI Brand A	10,96	57,89	22,90	2,62
" + pyr.	10,81	56,88	22,30	2,66
Sodium Cas.B	10,84	58,24	22,90	2,68
" + pyr.	10,79	57,02	22,80	2,68
NFDM	10,16	56,44	21,60	2,56

Table 6. Proximate composition analysis.