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STUDIES ON SAUSAGE SUPPLEMENTED WITH SOY - SUNFLOWER PROTEINS :

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SUMMARY

Sunflower-Soy protein isolate mixture (containing 70% soybean and 30% sunflowerprotein isolates) was used to supplement sausage . Such a mixture was used at a level of 7.5% plus 22.5% water to replace 30% of red meat. Organoleptic tests and consumer preferences were in favour of supplemented sausage with soy - sunflower protein isolate mixture plus sodium alginates. The nutritional value of supplemented sausage protein was not affected when compared with the FAO pattern , where calculated amino acid score (A.S) values were 1.0 or more .

Grams consumed to cover the daily requirements of man in all essential amino acids were 196 gram for the control beef sausage, being less for supplemented sausage with plant protein isolate mixture (189 gram) and supplemented sausage plus alginate (193 gram) . Supplementation increased methionine plus cystine in 100 gram of sausage.

INTRODUCTION

The incorporation of soy products such as soy flour , concentrate and isolate in comminuted meats drew the attention of many investigators (6, 22, 16, 13, 15, 2, 27, 5, 20, 7 and 17). The replacement of meat by hydrated vegetable proteins in meat products should be limited to a maximum of 30% . The organoleptic properties of some meat products containing different levels of soy products were also evaluated by some research workers , 10, 8, 11 and 17. The characteristics of sausages prepared with alginates has been also studied (1).

It is well known that soy protein is high in lysine and low in sulphur containing amino acids. (25, 24). On the other hand sunflower protein is poor in lysine and has a moderate content of sulphur containing amino acids . (25 , 24). Accordingly both proteins could complement each other . It has been proved that as regards to amino acids and nutritive value a best sunflower-soybean protein isolate mixture could be obtained by mixing 20% soybean protein isolate and 30% sunflower protein isolate (12) .

This investigation was carried out to study the production of sausage supplemented with soy-sunflower protein isolates as regards to its nutritive value and organoleptic properties.

MATERIALS AND METHODS

- 1) Soybean and sunflower protein isolates were prepared accoring to Foda (19 & 6)
- 2) Different sausage samples were prepared as mentioned by El-Dashlouty(1978) as follows :
a) Control sample (100% meat). b) Sausage supplemented with soybean-sunflower protein isolates were processed by replacement 30% red meat by 7.5% soy-sunflower protein isolate mixture (70% soy + 30% sunflower isolate plus 22.5% water) . c) sausage prepared as mentioned in sample b + 1% sodium alginate .

- 3) Qualitative and quantitative analysis of amino acids :
a. Amino acids were determined using paper chromatography procedure as described by (4 , 26) .
b. Tryptophan was determined according to the method reported by (3) .
c. The amino acid score (A.A.S) was calculated for each sample according to the following equation :
$$A.A.S = \frac{\text{mg. of amino acid in 1 gm. of tested Protein}}{\text{mg. of amino acid in 1 gm. of reference pattenr FAO}}$$

d. The essential amino acid index (EAAI) had been calculated (21) .
e. The biological value (B.V.) of each product was calculated according to (21) equation
$$B.V. = 1.09 \times EAAI - 11.73$$
- 4) Organoleptic evaluation of cooked sausage
organoleptic evaluation of cooked samples in bioling water (sausage:water, 1:2 W/W) at 100°C for 15 minutes , (19). A number of 5 trained persons were asked to evaluate : colour , aroma, taste and tenderness of the cooked sausage. Average scores were given out of ten for each parameter .

RESULTS AND DISCUSSIONS

Organoleptic evaluation of sausage :

From table (1) it could be observed that the colour, odour, taste and texture scores were reduced somewhat as the proportion of sunflower-soy protein isolate mixture was increased. Nevertheless, addition of 1% alginate raised the scores to the level characteristic of the control sample . In addition tenderness scores were higher than that recorded for the control sample.

Table(1): Organoleptic Scores of cooked beef sausage

parameter	Beef Sausage containing				
	Control	3.75% protein isolate	5% protein isolate	7.5% protein isolate	7.5% protein isolate + 1% alginates
Colour	9	9	8	7	9
Aroma	8	8	7	7	8
Taste	9	9	9	8	9
Tenderness	7	7	6	6	9

Amino acid composition of sausages :

Data presented in table (2) indicated that supplementation of beef sausage with sunflower-soy protein isolate mixture reduced somewhat the EAAI and B.V. of beef sausage and addition of alginate did not affect either the amino acid composition or the EAAI and B.V. of sausage protein to a great extent .

Although the addition of plant protein isolate mixture reduced somewhat the EAAI and B.V. of sausage protein, it appeared that such reduction did not affect the protein quality when compared with the FAO reference protein (Table 3). Amino acid scores (A.S.) for all essential amino acids were over 1.0 except for threonine, where A.S. was about 1.0 . Thereby, supplementation of beef sausage, with sunflower - soy protein isolate mixture or in other words replacement of some part of meat with 7.5% protein isolate and or 7.5% protein isolate + 1% alginate did not reduce the amino acids below the FAO pattern. Addition of sodium alginate had very slight effect on the calculated A.S. values .

Amino acid composition as gm/100 gram sausage was calculated and grams consumed to meet the daily requirements (G.D.R.) of man in essential

amino acid(G.D.R.)were calculated;results are shown in tables (4 & 5).From the results in table (5)it could be noticed that the limiting amino acids were the sulphur containing acids.where highest values of G.D.R. were recorded.Nevertheless supplementation of beef sausage with sunflower-soy protein isolate slightly increased the sausage content of methionine + cysteine and reduced calculated G.D.R. for these limiting acids indicating the higher nutritional value of supplemented sausage when compared with the control sample. Grams consumed to cover the daily requirements of man in all essential amino acids were 196 gm,189 gm and 193 gm in case of control sausage,sausage which contained 7.5% protein isolate and that which contained 7.5% protein isolate + 1% alginate.This indicated that alginate sample was also of higher nutritional value than the control sausage due to supplementation with plant protein isolate mixture.

Table(2):Amino acid composition of sausage (gm/100 gm protein)

Amino acids	Sausage		
	Beef sausage control	with 7.5% protein isolate	with 7.5% protein isolate +1% alginate
Leucine + isoleucine	13.52	12.94	12.93
Phenylalanine	4.00	4.38	4.37
Valine	5.27	5.46	5.45
Methionine	2.00	2.07	2.06
Tyrosine	3.20	3.23	3.24
Proline	5.42	6.11	6.10
Alanine + Glutamic	20.77	19.97	19.95
Threonine	4.94	3.98	3.96
Glycine	7.14	6.31	6.30
Aspartic	3.78	5.52	5.51
Arginine	6.61	7.19	7.18
Histidine	2.86	2.66	2.65
Lysine	8.39	7.44	7.43
Cystine + cysteine	1.42	1.59	1.58
Tryptophan	1.09	1.11	1.10
EAAL	83.16	78.73	67.58
B.V.	77.85	72.91	72.75

Table (4)
Amino acid composition of beef sausage (gm/100 gm sample)

Amino acids	Sausage containing		
	Control	7.5% protein isolate	7.5% protein isolate + 1% alginate
Leucine + isoleucine	1.96	2.05	2.02
Phenylalanine	0.58	0.70	0.68
Valine	0.83	0.87	0.85
Methionine	0.55	0.53	0.52
Proline	0.46	0.51	0.50
Tyrosine	0.79	0.97	0.95
Alanine + Glutamic	3.01	2.94	2.89
Threonine	0.59	0.63	0.62
Glycine	1.03	1.00	0.98
Aspartic	1.28	1.40	1.44
Arginine	0.54	0.66	0.66
Histidine	0.96	1.00	0.98
Lysine	0.44	0.42	0.41
Cystine + cysteine	1.22	1.11	1.16
Tryptophan	0.21	0.25	0.24
EAAL	0.16	0.16	0.17

Table (3)

Amino acid composition (mg/1 gm Nitrogen) and amino acid Score for beef sausage supplemented with protein isolate

Amino acids	P A O mg/1 gm N.	Amino acid composition sausage containing			Amino acid Score sausage containing		
		Control	7.5% protein isolate	7.5% protein isolate + 1% alginate	Control	7.5% protein isolate	7.5% protein isolate + 1% alginate
Leucine + isoleucine	690	845.00	808.75	808.13	1.23	1.17	1.17
Lysine	430	524.00	465.00	464.38	1.54	1.37	1.36
Methionine + Cystine	220	258.75	228.75	227.50	1.09	1.04	1.03
Phenylalanine + Tyrosine	380	450.00	475.63	475.62	1.18	1.25	1.25
Threonine	250	252.50	248.75	247.50	1.01	1.00	0.99
Tryptophan	60	68.13	69.75	68.75	1.14	1.16	1.15
Valine	310	357.50	341.25	340.63	1.15	1.10	1.09

Table (5)

Grams consumed of sausage to meet the daily requirements of man in essential amino acids (G.D.R.)

Amino acids	Daily requirements of man/gm.	Sausage containing					
		Control		7.5% protein isolate		7.5% protein isolate + 1% alginate	
		gm/100 gm sample	G.D.R.	gm/100 gm sample	G.D.R.	gm/100 gm sample	G.D.R.
Leucine + isoleucine	1.80	1.96	92	2.05	81	2.02	89
Lysine	0.80	1.22	66	1.16	66	1.16	69
Methionine + Cystine	1.10	0.56	196	0.58	189	0.57	193
Phenylalanine + Tyrosine	1.10	1.04	106	1.21	91	1.19	92
Threonine	0.50	0.59	85	0.63	79	0.62	81
Tryptophan	0.25	0.16	156	0.18	139	0.17	147
Valine	0.60	0.83	96	0.87	92	0.85	94

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