Egypt. J. Agric. Res. , 72 (3), 1994.

COMMON NUTS SUBSTITUTE PREPARED OF SOYBEANS: 3 - UTILIZATION OF SOY NUT IN HIGH PROTEIN ORIENTAL SWEETS.

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(Manuscript received 26 August 1990)

Abstract

In the persent work a new name (high protein sweets) was suggested for halwa baladi prepared with high proportion of nuts (sugar was used only for taste and as a sticking a gent for nuts). While in a previous study halwa kors was found to contain 7.11-13.57%, high protein sweets had in the present work 10.67-19.78% protein. High protein sweets such as folea (peanut), semsimea(sesame), loozea (almond), bondokea (hazel nut) and fostokea (pistachio) were prepared with replacement of 50% common nuts with soy nut. This increased the protein content to 20.20 - 24.90%. Soyea prepared from 100% soy nut had 29.66% protein . The number of deficient essential amino acids (EAA) decreased and protein quality increased when substitution of common nuts with soy nut was made . In this connection, best nutritional and biological values were recorded for soyea. The organoleptic evaluation revealed the acceptance of soyea and 50% soy nuts confections. High protein sweets especially when soy nuts were used, and in particular soyea, are good protein sources for children, beside being of course lower in price.

INTRODUCTION

Baladi or oriental sweets include a high number of confection kinds (Anon, 1978). Nuts are widely used in these products for flavour as well as for decoration purposes (Anon, 1978; Anon 1979; El-Gendi, 1981; Decke, 1982). When nuts, the only source of protein in sweets are used for flavour and decoration on a sugar base as in halwa kors such as hommosea kors, protein content will be low to moderate (Omnia G.Reffat, 1981). The authors of the present work would like to identify a separate group of confections and call them "high protein oriental sweets". These are special products prepared with a considerable proportion of roasted nuts for full flavour, a matter which will result in high protein content. The sugar fraction here is used only as an adhesive material and for sweet taste. The new products include folea (peanut), semsimea (sesame), loozea (almond), bondokea (hazel nut) and fostokea (pistachio). Confection with 100% soy nut was called "soyea", which is not soyea kors in which suger base is considerable and nuts are used in small amounts for decoration. The present work deals with partial or total replacement of common nuts with soy nuts to decrease the cost of production and to save a part of foreign currency used in importation of common nuts. One of the purposes for replacing common nuts with soy nuts is to increase the protein in sweets so it becomes a protein source for childern who frequently refuse to eat meat or fish but not sweets.

MATERIALS AND METHODS

Processing

Soy nuts was prepared as described by Omnia G. Reffat (1988). Loozea, bondokea, fostokea, folea and semsimea were processed by the common method applied commercially in a halwa baladi plant at Cairo. Ingredients for each processing lot were : sugar (3 kg), glucose syrup (10 kg) , water (1.5 kg), roasted almond, hazel nut, pistachio, peanut or sesame (50 kg).

Analytical methods

Moisture, protein (N x 6.25; Kjeldahl method), fat (hexane solvent , Soxhlet apparatus) and ash were determined using the methods described in the A.O.A.C. (1980). The crude fibers were determined using the method given by Pearson (1971). Carbohydrates were calculated by difference. The energy value was calculated by multiplying protein and carbohydrates by 4.0 and fat by 9.0.

Amino acids composition was determined after HCL hydrolysis, using paper chromatography method as described by Block (1958). Tryptophan was determined colorimetrically after alkaline hydrolysis using 14% barium hydroxide solution according to Blauth *et al.* (1963).

Grams consumed of food articles on wet weight basis to cover the daily requirements (G.D.R.) of humans were calculated using the daily energy needs as given by N.R.C. (1980): Children 1-3 years 1300 KCal, children 4-6 years 1700 KCal, children 7-10 years 2400 Kcal, male 11-14 years and adult males 23-50 years 2700 Kcal, female 11-14 years 2200 Kcal and adult female 23-50 years 200 Kcal. Then per cent satisfaction of daily needs of humans in protein upon consumption of 150 g of food products (P.S./150) were calculated. Similarly G.D.R. values for protein were calculated using the daily requirements in gram given by the N.R.C. (1980): children 1-3 years 23, children 4-6 years 30, children 7-10 years 34, male 11 -14 years 45, males 23-50 years 56, female 11-14 years 46 and females 23-50 yeras 44. P.S./150 values for protein were also calculated.

Amino acid scores (A.S) were calculated using the reference protein given by FAO/WHO (1973) through dividing the concentration of test protein in essential amino acid by its corresponding concentration of the FAO pattern. Values g/16 g N for reference protein are : isoleucine 4.0, leucine 7.0. lysine 5.5, threonine 4.0, tryptophan 1.0, valine 5.0, methionine + cystine 3.5 and phenylalanine+ tyrosine 6.0. A.S. value less than 1.0 indicates deficiency in considered essential amino acid (EAA). The EAA which showed the highest deficiency was called first limiting amino acid (L.A.).

Essential amino acid index (E.A.A.I.) and biological value (B.V.) were determined according to the method of Oser (1959) using the values of EAA (g/16 g N) found in samples for isoleucine, leucine, lysine, threonine, tryptophan, valine, methionine + cystine and phenylalanine + tyrosine. Protein efficiency ratio (PER) of the tested food was calculated based on the amino acid concentrations (g/16g N) according to the following equations given by Alsmeyer *et al.* (1974)

PER_1 = - 0.684 + 0.456 (Leucine) - 0.047 (Proline).

PER_2 = - 0.468 + 0.454 (Leucine) - 0.105 (Tyrosine).

PER_3 = - 1.816 + 0.435 (Methionine) + 0.78 (Leucine) + 0.211 (Histidine) - 0.944 (Tyrosine).

G. D.R. values for individual EAA were calculated in gram using the daily requirements given by N.R.C. (1973) for children 10-12 years, adult male 23-50 years and adult female 23-50 years as follows , respectively: isoleucine 1.26, 0.84, 0.66; leucine 1.89, 1.12, 0.88; lysine 1.98, 0.84, 0.66; threonine 1.26, 0.56, 0.44; tryptophan 0.18, 0.21, 0.165, valine 1.125, 0.980 , 0.77; methionine

+ cystine (suphure amino acids) 0.99, 0.70, 0.55 and phenylalanine + tyrosine (aromatic amino acids) 0.99, 1.12, 0.88. The highest G. D. R. value amongst individual EAA indicates what is called restricting amino acid (R.A.). When the mentioned values are consumed the daily needs of humans in all EAA including the R.A. will be simply covered. P.S. /150 for R. A. was also calculated.

Organoleptic evaluation for taste, aroma, colour, consistency (Texture) and overall acceptability was carried out by the aid of 10 panelists according to Molander (1960) using the following Judging scale : very good 8-9, good 6-7, fair 4-5 , poor 2 - 3 and very poor 0-1. Results were analyzed statistically according to Snedecore and Cochran (1971).

RESULTS AND DISCUSSION

1. Gross chemical composition

There is a consensus among processors that due to high proportion of nuts, protein confections are rich in flavour. Nuts are also a good source of protein for children who although might reject meat and fish, are usually fond of sweets. From the results in Table 1, control samples of such confection (100% common nuts) had relatively high protein content which ranged from 10.067 - 19.78%. Halwa kors had only 7.11 - 13.57 % protein (Omnia G. Reffat, 1988). When soy nuts were added at the level of 50% , the protein content was raised to 24.90 % for semsimea, 21.71% for loozea, 20.20 % for bondokea and 22.62% for fostokea. As compared with traditional products, processing of soyea (100% soy nut) increased appreciably the protein to 29.66%. Percent increase compared with the control reached 24.72 - 45.28%. From the results in Table 2, G.D.R. Value for male (10-14 years) in case of bondokea was 422 g, but decreased to 223 g for soy nut 50%, being 152 g for soyea. P.S./150 values were 35.57%, 67.33% and 98.87%, respectively indicating considerable improvement in the nutritional value for soy nut sweets. Of course the price of soy nut sweets will be comparatively lower.

Table 1. Gross Chemical composition of high protein oriental sweets.

Samples			Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohydrate %	Energy value Cal./100gm
Soyea	Soy nut 100%	WWB	7.11	29.66	13.35	3.58	3.71	42.59	409.15
		MFB	92.89	31.93	14.37	3.85	3.99	45.86	440.49
Folce	Peanut 100%	WWB	7.00	19.78	36.19	2.01	1..61	33.41	538.47
		MFB	93.00	12.27	38.91	2.16	1.73	35.93	578.99
	Peanut 50% + Soy nut 50%	WWB	7.23	24.67	24.76	2.79	2.65	37.90	473.12
		MFB	92.77	26.59	26.69	3.01	2.86	40.85	509.97
Semsimea	sesame 100%	WWB	5.97	18.77	42.80	2.68	3.86	25.92	653.69
		MFB	94.03	19.96	45.52	2.85	4.11	27.56	599.76
	sesame 50% + soyn nut 50%	WWB	6.34	24.90	24.99	7.82	2.68	38.27	477.59
		MFB	93.66	26.59	26.68	3.01	2.86	40.86	509.92
Loozea	almond 100%	WWB	7.36	13.79	41.71	2.19	2.07	32.88	562.07
		MFB	92.64	14.89	45.92	2.36	2.24	35.49	606.70
	almond 50% + soy nut 50%	WWB	7.31	21.71	27.52	2.88	2.89	37.69	485.28
		MFB	92.69	23.42	29.69	3.11	3.12	40.66	523.53
Bondokea	hazedl nut 100%	WWB	5.37	10.67	45.97	3.27	7.26	27.46	566.25
		MFB	94.63	11.28	48.58	3.46	7.67	29.01	598.38
	hazel nut 100% + soy nut 50%	WWB	6.25	20.70	79.59	3.43	5.48	35.05	487.31
		MFB	93.75	21.55	31.56	3.66	5.85	37.38	519.76
Fostokea	Pistachio 100%	WWB	7.38	15.57	27.70	5.56	1.41	42.38	481.10
		MFB	92.62	16.18	29.91	6.00	1.52	45.76	519.47
	Pistachio 50% + soy nut 50%	WWB	7.30	22.62	50.51	4.57	2.47	42.43	444.79
		MFB	92.70	214.40	22.13	4.93	2.77	45.77	479.85

WWB : Wet weogjt basls

MFB: Moisture free basls

Table 2. Evaluation of energy value and protein of high protein oriental sweets.

Samples		Factors	Energy						Protein						
		Sex	Child			Male	Female		Child			Male		Female	
		Age (Years)	1-3	6-4	7-10	11-14	11-14	23-50	1-3	6-4	7-10	11-14	1123.5 014	11-14	23-50
		Daily needs	1300 Cal.	1700 Cal.	2400 Cal.	2700 Cal.	2200 Cal.	2000 Cal.	23 Cal.	30 Cal.	34 Cal.	45 Cal.	56 Cal.	46 Cal.	44 Cal.
Soyea	Soy nut 100%	G.D.R.	318	416	587	660	538	489	78	101	115	152	189	155	148
		P.S./150	47.21	36.10	25.57	22.73	27.90	30.69	193.44	148.30	130.85	98.87	79.45	96.75	101.11
Folea	Peanut 100%	G.D.R.	241	316	446	501	409	371	116	152	172	228	283	233	223
		P.S. / 150	62.13	47.51	33.65	29.92	36.71	40.39	129.00	98.90	87.27	65.93	52.98	64.50	67.43
	Peanut 50% + Soy nut 50%	G.D.R.	474.77	359	507	571	465	423	93	122	138	182	227	187	178
		P.S. / 150	54.59	41.75	29.57	26.28	32.26	35.48	160.89	123.35	108.84	88.63	66.08	80.45	84.10
Semsimea	sesame 100%	G.D.R.	231	301	426	479	390	355	123	160	181	240	298	245	234
		P.S. / 150	65.07	49.76	35.25	31.33	38.45	42.30	122.41	93.85	82.81	62.57	50.28	61.21	63.99
	sesame 50% + soyn nut 50%	G.D.R.	272	356	503	565	461	419	92	120	137	181	225	185	177
		P.S. / 150	55.11	42.14	29.85	26.53	32.56	35.82	162.39	129.95	109.85	83.00	66.70	81.20	84.89
Loozea	almond 100%	G.D.R.	231	303	427	480	391	356	167	218	247	326	406	334	319
		P.S. / 150	64.85	49.59	35.13	31.23	38.32	42.16	89.94	68.95	60.84	45.97	36.94	44.97	47.01
	almond 50% + soy nut 50%	G.D.R.	268	350	495	556	453	412	106	138	157	207	58.15	212	203
		P.S. / 150	55.99	42.82	30.33	26.96	33.08	36.40	141.59	108.55	95.78	72.37	525	70.79	74.01
Bondokea	hazedl nut 100%	G.D.R.	230	300	424	477	389	353	216	281	319	422	28.58	431	412
		P.S. / 150	65.34	49.96	35.39	31.46	38.61	42.47	69.59	53.35	47.07	35.57	277	34.79	36.38
	hazel nut 100% + soy nut 50%	G.D.R.	267	349	493	554	457	410	114	149	168	222.77	54.11	228	218
		P.S. / 150	56.23	43.00	30.40	27.07	33.23	35.66	131.74	101.00	89.12	67.33	360	65.87	68.86
Fostokea	Pistachio 100%	G.D.R.	270	353	499	061	457	416	148	193	218	289	41.71	295	283
		P.S. / 150	55.51	42.45	30.07	26.73	32.08	36.08	101.54	77.85	68.69	51.90	248	50.77	5308
	Pistachio 50% + soy nut 50%	G D.R.	292	382	540	607	459	450	102	133	100	199	248	203	195
		P.S. / 150	51.32	39.25	27.80	24.71	30.33	33.36	147.52	113.10	99.79	75.40	6059	73.76	77.11

2. Amino acid composition

As shown in Table 3, when the FAO pattern and calculation of A.S. were taken into comparison, the protein of traditional sweets was deficient in 2-6 essential amino acids (EAA). By incorporation of soy nut, this number decreased. Moreover, the quality of protein was improved as indicated by A.S., E.A.A.I. , B.V., PER (Table 2), concentrations of EAA in sample (Table 4), G.D.R., values for EAA, P.S./150 values for R.A. and P.S. /150 based on R.A. In this regard , the best nutritional and biological values were recorded for soyea followed by 50% soy nut sweets. When a child of 11-14 years old consumes 150g of soyea (Table 5) about 99% of his daily requirements of protein (nearly all his daily needs) will be covered. At the same time the daily requirements in restricting EAA will be met in excess (about 145%) . By covering the daily requirements in restricting amino acid which showed the highest G.D.R. value, all other EAA requirements will be met in excess.

3. Organoleptic evaluation

From the results shown in Table 6, it is evident that replacement of common nuts with soy nut at the level of 50% did not affect the acceptance of the prepared sweets. Although flavour was somewhat different when compared with 100% common nuts sample, the 50% soy nut sweets ranked for flavour as high as in the control. Soyea had actually a special flavour, different from that of traditional sweets, but its organoleptic characteristics rated high (8-9 scores) as in the control. Therefore soyea as well as 50% soy nut high protein sweets could be recommended for the commercial production of high protein confections of developed quality.

Table 3. Amino acid composition of high protein oriental sweets (gm/16 gm N).

	Soyea		Folea				Semsimea				Loozea				Bondokea				Fostokea			
	Soy nut 100%		Peanut 100%		Peanut 50% + Soy nut 50%		Sesame100%		Sesame 50% + Soy nut 50%		Almond100%		Almond 50% + Soy nut 50%		Hazel nut 100%		Hazel nut 50% + Soy nut 50%		Pistachio 100%		Pistachio 50% + Soy nut 50%	
	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S	g/16 gN	A.S
Agrinine	8.68		10.70		9.48		12.40		10.11		9.79		9.00		12.64		9.73		9.34		8.91	
Histidine	2.47		2.33		2.42		2.57		2.51		2.63		2.53		1.88		2.32		2.41		2.46	
Isoleucine	4.91	1.23	3.92	0.98	4.50	1.13	3.78	0.95	4.47	1.12	4.67	1.17	4.84	1.21	5.74	1.44	5.14	1.29	4.34	1.09	4.71	1.18
Leucine	7.79	1.11	6.86	0.98	7.51	1.06	7.49	1.07	7.67	1.10	7.86	0.98	7.51	1.07	6.44	0.92	7.43	1.06	6.87	0.98	7.47	1.07
Lysine	6.65	1.21	3.78	0.69	5.51	1.00	3.10	0.56	5.29	0.96	3.15	0.57	5.52	1.00	3.16	0.58	5.73	1.04	5.34	0.97	6.20	1.13
Methionine	1.52		1.01		1.32		3.11		2.14		1.39		1.48		1.13		1.42		1.53		1.52	
Phenylalanine	5.21		5.67		5.40		4.52		4.94		6.04		5.47		4.16		4.93		4.91		5.11	
Threonine	4.17	1.04	3.15	0.79	3.77	0.94	4.14	1.04	4.15	1.04	3.29	0.82	3.91	0.98	3.22	0.81	3.93	0.98	3.21	0.80	3.87	0.97
Tryptophan	1.28	1.28	1.01	1.01	1.17	1.17	1.75	1.75	1.45	1.45	0.93	0.93	1.16	1.19	1.36	1.36	1.30	1.30	1.31	1.13	1.23	1.23
Valine	5.52	1.10	4.75	0.95	5.22	1.04	5.02	1.00	5.40	1.08	6.01	1.20	5.68	1.14	6.42	1.28	5.76	1.15	5.83	1.17	5.63	1.13
Tyrosine	2.47		4.32		3.20		3.74		2.97		3.17		2.69		3.64		2.78		5.92		2.64	
Cystine	1.68		1.20		1.49		1.93		1.77		0.95		1.45		1.13		1.54		2.09		1.82	
Proline	3.81		4.43		4.06		3.83		3.81		4.51		4.00		4.58		4.10		3.94		3.86	
Alanine+glutamic	22.60		24.85		23.45		24.46		23.32		27.42		24.16		21.93		22.42		25.32		23.54	
Gycine+aspartic	16.46		17.49		16.87		13.55		15.33		15.87		16.28		14.26		15.88		14.22		15.69	
serine	5.18		4.82		5.04		4.80		5.00		3.59		4.68		8.44		6.04		6.66		5.69	
Methionine+Cystine	3.20	0.91	2.21	0.63	2.81	0.80	5.04	1.44	3.91	1.12	2.34	0.67	2.93	0.84	2.26	0.65	2.96	0.85	3.62	1.03	3.34	0.95
Phenylalanine+tyrosine	7.68	1.28	9.99	1.67	8.60	1.43	8.26	1.38	7.91	1.32	9.21	1.54	8.16	1.36	7.80	1.30	7.71	1.29	7.86	1.31	7.75	1.29
E.A.A.I.	78.72		63.71		63.71		63.71		63.71		63.71		63.71		63.71		63.71		63.71		63.71	
B.V.	74.08		57.71		57.71		57.71		57.71		57.71		57.71		57.71		57.71		57.71		57.71	
PER_1	2.6892		2.2360		2.2360		2.2360		2.2360		2.2360		2.2360		2.2360		2.2360		2.2360		2.2360	
PER_2	2.8093		2.1928		2.1928		2.1928		2.1928		2.1928		2.1928		2.1928		2.1928		2.1928		2.1928	
PER_3	3.1109		0.3877		0.3877		0.3877		0.3877		0.3877		0.3877		0.3877		0.3877		0.3877		0.3877	

E.A.A.I. : Essemtial Amino Acid Index.
B.V. : Brological Value %
PER : Protein Efficiency Ratio.
A.S. : Amino Acid Score.

Table 4. Amino acid composition of high protein oriental sweets (g/100 g N).

Amino acids	Soyea	Folea		Semsimea		Loozea		Bondokea		Fostokea	
	Soy nut 100%	Peanut 100%	Peanut 50% + Soy nut 50%	Sesame100%	Sesame 50% + Soy nut 50%	Almond100%	Almond 50% + Soy nut 50%	Hazel nut 100%	Hazel nut 50% + Soy nut 50%	Pistanchio100%	Pistachio 50% + Soy nut 50%
Arginine	2.58	2.12	2.34	2.33	2.52	1.35	1.95	1.35	1.97	1.45	2.02
Histidine	0.73	0.46	0.60	0.48	0.63	0.36	0.55	0.20	0.47	0.38	0.56
Isoleucine	1.46	0.78	1.11	0.71	1.11	0.95	1.05	0.61	1.04	0.68	1.07
Leucine	2.31	1.36	1.83	1.41	1.91	0.43	1.63	0.69	1.50	1.07	1.69
Lysine	1.97	0.75	1.36	0.58	1.32	0.19	1.20	0.34	1.16	0.83	1.40
Methionine	0.45	0.20	0.33	0.58	0.53	0.83	0.32	0.12	0.29	0.24	0.34
Phenylalanine	1.55	1.12	1.33	0.78	1.23	0.45	1.19	0.44	1.00	0.77	1.16
Threonine	1.24	0.62	0.93	0.33	1.03	0.13	0.85	0.34	0.79	0.50	0.88
Tryptophan	0.38	0.20	0.29	0.94	1.35	0.83	0.25	0.15	0.26	0.18	0.28
Valine	1.64	0.64	1.29	0.70	0.74	0.44	1.23	0.69	1.18	0.91	1.27
Tyrosine	0.73	0.88	0.79	0.38	0.44	0.13	0.58	0.39	0.31	0.46	0.60
Cystine	0.50	0.24	0.37	0.72	0.95	0.82	0.32	0.12	0.81	0.33	0.41
Proline	1.13	0.88	1.00	4.59	5.81	3.78	0.87	0.49	4.53	0.61	0.87
Alanine+gutamic	6.70	4.92	5.79	2.54	3.82	2.19	5.25	2.34	3.21	3.94	5.33
Gycine+aspartic	4.88	3.46	4.16	0.90	1.25	0.50	3.53	1.52	1.22	2.21	3.55
serine	1.54	0.95	1.24	0.94	0.97	0.32	1.02	0.90	0.60	1.04	1.29
Methionine+Cystine	0.95	0.44	0.70	1.55	1.97	1.27	0.64	0.24	1.56	0.57	0.75
Phenylalanine+tyrosine	2.26	1.98	2.12				1.77	0.63		1.23	1.79

Table 5. Evaluation of amino acid composition of high protein oriental sweets.

Amino Acids	Soyea			Folea						Semsimea					
	Soy nut 100%			Peanut 100%			Peanut 50% + Soy nut 50%			Sesame 100%			Sesame 50% + Soy nut 50%		
	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman
Isoleucine	86	58	45	162	108	35	114	76	59	178	118	93	114	76	60
Leucine	82	49	38	139	52	65	193	61	48	134	79	52	99	59	46
Lysine	101	43	34	264	112	38	146	62	49	301	145	114	150	64	50
Threonine	102	45	36	293	93	71	136	60	47	162	72	56	122	54	43
Tryptophan	47	55	43	90	105	83	62	72	57	55	64	50	50	53	46
Valine	69	60	47	120	124	82	87	76	60	120	104	82	83	73	57
Methionine+Cystine	102	74	58	225	159	125	141	100	79	105	75	59	102	72	57
phenylalanine+Tyrosine	43	49	39	50	57	47	47	53	42	64	35	57	50	57	45
Restricting amino Acid (R.A.)	Methionine + Cystine			Lysine	Methionine + Cystine		Lysine	Methionine + Cystine		Lysine			Lysine	Isoleucine	soleucine
G.D.R. for R.A.	104	74	58	264	159	125	146	100	79	341	145	114	150	76	60
G.D.R. for Protein	152	189	148	228	233	223	182	227	178	240	298	234	181	255	177
P.S./150 based on R.A.	144.94	203.57	259.09	56.32	94.29	120.00	103.03	150.00	190.91	43.94	103.57	31.82	00.00	207.36	264.55
P.S./150 based on protein.	98.87	79.54	101.11	65.93	52.98	67.43	38.63	66.08	84.10	62.57	50.28	63.99	83.00	66.70	84.89
First Lmiting Amino Acid (L.A., based on A.S.).	Methionine + Cystine			Methionine + Cystine			Methionine + Cystine			Lysine			Lysine		

Child : 11-14 years.
Man : 23 -50 years.
Woman : 23 -50 years.

cont. Table 5.

Amino Acids	Loozea						Bondokea						Fostokea					
	Almond 100%			Almond 50% + Soy nut 50%			Hazel nut 100%			Hazel 50% + Soy nut 50%			Pistachio 100%			Pistachiol 50% + Soy nut 50%		
	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman	Child	Man	Woman
Isoleucine	197	131	103	120	80	63	207	138	108	121	81	64	185	124	97	118	79	62
Leucine	199	118	93	166	69	54	274	162	128	126	75	59	177	105	82	112	66	52
Lysine	491	195	154	165	70	55	582	247	194	171	72	57	239	101	80	141	60	47
Threonine	180	124	98	148	66	52	371	165	129	160	71	56	252	112	88	143	64	50
Tryptophan	139	162	127	72	84	66	120	140	110	69	81	64	100	117	92	64	75	60
Valine	136	118	93	92	80	63	163	142	112	97	85	66	124	108	85	89	77	61
Methionine+Cystine	309	219	172	155	109	86	413	292	229	165	117	92	174	123	97	132	93	73
phenylalanine+Tyrosine	78	58	69	56	63	50	119	135	106	64	72	56	81	91	72	56	64	50
Restricting Amino Acid (R.A.)	Lysine	Methionine + Cystine		Lysine	Methionine + Cystine		Lysine	Methionine + Cystine		Lysine	Methionine + Cystine		Threonine + Isoleucine			Threonine +	Methionine + Cystine	
G.D.R. for R.A.	461	219	172	165	109	86	582	292	229	171	117	92	252	124	97	143	93	73
G.D.R. for Protein	326	406	319	207	258	203	422	525	412	222	277	218	289	360	283	199	248	195
P.S./150 based on R.A.	32.5	68.57	87.27	90.91	137.14	174.55	25.76	51.43	65.46	87.88	128.57	63.64	59.52	121.43	154.55	104.76	160.71	204.00
P.S./150 based on protein.	45.97	36.94	47.01	72.37	58.15	74.01	35.57	28.58	36.38	67.33	54.11	68.86	51.90	41.71	53.08	75.40	60.59	77.11
First Lmiting Amino Acid (L.A., based on A.S.).	Lysine			Methionine + Cystine			Lysine			Methionine + Cystine			Threonine			Methionine Cystine		

Table 6. Organoleptic evaluation of high protein oriental sweets (average scores).

Treatment / Factor	Folea		
	Peanut 100%	Soy nut 100%	Peanut 50% + Soy nut 50%
Aroma	9^a	8^a	9^a
Taste	8^a	8^a	9^b
Texture	8^a	9^a	9^a
Colour	9^a	8^a	9^a
Overall acceptability	9^a	8^a	9^a
	Semsimea		
	Sesame 100%	Soy nut 100%	Sesame 50% + Soy nut 50%
Aroma	8^a	9^a	9^a
Taste	8^a	9^b	8^a
Texture	9^a	9^a	8^a
Colour	8^a	9^a	9^a
Overall acceptability	8^a	9^a	9^a
	Loozea		
	Almond 100%	Soy nut 100%	Almond 50% + Soy nut 50%
Aroma	9^a	9^a	9^a
Taste	9^a	9^a	8^a
Texture	8^a	9^a	8^a
Colour	9^a	9^a	8^a
Overall acceptability	9^a	9^a	8^a
	Bondokea		
	hazel nut 100%	Soy nut 100%	hazel nut 50% + Soy nut 50%
Aroma	9^a	9^a	9^a
Taste	9^a	9^a	8^a
Texture	8^a	9^b	8^a
Colour	9^a	9^a	9^a
Overall acceptability	9^a	9^a	9^a
	Foastokea		
	Pistatchio 100%	Soy nut 100%	Pistatchio 50% + Soy nut 50%
Aroma	9^a	9^a	8^a
Taste	8^a	9^b	8^a
Texture	8^a	9^a	9^a
Colour	9^a	9^a	8^a
Overall acceptability	9^a	9^a	8^a

Figures given similar letters indicate no significant difference.

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بديل للمكسرات الشائعة مجهز من بذور الصويا :
٣-استخدام مكسرات الصويا في الحلوي الشرقيه عالية البروتين

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في الدراسات الحاليه أطلقت تسمية جديدة «الحلوي عالية البروتين» علي الحلوي البلديه المجهزة مع نسبة عاليه من المكسرات (السكر يستخدم فقط للطعم وكمادة لاصقة للمكسرات). وفي دراسة سابقة لوحظ أن الحلوي قرص (اقراص الحلوي المحتويه علي السكر كماده اساسيه والمكسرات تستخدم لمجرد التزيين واكساب الطعم) ، تحتوي علي ٧,١١ - ١٣,٥٧٪ بروتين بينما الحلوي عالية البروتين كانت تحتوي علي ١٠,٦٧ - ١٩,٧٨٪ بروتين وفقا لنتائج الدراسة الحالية. وفي الدراسة الحاليه الحلوي عالية البروتين مثل الفوليه (من الفول السوداني) والسمسمية (من السمسم) واللوزيه (من اللوز) والبندقيه (من البندق) والفستقيه (من الفستق) جهزت مع استبدال ٥٠٪ من المكسرات الشائعة بمكسرات الصويا. وقد ادي هذا الي رفع محتوي البروتين الي ٢٠,٢٠ - ٢٤,٩٠ ٪. والصويية المجهزة مع ١٠٠٪ مكسرات صويا كانت تحتوي علي ٢٩,٦٦٪ بروتين - وقد لوحظ أن عدد الأحماض الأمينيه الناقصه يقل وجودة البروتين تزداد باستبدال المكسرات الشائعه بمكسرات الصويا. وكانت أفضل قيمة غذائية وبيولوجيه موجودة في حالة الصوييه، كما دلت نتائج الأختبارات الحسية أن الصوييه والحلوي المجهزه مع ٥٠٪ مكسرات صويا كانت مقبوله والحلوي عاليه البروتين خاصه عند تجهيزها مع مكسرات الصويا وبالاخص علي مستوي ١٠٠٪ مكسرات صويا كانت مصدرا جيداً للبروتين للاولاد ، هذا فضلا عن انخفاض سعرها.