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RESEARCH ARTICLE

Nutritional quality evaluation of soyaflakes chiwada

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ABSTRACT

Soyaflakes Chiwada was formulated in three different combinations with soyaflakes and riceflakes like 40:50, 50:40 and 40:40, respectively.All these three combinations were evaluated organoleptically. Among these combinations high scored product was selected for the nutritional quality assessment along with its storage stability. Due to attractive colour, flavour, taste appearance and over all acceptability of soyaflakes chiwada prepared with combination III *i.e.* rice flakes 40 g.and soyaflakes40g. scored highest. The nutritional qualities like moisture (4.1 per cent), ash (2.4 per cent), crude fiber (0.8 per cent), crude protein (21.4 per cent), iron(5.3 mg), calcium (74.0mg), zinc (2.7mg), â carotene (235. ug) and B complex vitamins like B_1 (0.2mg),B_2 (0.1mg)and B_3 (2.01mg) were found in soyaflakes chiwada. No significant changes were observed in nutritional qualities of soyaflakes chiwada when it was stored in tetra package for 1 to 2 months.

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Key words : Soyaflakes chiwada, Nutritional quality, Storage stability

INTRODUCTION

Soyabean (*Glycine* max L Merril) is an important source of quality legume protein. It is one of the nature's wonderful nutritional gifts,which provides a complete proteins with quality of essential amino acids, carbohydrates, unstaturated fat, vitamins and minerals including folic acid, calcium, potassium and iron. Soyabean also contains nutraceutical properties like isoflavones phytoestrogen, soluble phosphate and potassium sulphate. These properties mostly play vital role to prevent the risk of dreaded diseases like breast cancer, oesteoporosis, cardiovascular diseases, kidney stones and help in beating 'menopausal blue' (Messina 1997).

Soyabean is less expensive and highly nutritious. Hence, most of the studies (Chandrashekhar and Rani 2004. Despande *et al.,* 2004 Sahay and Kacharu 1988) recommended the use of soyabean in the preparation of snack, weaning and supplementary foods after necessary processings on it. Soyaflakes chiwada can be the best option for the traditional chiwada after enhancing the nutritional qualities with its addition.

MATERIALS AND METHODS

Local varities of soyabean *i.e*. MH-CH-58 and readymade riceflakes were procured from local market. The processing techniques like cleaning, washing, soaking, germination, degermination, dehulling,boiling, pressing under controlled condition by use of flaking machine and drying were carried out on soyabean for the preparation of soyaflakes.

Formulation and preparation of soyaflakes chiwada:

Flakes composition:

Soyaflakes chiwada was formulated on the basis of per cent combination with rice flakes and soyaflakes 40:50, 50:40 and 40:40, respectively and prepared by using standard methods.

Type of oil used:

Soya oil was used for the shallow frying of flakes with different oil quantities 5 g, 10 g, and 15 g, respectively. Soyaflakes and rice flakes were also deep fried in soya oil separately at medium flame. Oil consumption during frying of flakes was calculated by measuring remaining

quantity of soya oil.

Use of roasted bengal gram dhal:

Roasted bengal gram dhal and fried bengal gram dhal were used in different amounts such as 2 g,4 g,and 6g. of each flake combinations, The product was prepared with varying combinations.

Use of groundnut:

Roasted groundnut and fried groundnut were the combination made for the preparation of soyaflakes chiwada. The amount of 5 g, 10 g, 15g and 20 g per 100 g of roasted and fried ground nuts were used for the variations in the preparation.

Use of colouring agent:

Soyaflakes chiwada was prepared with varying combination of colouring agent *i.e.* turmeric powder and artificial liquid yellow colour as a colouring agent. It was used with varying amount 2-0,4-0,6-0,8-0 ml artificial edible liquid yellow colour and 2.0,4.0.6.0 and 8.0g. of turmeric powder of each combination chiwada.

Use of flavouring agent:

Cumin seed used as a flavouring agent in the preparation of soyaflakes chiwada. It was prepared with different amount 0.5, 1, 1.5and 2 g. Soyaflakes chiwada was also prepared without using of any flavouring agent and compared for score.

Sensory evaluation:

By the use of different combination and variation soyflakes chiwada was prepared. It was evaluated organoleptically with the help of trained pannal of judges on a nine point Hedonic scale (Amerine *et al.,* 1965).

Nutritional quality assessment and cost calculation of soyflakes chiwada:

High scored soyflakes chiwada in sensory evaluation was selected for the nutritional quality analysis. Moisture content, total ash, major nutrient like crude protein, fat, carbohydrates, B complex vitamins including vitamin B_1,B_2 and B_3 , minerals such as iron, calcium, zinc and crude fiber were analyzed by use in methods described in (AOAC 1975). Keeping qualities of soyaflakes chiwada were recorded after storage of soyaflakes chiwada for 0 to 1 month and 1 to 2 month packed in polythene and tetra packaging material at room temperature. The production cost of the prepared product was calculated by taking into account the cost of every ingredients used in the preparation of soyaflakes chiwada.

Statistical analysis:

The variations noticed in the nutritional qualities in the soyaflakes chiwada before and after its storage were calculated with the statistical significant differences by applying 't' test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as well as relevant discussion have been presented under following heads :

Formulation of the Soyflakes chiwada:

The data regarding formulation of soyaflakes chiwada on the basis of different variations such as soyaflakes composition with rice flakes, use of flavouring agent, colouring agent, shortening agent, groundnut and roasted bengal gram dhal with its score of sensory evaluation is presented in the Table 1 to 5. Soyaflakes mixing with 40 per cent of rice flakes scored more with its organoleptic qualities. Combination of Soyaflakes: Riceflakes (40:50g,

Table 1 : Score of soyaflakes chiwada with soya and rice flakes combination

Sr. No.	Combination	Organoleptic qualities				
	Soyaflakes : flakes	Colour	Flavour	Taste	Texture	Overall acceptability
1.	40 : 50	6.6	6.6	6.0	5.8	6.4
2.	50 : 40	5.8	5.4	5.2	5.0	6.0
3.	40 : 40	7.5	7.4	7.8	7.9	7.6

Table 2 : Score of soyaflakes chiwada according to use of cooking oil

Sr. No.	Cooking oil	Amount used (g)	Organoleptic qualities				
			Colour	Flavour	Taste	Texture	Overall acceptability
1.	Fried in soya oil	--	3.9	3.8	3.6	4.0	4.1
2.	Roasted in soya oil	10	6.0	6.4	6.6	6.4	6.6
		15	4.6	4.4	4.8	4.4	5.0

Table 3 : Score of soyflakes chiwada according to use of ground nut and roasted bengal gram dhal

Sr. No.	Groundnut	Amount (g)	Organoleptic qualities				
			Colour	Flavour	Taste	Texture	Over acceptable
A	Use of groundnuts						
i)	Roasted	05	5.9	6.0	6.4	6.2	7.0
		10	6.9	7.0	7.2	7.4	7.6
		15	4.9	5.9	5.2	5.4	6.0
		20	3.9	3.8	3.6	4.0	5.0
ii)	Fried	05	7.0	6.9	6.6	6.0	6.8
		10	7.6	7.4	7.0	6.9	7.0
		15	3.9	3.8	3.7	4.0	4.0
		20	3.6	3.7	3.4	3.4	3.9
B	Useof bengal gram dhal roasted						
i)		02	5.8	5.2	6.0	6.2	6.0
		04	5.4	5.0	5.2	5.2	5.0
		06	4.8	4.6	4.2	4.4	4.6
ii)	Fried	02	7.0	6.9	6.6	6.0	6.8
		04	6.0	6.0	5.8	5.9	6.4
		06	7.6	7.4	7.0	6.9	7.0

Table 4 : Score of soyaflakes chiwada according to use of coloring agent

Sr. No.	Coloring agent	Amount (ml/g)	Organoleptic qualities				
			Colour	Flavour	Taste	Texture	Overall acceptability
1.	Yellow artificial edible liquid colour	2	6.0	6.2	6.2	5.7	5.0
		4	5.4	5.2	5.0	5.2	4.8
		6	4.1	4.1	4.4	4.2	4.7
		8	3.8	4.0	4.1	4.0	4.4
2.	Turmeric powder	2	6.7	7.1	7.3	7.0	7.0
		4	3.2	3.1	3.0	3.9	3.1
		6	4.0	3.9	3.9	3.2	3.1
		8	4.0	4.1	3.1	4.5	4.0

Table 5 : Score of soyaflakes chiwada according to use of flavoring agent

Sr. No.	Flavouring agent	Amount (g)	Organoleptic qualities				
			Colour	Flavour	Taste	Texture	Overall acceptability
1.	Cumin seed	0.5	4.1	4.0	3.9	4.0	4.1
		1.0	4.8	4.5	4.5	4.5	4.6
		1.5	5.4	5.7	5.7	5.7	5.1
		2.0	6.1	6.9	7.2	7.1	7.1
2.	Without use of any flavouring agent	--	5.4	4.2	3.8	3.8	4.0

rank highest *i.e.* 7.6 as compared with other *i.e.* 6.4 for 40:50 and 6.0 for 50:40 soyaflakes and riceflakes combination, respectively(Table 1).

Table 2 describes the sensory quality scores of the product in variation with the use of soya oil. The chiwada roasted in soya oil with the amount of 10 g scored high and obtained better organoleptic qualities. Chiwada roasting in 15 g of oil shown loosing its sensory qualities. The use of fried bengal gram dhal and ground nuts with the amount of 6 and 10g, respectively showed (Table 3) higher organoleptic score than use of 5,15 and 20 g roasted bengal gram and nuts. The soyaflakes chiwada prepared with the use 2 g of turmeric powder was found highest in score. Where as use of artificial colour in the soyaflakes

chiwada was not accepted much organoleptically (Table 4). Table 5 highlights the score of chiwada by use of flavouring agent. Use of 2 g of cumin seed powder per 100 g of the product was found developed a better aroma to the product. On the whole different composition and use of ingredients in the variation. The highes scored formulated major ingredients of soyaflakes chiwada were tabulated in Table 6.

Table 6 : High scored soyaflakes chiwada according their major ingredients

Sr. No.	Ingredients	Amount (g/ml)
1.	Soya flakes	40
2.	Rice flakes	40
3.	Bengal gram dhal(fried)	06
4.	Ground nut (fried)	10
5.	Cumin seed	02
6.	Soya oil	10
7.	Turmeric powder	02
8.	Salt	02

Assessment of nutritional quality:

The data given in Table 7 and 8 reveals the changes in proximate, sensory qualities and nutritional composition in soyaflakes chiwada before and after processing and its storage up to 1 month and 1 to 2 months kept in different packages at room temperature. The moisture and ash content of soyaflakes chiwada before and after processing was 6.6 to 4.9 per cent and 2.4 to 2.3 per cent, respectively. There was no significant changes seen in ash and moisture content between raw and finished form of chiwada. Similarly there was no significant change found in carbohydrates (49.5 to 48.3 g) content in chiwada before and after processing. The change in B complex vitamins content in soyaflakes chiwada before and after processing were noted as vitamin B_1 (0.33 to 0.31 mg), vitamin B_2 (0.29 to 0.26 mg) and vitamin B_3 (2.09 to 2.01 mg). Where as mineral content was reduced at negligible amount before and after processing in the soyaflakes chiwada. Decrease in the content of iron, zinc and calcium before and after processing were reported as (5.5 to 5.30mg,) (2.8 to 2.70mg) and (100.11 to 99.11 mg) respectively. The difference in crude fiber content noted as 1.30 to 0.80 g before and after processing. The significant change has been seen only in crude fat, energy and âcarotene contents in soyaflakes chiwada before and after processing. The crude fat content was (9.1 to 15.3) g before and after processing. The energy content was (394.8 to 489.5) kcal and β carotene was (219.4 to 202.2 µg) before and after processing.

Production cost of soyaflakes chiwada:

Total cost of production of soyaflakes chiwada was calculated on pilot-plant trial and depicted in Table 9. It reveals that, for one kilogram soyaflakes chiwada cost 32.65 Rs. Out of that 27.65 Rs. was incurred for raw materials and Rs. 5.00 for considered as a charges of processing and packaging cost. The total cost of soyaflakes chiwada was very much less than the cost of any other chiwada available in the market.

From above result it is concluded that soyaflakes chiwada formulated with 40:40 per cent soyaflakes and

Table 7 : Nutritional quality of soyaflakes chiwada with its storage stability

Sr. No.	Nutrition qualities	Soyaflakes chiwada (100)g			Storage stability					
					Polythene package			Tetra package		
		Raw form	Finished form	't'test	Upto 1 month	1 to 2 months	't'test	Upto1 month	1 to 2 months	't'test
1.	Moisture(%)	6.6	4.9	0.89NS	4.8	4.6	0.104 NS	4.8	4.7	0.052 NS
2.	Ash(%)	2.4	2.3	0.64 NS	2.3	2.27	0.015 NS	2.3	2.29	0.005 NS
3.	Crude protein (g)	28.3	27.7	0.80 NS	27.7	26.9	0.418 NS	27.7	26.5	0.628 NS
4.	Crude fat(g)	9.1	15.3	2.69*	15.3	15.0	0.157 NS	15.3	14.9	0.209NS
5.	Carbohydrate (g)	49.5	48.3	0.54 NS	48.0	47.2	0.41 NS	48.0	48.0	-----
6.	Energy (kcal)	394.8	489.5	4.55**	487.0	485.0	1.04 NS	487.0	484.0	1.570 NS
7.	B Carotene (ug)	219.4	202.2	2.64*	202.0	201.0	0.523 NS	202.0	201.5	0.261 NS
8.	Vitamin B_1(mg)	0.33	0.31	0.26 NS	0.31	0.30	0.0052 NS	0.31	0.29	-----
9.	Vitamin B_2(mg)	0.29	0.26	0.12 NS	0.25	0.25	0.010 NS	0.25	0.24	0.0052NS
10.	Vitamin B_3(mg)	2.09	2.01	0.109 NS	2.01	2.01	0.005 NS	2.01	2.00	0.005NS
11.	Crude fiber(g)	1.30	0.80	0.60 NS	0.80	0.80	----	0.80	0.80	----
12.	Iron (mg)	5.50	5.30	0.104 NS	5.30	5.30	0.052 NS	5.30	5.20	0.157 NS
13.	Zinc(mg)	2.80	2.70	0.052 NS	2.70	2.70	0.026 NS	2.70	2.64	0.026 NS
14.	Calcium (mg)	100.11	99.11	1.21 NS	100.11	100.11	1.21 NS	100.11	1.21	1.21 NS

* and ** indicate significance of values at P=0.01 and 0.05, respectively NS=Non-significant

Table 8 : Sensory qualities of soyaflakes chiawada after storage in different packages

Sr. No.	Storage type and peroids	Organoleptic score				
		Colour	Flavour	Taste	Texture	Over all accepted
	Polyhene package					
1.	Up to 1 month	6.1	6.3	7.0	6.4	7.0
2.	1 to 2 month	5.4	5.2	5.4	5.2	6.2
	S.E.	0.350	0.451	0.802	0.601	0.395
	C.D. (P=0.05)	0.0352	0.061	0.887	0.0665	0.044
	Tetra package					
1.	Up to 1 month	6.2	6.4	6.2	6.1	6.4
2.	1 to 2 month	5.1	5.0	4.8	4.2	5.8
	S.E.	0.551	0.702	0.802	0.952	0.3008
	C.D. (P=0.05)	0.61	0.0665	0.0776	0.105	0.0332

Table 9 : Cost calculation of prepared soyaflakes chiwada (per kg.)

Sr. No.	Ingedient	Soya Chiwada		
		Quantity (g)	Rate/ unit	Cost (Rs.)
1.	Soya flakes	500	20kg	10/-
2.	Rice flakes	500	20kg	10/-
3.	Roasted groundnut	50	50kg	2.5/-
4.	Soya oil	25	50kg	1.25/-
5.	Roasted bengal gram dhal	50	40kg	2/-
6.	Cumin seed	10	160kg	1.6/-
7.	Turmeric	10	20kg	0.2/-
8.	Salt	10	10kg	0.1/-
9.	Processing and packaging cost @ 20%	--	--	5.0/-
Total				32.65

riceflakes roasted in 5g of soya oil and, use of 6g fried bengal gram dhal, 10g fried ground nut, with the use of 2g of cumin seed as flavouring agent and 2 g of turmeric powder as colouring agent scored high organoleptically.

The soyflakes chiwada prepared with above combination was found very good in nutritional quality. Its content all most all nutrients were rich, especially in protein. No significant change has been observed after storage in polythene package and tetra package at room temperature up to 2 months. The cost of production is affordable, hence it is concluded that the soyaflakes chiwada prepared with this formulation is more beneficial to combat the malnutrition especially in children.

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