

Research Paper :

Nutritional and sensory evaluation of papad and badi enriched with defatted soy flour and drumstick leaves powder

NAVITA PAREEK, RUCHI CHAUDHARY AND GITA BISLA

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ABSTRACT

Malnutrition is the most important and widespread nutritional problem along with the prevalence of other deficiency diseases like- protein energy malnutrition, vitamin-A deficiency etc. Therefore, the present study was undertaken in an attempt to eliminate the ill effects of nutrition related problems by the exploration of possibility and utilizing dehydrated drumstick leaves powder, a highly nutritious green leafy vegetable and defatted soy flour rich in protein with combination of wheat flour in conventional preparation. The main aim of study was to develop the low cost nutritious Papad and Badi with the incorporation of defatted soy flour (10%, 20% and 30%) and drumstick leaves powder (3%, 5% and 10%) in different proportions. Organoleptic evaluation was done on the basis of 9-point hedonic scale. The results of sensory evaluation revealed that among different forms of Papad, PA2 was most acceptable which was prepared by 10% defatted soy flour and 5% drumstick leaves powder. In case of Badi, BA1 was most acceptable which was prepared by 10% defatted soy flour and 3% drumstick leaves powder. These recipes were nutrient dense and cost effective, so it could be beneficial in feeding programmes.

See end of the article for authors' affiliations

Correspondence to:

NAVITA PAREEK

Department of Food Science and Nutrition, Faculty of Home Science, Banasthali University, BANASTHALI (RAJASTHAN) INDIA
navitapareek@yahoo.com

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Key words : Wheat flour, Drumstick leaves powder, Defatted soy flour, Standard sample of Papad and Badi

Malnutrition is a deficiency disease of complex interactions. The basic reason is- "traced to poverty". It is the most troubling deficiency in the diet of under-fed children especially belonging to poor underprivileged communities in developing countries. As a result of malnutrition, several nutrient deficiencies with clinical manifestation and disabilities are encountered in country namely, protein energy malnutrition, vitamin-A deficiency and many other deficiencies impair human development on a truly massive scale worldwide (Pana and Bacullao, 2002). Therefore, various preparations based on cereal-pulse combination are of paramount importance to improve the nutritional quality in Indian dietaries. FAO (1999) suggested that to meet the recommended dietary allowances of infants and pre school children, low cost supplementary foods could be processed domestically by employing simple and inexpensive processing technology. Incorporation of locally available cheap food sources is one of the best and effective strategies to enrich the diet of rural folk for addressing the nutritional deficiencies (Faber *et al.*, 2005).

Soybean is a species of legume, native to Eastern

Asia. Soybean is a source of complete protein, which contains all the essential amino acids in adequate amounts (Antia and Philip, 2005). It is an important source of protein equivalent to animal protein and vegetable oil worldwide (Manay *et al.*, 2001). In this study, defatted soy flour has been used which is made entirely from defatted soy meal. It is an excellent source of iron, calcium, protein, B-vitamins, fibre, manganese and very low in saturated fat, cholesterol and sodium (Joshi and Vaidehi, 2000) and also contains anti-inflammatory nutrients such as-folate and zinc (Swamy, 2006). The use of defatted soy flour increases the quality and the shelf-life of the products (NIN, 2000). Drumstick (*Moringa oleifera*) leaves are used in dehydrated form. It is an exceptionally nutritious green leafy vegetable with a variety of potential uses. Having amazing therapeutic properties it is used medicinally by local herbalists. They are low in carbohydrate and fat but are good source of beta-carotene, calcium, riboflavin, folic acid, ascorbic acid and iron. Papad is a nutritious snack which is crispy in texture and badi is prepared with green gram dal. These recipes were selected on the basis of popularity because of easy to

processing, non-perishable and low in cost so, could be easily affordable by rural folk. The endeavours involved preparing soy blended product like- Papad and Badi with the incorporation of dehydrated drumstick leaves powder. They provide a healthy and nutritious snack and will be helpful in fulfilling the demand-supply gap between nutritional deficiencies and healthy status.

EXPERIMENTAL PROCEDURE

In present study, drumstick leaves powder and defatted soy flour were used. Drumstick leaves were collected from the agricultural farmhouse of Banasthali University for experimental work. Defatted soy flour was purchased from "Ambika Solvent Plant" from Akola in Maharashtra in the form of cakes. Defatted soy flour is obtained from solvent extracted flakes and contains less than 1% oil, which increases the shelf-life and reduces the rancidity of the product. Defatted soy cakes were grinded and sieved to get fine flour. After purchasing the drumstick leaves, preliminary preparation was done like-cleaning and washing and let dry in a shade out of direct sunlight for three days. After drying, the leaves were crushed to make a fine powder through rubbing it over a wire screen. This powder was used for making recipes and left stored in an opaque, well-sealed plastic container. Papad and Badi were prepared with different proportions of defatted soy flour (10%, 20% and 30%) and drumstick leaves powder (3%, 5% and 10%) Table 1. Organoleptic analysis was conducted to evaluate the acceptability of all the different proportions of the recipes with respect to appearance, colour, taste, after taste, aroma and overall-acceptability on the basis of 9 point hedonic scale by 25 semi-trained panel members who were short listed after the triangle test and to get the most acceptable level from

Table 1: Per cent incorporation of defatted soy flour and dehydrated drumstick leaves powder in Papad and Badi with basic ingredients

Sample of Papad/Badi	Different proportion of defatted soy flour (DSF), drumstick leaves powder (DLP), wheat flour (WF) and green gram Dal (GGD)
Std. of Papad/ Badi = SP/SB	100% WF/GGD
Test sample of Papad/Badi	
PA1/BA1	10% DSF+3% DLP+87% WF/GGD
PA2/BA2	10% DSF+5%DLP +85% WF/GGD
PA3/BA3	10% DSF +10% DLP +80% WF/GGD
PB1/BB1	20% DSF+3% DLP+77% WF/GGD
PB2/BB2	20% DSF+5% DLP+75% WF/GGD
PB3/BB3	20% DSF + 10% DLP+70% WF/GGD
PC1/BC1	30% DSF +3% DLP+67% WF/GGD
PC2/BC2	30% DSF +5% DLP+65% WF/GGD
PC3/BC3	30% DSF +10% DLP+60% WF/GGD

WF = Wheat flour, DLP = Drumstick leaves powder, DSF = Defatted soy flour, GGD= Green gram dal, SP/SB = Standard of Papad and Badi

these recipes. Data obtained were subjected to the analysis of Mean and Standard Deviation. Cost Analysis were done of most acceptable form of Papad and Badi.

OBSERVATIONS AND ANALYSIS

The results obtained from the present investigation are summarized below:

Organoleptic analysis:

The average results of sensory evaluation of different proportion of Papad and Badi are listed in Tables 2 and 3. According to the results, the PA2 sample (10% DSF +

Table 2: Mean scores of Papad prepared by different proportion of defatted soy flour and drumstick leaves powder

Sample of Papad	Ratio of ingredients	Sensory attributes							
		WF	Colour	Appearance	Texture	Taste	After Taste	Aroma	Overall acceptability
Std. of Papad	WF								
SP	100		7.7	6.9	6.7	6.8	6.6	6.0	6.6
Test sample of Papad	DSF:DLP:WF								
PA1	10:3:87		6.0	6.2	5.0	5.7	5.4	5.5	5.5
PA2	10:5:85		6.4	6.8	6.0	6.3	5.8	6.2	6.1
PA3	10:10:80		4.2	4.5	4.8	5.0	4.7	5.0	4.7
PB1	20:3:77		4.9	5.3	4.5	6.1	4.6	4.9	4.8
PB2	20:5:75		5.5	4.9	4.8	5.4	5.1	4.8	4.9
PB3	20:10:70		6.1	5.9	6.1	5.8	5.4	5.8	5.7
PC1	30:3:67		5.5	6.1	5.6	5.7	5.4	6.1	5.7
PC2	30:5:65		6.0	6.2	5.6	6.0	4.4	5.0	5.4
PC3	30:10:60		3.8	4.0	3.9	4.9	5.2	5.0	4.7

Table 3: Mean scores of Badi prepared by different proportion of defatted soy flour and drumstick leaves powder

Sample of Papad	Ratio of ingredients	Sensory attributes						
		GGD	Colour	Appearance	Texture	Taste	After taste	Aroma
SB	100	7.1	7.2	6.4	6.5	6.0	6.3	6.5
Test sample of Badi	DSF:DLP: GGD							
BA1	10:3:87	6.5	6.2	5.3	5.8	5.8	5.8	6.9
BA2	10:5:85	6.5	5.9	5.8	4.6	4.8	4.9	5.4
BA3	10:10:80	5.5	5.5	5.5	5.4	5.2	5.4	5.1
BB1	20:3:77	5.9	5.5	5.1	4.3	4.4	4.5	4.3
BB2	20:5:75	5.2	4.9	4.8	3.7	3.8	4.7	4.3
BB3	20:10:70	4.9	4.9	4.7	3.8	3.7	3.9	4.3
BC1	30:3:67	4.8	4.9	4.8	3.9	4.1	3.9	4.3
BC2	30:5:65	5.3	5.1	4.8	3.4	3.5	4.1	4.5
PC3	30:10:60	4.4	4.5	4.7	2.9	2.9	3.1	4.5

Table 4: Nutrient composition of Papad and Badi prepared by incorporation of defatted soy flour and drumstick leaves powder

Nutrient Content of Papad and Badi	Papad			Badi		
	WF(85%)	*DSF(10%)	DLP(5%)	GGD (87%)	DSF (10%)	DLP (3%)
Moisture(g)	10.37	0.81	3.79	8.78	0.81	2.27
Protein(g)	10.28	4.32	0.33	21.31	4.32	0.20
Fat(g)	1.44	1.95	0.08	1.04	1.95	0.05
Fiber (g)	1.61	0.37	0.04	0.69	0.37	0.02
Carbohydrates (g)	58.99	2.09	0.62	52.11	2.09	0.37
Calcium(mg)	40.8	24	22	62.25	24	13.2
Phosphorus(mg)	301.75	69	3.5	352.35	69	2.1
Iron(mg)	4.16	1.04	0.04	3.39	1.04	0.02
Beta-Carotene(µg)	24.65	42.6	5.5	42.63	42.6	3.3
Folic Acid (µg)	30.43	10	-	121.8	10	-
Vitamin-C(mg)	-	-	6.0	-	-	2.27

As per values according to Nutritive value of Indian foods given in ICMR.

* Indian Dietetic Association, 2006

5% DLP) showed the highest over all acceptability attributes and the score was fall in the range of like very much and the value was 6.1, where as PC3 sample (30% DSF + 10% DLP) showed the lowest acceptability scores and the value was 4.7 (Table 2). In the sample of Badi, the most acceptable proportion was BA1 (10% DSF + 3% DLP) showed the highest over all acceptability attributes and the scores was fall in the range of like very much and the value was 6.9, where as BC3 sample (30% DSF + 10% DLP) showed lowest acceptability scores and the value was 4.5 (Table 3). As the level of defatted soy flour increased, the sensory scores for different attributes decreased in all samples of Papad and Badi. The same result was found in the study conducted by Jha (2005) that Papad containing highest per cent of defatted

soy flour obtained lowest scores. Percentage of soya increased and simultaneously scores was decreased because of beany flavour of soybean. Incorporation of defatted soy flour in a small quantity will improve the protein quality of cereal-based products without causing significant difference in the acceptability of the developed product as observed by Mridula and Gupta (2008). This recipe was proved to be a good source of protein and beta-carotene. Hence, it can be propagated for consumption among vulnerable group which can enhance the nutritional status.

Nutrient calculation was done as per values given in the nutritive value of Indian foods by ICMR (Table 4). The cost of Papad and Badi were ranging from Rs. 1.5 to 2.25 /100g of sample and for one serving ranged from

Table 5: Cost analysis of papad and badi prepared by incorporation of defatted soy flour and drumstick leaves powder						
Cost of Papad and Badi		Papad			Badi	
Ingredients	Amount	Cost/kg	Cost/unit	Amount	Cost/kg	Cost/unit
WF	85g	14/-	1.91/-	-	-	-
GGD	-	-	-	87g	14/-	1.218/-
DSF	10g	4/-	0.04/-	10g	4/-	0.04/-
DLP	5g	-	-	3g	-	-
Oil	1ml	55/-	0.05/-	-	-	-
Total		1.28/-			1.25/-	
Cost of fuel & spices= 25% of 1.28 = 1.28 + 0.32				Cost of fuel & spices= 25% of 1.25 = 1.25 + 0.31		
Total cost (per 100g)= 1.6/-				Total cost (per 100g)= 1.56/-		
Cost per serving (50g)= Rs. 0.8/-.				Cost per serving (15g)= Rs. 0.25/-.		

Rs. 0.25 to 1.00, so that could easily reach within the limit of low income group of the society (Table 5).

Conclusion:

Green revolution is the most recent of a long series of environmental rearrangement to increase the food production system of human population. In present scenario, one needs to emphasise on the consumption of locally available and cost effective sources which could enhance the nutritional potential of traditional recipe. In this study, one such attempt has been made in this direction, the defatted soy flour and drumstick leaves powder incorporated with value added Papad and Badi can be a good source of beta-carotene and protein. These are beneficial for combating the deficiency diseases such as protein energy malnutrition and vitamin-A deficiency which is widespread in vulnerable section of the society.

Authors' affiliations:

RUCHI CHOUDHARY AND GITA BISLA,
Department of Food Science and Nutrition, Faculty of Home Science, Banasthali University, BANASTHSLI (RAJASTHAN) INDIA

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