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Sensory and nutritional assessment of soya value added traditional products from Rajasthan

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ABSTRACT

Soybean (*Glycine max*) is one of the nature's best nutritional gifts, as it is the most highly proteinaceous vegetable source. Incorporation of soybeans in popular traditional Indian foods is likely to help in acceptability of soy blended foods. Therefore the present study was under taken to find out the acceptability of different traditional recipes of Rajasthan namely Kadhi, Raabri, and Dhokla developed by incorporating soy flour in different proportions as it suits the regional taste and preferences. These traditional products were developed by replacing 25%, 50% and 75% of soy flour with the main ingredient of the recipe. Acceptability was judged by panel members. A composite scoring test was used to determine the degree of acceptance in soy fortified traditional products. Kadhi in which Bengal flour was replaced by 75% of soy flour was 88.6% preferred in consistency with mean scores of 26.4 ± 6.4 and standard recipe of Kadhi was 80% acceptable and scored 24 ± 5.6 . Acceptability score of Dhokla where maize flour replaced with 75% soy flour had scored 88.6% in texture which was comparable to 90% of standard recipe of Dhokla. Mean scores of Dhokla fortified with 75% soy flour scored 26.6 ± 4.4 and standard recipe scored 27 ± 4.2 . Overall acceptability evaluation showed that 25% replacement with Soy flour in Kadhi and Dhokla were as good as standard traditional recipe whereas only in Raabri with 75% replacement (87.6 ± 11) of bajra flour with Soy flour was more acceptable than standard recipe (83.4 ± 9.8). The value added traditional products from Soy flour act as a good source of protein and minerals, and the cost of formulations were also affordable. Thus formulation of traditional products serves the dual purpose of convenience and ensuring nutritional security.

Key words : Traditional products, Soy fortification, Full fat soy flour (FFSF), Organoleptic evaluation, Composite scoring

INTRODUCTION

Soybean (*glycine max*) is one of the nature's best nutritional gifts, as it is the most highly proteinaceous vegetable source. Therefore it has been used in various food formulations because of its high nutritional values. As a source of protein, soybean is inexpensive when compared to meat, milk, fish, egg, cowpea and nuts. Soybean contains 33% carbohydrate, 18% fat and 40% protein. The amino acid content is well balanced to meet body's requirement (Singh *et al.*, 2001).

Soybean cultivation in India started long ago but its successful cultivation was increased over last two decades (SOPA report, 2003). Incorporation of soy flour in various

traditional recipes would not only increases the nutritional value of the food product but to some extent its palatability as well as functional properties also increases. Therefore Soya flour was incorporated in different Rajasthani dishes. In Rajasthan Dhokla, Kadhi and Rabri is traditionally prepared using maize flour, bengal gram flour and bajra flour. Soybean contains higher amount of protein and fat than maize flour, bengal gram flour and bajra flour therefore could be partially substituted to enrich the traditional products of Rajasthan. The intake of these foods is more popular in villages of Rajasthan. By incorporating soy flour in traditional recipes problem of malnutrition can be cured to some extent. The study was carried out to

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find out the acceptability by sensory evaluation technique and to popularize the products among population.

Present study was undertaken with the specific objectives: to develop Soy fortified food products (kadhi, raabri and dhokla) with different proportions of soy flour, to find the acceptability of different traditional food products using composite scoring test, to analyze best acceptable proportion of soy flour in different traditional recipes of Rajasthan and to calculate nutritive value and cost of traditional recipes.

MATERIALS AND METHODS

Soy flour was used to develop traditional products of Rajasthan which were more conveniently acceptable to the common man and does not require any special skills and effort in preparation. Methodological aspect related to present study are discussed in three phases:

Phase I: Standardization and modification of traditional products of Rajasthan:

Traditional recipes of Rajasthan Kadhi, Raabri and Dhokla were standardized. Modification of standard traditional recipe of Rajasthan is done by replacing the main ingredient of recipe with full fat soy flour at different levels as 25 %, 50 %, and 75 % and acceptability of each product was evaluated.

Phase II: Acceptability evaluation of soy fortified traditional products of Rajasthan:

For acceptability of soy based traditional products of Rajasthan, thirty females in the age group of 40 to 50 years were selected. All the panel members were asked to assign scores to indicate their preference for the product. The acceptability evaluation of traditional products was done by using Composite scoring test. In this specific characteristic of a product are rated separately and the most important characteristic will account for a large part of the total score.

Phase III: Comparison of Nutritive value and cost of standard and soy fortified traditional products of Rajasthan:

The products developed were analysed for the proximate compositions using Nutritive Value of Indian Foods, Gopalan *et al.*, (2000) and the cost of products were also calculated. The data were statistically analyzed using the software Statistical package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

The full fat soy flour is blended at different proportions with cereal, millet or pulse flours to make a wide range of traditional products of Rajasthan. Organoleptic evaluation of such indigenous products (Dhokla, Kadhi and Raabri) prepared from soybean was conducted and all the products were acceptable.

Dhokla:

Results of mean percent acceptability score of soy incorporated dhokla (Fig. 1) revealed that Dhokla incorporated with 75 per cent soy flour was 88 percent acceptable in texture which was comparable with standard recipe (90%). 25 per cent soy incorporated scored highest in appearance (92%). Overall acceptability of soy incorporated Dhokla ranges from 75 to 79 per cent. Significant difference was observed in texture and overall acceptability of dhokla prepared from 25% and 50% soy incorporation. In all other sensory attributes no significant difference was observed (Table 1).

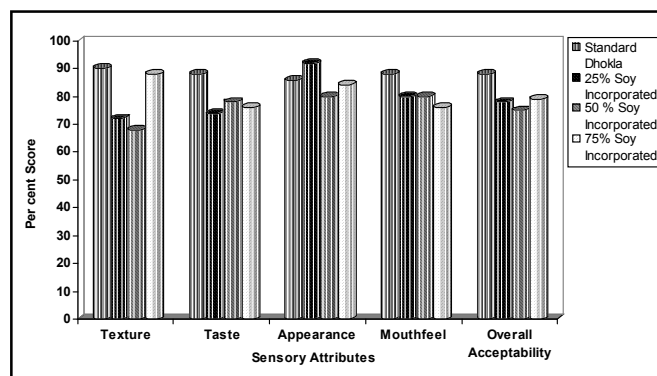


Fig. 1 : Level of significance in sensory characteristics of standard and soy incorporated Dhokla

Table 1 : Level of significance in sensory characteristics of standard and soy incorporated Dhokla

Sensory characteristics	Standard v/s 25%	Standard v/s 50%	Standard v/s 75%
Texture	**2.862	**3.498	1.238
Taste	1.544	1.301	1.342
Appearance	0.976	0.818	0.225
Mouth Feel	1.000	1.078	1.214
Overall acceptability	*2.421	*2.359	1.443

* and ** indicate significance of values at $P < 0.05$ and 0.01 , respectively

Ghade *et al.*, 2008 reported similar results that an acceptable and protein rich dhokla can be prepared by replacing chickpea with soybean flour. They contain more protein and fat and was found organoleptically comparable

to that of control.

Kadhi:

Results of mean acceptability score of standard and soy incorporated Kadhi (Fig.2) in which Bengal gram flour was replaced with 75 % of soy flour was 88.60 per cent preferred in consistency with mean scores of 26.4 ± 6.4 and standard recipe of Kadhi was 80 % acceptable and scored 24 ± 5.6 . In colour, taste and flavor 25 % replacement of soy flour was most acceptable than 50 % and 75 % replacement.

Highly significant difference was observed in acceptability of kadhi in 50% and 75% soy incorporated kadhi. Soy flour in kadhi can be replaced up to 25% level (Table 2).

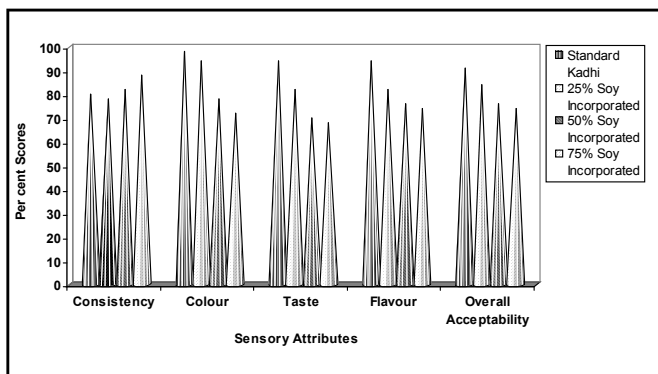


Fig. 2 : Acceptability evaluation of soy incorporated Kadhi

Table 2 : Level of significance in sensory characteristics of standard and soy incorporated Kadhi

Sensory characteristics	Standard v/s 25%	Standard v/s 50%	Standard v/s 75%
Consistency	0.231	0.287	0.885
Colour	1.095	**3.030	***4.044
Taste	1.897	***5.308	**2.867
Flavour	*2.151	**3.576	***3.803
Overall acceptability	*2.307	***4.137	**2.876

*, ** and *** indicate significance of values at P<0.05, 0.01 and 0.001, respectively

Raabri:

Mean acceptability scores of standard and soy incorporated Raabri (Fig.3) revealed that 75 % replacement of bajra flour with soy flour was best acceptable in taste, consistency and mouth feel than the standard raabri recipe. Only colour was one attribute where 75 % replacement scored less. The full fat soy flour as a supplement to wheat flour has a softening effect on chapattis (Gandhi and Bourne, 1988).

No Significant difference was observed in 25 per cent soy incorporated raabri. Significant difference was observed in taste and colour of 50 per cent and 75 per cent soy incorporated raabri (Table 3).

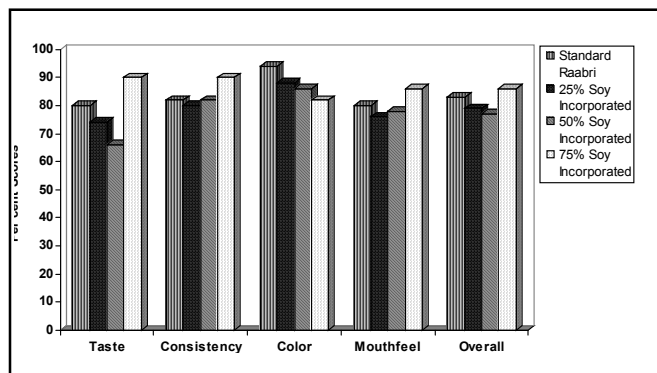


Fig. 3 : Acceptability evaluation of soy incorporated Raabri

Table 3 : Level of significance in sensory characteristics of standard and soy incorporated Raabri

Sensory characteristics	Standard v/s 25%	Standard v/s 50%	Standard v/s 75%
Consistency	0.896	*2.333	1.25
Colour	0.287	0.00	1.04
Taste	1.342	1.852	*2.546
Flavour	0.612	0.318	1.00
Overall acceptability	0.966	1.234	0.88

* indicates significance of value at P<0.05

Overall acceptability evaluation (Fig.4) showed that 25% replacement with Soy flour in Kadhi and Dhokla were as good as standard traditional recipe whereas only in Raabri with 75% replacement (87.6±11) of bajra flour with Soy flour was more acceptable than standard recipe (83.4±9.8).

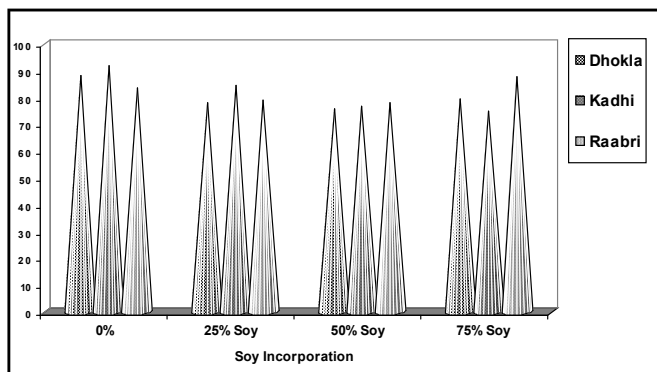


Fig. 4 : Overall acceptability of soy incorporated traditional products of Rajasthan

Nutrient and cost of the Soy based traditional products of Rajasthan:

The value added traditional products from soy flour act as a good source of protein and minerals. Percent increase in nutrient content of soy incorporated traditional products (Table 4, 5 and 6) revealed that percentage of nutrient in dhokla, kadhi and raabri was increased with increase in the replacement with soy flour 25%, 50% and 75%. Soy incorporation increases energy, protein, iron and

Table 4 : Nutrient content of soy incorporated Dhokla

Nutrients	0%	25 %	50 %	75 %
Energy (k.cal)	136.60	145.80 (6.73)	154.80 (13.32)	163.80 (19.91)
Protein (g)	4.40	7.65 (73.86)	10.86 (146.80)	14.07 (219.70)
Fat (g)	6.44	8.03 (24.69)	9.62 (49.38)	11.21 (74.07)
Carbohydrate (g)	26.48	21.89 (-17.33)	17.34 (-34.52)	12.89 (-51.32)
Iron (mg)	0.92	1.73 (88.00)	2.54 (176.00)	3.35 (264.00)
Calcium(mg)	4.00	27 (575.00)	50.00 (1150.00)	73.00 (1725.00)

Value in parentheses indicates the per cent nutrient increase / decrease

Table 5 : Nutrient content of soy incorporated Kadhi

Nutrients	0%	25 %	50 %	75 %
Energy (k.cal)	129.00	131.70 (2.09)	134.40 (4.10)	137.10 (6.20)
Protein (g)	4.16	5.12 (23.00)	6.04 (45.10)	7.06 (69.70)
Fat (g)	8.04	8.56 (6.47)	9.08 (12.93)	9.51 (18.28)
Carbohydrate (g)	9.72	8.2 (-15.64)	6.75 (-30.55)	5.39 (-55.55)
Iron (mg)	0.89	1.12 (25.80)	1.24 (39.30)	1.54 (73.40)
Calcium(mg)	90.30	91.70 (1.50)	93.10 (3.10)	94.50 (4.60)

Value in parentheses indicates the per cent nutrient increase / decrease

calcium with increase in the level of soy concentration as it is a good source of all these nutrient. Increase in protein content of soy based traditional products was found with increase in soy incorporation (Fig. 5).

Processed soybean, in the form of full fat soy flour (FFSF), would cost Rs.30/kg in the retail market with about

Table 6 : Nutrient content of soy incorporated Raabri

Nutrients	0%	25 %	50 %	75 %
Energy (k.cal)	76.10	79.30 (4.24)	81.90 (7.60)	84.60 (11.18)
Protein (g)	2.94	4.10 (39.45)	5.31 (74.48)	6.49 (120.74)
Fat (g)	2.35	2.89 (22.97)	3.03 (28.94)	3.88 (65.10)
Carbohydrate (g)	10.62	8.73 (-17.80)	7.08 (-33.33)	5.43 (-48.87)
Iron (mg)	1.35	1.44 (6.60)	1.53 (13.33)	1.62 (20.00)
Calcium(mg)	51.30	58.72 (14.40)	66.15 (28.90)	73.57 (43.91)

Value in parentheses indicates the per cent nutrient increase / decrease

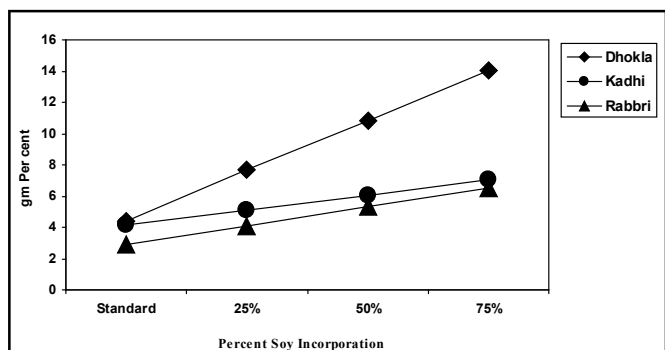


Fig. 5 : Per cent increase in protein of soy incorporated traditional products

40% protein and other nutrients. Soy protein is of the best quality among all plant proteins. Soy based food items, like FFSF containing all nutrients as well as phytochemicals, is healthful and economically affordable by all sections of Indian population especially those living below poverty line. Protein efficiency ratio (PER) of soy protein increases considerably when combined with cereal and legume proteins (Gandhi *et al.*, 2008).

Shirsat *et al.*, 2008 reported that soybean can make significant nutritional contribution if supplemented in typical traditional foods and in combination with cereals. Full fat soy flour is one of the simplest soy based food products to be used in combination with cereals and pulses.

Cost formulation of soy incorporated traditional products of Rajasthan (Table 7) indicated that cost of kadhi was not changed due to soy incorporation. In raabri and dhokla cost of the product is slightly increased with increase in soy incorporation.

Soy foods provide good quality nutrition and health

Table 7 : Cost of soy flour incorporated traditional products

Traditional products	Cost of soy flour incorporated traditional products (in Rs. / serving)			
	0%	25 %	50 %	75 %
Dhokla	1.00	1.25	1.50	1.75
Kadhi	6.50	6.50	6.50	6.50
Raabri	4.25	4.35	4.45	4.55

promoting phytochemicals at an affordable price. 65 to 70% of Indian population is vegetarian and majority of them suffer from energy protein malnutrition as they cannot afford high cost traditional pulses and or animal product like milk. Even the majority of non-vegetarian segment of population can not afford regular eating of animal protein because of its very high cost and those who can afford also have the cholesterol risk. In such a situation, soybean is an effective alternative as it provides both, protein and fat at low cost and conducive to good health. Soybean may be consumed in the form of flour in combination with cereals and legume products.

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