

## Organoleptic evaluation of bajra roti fortified with full fat soy flour

■ BHARTI JAIN

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### AUTHOR FOR CORRESPONDENCE

#### BHARTI JAIN

Department of Food Science  
and Nutrition Maharshi  
Dayanand Saraswati  
University, AJMER  
(RAJASTHAN) INDIA  
E-mail: drbharti@rediffmail.com

■ **ABSTRACT** : Bajra is the staple cereal of rural people living in Rajasthan. It has low protein content and limited in lysine. The essential amino acids mainly methionine and cystine need for growth are high in bajra. In contrast, soy protein is high in lysine but low in methionine and cystine. Combination of both will produce highly nutritious products. Therefore, the present study was undertaken to develop and to find out the acceptability of bajra roti fortified with full fat soy flour in different proportions. The traditional recipe of bajra roti was developed by replacing 30 per cent, 50 per cent and 60 per cent of soy flour with the main ingredient of the recipe. A composite scoring test was used to determine the degree of acceptance in soy fortified traditional products. Acceptability score of bajra roti where bajra flour replaced with 60 per cent soy flour scored highest in appearance and texture which was comparable to standard recipe of bajra roti. Taste and mouth feel characteristics of bajra roti fortified with 30 per cent FFSF scored highest. Overall acceptability of bajra roti fortified with 30 per cent FFSF scored highest as compared to others. Incorporation of soyabean flour in bajra roti not only improves the palatability but also its nutrient content.

■ **KEY WORDS** : Full fat soy flour, Soy fortification, Organoleptic evaluation

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Soybean [*Glycine max* (L.) Merrill] is an environment friendly food legume and is a nutritional power house, packed with 40 per cent protein, 20 per cent oil, carbohydrates, reasonable amounts of minerals, vitamins and number of health promoting compounds and is an economical source of good quality nutrition with many health benefits. A majority of world population suffers from qualitative and quantitative insufficiency of dietary protein and calorie intake. In all such cases, physiological maintenance and growth are impaired, and malnutrition results. In this context soybean can play a very significant role through production of protein energy rich full fat soy flour and fortification of FFSF in different traditional products of Rajasthan. Acceptance of soybean foods in India is increasing but at a slower pace because it is a new introduction to the food baskets of Indian people. In order to accelerate the process of promotion of soy foods, creation of awareness about the economic and health benefits of soy foods, transfer of presently available technology, development of specially new and diversified products and human resources are needed. Regular use of

soybean in daily diet enhances and protects human health and results in longevity – the goal every human wants to achieve. Hence, the food uses of soybean is in the interest of mankind and therefore, should be promoted globally and particularly in India where a majority of its population is vegetarian and suffer from energy protein malnutrition. Food security at the individual, household, national, regional and global level will be achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Bajra is the staple cereal of rural people living in Rajasthan. It has low protein content and limited in lysine. The essential amino acids mainly methionine and cystine need for growth are high in bajra. In contrast, soy protein is high in lysine but low in methionine and cystine. Combination of both will produce highly nutritious products. The intake of bajra roti is more popular in villages of Rajasthan. By incorporating full fat soy flour in traditional food products, problem of malnutrition can be cured to some extent. As soybean contains higher amount of protein and fat than bajra

flour and could be partially substituted to fortify the bajra roti which is a major traditional products of Rajasthan. Therefore, the present study was under taken to develop full fat soy flour fortified bajra roti .

## ■ RESEARCH METHODS

Methodological aspects related to present study have been described in four phases:

### Phase I: Development of full fat soy flour (FFSF) :

The cooked split soybean was sun dried and ground for development of full fat soy flour powder. From 10 kg raw beans about 7.5 to 8 kg FFSF is obtained. FFSF 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 (Gandhi *et al.*, 1983).

### Phase II: Development of FFSF fortified bajra roti :

Traditional recipes of bajra roti was standardized. Modification of standard traditional recipe of bajra roti was done by replacing the main ingredient of recipe with FFSF at different levels as 30 per cent, 50 per cent and 60 per cent and acceptability of each product was evaluated.

### Phase III: Organoleptic evaluation :

The developed FFSF fortified bajra roti was standardized using organoleptic evaluation technique with the help of semi-trained panel members using composite scoring test. In this specific characteristic of a product is rated separately and the most important characteristic accounts for a large part of the total score.

### Phase IV: Comparison of nutritive value and cost of standard and FFSF fortified bajra roti :

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.

## ■ RESEARCH FINDINGS AND DISCUSSION

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

### Organoleptic evaluation:

Traditional recipe of bajra roti fortified with different levels of full fat soy flour was developed as it suits the regional taste and preferences. These traditional products were developed by replacing bajra flour with 30 per cent, 50 per cent and 60 per cent of full fat soy flour. To find out the acceptability, bajra roti fortified with different levels of FFSF was served to the panel member for sensory evaluation. A

composite scoring test was used to determine the degree of acceptance of bajra roti fortified with full fat soy flour. Mean acceptability score of standard and soy fortified bajra roti where bajra flour was replaced by 30 per cent, 50 per cent and 60 per cent with full fat soy flour was almost equally acceptable in texture (24±4.4, 24.4±6.1 and 24.8±5.6, respectively). Acceptability in taste reduced to 86 per cent, 78 per cent and 64 per cent, respectively with increase in replacement with soy flour (Table 1).

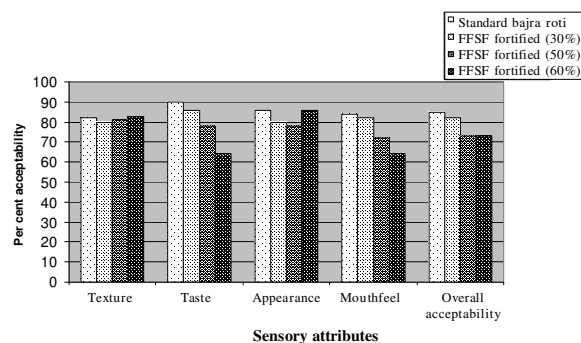
**Table 1: Organoleptic acceptability of developed FFSF fortified bajra roti**

Attributes	Bajra roti	Bajra roti fortified with FFSF		
		30 %	50 %	60%
Texture (30)	24.6±4.42	24.0±4.42	24.4±6.19	24.8±5.65
Taste (30)	27.0±3.16	25.8±4.04	23.4±5.96	19.2±7.89
Appearance (20)	17.2±4.23	16.0±3.26	15.6±2.27	17.2±3.29
Mouth feel (20)	16.8±3.67	16.4±3.50	14.4±3.37	12.8±2.52
Overall	85.6±9.22	82.8±9.53	73.2±14.48	73.2±13.00

acceptability (100)

\* Value in parentheses indicates the total score for that attribute  
Values are mean ±SD of ten panelists

Mean acceptability score of standard bajra roti and FFSF fortified bajra roti revealed that overall acceptability of bajra roti fortified with 30 per cent FFSF scored maximum (82.8%) as compared to bajra roti fortified with 50 per cent and 60 per cent FFSF (Fig. 1).



**Fig. 1 : Per cent acceptability of standard and FFSF fortified bajra roti**

No significant difference was observed in organoleptic acceptability of 30 per cent FFSF fortified bajra roti (Table 2). Significant difference was observed in overall acceptability ( $p < 0.05$ ) of 50 per cent and 60 per cent FFSF fortified bajra roti. Highly significant difference was observed in taste and mouthfeel of 60 per cent FFSF fortified bajra roti ( $p < 0.01$ ). In between all the products of FFSF fortified bajra roti analysis of data at 5 per cent level determined no significant difference,

indicating that the sensory quality of the products remain unaffected due to fortification of bajra roti with different levels of FFSF.

**Table 2 : Level of significance in sensory characteristics of standard and FFSF fortified bajra roti**

Sensory characteristics	Standard v/s 30% t-value	Standard v/s 50% t-value	Standard v/s 60% t-value	F value
Texture	0.000NS	0.747NS	0.264NS	1.3NS
Taste	0.739NS	1.686NS	2.899**	
Appearance	0.709NS	1.052NS	0.000NS	
Mouth feel	0.249NS	1.521NS	2.835**	
Overall acceptability	0.667NS	2.283*	2.459*	

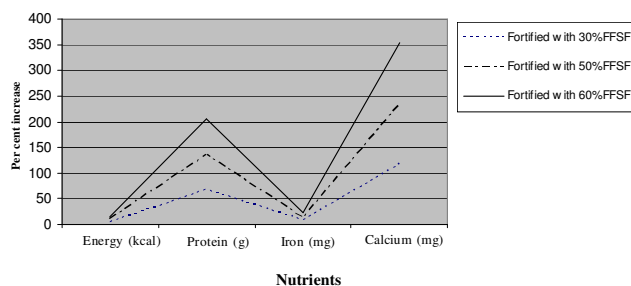
NS=Non-significant (P>0.05), Significant \*P <0.05 and \*\* P <0.01+

**Nutrient and cost of FFSF fortified bajra roti :**

The value added traditional products from FFSF act as a good source of protein and minerals. Per cent increase in nutrient content of FFSF fortified bajra roti revealed that percentage of nutrient increased with increase in the replacement with soy flour 30 per cent, 50 per cent and 60 per cent. Soy incorporation increases energy, protein, iron and calcium with increase in the level of FFSF as it is a good source of these entire nutrients (Table 3 and Fig.2).

**Table 3: Nutrient content of standard and FFSF fortified bajra roti**

Nutrients	Bajra roti	Bajra roti fortified with different level of FFSF		
		30 %	50 %	60 %
Energy(K.cal)	144.4	151.5	158.6	165.7
Protein (g)	4.64	7.8	10.96	14.21
Iron( mg)	3.2	3.44	3.6	3.92
Calcium( mg)	16.8	36.68	56.4	76.2



**Fig. 2 : Per cent nutrient of standard and FFSF fortified bajra roti**

Processed soybean, in the form of full fat soy flour (FFSF), would cost Rs.30/kg in the retail market with about 40

per cent protein and other nutrients whereas an average cost of one kg split pulse in the market is about Rs. 60 and its protein content is about 25 per cent. Quality wise, soy protein is better than pulse protein. In fact, soy protein is of the best quality among all plant proteins. 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 FFSF fortified bajra roti (Table 4) indicated that cost of the product increased with increase in soy incorporation. Soy foods provide good quality nutrition and health promoting phytochemicals at an affordable price. 65 to 70 per cent 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 consumption 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 is conducive to good health. Soybean may be consumed in the form of flour in combination with cereals and legume products, and dairy analogs.

**Table 4: Cost of standard and FFSF fortified bajra roti**

Traditional products	Cost (Rs.) per serving
Bajra roti	1.00
FFSF bajra roti (30%)	1.60
FFSF bajra roti (50%)	2.00
FFSF bajra roti (60%)	2.20

**Conclusion :**

It can, therefore, be concluded that bajra roti fortified with FFSF was acceptable by panel members. Bajra roti fortified with 30 per cent FFSF has higher overall acceptability. 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. Thus, by making alteration in the traditional recipes of Rajasthan with FFSF the palatability of the food products was increased.

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