

Sensory evaluation of biscuits supplemented with soy flour and jamun seed powder

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■ **ABSTRACT** : Protein fortification is an area of current interest because of nutritional awareness of consumers, government guidelines and changing demographics. Efforts were made to prepare biscuits having different combinations of jambul seed powder fortified with soy flour in order to enhance the sensory evaluation. The statistical analysis of quality evaluation was made. Colour, texture, appearance, flavour and overall acceptability of biscuits were found better in treatment A₂, whereas, better taste was found in A₁ composition. Biscuit composition A₂ was found significantly superior to the composition A₁ and composition A₃.

■ **KEY WORDS** : Soyflour, Jamun seed powder, Sensory evaluation

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India is considered as the third largest producer of biscuits after USA and China. The biscuit market in the recent years has witnessed a little higher growth at around 8-10% pa. The annual production of bakery products, which includes bread, biscuits, pastries, cakes, buns, rusk etc., is estimated to be in excess of 3 million tonnes. Biscuits are very convenient and inexpensive food products and are becoming very popular among both rural and urban population especially among children as well as aged persons of India. A new type of Jamun seed powder-containing biscuit have been developed and incorporated into the diabetic diet. It has been found to be effective in reducing the postprandial rise in the blood glucose level and in improving glycaemic control (Bhargava, 1991). These biscuits can be used for dealing with the symptoms of indigestion (Shorti *et al.*, 1962). These biscuits can be also stimulating the liver functions (Shorti *et al.*, 1962). Hence, these biscuits contain high fibre and low calories so it is an excellent nutritional snack food with a high degree of acceptability especially to diabetic patients. If these biscuits are enriched with protein from soybean and jamun seed powder can help not only children's health but also maintaining health of diabetic patients. There is an ever increasing demand for high protein biscuits for therapeutic value. Nutritionally, biscuits can be easily fortified with protein – rich flours to provide a convenient food to supplement the

poor quality diets. Protein, low calories and high fibre fortified biscuits contain nutrients in concentrated forms for feeding programmers at such institutes as day – care centers and schools or as emergency rations (Singh *et al.*, 2000).

Biscuits may be regarded as a form of confectionery dried to very low moisture content. According to Fayemi (1981), biscuit is defined as a small thin crisp cake made from unleavened dough. Onweluzo and Iwezu (1998) described the production of biscuits as a mixture of flour and water but may contain fat, sugar and other ingredients mixed together into dough which is rested for a period and then passed between rollers to make a sheet. Biscuits may be classified either by the degree of enrichment and processing or by the method adopted in shaping them. Soy fortified biscuits of different composition were developed by Meena and Meena (2004) as a value added product by fortifying biscuits with soy flour and sorghum.

■ METHODOLOGY

Preparation of jamun seed powder fortified soy biscuits:

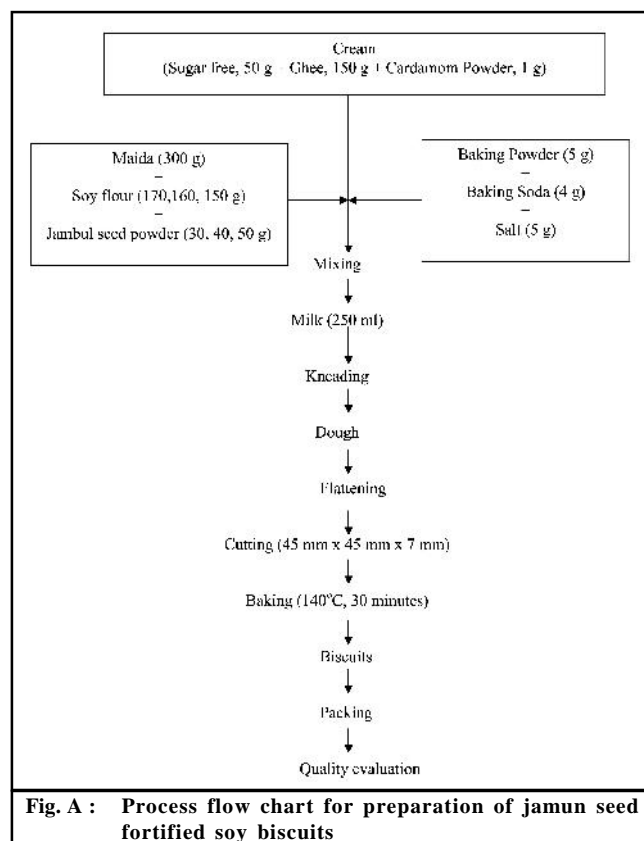
In the developing countries, malnutrition is one of the major problems in tribal, hilly and backward region, especially in women and children. Conventional protein source is insufficient in these countries to meet the situation. Soybean is rich in protein, and Jamun seed is believed to have medicinal

properties and is used to treat diabetes. The nutritive value of traditional biscuits can be improved to a great extent by fortification of jamun seed powder with soy flour. Biscuits were prepared by using maida (refined wheat flour), soy flour and Jamun seed powder. Soybean flour and jamun seed powder were procured from food industries of Udaipur. All other ingredients were procured from the local market of Udaipur. The jamun seed powder fortified soy biscuits were prepared by using traditional creamy method (Meena and Meena, 2004) having different compositions as given in Table A. The soy flour and jamun seed powder were mixed in various proportions (34% soy flour and 6% jamun seed powder; 32% soy flour and 8% jamun seed powder; 30% soy flour and 10% jamun seed powder) with 60% maida as a binding ingredient. The recipe such as ghee, sugar free, cardamom powder, baking powder, baking soda, salt and water were kept constant for all three combinations.

Ingredients	Biscuit samples		
	A ₁	A ₂	A ₃
Maida, g	300	300	300
Soy flour, g	170	160	150
Jambul seed powder, g	30	40	50
Ghee, g	150	150	150
Sugar free, g	50	50	50
Baking powder, g	5	5	5
Baking soda, g	4	4	4
Salt, g	5	5	5
Cardamom powder, g	1	1	1

Measured quantities of maida, soy flour and jamun seed powder were mixed together and baking powder, baking soda and salt were added to the mix. Cream was prepared by adding the sugar free (used for diabetic patients) and cardamom powder (for flavour) to ghee and manually whipping it thoroughly for about ten minutes in a pan with the help of a spoon. The mix of flour was then added to the prepared cream and by adding 250 ml of milk, dough was made by hand. The prepared dough was flattened with the help of traditional

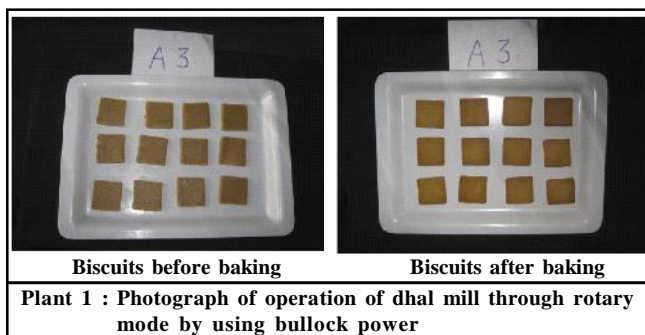
wooden roller “belan”, used in making chapattis, to a thickness of about 7.0 mm. Square pieces of size 45 mm x 45 mm were then taken out of the flattened dough with the help of a steel mould. These moulds of biscuits were then kept in a tray and placed in a thermally controlled oven. The baking of biscuits was done at a temperature of 140°C for 30 minutes. The biscuit samples of various combinations before and after baking are shown in Plate 1. The process flow chart for preparation of biscuits is given in Fig A.



Sensory evaluation of biscuits:

Sensory evaluation is multi-disciplinarians that use human panelists with their senses of sight, taste, feeling to measure the sensory characteristics and acceptability of food products, as well as many other materials. There is no instrument that can replicate or replace the human response making the sensory evaluation.

Jamun seed powder-soy based biscuits were prepared in the study and conducted product oriented testing using a panel of 15 judges. They were requested to identify differences among similar food products or to measure the colour, intensity of flavor (odour and taste) and texture or appearance characteristics. Panelists were drawn from the institute where the research work was conducted. All the panelists were asked to complete the questionnaire giving their choice from like



extremely to dislike extremely. The food products were rated on a nine-point hedonic scale. Nine points were awarded as like extremely-9, like very much-8, like moderately-7, like slightly-6, neither like nor dislike-5, dislike slightly-4, dislike moderately-3, dislike very much-2, dislike extremely-1 (Khedkar, 2004). The proforma, was given to each panelis. Fifteen members consumer test panel awarded grades for different quality aspects of jamun seed fortified soy biscuits like general appearance, color, flavor, texture, taste and overall acceptability.

Statistical analysis:

The quality evaluation data were statistically analyzed by using the analysis of variance. In analysis of variance, the sum-of-square, degree of freedom, mean-square and F-ratio were calculated.

RESULTS AND DISCUSSION

The sensory evaluation was done on the basis of colour, texture, flavour, taste, appearance and overall acceptability. There were three samples of biscuits of different compositions. The quality was judged by a fifteen members consumer panel. The food products were rated on a nine-point hedonic scale. The average scores of soy jamun seed powder biscuits given by the consumer panel for each characteristic are represented in Fig. 1 and Table 1. It was observed that the maximum scores of colour (8.13), texture (8.13), flavour (7.78), taste (8.26) appearance (8.00), and overall acceptability (8.26) were obtained for the composition of A₂. It is observed from Fig. 1 that the combination A₂ containing 32% soy flour and 8% jamun seed powder was most accepted by the judges of consumer panel.

From Table 1 and Fig. 1 it can be found that the scores for colour, texture, flavour, taste, appearance and overall acceptability (OA) of biscuits A₁ were 7.46, 7.73, 7.66, 8.26, 7.6 and 7.66, respectively. Similarly, the scores for colour, texture, flavour, taste, appearance and overall acceptability (OA) of biscuits A₃ were observed as 6.4, 6.06, 5.86, 6.13, 6.26 and 6.2, respectively. The scores for flavour were almost same for A₁ and A₂ composition. The scores for colour, texture, flavour, taste, appearance and overall acceptability (OA) of biscuits were found to decrease with increasing per cent of

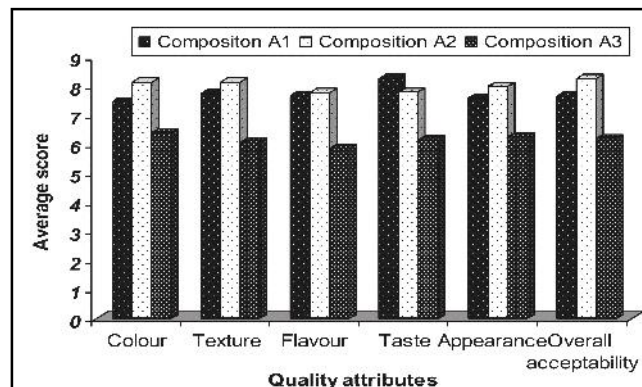


Fig. 1 : Average score of various attributes of sensory evaluation

jamun seed powder and decreasing per cent of soy flour. It can be clearly seen from Table 1.

It is evident from the results that highest score was obtained by biscuits prepared from 32% soy flour + 8% jamun seed powder while lowest by biscuits prepared from 30% soy flour + 10% jamun seed powder. Judges have disliked the biscuits prepared from 34% soy flour + 6% jamun seed powder and 30% soy flour + 10% jamun seed powder with respect to colour when subjected under sensory evaluation. More darkness in the colour of the biscuits was observed as the level of the supplementation of the jamun seed powder was increased in the soy flour that may be subjected to the dark brown colour of the biscuits.

Texture of the biscuits containing soy flour in their formulation was significantly affected with the increase in the level of the jamun seed powder. Biscuits prepared from 32% soy flour + 8% jamun seed powder got highest (8.13) score while lowest score was obtained in the biscuits prepared from 30% soy flour + 10% jamun seed powder. With respect to the texture, judges have accepted biscuits prepared from all the treatments of the composite flours.

The results indicated that the biscuits prepared from 32% soy flour + 8% jamun seed powder significantly got highest score (7.78) for flavour. The data for quality score of taste revealed that judges placed sample 34% soy flour + 6% jamun seed powder at top position (8.26) and rejected 30% soy flour + 10% jamun seed powder (6.13). Judges have disliked

Table 1 : Average score of biscuits by consumer panel

Sample no.	Colour	Texture	Flavour	Taste	Appearance	Overall acceptability
Composition A ₁ (60% maida + 34% soy flour+6% jambul seed powder)	7.46	7.73	7.66	8.26	7.60	7.66
Composition A ₂ (60% maida + 32% soy flour+8% jambul seed powder)	8.13	8.13	7.78	7.80	8.00	8.26
Composition A ₃ (60% maida + 30% soy flour+10% jambul seed powder)	6.40	6.06	5.86	6.13	6.26	6.20

the biscuits prepared from 32% soy flour + 8 % jamun seed powder and 30 % soy flour + 10% jamun seed powder with respect to taste when subjected under sensory evaluation. The samples 32% soy flour + 8 % jamun seed powder and 30 % soy flour + 10% jamun seed powder scored very low as the judges complained of excessive jamun seed powder-like flavour in them, which might be due to the bitter taste of jamun seed powder.

The highest (8.00) significant value for the quality score of the biscuits was found for 32 % soy flour + 8 % jamun seed powder and lowest (6.26) for the biscuits prepared from 30 % soy flour + 10% jamun seed powder. Judges have disliked the biscuits prepared from 30 % soy flour + 10% jamun seed powder when subjected under sensory evaluation for their appearance.

Maximum score (8.26) was obtained by biscuits prepared from 32 % soy flour + 8 % jamun seed powder minimum scores 7.66 and 6.2 were scored by the biscuits prepared from 34 % soy flour+ 6% jamun seed powder and 30 % soy flour + 10% jamun seed powder, respectively. Biscuits prepared from 34 % soy flour+ 6% jamun seed powder and 30 % soy flour + 10% jamun seed powder have been rejected by judges with respect to overall acceptability.

Statistical analysis of sensory evaluation obtained by various judges:

The statistical analysis was performed on the basis of grade score with the help of data collected during the sensory analysis. The statistical analysis was carried out in MS excel programme and ANOVA (Analysis of variance) tables were prepared.

In analysis of variance for each organoleptic quality factor are presented in Table 2 to 3. It is evident from the tables that all the organoleptic qualities were significantly affected at 5 % level of significance.

Colour:

Colour is very important parameter in judging whether biscuits were baked properly and uniformly or not and also reflects the suitability of raw material used for the preparation and provides information about the formulation and quality of the product (Fig. 1). Mean quality score of the colour of the biscuits have been given in the Table 1 and ANOVA presented in Table 2.

It can be concluded that biscuits composition A₂ (32% soy flour + 8% jamun seed powder) gave the highest biscuit colour (8.13) and was found significantly superior to that composition A₁ (34% soy flour+6 % jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder) whereas its superiorly over that composition A₁ (34% soy flour+6 % jamun seed powder) only was not significant.

Texture:

The texture of food is one of the most challenging areas of food characteristics and main quality parameter affecting food preference. The Analysis of variance (ANOVA) table was prepared for texture and shown in Table 3.

It can be concluded that biscuits composition A₂ (32% soy flour+ 8% jamun seed powder) gave the highest biscuit texture (8.13) and was found significantly superior to that composition A₁ (34% soy flour+6 % jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder) whereas its superiorly over that composition A₁ (34% soy flour+6 % jamun seed powder) only was not significant.

Flavour:

Flavour is the main criterion that makes the product to be liked or disliked. Quality score for the flavour of the biscuits revealed that the flavour of the biscuits varied significantly among different treatments.

It can be concluded (Table 5) that biscuits composition A₂ (32% soy flour+ 8% jamun seed powder) gave the highest biscuit flavour (7.78) and was found significantly superior to that composition A₁ (34% soy flour+6 % jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder) whereas its superiorly over that composition A₁ (34% soy flour+6 % jamun seed powder) only was not significant.

Taste:

The statistical analysis regarding the taste of biscuits prepared from composite flours has been depicted in Table 5. It is obvious from the results that supplementation significantly effected the overall acceptability of the biscuits.

It can be concluded that biscuits composition A₁ (34% soy flour+ 6% jamun seed powder) gave the highest biscuit taste (8.26) and was found significantly superior to that composition A₂ (32% soy flour + 8% jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder) whereas its superiorly over that composition A₂ (32% soy flour+8 % jamun seed powder) only was not significant.

Appearance:

Table 7 shows the quality scores for the appearance of the biscuits. It is obvious from results that quality score for the appearance of the biscuits ranged from 6.26 to 8.00.

It can be concluded that biscuits composition A₂ (32% soy flour+ 8% jamun seed powder) gave the highest biscuit appearance (8.00) and was found significantly superior to that composition A₁ (34% soy flour+6 % jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder) whereas its superiorly over that composition A₁ (34% soy flour+6 % jamun seed powder) only was not significant.

Overall acceptability:

The statistical analysis regarding the overall acceptability of biscuits prepared from composite flours has been depicted in Table 6. It is obvious from the results that supplementation significantly effected the overall acceptability of the biscuits.

It can be concluded that biscuits composition A₂ (32% soy flour+ 8% jamun seed powder) gave the highest biscuit overall acceptability (8.26) and was found significantly superior to that composition A₁ (34% soy flour+6 % jamun seed powder) and A₃ (30% soy flour+ 10%jamun seed powder)

Source of variation	Sum of square	Degree of freedom	Mean sum square	F-ratio
Biscuits samples	19.37	2	9.68	6.55*
Panelist	14.26	42	0.33	1.125
Error	49.06	28	1.75	
Total	82.69	72		

* indicates significance of value at P=0.05

Source of variation	Sum of square	Degree of freedom	Mean sum square	F-ratio
Biscuits samples	36.31	2	18.15	12.17*
Panelist	14.93	42	0.35	1.07
Error	41.6	28	1.48	
Total	92.84	72		

* indicates significance of value at P=0.05

Source of variation	Sum of square	Degree of freedom	Mean sum square	F-ratio
Biscuits samples	34.97	2	17.48	9.5*
Panelist	7.46	42	0.17	1.155
Error	51.52	28	1.84	-
Total	93.95	72		

* indicates significance of value at P=0.05

Source of variation	Sum-of-square	Degree of freedom	Mean-square	f-ratio
Biscuits samples	37.73	2	18.86	11.22*
Panelist	9.06	42	0.21	1.39
Error	47.07	28	1.68	
Total	93.86	72		

* indicates significance of value at P=0.05

Source of variation	Sum-of-square	Degree of freedom	Mean-square	f-ratio
Biscuits samples	24.71	2	12.35	9.73*
Panelist	18.53	42	0.44	1.486*
Error	36.54	28	1.30	-
Total	79.78	72		

* indicates significance of values at P=0.05

Source of variation	Sum-of-square	Degree of freedom	Mean-square	f-ratio
Biscuits samples	33.91	2	16.95	9.8*
Panelist	8.66	42	0.20	1.31*
Error	48.67	28	1.73	-
Total	91.24	72		

* and indicates significance of value at P=0.05

whereas its superiorly over that composition A₁ (34% soy flour+6 % jamun seed powder) only was not significant.

The results of the sensory evaluation of the biscuits prepared from the different treatments of the composite flour are according to the findings of Gambus *et al.* (2003), Iqbal (1997), Shearer (2002) and Alpers and Sawyer-Morse (1996) who reported increasing the level of flaxseed flour and soy flour in the biscuits resulted in the significant decrease in the sensory attributes of the biscuits. Unequal proportions of soy flour and jamun seed powder greatly affected the colour, texture, taste and overall acceptability of biscuits.

Conclusion:

Sensory evaluation was conducted on a nine-point hedonic scale by 15 members consumer test panel for colour, texture, flavour, taste, appearance and overall acceptability for soy- jamun seed powder based biscuits. The sensory evaluation data were statistically analysed by using the analysis of variance for various characteristics of biscuits. Unequal proportions of soy flour and jamun seed powder affected the colour, texture, taste and overall acceptability of biscuits. The composition 60% maida+32% soy flour+8% jamun seed powder *i.e.* A₂ was best for colour, texture, flavour, appearance, overall acceptability and was most accepted by the judges of consumer panel. From statistical analysis, it can be concluded that biscuit composition A₂ (60% maida+32% soy flour+8% jamun seed powder) was found significantly superior to the composition A₁ (60% maida+34% soy flour+6% jamun seed powder) and A₃ (60% maida+30% soy flour+10% jamun seed powder).

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REFERENCES

- Alpers, L. and Sawyer-Morse, M. (1996).** Eating quality of banana nut muffins and oatmeal cookies made with ground flaxseed. *J. Am. Diet. Assoc.*, **96** (8) : 794-796.
- Bhargava, S. (1991).** Efficiency of bitter Gourd and Jamun fruit seed in the treatment of diabetes mellitus. M.Sc (Home Science) Thesis, Department of Food and Nutrition, College of Home Science, Udaipur, RAJASTHAN (INDIA).
- Gambus, H., Mikulec, A. and Matusz, A. (2003).** The Canadian muffins and hermit cookies with linseeds. *J. Food Sci.*, **10**: 82-92.
- Iqbal, M.A. (1997).** Quality aspects of biscuits containing figs in their formulation. M.Sc. Thesis, Department of Food Technology, Agricultural University Faisalabad, Pakistan.
- Khedkar, M.B. (2004).** Development of nutritious products from millets and soybean. M.E. (Ag) Thesis, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur, RAJASTHAN (INDIA).
- Meena, M.S. and Meena, S.S. (2004).** Value added products from soybean. B.E. (Ag) Thesis, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur, RAJASTHAN (INDIA).
- Onweluzo, C.J. and Iwezu, N.E. (1998).** Composition and characteristics of cassava-soybean and wheat-soybean biscuits. *J. Food Sci. & Technol.*, **35** : 128-131.
- Shearer, A. (2002).** Physicochemical properties of muffins prepared with various levels of flaxseed flour. Animal and Food Sciences University Delaware College of Agricultural Newark.
- Shorti, D.S., Kelkar, M., Deshmukh, V.K. and Aiman, R. (1962).** Investigation of hypoglycaemic properties of *Vinca rosea* and *Eugenia jambolina*. *Indian Med.*, **3** 62-51.
- Singh, R., Singh, G. and Chauhan, G.S. (2000).** Nutritional evaluation of soy fortified biscuits. *J. Food Sci. & Technol.*, **37**:162-164.

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