

Studies on nutritional composition and sensory evaluation of developed multi-grain Indian bread

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ABSTRACT

Present investigation is planned to optimize the proportion of wheat flour with the processed soya flour and green gram flour to make good quality Indian Bread (poori). Experimental design used in the formulation of product in randomized block design for seven treatment combination (six different blend ratios with one control) in Randomized Block Design. Nutritional and organoleptic quality characteristics of product were evaluated. Descriptive analysis technique was used to assess the product for producible and consistent analysis. The data were statistically analyzed by software SPSS version 16. Findings indicate that mean nutrient value were found to be highest in CF₆ made wholly from soya flour however its dough characteristic and poori organoleptic quality was found to be unacceptable. Mean score of blend CF₃ prepared from 60% wheat flour, 20% processed soya flour, and 20% green gram flour was highest in texture, taste pliability and overall acceptability and hence most recommended.

Key Words : Nutritional composition, Sensory evaluation, Indian bread

INTRODUCTION

Development of reasonable nutrient rich food is a pre-requisite for developing country. A simple way to achieve this is to opt for multi-grain mix for making staple food. Senthil *et al.* (2002) and Malik *et al.* (2015) stated that multigrain products can contribute to a healthy digestive system, help in weight control, reduce the risk of diabetes reduce the risk of cardiac failures and prevent the chances of bowel cancer. Traditional Indian deep fried puffed bread (poori) consumed in many celebrations as breakfast, lunch, dinner item due to its characteristic flavour and texture. In view of increasing demand of wholesome food by health conscious consumer's nutritious poori were developed by blending. Present investigation is planned to optimize the proportion of wheat flour with the processed soya flour and green gram flour to make good quality poori and to evaluate the effect of same on nutritional and organoleptic quality characteristics of product.

METHODOLOGY

Experimental Material and Design :

The raw ingredients of Poori *viz.*, as wheat flour, processed soya flour and green gram was brought from the local market of Jabalpur and stored at room temperature in air tight plastic

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containers. Experimental design used in the formulation of product in Randomized Block Design. Wheat flour, processed soya flour and green gram flour were used as experimental sample in which wheat was used as control. The experimental and control item were formulated so as to make 100 g of flour.

Preparation of composite flour/blends :

Six blends and one control were prepared by using Randomized Block Designing (Table 1 and 2).

Table 1 : Different codes used in the preparation of blends					
Coding	Decoding	Coding	Decoding	Coding	Decoding
W	Wheat Flour	S	Processed Soy Flour	G	Green Gram Flour
W ₁	100%	S ₁	10%	G ₁	10%
W ₂	80%	S ₂	20%	G ₂	20%
W ₃	60%	S ₃	30%	G ₃	30%
W ₄	40%	S ₄	40%	G ₄	40%
W ₅	20%	--	--	--	--

Table 2 : Different coding and decoding used in the preparation of blends		
Coding - 1	Coding-2	Decoding
CF ₁	Control W ₁	100
CF ₂	W ₂ S ₁ G ₁	80:10:10
CF ₃	W ₃ S ₂ G ₂	60:20:20
CF ₄	W ₄ S ₃ G ₃	40:30:30
CF ₅	W ₅ S ₄ G ₄	20:40:40
CF ₆	W ₀ S G ₀	100
CF ₇	W ₀ S ₀ G	100

Procedure :

Conventional method for preparing Poori was opted. All the flour mixed according to different blends (CF₁, CF₂, CF₃, CF₄, CF₅, CF₆, CF₇), designed flour was mixed with weighed amount of water and small quantity of table salt (5g) required for making optimum dough consistency by hand kneading. The dough was allowed to rest for 1 hour at room temperature. The dough pieces made into (20g) round balls. Each dough balls rolled manually into circle (8 cm of diameter and 2 mm of thickness). Measured oil (200ml) was taken in pan (180°C). Poori was deep fried allowed to puffed completely till golden brown in colour. Excess oil from Poori was drained and measured left over.

Nutritional analytical methods :

The nutritive value via calorie, carbohydrate, protein, fat, crude fibre, moisture and mineral contents of poori from different blends was calculated using NIN nutritive value bulletin by C. Gopalan, B.V. Rama Sastri and S.C. Bala Subramaniam.

Organoleptic (Sensory) evaluation :

The sensory evaluation of prepared products was performed by the panel of 10 judges based on the sensory attributes like colour and appearance, flavour, texture, taste, pliability and overall acceptability. The evaluation was done on a nine point hedonic scale as described by the Amerine

et al. (1965). The descriptive analysis technique was used to evaluate the product for producible and consistent analysis (Table 3).

Table 3 : Evaluation criteria and attributes of the developed product

Evaluation Criteria	Attributes
1. Appearance	- Color of the center of the slice, Color of crust, Uniformity of pores - Surface area, Glossiness, Feel
2. Taste	- Taste during chewing
3. Texture	- Tissue adhesiveness, Brittleness, Chewiness, Elasticity, Hardness
4. Flavor	- Flavor before or after biting.

Statistical analysis :

Analysis of different Blends was carried out to know the degree of variation and significance among all the blends. The statistical analysis of variance (one way- ANOVA) was done to determine significance among mean using software SPSS version 16.

RESULTS AND DISCUSSION

Nutritional composition of Poori of various blends :

Nutritional analysis of poori made from different blends depicted in Table 4. The highest calorie (432 kcal), protein (43%), fat (19.5%) and fibre (3.7%) content was noticed in CF₆ (19.5%) whereas the highest carbohydrate content was observed in CF₁ with (69.4%) which also has lowest protein (12%), fat (2.7%) content.

Table 4 : Nutritional composition of Poori of various blends of flour

Blend code	Blend decode			Nutritional composition							
	Treatment	W.F	P.S.F	G.G.F	Calorie (kcal)	CHO (g%)	Protein(g%)	Fat g%	Crude fibre g%	Moisture g%	Mineral g%
CF ₁		100	0	0	341	69.4	12.1	1.7	1.9	12.2	2.7
CF ₂		80	10	10	349.5	63.1	16.3	4.4	1.8	11.4	2.8
CF ₃		60	20	20	401	57.6	20.7	5.2	1.9	13.6	3.2
CF ₄		40	30	30	394.3	54.4	27.3	7.5	2.1	10.8	3.6
CF ₅		20	40	40	378.2	46	29.4	8.59	2.1	9.6	3.6
CF ₆		0	100	0	432	20.9	43.2	19.5	3.7	8.1	4.6
CF ₇		0	0	100	343	59.9	24.5	1.2	0.8	10.1	3.5

*W.F.=Wheat flour, *P.S.F= Processed soya flour, *G.G.F= Green gram flour

The highest percentage of fat absorbed in CF₆ could be because of the presence of higher amount of fibre. The amount of water present in the blend directly proportional to the amount of fat absorbed during frying also, soya bean flour itself contains oil in good amount therefore, maximum oil noted in CF₆. The variation in the moisture per cent can be attributed to the changes in fibre content due to presence of soya flour and green gram flour in various proportions of different blends. Therefore, it can be concluded that poori prepared by blend CF₆ made completely from soyabean flour has highest nutritional value.

Dough and Poori characteristics :

Table 5 shows the dough, it was found that CF₃ was best in colour and texture in comparison

with other variations because it was slightly yellow and texture was soft and slightly sticky. CF₁ was whitish and CF₇ was yellowish in color and texture was very sticky.

Treatments	Water absorb (ml)	Weight of dough (g)	Colour of dough	Texture of dough
CF ₁	69	165	Whitish	Soft and Non-sticky
CF ₂	67	175	Creamish	Soft and Non-sticky
CF ₃	61	170	Slight yellow	Soft and Non-sticky
CF ₄	55	165	Slight yellow	Slightly-Hard
CF ₅	58	162	Slight yellow	Slightly-Hard
CF ₆	60	160	Dirty yellow	Hard-Slightly Soft
CF ₇	50	150	Yellowish	Soft and more Sticky

Water absorbed for making a dough from blend CF₁ (69 ml) had got higher absorption ratio. It has been observed that Poori made of poor water absorbing capacity (less than 60 %) tends to become stiff and brittle (less pliable) especially on keeping for an hour or so, whereas the poories made with atta of higher water absorption capacity appear soft and pliable for longer time.

It was analysed that there is no significant difference between CF₃, CF₄ and CF₅ but they significantly different from the rest of other blends *i.e.* CF₆ and CF₇. Texture is affected by the incorporation of the blend because of the presence of fibre. There is no significant difference between blends CF₁, CF₂ and CF₃ for softness and non-stickiness from the blends CF₄ and CF₅ *i.e.* slightly hard. Hence, dough of Poori prepared by blend CF₃ was best in colour and texture in comparison with other blends.

Poori characteristics :

Table 6 shows the characteristics of Poori like puffiness, colour, texture, oil absorption of the flours of with 7 treatments. The maximum absorption of oil in poori takes place in blends CF₆ and CF₇ (2.1ml) while the lowest oil content was seen in blend CF₄ (1.6ml). Based on above observation it was found blend CF₂ and CF₃ was best with pale color, soft texture and complete puffing, where as in CF₆ in which ratio was 100% soybean flour found to be slightly hard in texture with color is more brownish color than others.

Treatments	Color	Puffiness	Texture	Oil absorbed (ml)	Overall acceptability
CF ₁	Whitish	Fully Puffed	Soft	2	Like extremely
CF ₂	Creamish	Puffiness present	Soft and Nice	1.9	Like very much
CF ₃	Slight yellow	Puffiness present	Soft and Nice	1.8	Like very much
CF ₄	Slight yellow	Puffiness present	Slightly Soft	1.6	Like moderately
CF ₅	Slight yellow	Slightly Puffed	Slightly Soft	2.1	Neither dislike
CF ₆	Dirty yellow	No Puffiness	Slightly Hard	2.1	Dislike very much
CF ₇	Yellowish	Puffiness Present	Soft	1.6	Like Slightly

Organoleptic evaluation :

Sensory quality of poori prepared is presented in Table 7. The difference among the various products was significant for color and appearance, texture, flavor, taste and overall acceptability.

The quality characteristics were found to be significantly different from each other for various blends. Variance due to judges did not exist, indicating that panelist group was homogenous.

Table 7 : Mean scores of organoleptic evaluation

Treatment	Color and appearance	Flavor	Texture	Taste	Pliability	Overall acceptability
Control CF ₁	8.6	7.3	8.0	7.6	7.9	7.8
CF ₂	7.6	7.0	7.6	7.5	6.8	7.4
CF ₃	8.1	7.1	7.8	7.4	7.0	7.7
CF ₄	8.0	7.0	7.5	7.2	6.8	7.3
CF ₅	7.3	6.5	6.5	6.5	6.5	6.9
CF ₆	6.7	6.5	6.0	6.1	6.3	6.8
CF ₇	7.1	6.8	6.6	6.8	6.4	7.1
pValue	0.03*	0.04*	0.01*	0.30*	0.04*	0.03*

*Significant at 0.05 % level.

Sensory attributes via color, appearance, flavor, texture, taste, pliability and overall acceptability shows that mean score of blend CF₃ is highest in texture, taste pliability and overall acceptability which is prepared from 60% wheat flour, 20% processed soya flour, 20% green gram flour.

Conclusion and Recommendation :

The nutritional analysis reveals that the maximum amount of energy content, protein, fat, fiber and minerals was found in CF₆ which was made wholly from soya flour however its dough characteristic and poori organoleptic quality was found to be unacceptable. Physical and sensory parameters of blend CF₃ were significantly higher in favor, texture, color and appearance with optimum nutritional content. Therefore, the composition of blend CF₃ is highly recommended for Puri preparation *i.e.* 60% wheat flour, 20% processed soya flour, 20% green gram flour. Although, the present investigation has given much useful information on various sensory attributes as well as proximate composition of “poori”, yet studies on shelf life, packaging and functional properties of the product need to be studied.

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