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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 where 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%	\mathbf{S}_1	10%	G_1	10%			
W2	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 Subramanium.

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 STUDIES ON NUTRITIONAL COMPOSITION & SENSORY EVALUATION OF DEVELOPED MULTI-GRAIN INDIAN BREAD

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	CHO	Protein(Fat	Crude	Moisture	Mineral
			-	(kcal)	(g%)	g%)	g%	fibre g%	g%	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 CF_6 could be because of the presence of higher amount of fibre. The amount of water resent in the blend directly proportional to the amount of fat absorbed during frying also, soya beam flour itself contains oil in good amount therefore, maximum oil noted in CF_6 . 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 CF_6 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

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with other variations because it was slightly yellow and texture was soft and slightly sticky. CF_1 was whitish and CF_7 was yellowish in color and texture was very sticky.

Table 5 : Characteristics of Dough								
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 CF_1 (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 CF_3 , CF_4 and CF_5 but they significantly different from the rest of other blends *i.e.* CF_6 and CF_7 . Texture is affected by the incorporation of the blend because of the presence of fibre. There is no significant difference between blends CF_1 , CF_2 and CF_3 for softness and non-stickiness from the blends CF_4 and CF_5 *i.e.* slightly hard. Hence, dough of Poori prepared by blend CF_3 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 CF_6 and CF_7 (2.1ml) while the lowest oil content was seen in blend CF_4 (1.6ml). Based on above observation it was found blend CF_2 and CF_3 was best with pale color, soft texture and complete puffing, where as in CF_6 in which ratio was 100% soybean flour found to be slightly hard in texture with color is more brownish color than others.

Table 6 : Characteristics of Poori								
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.

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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 CF_3 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 CF_3 were significantly higher in favor, texture, color and appearance with optimum nutritional content. Therefore, the composition of blend CF_3 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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