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Sensory Evaluation of Protein and Fiber Enriched Cookies Prepared From Blend of Soya and Corn Flour

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ABSTRACT

Bakery products are mainly prepared from wheat as its main ingredient. A study was designed to blend soy flour and corn flour as a source of protein and fibre replacing refined flour to make protein rich cookies. Soy and corn flour was incorporated in different proportions i.e., T_1 (50:50), T_2 (60:40), T_3 (70:30), T_4 (80:40) and T_5 (90:10). Physical parameters of control and experimental cookies were also analyzed during baking. It was observed that the diameter of the cookies remains constant when it was baked at different time period, spread ratio was found maximum at the starting of baking at the time of 10 minutes. Soya bean is limiting in sulphur, amino acid, methionine but higher in lysine, isoflavones and protein, while corn protein is deficient in lysine and tryptophan and rich in methionine. Thereby blending soy and corn flour nutritional quality can be improved. Cookies were prepared by blending soy flour (SF) with corn flour (CF) from 0-100% levels using traditional creamery method. Cookies were evaluated for physicochemical, functional and sensory quality parameters. Combination of CF/SF significantly improved ($p < 0.05$) the nutrient content of the blend when compared to CF alone. The cooking containing maximum level of SF had high content of protein, crude fibre, ash and fat, while cookies containing maximum level of CF had high content of carbohydrate. The cookies with 90% of soya flour and 10% of corn flour scored maximum for all the sensory quality attributes. The use of soy flour/ corn flour blend for cookie preparation is an advantage in a non-traditional wheat producing country and in proving nutritional quality too.

Keywords: *Soy flour, corn flour, cookies.*

INTRODUCTION

India is a developing country with large segment of population depending on wheat as staple food and 25% of wheat is used in the preparation of beaked food. Cookies are also known as biscuits commonly made from wheat flour and other ingredients. The long shelf life of cookies makes the possibility of large scale production and distribution. Enrichment of cereal based foods with other protein sources such as oil seeds and legumes has received considerable attention **(Ayo and Okka, 2005).** This is because oil seeds and legume proteins are high in lysine, essential limiting amino acids in most cereals. Grain legumes, like soy bean (*Glycine max*) is an excellent source of protein (40-45%), hence the seeds are richest in the food value of all plant foods consumed in the world. It is also rich in calcium, iron, phosphorus and most of the vitamins.it is the only source that contains all essential amino acid **(Mooriya ,2003).** Soybean plays a vital role in balancing the protein deficiency of our diet. Soybean has 3% lecithin, which is helpful for brain development **(Akubor and Ukwuru, 2005).** Corn is one of the abundant cereal with its increasing production in the world. In many countries corn is main food cereal and its products are used in a wide range of foods **(Osman, 1967).** Corn flour can be used in baked goods as an economic, nutritive and tasty additive. The particular amino acid in corn, leucine, is important in the incidence of Pellagra. Corn flour, Soy flour can be used to enrich and diversify cookies. However soybean and corn flour blend would provide a nutritionally balanced food because of the improved protein quality and high-energy value of the blend.

MATERIAL AND METHODS

Soya and corn flour blended cookies were prepared by following the standard procedure of Gupta (1982). Control cookies were made from wheat flour (T_0). Whereas experimental cookies i.e., soya + corn flour was made in different ratio - T_1 (50:50), T_3(70:30), T_4(80:20) and T_5(90:10) respectively. Then cream was added to the mix (@25% of the mix). Sugar was added @ 20% of the mix. Then baking powder was added to the mix (@ 0.5% of mix). Now all the ingredients were mixed thoroughly and aerated. After that sheeting and rolling of the mix was done on wooden board. After this the mix was baked in hot oven at 160°C for 6-8 minutes. Now the cookies were ready and cooled at 24°C and sent for packing.

Table No. 1: Details of different treatments using Wheat flour, Soy flour and Corn flour for making cookies

Materials(%)	Different treatments (cookies)					
	T_0	T_1	T_2	T_3	T_4	T_5
Wheat flour	100	-	-	-	-	-
Soy flour	-	50	60	70	80	90
Corn flour	-	50	40	30	20	10

Flour (Wheat flour/ Soy flour and Corn flour)
↓
Mixing (As above treatment)
↓
Adding of ingredients
(Sweetener, salt, sodium bicarbonate, water and shortening materials)
↓
Kneading
↓
Greasing
↓
Moulding
↓
Putting them on the tray
↓
Baking (at 160 degree Celsius for 6-8 min.)
↓
Cooling
↓
Packaging
↓
Storage

Fig. 1: Flow chart for preparation of cookies

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Organoleptic Evaluation of the prepared product:

Freshly prepared herbal Kalakand were served for evaluation to panel members consisting of 5 experienced persons. 9 point hedonic scale proforma was used as suggested by **Amerine *et.al.* (1965).**

Statistical analysis: The data obtained on different aspects as per plan were tabulated and statistically analyzed as per **Chandel (1991).**

RESULTS AND DISCUSSION

Organoleptic attributes of control and fortified cookies (prepared from admixture of soy and corn flour):

Table-2 shows organoleptic attributes of control and fortified cookies (prepared from admixture of soy and corn flour).

Colour and Appearance:

There were significant differences found among the treatments for colour and appearance. The highest mean value for colour and appearance of cookies was found in T_2 (8.12), followed by T_3 (8.11), T_4 (8.08), T_5 (8.0), T_1 (8.0) and T_0 (7.74). F Value was 2534.63, indicating significant effect of treatment on colour and appearance (Fig. 2).

Table No. 2: Average of organoleptic score of control and fortified cookies (prepared from admixture of soy and corn flour flour)

Parameters (%)	Control and fortified cookies (prepared from admixture of soy and corn flour)						F value	C.D.
	T_0	T_1	T_2	T_3	T_4	T_5		
Colour and Appearance	7.74	8.0	8.12	8.12	8.08	8.0	2534.63*	0.32
Body and Texture	7.20	8.42	7.84	7.50	7.82	7.74	21.83*	6.60
Flavour and Taste	7.60	7.82	7.92	7.82	8.22	8.24	6.42*	9.59

* Significant at $p < 0.05$; ** Non-significant at $p < 0.05$

Body and texture:

The average score for body and texture differed significantly. The highest mean value for body and texture was found in T_1 (8.42), followed by T_2 (7.84), T_4 (7.82), T_5 (7.74), T_3 (7.50) and T_0 (7.20). F Value was 21.83, indicating significant effect of treatment on body and texture (Fig. 2).

Flavour and Taste:

There was significant difference found among the treatments for flavour and taste score. The highest mean value for flavour and taste was found in T_5 (8.24), T_4 (8.22), T_2 (7.92), T_3 (7.82), T_1 (7.81) and T_0 (7.60). F Value was 6.42, indicating significant effect of treatment on flavour and taste (Fig. 2).

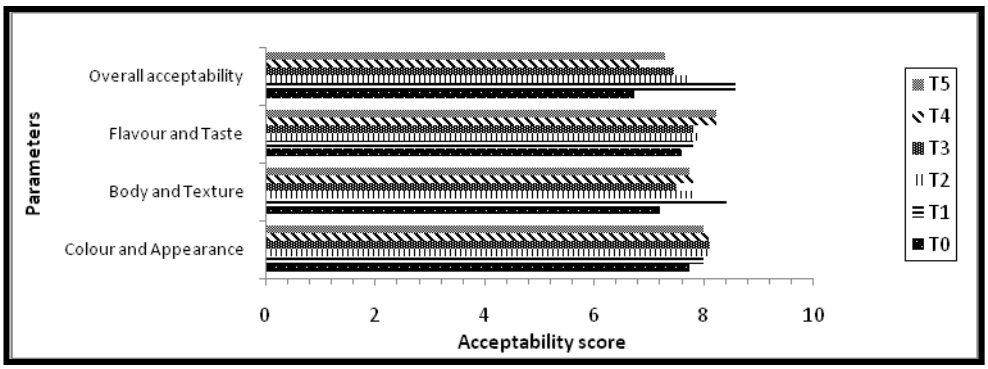

Fig. 2: Average of organoleptic parameters and overall acceptability score control and fortified cookies (prepared from admixture of soy and corn flour flour)

Overall acceptability scores for control and fortified cookies (prepared from admixture of soy and corn flour):

Table 3 and fig.2 showed the highest mean value for overall acceptability of the product was found in T_1 (8.59), followed by T_2 (7.75), T_3 (7.46), T_5 (7.29), T_4 (6.82) and T_0 (6.73). There were significant differences found between the treatments. F Value was 924.44, indicating significant effect of treatment on Overall acceptability.

Table No. 3: *Overall acceptability scores for control and fortified cookies (prepared from admixture of soy and corn flour):*

Replication	Control and fortified cookies (prepared from admixture of soy and corn flour)						F value	C.D.
	T_0	T_1	T_2	T_3	T_4	T_5		
R_1	6.25	8.6	8.0	7.0	7.12	8.75	924.44*	0.98
R_2	7.24	7.8	8.20	6.7	7.5	6.35		
R_3	6.80	9.0	8.37	7.2	6.3	7.40		
R_4	6.20	8.67	7.40	7.5	6.8	7.15		
R_5	7.15	8.90	6.80	8.9	6.42	6.80		
Mean	**6.73**	**8.59**	**7.75**	**7.46**	**6.82**	**7.29**		

* Significant at $p < 0.05$; ** Non-significant at $p < 0.05$

Cost Analysis of control and fortified cookies (prepared from admixture of soy and corn flour):

The data regarding cost of Control and fortified cookies (prepared from admixture of soy and corn flour) was found as expensive in T_1 (195.45 Rs/Kg), followed by, T_2 (192.4Rs/Kg), T_3 (189.45Rs/Kg), T_4(186.45Rs/Kg), T_5 (183.42Rs/Kg) and T_0 (165.55Rs/Kg) (Table.4 and Fig.3).

Table No. 4: Cost Analysis of control and fortified cookies (prepared from admixture of soy and corn flour)

Parameters	Control and fortified cookies (prepared from admixture of soy and corn flour)					
	T_0	T_1	T_2	T_3	T_4	T_5
Cost(Rs/Kg)	165.55	195.45	192.4	189.45	186.45	183.42

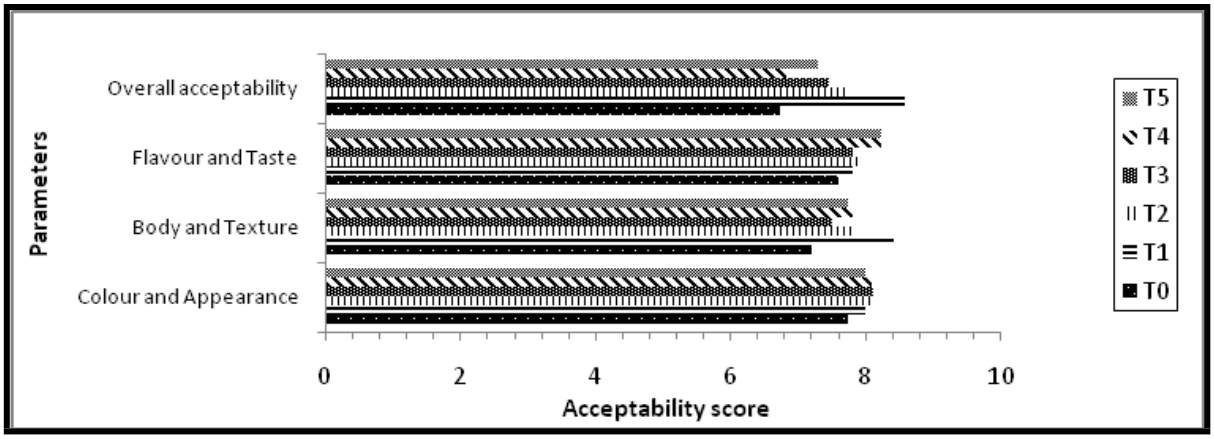

Fig. 3: Cost Analysis of control and fortified cookies (prepared from admixture of soy and corn flour)

CONCLUSION

The results from statistical analysis revealed that the CF cookies received higher rating than SF cookies. Combination of CF/SF significantly improved ($p < 0.05$) the nutrient contents of the blend when compared to CF alone. All constituents accept carbohydrate increased with levels of SF. The ratio 10:90 (SF: CF) appeared optimum for the blended cookies. Therefore, Soya and Maize flour can be combined to produce acceptable cookies with greatly improved nutritional quality. It also helps in child feeding program for low income group.

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