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## SENSORY EVALUATION OF *BISCUITS* PREPARED WITH FLAXSEED FLOUR

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### ABSTRACT

The objective of this study was acceptability of biscuit containing four different combinations of powders of wheat and flaxseed *viz.*, 80:20, 70:30, 60:40 percent were used to prepare 100g flour mix. The acceptable level of flaxseed flour in biscuit was assessed by incorporating 20 to 40 percent of flaxseed flour in wheat flour and standardized for the sensory characteristics. Acceptance was assessed using a hedonic scale of nine points. It was noticed that incorporation of flaxseed flour at 40 percent was unacceptable in biscuit. At this level of incorporation of flaxseed flour, the appearance of the product was affected *i.e.* darker in colour and taste wise, bitterness was found by the panel where as 30 percent incorporation produced good results. Data revealed that the overall acceptability of *biscuit* ranged from 8.6 to 6.4. This indicated that the recipes were found to fall under the category of 'liked very much to like slightly. It can finally be discerned from the sensory scores for biscuit prepared with 30 percent incorporation of flaxseed flour that the biscuit were equally acceptable as that of control. The use of up to 30 percent of flaxseed flour in the preparation of biscuit is a useful strategy to optimize the consumption of food rich in functional ingredients.

**Keywords:** Flaxseed flour, wheat flour, biscuit, bioactive compounds and sensory characteristics.

### INTRODUCTION

Flaxseed (*Linum usitatissimum*) has been part of the human diet for thousands of years, and more recently it has been used as a source of nutraceuticals. It has been identified as a functional food, whose benefits to health are generally attributed to high concentrations of linolenic acids (omega-3) and lignins, as well as significant quantities of dietary fiber. Flaxseed contains approximately 28 percent fiber, of which one third is soluble and has proved to reduce cholesterol. The remaining two thirds of insoluble dietary fiber can increase fecal mass, reducing transit time in the lumen, preventing constipation (Hussain *et. al.* 2006). Linolenic acid is the predominant fatty acid in the lipids of the flaxseed, and studies have showed its beneficial effect on the growth and development of children as well as on reducing the risk of cardiovascular disease, stroke, and inflammatory and immunological disorders (Lucas *et. al.* 2002).

Flaxseed is a food with higher contents of lignans, containing 75 to 800 times more of this substance than any other food. Phytoestrogens, such as lignans, act on the estrogen metabolism and are purported to serve as an adjuvant in hormone replacement therapy and breast and prostate cancer prevention strategies (Thompson *et. al.* 2005).

Flaxseed consumption is still very low in Brazil despite the growing interest of specific consumer groups encouraged to adopt healthy eating habits. The growing consumer demand for food with nutritional and sensory quality as well as functional claim (Moscatto; Prudencio-Ferreira and Haully, 2004) has called for research to develop new products, which include not only the nutritional and functional characterization, but also consider consumer acceptance. Bakery products such as biscuit have high consumer acceptance and are important for delivering bioactive compounds into the human diet (Alpaslan and Hayta, 2006).

The objectives of this work were to prepare *biscuit* with different proportions of flaxseed and wheat flours, to characterize their nutritional value, and to evaluate the *biscuit* acceptance by penal member.

### MATERIALS AND METHODS

#### PROCUREMENT OF RAW MATERIAL

Wheat and flaxseed were used in the study. The wheat flour was used as a base material for the preparation of flour mix with flaxseed and other ingredients used in the preparation of *biscuits* included flour, sugar, baking soda,

butter, milk powder and water. All ingredients were purchased from local market of Udaipur city in bulk, to avoid varietal difference.

### PROCESSING OF RAW MATERIAL

The cleaning of flaxseed and wheat grains was performed manually to remove damaged seeds, dust particles, seeds of other grains/crops and other impurities such as metals, stones and weeds. Wheat and flaxseed were powdered separately in a mixer grinder to prepare flour.

### PREPARATIONS OF FLOUR MIX FOR BISCUITS

For the purpose of standardization of flour mix, a number of preliminary trials were conducted. Different combinations of powders of wheat and flaxseed viz., 80:20, 70:30, 60:40 percent were used to prepare 100g flour mix for biscuits.

### BISCUITS PREPARATION

The biscuits were prepared after the flour preparation, following a standard formulation, with the addition of four different levels of flaxseed flour. Table 1 show the ingredients utilized in the biscuits preparation. Dry ingredients (like flour, soda and baking powder) were mixed and sieved twice for uniform mixing of leavening agents to the flour. Milk powder was added to the flour mixture. Weighed amount of ghee was taken in a bowl and stirred until it melts; sugar was added and stirred continuously for creaming. Flour mix was added in smaller amounts into the cream and uniformly mixed. Soft dough was prepared by sprinkling small quantity of water. Dough was rolled and then biscuits were cut into small round shape using biscuit cutter. Biscuits were kept in an electric oven for 30 min at 125°C for uniform baking.

**Table 1: Standardized recipe of Biscuit**

Ingredients	Amount (g)
Flour mix	50
Milk Powder	10
Butter	5
Sugar (powdered)	20
Baking soda	0.350

Product Outcome = Three biscuits

### SENSORY EVALUATION

The acceptable level of flaxseed flour in biscuits was assessed by incorporating 20 to 40 percent of flaxseed flour in wheat flour and standardized for the sensory characteristics. During preliminary trials, it was noticed that incorporation of flaxseed flour at 40 percent was unacceptable in selected recipes. At this level of incorporation of flaxseed flour, the appearance of the product was affected i.e. darker in colour and taste wise, bitterness was found by the panel where as 30 percent incorporation

produced good results. Hence, in the present study flaxseed flour was incorporated at 30 percent level in the standardized recipes. The recipes were evaluated for sensory characteristics by the panel of judges.

### STATISTICAL ANALYSIS

The difference in mean acceptability scores of different variation of flour, assessing the acceptability of flour mix in biscuits were analyzed in term of analysis of variance (ANOVA).

### RESULTS AND DISCUSSION

The results of the present research have been discussed under following sub heads.

#### PREPARATION OF FLOUR MIX FOR BISCUITS

To develop the flour mix, flaxseed and wheat grain were procured and processed separately. Then both the flours were mixed in different ratio viz, 80:20, 70:30 and 60:40 percent respectively were used to prepare 100g flour mix for biscuits. Adesina *et. al.* (1998) also developed maize-soy based RTE snacks using different proportions and found that the extrudates of 85:15 had the highest scores for texture whereas overall acceptability was highest for 75:25 maize-soy extrudates.

#### SENSORY SCORES OF BISCUITS

Results of sensory evaluation of biscuits prepared with 20 (B2), 30 (B3) and 40 (B4) percent of flaxseed flour were present in Table 2. Data revealed that the overall acceptability of biscuits ranged from 8.6 to 6.4. This indicated that the recipes were found to fall under the category of 'liked very much to like slightly'. Control biscuits (B1) exhibit highest scores for all sensory attributes were represented here such as 8.7±0.48(color), 8.4 ±0.51 (appearance), 8.5±0.52 (texture), 8.3±0.48 (aroma), 8.8±0.42 (taste) and 8.6±0.69 (overall acceptability) as compared to biscuits prepared with 20, 30 and 40 percent ratio of flaxseed flour. As the level of flaxseed was increased to 40 percent, decrease in all sensory attributes was noticed. From the statistical data, it is clear that, there was significant difference at p≤0.01 in all the sensory attributes viz., color, appearance, texture, aroma, taste and overall acceptability.

Similar were the finding of Hussain *et. al.* (2006) who developed cookies by using full fat flaxseed flour supplemented with wheat flour at 5, 10, 15, 20, 25 and 40 percent level. The mean quality scores of the cookies decreased with the increase in the level of the flaxseed flour supplementation. Cookies containing 30 percent and lower level of the full fat flaxseed flour were acceptable. Supplementation of wheat biscuits with bengal gram flour was tried by Shakuntala *et. al.* (2008) at 10, 15, 20, and 25 percent levels along with modifications in water, fat and baking powder to improve the nutritional and textural quality of biscuits. It was found that sensory attributes of biscuits

improved on supplementation of *bengal gram* flour at 15 to 20 percent level.

**Table 2: Sensory acceptability scores of biscuits prepared by using flour mix**

Recipe no.	Combinati on of flour	Ratios of WF:FS	Sensory Attributes					
			Colour	Appearance	Texture	Aroma	Taste	Overall Acceptability
B1	WWF	100:0	8.7±0.48	8.4±0.51	8.5±0.52	8.3±0.48	8.8±0.42	8.6±0.69
B2	WWF+FSF	80:20	7.6±0.84	8.2±0.42	8.0±0.66	8.2±0.63	8.2±0.63	8.2±0.63
B3	WWF+FSF	70:30	7.7±0.48	8.0±0.81	7.9±0.87	8.1±0.73	8.0±0.66	8.0±0.66
B4	WWF+FSF	60:40	6.5±0.52	6.3±0.82	6.7±0.48	6.4±0.69	6.4±0.51	6.4±0.51
Mean			7.62±0.9	7.72±1.06	7.77±0.9	7.75±1	7.85±1.05	7.80±1.04
SE			0.190	0.211	0.207	0.204	0.179	0.200
CD5%			0.547	0.606	0.595	0.585	0.514	0.573
CD1%			0.734**	0.813**	0.798**	0.785**	0.690**	0.769**

\*\* Significant at 1% level, WWF – Whole Wheat Flour, FSF – Flaxseed Flour

According to Preethi (2009), developed omega-3 enriched food products like cookies, *laddu* and *champakali* were highly acceptable with good storage quality. It can finally be discerned from the sensory scores for biscuits prepared with 30 percent incorporation of flaxseed flour that the biscuits were equally acceptable as that of control. The statistical analysis of the data reveals that there was significant difference in colour, appearance, texture, aroma, taste and overall acceptability at  $p < 0.01$  in biscuits. Since 30 percent ratio was found acceptable and provided the 1-2g/day maximum requirement of omega-3 fatty acid for adult. Hence, the flour mix 30 percent incorporation of flour mix was selected for further standardization of the recipe.

#### STANDARDIZATION OF RECIPES BY SELECTED RATIO OF FLOUR MIX

The most acceptable ratio of wheat flour and flaxseed flour was found to be 70:30. The *biscuits* were repeatedly prepared till consistently highly acceptable scores were

obtained (Table 3 and Plate 1). Sensory evaluation of *biscuits* for the last three consecutive trials during standardization has been presented in Table 3. The overall mean scores of trials ranged from 7.9 to 8.1. Further, it can be discerned from the mean value of sensory attributes *viz.*, colour (7.8), appearance (8.1), texture (7.73), Aroma (8.4), taste (8.13) and overall acceptability (8.04) that the *biscuits* were highly acceptable by the panel members (Plate 1). Hussein *et. al.* (2011) prepared flour with raw, soaked and germinated fenugreek seeds and corn. Organoleptic evaluation revealed that *Gelatinized Corn Flour* (GCF) can be replaced using 10 percent Soaked Fenugreek (SF) and 20 percent Germinated Fenugreek (GF) flours to produce acceptable and high nutritional value *biscuits*. Alpaslan and Hayta (2006) evaluated the sensory quality of bakery products prepared with corn, soybean, and flaxseed flours. Cake formulations by substitution of wheat flour with flaxseed flour (30%) flour were very well acceptable.

**Table 3: Sensory score of standardized Biscuits by using flour mix**

Sensory Characteristics	Trials			Mean
	I	II	III	
Colour	7.70±0.48	7.80±0.56	7.90±0.73	7.8±0.59
Appearance	8.00±0.81	8.10±0.84	8.20±0.90	8.1±0.85
Texture	7.90±0.87	7.80±0.77	7.50±0.90	7.73±0.84
Aroma	8.10±0.73	8.50±0.79	8.60±0.80	8.4±0.77
Taste	8.00±0.66	8.10±0.60	8.30±0.80	8.13±0.68
Overall acceptability	8.00±0.66	8.20±0.76	8.10±0.78	8.1±0.73
Mean	7.95±0.70	8.08±0.72	8.1±0.81	8.04±0.74



**Plate 1: Biscuits prepared by using flour mix**

Findings of earlier studies undertaken by Aliani *et al.* (2011) revealed that the sensory attributes of bagels containing 30 percent of milled flaxseed were acceptable. The cookies prepared from wheat flour containing 20 percent whole flaxseed grains, partially defatted flaxseed flour and full fat flaxseed flour were found acceptable with respect to their sensory attributes (Hussain, 2006).

## CONCLUSION

A novel biscuits product, fortified with flaxseed was successfully produced. The color of the fortified samples attained more dark color as the fortification was increased. The formulations made with up to 30 percent flaxseed flour as partial replacement of wheat flour had good acceptance. Adding flaxseed flour in bakery products is a useful strategy to increase the consumption of fiber and omega-3 in the human diet. New formulations could therefore be tested aiming at the development and consumption of foods fortified with higher proportions of functional and nutritious ingredients.

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