



# **Sensory Evaluation of Wheat Bran Biscuits Mixed with Flaxseed**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author AT designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SM managed the analyses of the study. Author AT managed the literature searches. Both authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/AJARR/2019/v6i330155

Editor(s):

(1) Dr. Azizur Rahman, Department of Chemical and Physical Sciences, University of Toronto, Davis Building, Canada.

Reviewers:

(1) Tamer Elsisy, Agriculture Research Center, Egypt.

(2) Luis Chel-Guerrero, Universidad Autónoma de Yucatán, México.

(3) Ningappa. M. Rolli, BLDEA'S Degree College, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/51871>

**Short Research Article**

**Received 09 August 2019**

**Accepted 13 October 2019**

**Published 21 October 2019**

## **ABSTRACT**

Biscuit consumption is considered one of the top ten daily consumed foods [1]. The objective of this study was acceptability of biscuit containing three different combinations of powders of wheat bran, flaxseed and wheat viz., 25:75:0, 0:50:50, 20:80:0 were used to prepare 100gms flour mix. Acceptance was assessed using a hedonic scale of nine points. It was noticed that incorporation of flaxseed flour at 80% was unacceptable in biscuit. At this level of incorporation of flaxseed flour, the sensory properties of the product were affected i.e., flavour and taste wise, body and texture, colour and appearance and overall quality whereas 75% addition of flaxseed flour produced good results [2]. The antioxidant activity, phenolic concentration was linearly increased as the fortification was increased [1]. Data revealed that the overall acceptability of biscuit ranged from 9 to 7. This indicated that the recipes were found to fall under the category of 'like extremely to like moderately'. It can finally be discerned from the sensory scores for biscuit prepared with 75% incorporation of flaxseed flour with 25% of wheat bran flour, that the biscuit was equally acceptable as that of control [2]. The acceptability of sensory characteristics was improved by this fortification immediately after preparation and during storage [3].

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*Keywords: Biscuit; flaxseed; wheat bran; texture; sensory analysis.*

## 1. INTRODUCTION

Nowadays, fast foods like pizza, burger, bread-butter, etc along with other bakery products like biscuits, cookies, cakes, etc are becoming a more important part of our diet. India is the second-largest producer of biscuits after the US. Biscuits are one of the low cost of processed foods, which are most widely consumed. It, amongst many snack items, has certain advantages, such as being cheaper than the conventional snack items, easy to use at home or even during travel, easily being available in a massive variety of shapes, sizes, tastes, and packs, and appeals to all age groups. Apart from the good taste, these foods with substantial energy having wholesome and nutritious quality are available at a reasonable price. They have a good shelf life at ambient temperature. Also, these biscuits convey the goodness of flour, fat and sugar in the most acceptable and economical term. Attempts were being made in recent days to improve the nutritional and sensory qualities of biscuit, due to competition in the market for more healthy, natural and functional products [3].

Flaxseed is the seed of the flax plant and can be eaten as whole seeds, ground into a powder, or the oil can be taken in liquid or pill form. There is evidence that it is a great way to incorporate dietary fibre, antioxidants, and omega-3 fatty acids into your diet [4,5,6]. Flaxseed has been shown to lower cholesterol in some people and it may even reduce the risk of breast cancer and certain other types of cancers [7]. Also, people take flaxseed to help with many digestive conditions [8,9]. Flaxseed has the potential to benefit everyone as a great source of dietary fibre with almost no side effects. People with high levels of bad cholesterol and women who are post-menopausal benefit the most. Bakery products can be supplemented with whole flaxseed grains to achieve an attractive and appealing form with enhancement in the texture of the final product [8,10,11]. It can easily be added to cereal, baked goods, salad, yoghurt, and many other types of food [12]. Incorporating flaxseed into a diet is simple and can add a tasty twist to routine dishes. The small, radish brown whole seeds have a nutty taste and can be sprinkled over salads, soups, yoghurt or cereals. Whole or ground flaxseed can replace some of the flour in bread, muffin, pancake and cookie recipes. Flaxseed can be added to baked

products as a whole seed or grounded, imparting a healthy appearance and increased texture quality [13]. Aliani et al. [14] showed that bagels prepared by flaxseed incorporation were acceptable in terms of appearance, colour, texture and flavour [13]. The grinding of flaxseed before its addition to food products can be more useful to obtain the potential health benefits from its active components such as dietary fibre and omega-3 fatty acids [8,10,11].

Most grains, like wheat and oats, have a hard outer layer. When they are processed, this layer becomes a byproduct, called bran. Likewise, when wheat is processed to get wheat flour, bran is acquired [15]. This bran is packed with nutrition and offers many dietary benefits. It is a concentrated source of insoluble fibre [16]. Fibre intakes are generally lower than recommendations. Wheat bran has a sweet taste. Adding wheat bran to muffins, pancakes, biscuits, waffles, or even cookies is a great way to bulk up the nutritional value of food, especially its fibre content. Wheat bran is high in protein, magnesium, manganese, niacin, phosphorus, zinc and vitamin B6, and is low in fat, with no cholesterol, and no sugar or sodium. It has relatively various applications in food industries due to its richness in polysaccharides, dietary fibre, the protein which makes it a vital dietary element [17,16]. It is one of nature's richest sources of natural food fibre [18]. It can help maintain normal bowel function and relieve occasional constipation, such as caused by changes in dietary habits or travel.

Studies have shown that increase in substitution level of flaxseed in different products has decreased sensory scores for different parameters as compared to standard products, but at a certain level, it was acceptable [19,20,1,21].

The growing consumer demand for food with nutritional and sensory quality as well as the functional claim 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. The objective of this study was to prepare biscuit with different proportions of flaxseed, wheat bran and wheat flours, to characterize their sensory

properties, and to evaluate the biscuit acceptance by penal member [1].

## 2. MATERIALS AND METHODS

### 2.1 Procurement of Raw Material

Wheat bran, wheat flour and flaxseed were used in the study. Other ingredients used in the preparation of biscuits included almond, baking powder, sugar, unsalted butter, salt and ginger which were all purchased from the local market of the Lucknow area.

### 2.2 Processing of Raw Material

All raw ingredients were cleaned to remove the sand, dirt and unwanted particles. After that, all ingredients were washed in water and dried to the desired level of moisture control. Flours were obtained by grinding them in the flour mill. Other materials like baking powder, almond, butter, salt and ginger were purchased from the market.

### 2.3 Preparation of Different Flour Mix for Biscuits

For standardization of flour mix, several preliminary trials were conducted. Different combinations of powders of wheat bran, flaxseed and wheat viz., 25:75:0, 0:50:50, 20:80:0 per cent were used to prepare 100g flour mix for biscuits.

### 2.4 Biscuits Preparation

The biscuits were prepared after the flour preparation, following a standard formulation, with the addition of three different levels of flaxseed flour. Table 1 shows the ingredients and their amounts used in the preparation of the biscuits. Dry ingredients (like wheat bran flour, flaxseed flour, wheat flour, baking powder) were mixed and sieved twice for uniform mixing of leavening agents to the flour. A weighed amount of salt was added in the flour mixture. A weighed amount of unsalted butter 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. The soft dough was prepared by sprinkling a small quantity of water. The dough was rolled and then biscuits were cut into small round shape using a biscuit cutter. Biscuits were kept in an electric oven for 20 to 30 minutes at 125°C for uniform baking.

**Table 1. Standardized recipe of biscuit**

Ingredients	Control T1	Sample T2	Sample T3
Wheat bran flour	25 g	-	20 g
Flaxseed flour	75 g	50 g	80 g
Wheat flour	-	50 g	-
Ginger	-	-	3 g
Almond	5 g	5 g	5 g
Sugar	14 g	14 g	14 g
Unsalted butter	330 g	330 g	330 g
Baking powder	3 g	3 g	3 g
Salt	1 g	1 g	1 g

### 2.5 Sensory Evaluation

Sensory analysis of freshly produced biscuit samples was carried out by a panel of 5 members. The samples were evaluated for desirability in appearance, colour, crispiness, texture, taste, flavour and overall acceptability using a 9-Hedonic scale test, varying from 9, which means 'like extremely' to 1, which means 'dislike extremely'. The acceptable level of flaxseed flour in biscuits was assessed by incorporating 50 to 80 per cent of flaxseed flour in wheat flour and wheat bran flour and standardized for the sensory characteristics. During preliminary trials, it was noticed that incorporation of flaxseed flour at 50% and 80% was unacceptable in selected recipes. At this level of incorporation of flaxseed flour, the sensory properties of the product were affected i.e. flavour and taste wise, body and texture, colour and appearance and overall quality whereas 75% addition of flaxseed flour produced good results. Hence, in the present study, flaxseed flour was incorporated at a 75% level in the standardized recipes.

### 2.6 Statistical Analysis

The data was statistically analyzed by performing an analysis of standard deviation technique. The average values and standard deviation of each sample based on each parameter were calculated and analyzed.

## 3. RESULTS AND DISCUSSION

The results of the present research have been discussed as under.

### 3.1 Preparation of Flour Mix for Biscuits

To develop the flour mix, wheat bran, flaxseed and wheat flour were procured and processed separately. All the three flours were then mixed in the ratios 25:75:0, 0:50:50, 20:80:0 per cent respectively, which were used to prepare 100g flour mix for biscuits.

### 3.2 Sensory Scores of Biscuits

The sensory evaluation was carried out as per 9 points hedonic scale. The sensory characteristics that were taken into account include colour, taste, appearance, texture, flavour, and overall acceptability. It is evident from the sensory evaluation scores by the evaluators, the recipe that scored most, contained 75% of flaxseed and scores ranged in 8 to 9 which depicted that the recipe was liked extremely. Overall acceptability of the sample T1 achieved the highest score. Results of sensory evaluation of biscuits prepared with 75 (T1), 50 (T2) and 80 (T3) per cent of flaxseed flour were present in Table 2.

**Table 2. Individual markings for overall calculation**

	A1	A2	A3
P1	45	41	34
P2	44	40	36
P3	44	44	35
P4	45	42	35
Overall	178	167	140
Average	45.5	41.75	35
S.D.	1.68	1.61	1.47

The table shows the overall calculations of average marks given by each panellist in each parameter, with calculated average values and S.D. of each sample based on each parameter, where, A1, A2, A3 is the total sum of marks given by the 5 members of the judging panel for each parameter.

P = parameter (P1 = flavor and taste, P2 = body and texture, P3 = color and appearance, and P4 = overall acceptability).

S.D. = standard deviation (S.D. reflects the fluctuation in the marks given by different members for different parameters).

Sample T1 (WBF:FSF:WF:: 25:75:0) scored the maximum with the highest average and S.D.

which indicates its highest acceptability among the three prepared experimental samples.

### 4. CONCLUSION

Incorporation of flaxseeds was found to be highly acceptable. Also, the addition of a small amount of wheat bran flour proved to be beneficial. Wheat bran's sweet taste added good sweet flavour and taste to the biscuits. The colour of the fortified samples attained more dark colour as the fortification was increased. The formulations made with up to 75% flaxseed flour and 25% wheat bran flour as partial replacement of wheat flour had good acceptance. Adding flaxseed flour and wheat bran flour in bakery products is a useful strategy to increase the consumption of fibre, omega-3 and many other nutrients in the human diet. Flaxseed and Wheat Bran appear to have a potential role as an extender in bakery products as well as a functional food.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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