

Study on Quality Attributes of Flaxseed Flour Supplemented Cookies

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Received: 5.08.2017 | Revised: 12.09.2017 | Accepted: 19.09.2017

ABSTRACT

Flaxseed can be added to baked products as a whole seed, imparting a healthy appearance and increased texture quality. Flaxseed is emerging as one of the key sources of phytochemicals in the functional food arena. In addition to being one of the richest sources of alpha-linolenic acid oil and lignans, In present study the efforts are made towards the nourishment of cookies with flaxseed flour. So three different samples were taken for recipe standardization and the ratios are made with 5%, 10% and 15% wheat flour replacement with flaxseed flour. Finally prepared cookies were analyzed for physical properties, chemical properties and sensory attributes. By all means the sample T₂ with 10% flaxseed flour incorporation was found suitable and sample T₂ found best one. At and above 15% addition structure of cookies and other factors found decreased in terms of many attributes.

Key words: Flaxseed flour, Incorporation, Composite flour, Sensory attributes.

INTRODUCTION

Flaxseed comes from the flax plant. It is a blue flowering crop grown on the prairies of Canada as well as on India for its oil rich seeds. The seeds of flax are tiny, smooth and flat, and range in color from light to reddish brown. There is little if any nutritional difference shades. Flaxseed had nutty taste.

Flax is an annual plant that has one main stem. At low plant population, branching at the base similar to tillers in a cereal grain is seen. The stems terminate in a multi-branched

inflorescence that bears blue to white flowers. Flax grows to height of about 24-36 inches. If you examine the nutritional information of flaxseed, you will see that in a one ounce (30-grams) serving, there are five grams carbohydrates with four of those fibers. It should also be noted that the majority of flaxseed is monounsaturated, and there is no cholesterol. Flaxseed contains fat (23%), protein (22.4%), vitamins-E (37%), folate (4%), magnesium (22%), phosphorus (14%), some iron (6%), and calcium (8%).

Cite this article: Kelapure, N.N., Jaju, R.H., Satwase, A.N., Gutthe, A.V. and Tidke, S.S., Study on Quality Attributes of Flaxseed Flour Supplemented Cookies, *Int. J. Pure App. Biosci.* 6(2): 1439-1445 (2018). doi: <http://dx.doi.org/10.18782/2320-7051.5392>

Among the bakery products, cookies are most significant. These are an important food products used as snacks by children and adults in India. However these are most commonly relished by school going children, who need more protein per unit body weight than adults. Cookies hold an important position in snack foods due to variety in taste, crispiness and digestibility. These are popular among all age groups especially in the children. Commercially available cookies are prepared from white flour that is comparatively inferior to whole wheat flour⁴.

The term biscuit is derived from the Latin *bis coctus* or the old French *biscuit*, meaning twice cooked. This reference to the practice generally abandoned on the 18th century, of first baking the product in hot oven and then transferring to the cooler oven to complete the drying process⁹.

Flax is a blue flowering crop. The seed of the flax are tiny, smooth and flat and pointed at one end. Because of its link to good health flaxseed is rapidly becoming a new food in many diets. Flaxseed has been used in the diet of the humans for thousands of years. Flaxseed is emerging as one of the key sources of phytochemicals in the functional food arena. In addition to being one of the richest sources of alpha-linolenic acid oil and lignans, flaxseed is an essential source of high quality protein and soluble fiber and has considerable potential as source of phenolic compounds¹⁰.

Flaxseed contains both soluble and insoluble fiber (about 28gram total per 100 grams of flaxseed). About one-third of the fiber is soluble. Studies have found that the soluble fiber in the flaxseed like that found in oat bran and fruit pectin can help to lower cholesterol. Soluble fiber. Also has been found to regulate blood sugar levels. The remaining two-thirds of the fiber in the flaxseed were insoluble. Insoluble fiber aids digestion by increasing bulk, reducing the time that waste remains in the body and preventing constipation. These characteristics seem to have a role in protecting against cancer.

Flaxseed oil is rich in alpha-linolenic acid and omega-3 fatty acid. Researchers are interested in omega-3 fatty acids for their roles

in proper infant growth and development, reducing risk factors for heart diseases and strokes (regulating cholesterol, triglyceride. Blood pressure, blood clotting), immune and inflammatory disorders.

Incorporating flaxseed into a diet is simple and adds 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 flour in bread, muffin, pancake and cookie recipes.

Flaxseed are small brown seeds hold some big promise for combating breast and colon cancer. In animal studies, flaxseed has significantly reduced existing breast and colon tumors while stopping new ones from getting started. In one study, researchers at the University of Toronto were able to reduce tumor size by more than half in animals that were fed flaxseed over a seven-week period. Flaxseed and flaxseed oil reduces the growth of existing tumors, but another component of flaxseed, called lignans appeared to help prevent the development of new ones.

Lignans are the plant-based compounds that can block estrogen activity in cells, reducing the risk of certain cancers. Lignans are phytoestrogens, meaning that they are similar to but weaker than the estrogen that a woman's body produces naturally. Therefore, they may also help alleviate menopausal discomforts such as hot flashes and vaginal dryness. They are also antibacterial, antifungal, and antiviral. Flaxseed can be added to baked products as a whole seed, imparting a healthy appearance and increased texture quality. However, flaxseed can be ground (milled) prior to consumption to obtain the potential health benefits from the omega-3 fatty acids and lignans. Flaxseed is high in mucilage (gums) that can increase the water Absorption properties of the dough, which can impact mixing time and dough handling characteristics. The American Institute of Baking Recommends additional formula water at a rate of 75% of the added ground flaxseed by weight.

Keeping in view the medicinal and nutritional benefits of the flaxseed, cookies were prepared

from the composite flour containing varying levels of the full fat flaxseed flour.

MATERIAL AND METHOSDS

The present study is carried out in the Department of food science and technology MGM College of Food Tech. (affiliated to V.N.M.K.V.), Parbhani. The Material used and methods adopted for the present investigations are presented under suitable heading.

1. MATERIALS

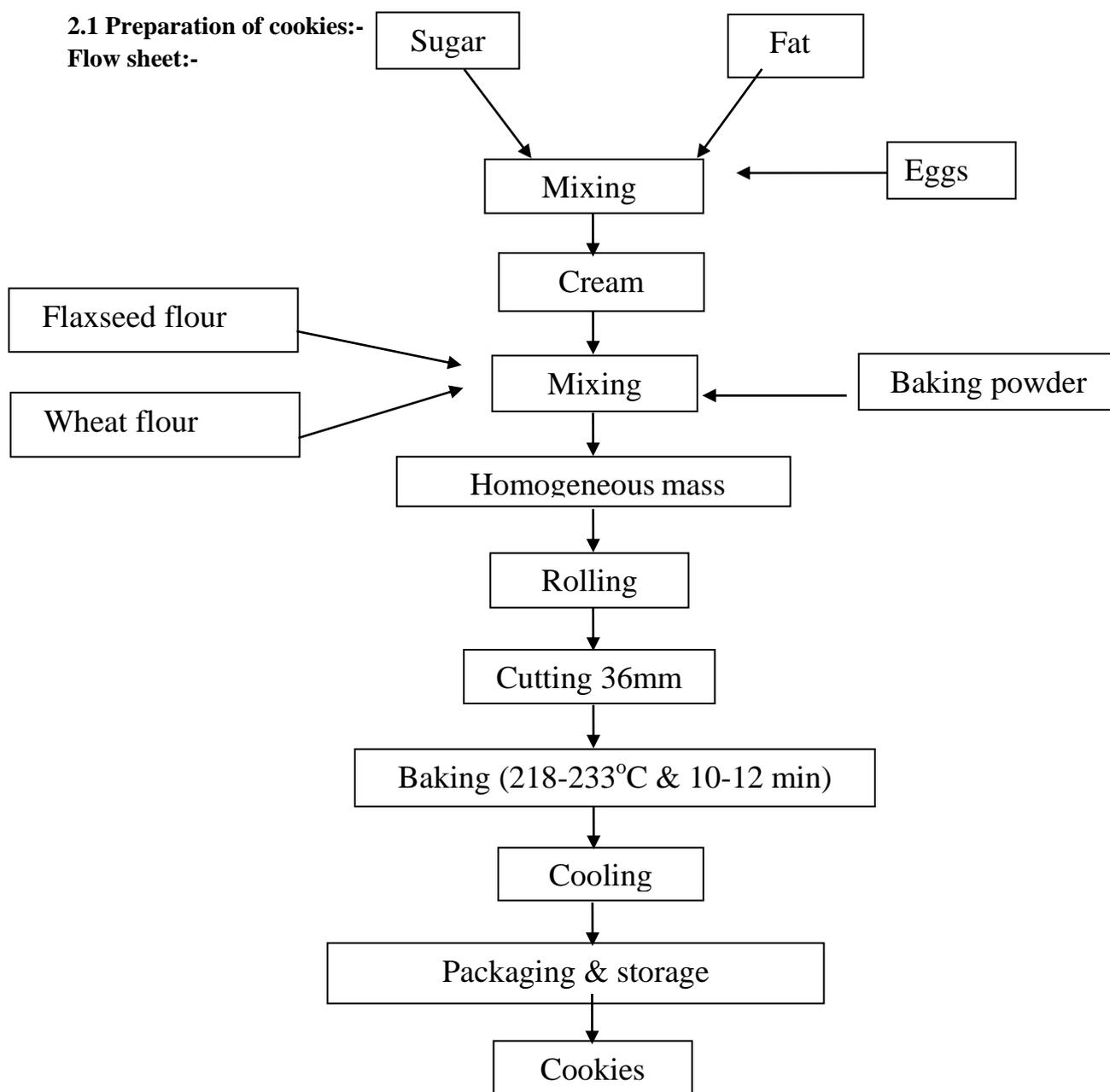
The different materials required for the entitled project like wheat flour, flaxseed flour, sugar,

baking powder, eggs, fat were collected from local market Aurangabad. The chemicals, glassware's and instruments required for the current entitled project were obtained from Department of Food Science and Technology, MGM college of Food Technology, Aurangabad.

2. METHODS

The methods for determination of moisture content, ash, crude fiber, carbohydrates, fat and protein by standard A.O.A.C. methods, 1975.

**2.1 Preparation of cookies:-
Flow sheet:-**



Cookies were prepared from composite flour with some modification in method described in

AACC. Following recipe is used for the preparation of cookies

1	Composite flours	500gm
2	Sugar	250gm
3	Hydrogenated vegetable ghee	250gm
4	Eggs	3(numbers)
5	Baking powder	10gm

The ingredients are weighed accurately. Vegetable ghee and sugar mixed and eggs are added one by one. The composite flours and baking powder are sifted and added to sugar-ghee-eggs mass and mixed to get a homogenous mass. The batter is then rolled out with the help of the rolling pin. Cookies are cut out with the help of cookies cutter having 36mm diameter and placed in tray. Baking is done at 218 to 233⁰c for 10 to 12 minutes. Cookies are allowed to cool at room temperature for 8 to 10 minutes before final packing.

2.2 Flaxseed flour Incorporated Cookies (Ingredients):

In the project entitled “Study on Quality Attributes of flaxseed flour supplemented cookies” four samples were taken. In which first sample T₀ was made with the standard specifications and held as the control sample. In other samples variation in the flaxseed flour were carried out in the range like 5%, 10% and 15 % respectively.

Table 1: Ingredients for Flaxseed flour Incorporated Cookies

Percent of incorporation	Maida	Flax Seed flour	Eggs	Sugar	Shortening	Baking Powder
Control(T ₀)	500	–	03	250	250	10
5 (T ₁)	495	05	03	250	250	10
10 (T ₂)	490	10	03	250	250	10
15 (T ₃)	485	15	03	250	250	10

3. Evaluation of Baking Quality

3.1 Color

Color of the cookies was measured by physical means (eye site).

3.2 Diameter

Vernier caliper was used for the measuring of diameter of cookies. Firstly the cookies were placed on the table and then reading was taken. Then the cookies were turned horizontally at 90⁰ angles and then again reading were taken for 10 biscuit and for the final result average was reported as mean diameter.

3.3 Thickness

Thickness was also measured by the vernier caliper. Six numbers of cookies were taken

and placed vertically one upon another in the vernier caliper, and then the reading was taken and the final thickness was reported by taking average thickness of that 6 cookies.

3.4 Spread ratio

Spread ratio was measured by taking the ratio of the diameter and thickness of cookies. Therefore,

$$\text{Spread ratio} = \frac{\text{Diameter}}{\text{Thickness}}$$

4. SENSORY EVALUATIO CHART

The sensory evaluation of different treatments of flaxseed incorporated cookies for various attributes including color, flavor, taste, texture and overall acceptability was carried out using

semi trained panel members using hedonic rating. On the day of evaluation, flaxseed incorporated cookies from all the treatments were placed in transparent plates, labeled with random codes. Panelists were given water and crackers to neutralize their mouth between the samples. The flaxseed incorporated cookies sample were presented in randomly coded order and judges were asked to rate their acceptance by giving a score for all the parameters. Judgments were made through rating products on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'.

RESULTS AND DISCUSSION

The results obtained in present investigation entitled "Study on Quality Attributes of

flaxseed flour supplemented cookies" are summarized and discussed under the following heading:

1. Proximate analysis of Wheat flour and Flaxseed flour
2. Physical characteristic of the cookies containing full fat flaxseed flour
3. Chemical composition of Flaxseed incorporated Cookies
4. Effect of incorporation of flaxseed flour on sensory characteristics of cookies

1. Proximate analysis of Wheat flour and Flaxseed flour :

In table 2 reveals the chemical composition of wheat flour and flaxseed flour with concern to different constituents.

Table 2: proximate analysis of Wheat flour and Flaxseed flour

Sr. No	Constituents	Wheat flour	Flaxseed flour
1	Moisture	12.80 ± 0.13	5.51 ± 0.09
2	Protein	11.07 ± 0.14	17.20 ± 0.16
3	Fat	0.90 ± 0.03	38.22 ± 0.36
4	Minerals	1.83 ± 0.08	3.33 ± 0.04
5	Fiber	0.29 ± 0.02	8.09 ± 0.06
6	Carbohydrate	72.81 ± 0.10	27.64 ± 0.05

**All the parameters indicated in % and each value is mean of three determinations with standard deviation*

From this table it was found that the wheat flour is rich in carbohydrate and protein content where as the flaxseed flour found rich in protein and fat content. Flaxseed flour rich in fat content with 38.22 ± 0.36 as compared to wheat flour which rest at 0.90 ± 0.03 Here carbohydrates content of flaxseed flour found to be 27.64 ± 0.05 as compared to wheat flour

72.81 ± 0.10. Hence the composite flour gives you an idea about enrichment in nutritive value.

2. Physical characteristic of Flaxseed incorporated Cookies

Following table represent the value related to the thickness, diameter and spread factor.

Table 3: Physical characteristic of Flaxseed incorporated Cookies

Treatment	Thickness	Diameter	Spread
T ₀ (Whole Wheat Flour)	44.33 ± 0.32	260.33 ± 0.33	58.73 ± 0.07
T ₁ (5% flaxseed flour)	45.34 ± 0.16	262.01 ± 0.09	57.81 ± 0.04
T ₂ (10% flaxseed flour)	48.31 ± 0.20	265.04 ± 0.14	54.84 ± 0.05
T ₃ (15% flaxseed flour)	49.29 ± 0.09	278.00 ± 0.11	56.56 ± 0.05

**All the parameters indicated are the mean of three determinations with standard deviation*

In above table sample T₂ represents fairly good values as compared to other samples in terms of spread factor. Sample T₃ with 15% and above shows decrease in structure binding abilities

3. Composition of Flaxseed incorporated Cookies

The composition of flaxseed incorporated cookies with concern to moisture, ash, carbohydrates, crude fiber and fat shown in Table 4.

Table 4: Chemical Composition of Flaxseed incorporated Cookies

Biscuits Samples	Carbohydrates (%)	Protein (%)	Fat (%)	Moisture Content (%)	Ash (%)	Crude Fiber (%)
T ₀ ⊙	78.13 ± 0.31	9.55 ± 0.14	5.62 ± 0.03	5.45 ± 0.21	0.98 ± 0.06	2.15 ± 0.04
T ₁	68.22 ± 0.24	9.13 ± 0.09	9.66 ± 0.06	5.92 ± 0.15	1.79 ± 0.09	6.19 ± 0.06
T ₂	64.74 ± 0.11	9.87 ± 0.07	10.36 ± 0.06	6.11 ± 0.14	1.94 ± 0.04	7.06 ± 0.02
T ₃	62.99 ± 0.11	10.45 ± 0.06	10.82 ± 0.04	6.24 ± 0.14	2.32 ± 0.05	7.81 ± 0.06

*All the parameters indicated in % and each value is mean of three determinations with standard deviation

Almost increase in nutritive value after addition of flaxseed flour was observed in terms of all attributes except for carbohydrates. Whereas the protein content found increased from 9.55 ± 0.14 to 10.45 ± 0.06 respectively for T₀ to T₃ In the similar trend fat content, moisture and ash also increased. But there was drastic change in the

crude fiber after addition of flaxseed flour as compared to control sample.

4. Sensory Evaluation for Flaxseed incorporated Cookies

The sensory evaluation for flaxseed incorporated cookies was conducted by semi trained panel members of MGM college of Food Technology, Aurangabad.

Table 5: Sensory Evaluation for Flaxseed incorporated Cookies

Treatment	Color	Flavor	Crispiness	Texture	Overall acceptability
T ₀ (Straight Grade flour)	08.00	08.10	08.00	08.20	08.07
T ₁ (5% Flaxseed flour)	07.25	07.25	07.00	07.50	06.50
T ₂ (10% Flaxseed flour)	07.50	08.50	08.20	08.25	08.12
T ₃ (15% Flaxseed flour)	06.00	07.12	06.25	07.20	06.00

The sample T₂ with 10% flaxseed flour was found to be the best sample among the all. The overall acceptability T₂ stand at 8.12 which shows greater quality attributes to cookie. Sample T₁ and T₃ were not found satisfactory when compared with others.

SUMMARY AND CONCLUSION

In the present investigation attempts have been made to study the effect of incorporation of

full fat flaxseed flour on the sensory and nutritional utilities of cookies. The result of the analysis and test show that the incorporation of full fat flaxseed flour 10 % is found to be most acceptable to obtain cookies with improved nutritional quality and satisfactory sensory attributes.

In present study the efforts are made towards the nourishment of cookies with flaxseed flour. So three different samples were

taken for recipe standardization and the ratios are made with 5%, 10% and 15% wheat flour replacement with flaxseed flour. Finally prepared cookies were analyzed for physical properties, chemical properties and sensory attributes. By all means the sample T₂ with 10% flaxseed flour incorporation was found suitable and sample T₂ found best one.

The spread restriction properties that the flaxseed flour exhibited also prevent the development of typical top grain during baking. Therefore these results show that even though the addition of flaxseed flour increases significantly the fat content of cookies but dough handling, baking performance and sensory quality attributes are affected adversely when more than 15 percent flaxseed flour is used to replace the wheat flour.

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