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Formulation of Flaxseed Powder Incorporated Cookies

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Abstract

Flaxseed (*Linum usitatissimum*) commonly known as linseed is a member of the genus *Linnum* in the family Linaceae. Flaxseed is considered as a potential functional food having various health benefits and also having numerous nutritional values. It is rich in dietary fiber, omega-3 fatty acids and lignans. The aim of the project is to formulate flaxseed powder incorporated cookies to cater for the nutritional needs of non-fish eaters. The physic-chemical parameters and sensory characteristics of the formulated cookies were also analyzed. The flaxseed cookies were formulated in three variations like 10%, 20% and 30%. The nutrients like dietary fiber, potassium, phosphorous, folic acid and antioxidant activity were analyzed using standard procedures. The organoleptic evaluation showed that the 10% flaxseed incorporated cookies showed the highest acceptability. Flaxseed powder incorporation in cookies will help to improve the health status of children who consume cookies very often.

Keywords: Cookies, Flaxseed, Organoleptic Evaluation, Physico-chemical Parameters, Texture Profile

1. Introduction

Flax is an oldest agronomic crop having more than 300 species and are cultivated for food and fiber since ancient times. Flaxseed is recognized either by variety or by color (brown and yellow). Brown colored flaxseed is the most common and high in alpha-linolenic acid, while there are two types of yellow colored flaxseed: Omega and Linola[1].

Flaxseed is cultivated in many parts of world for fiber, oil as well as for medicinal purposes and it is also considered as a nutritional product[2]. Demand for flaxseed has been increased because of consumer awareness about the relationship between diet and health. Flaxseed is considered as a potential functional food ingredient as it provides various health benefits along with nutritional value[3].

Flaxseed is an important source of α-linolenic acid in the diet of vegetarian people. Therefore, it may serve as an alternate for supplying fatty acid to populations which do not have large access to seafoods[4].

In India flaxseed is mainly cultivated in Madhya Pradesh, Maharashtra, Chattisgarh and Bihar. It is interesting to know that flaxseed was native of India and was a staple food crop. In India, flaxseed is still being consumed as food and as well as for medicinal purposes[5].

2. Materials and Methods

2.1 Selection of Flaxseeds

For the present study, the selection of good quality flaxseeds is very essential and it should be checked

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visually to be free from infestation. The seeds used for the study were procured from a department store in Erode.

2.2 Estimation of Physicochemical Properties

The flaxseed powder was analyzed for the physic-chemical properties such as ash, moisture, bulk density, true density and porosity were presented.

2.3 Formulation of Flaxseed Powder Incorporated Cookies

The flaxseed powder is incorporated in cookies at different proportions of 10%, 20% and 30% and the composition of various cookies is presented in the Table 1.

2.3.1 Procedure

- Roast the flaxseeds in a pan until it turns into brown color.
- Then the roasted flaxseeds are allowed to cool.
- The roasted flaxseed is ground into a fine powder using mixer.
- In a bowl take 60 g of butter and 50 g of brown sugar and mix it well upto 10 minutes.
- Then add wheat flour + brown sugar + baking powder mixture little by little and mix properly until homogenous dough is obtained.
- Make the dough into desired shapes. Preheat the oven and bake the mat180°C for 15-20 minutes.

2.4 Organoleptic Evaluation

Organoleptic evaluation is the composite characteristic, which determines the degree of acceptability of a specific. The quality attributes of the convenience food is broken into component characteristics like appearance, texture, flavour, taste etc. For organoleptic evaluation five point hedonic rating scale was used to measure the consumer acceptability of recipes with the help of 30 semi trained panel members.

2.5 Determination o f Nutrients in Flaxseed Powder

The prepared standard and flaxseeds powder incorporated cookies were analyzed for dietary fiber, iron, phosphorous, potassium, folic acid and antioxidant activity.

2.6 Cost Calculation

Cost is one of the important features to make a product acceptable. The costs for preparing the standard and flaxseed powder incorporated cookies were evaluated. The purchase cost of ingredients alone was used for cost calculation of the products.

3. Results and Discussion

3.1 Physico-chemical Properties

The physico-chemical properties such as ash, moisture,

Table 1. Composition of formulated cookies

Ingredients	Standard	Flaxseed powder in corporate cookies		
		Variation-I10%	Variation-II20%	Variation-III30%
Wheat Flour (gm)	100	90	80	70
Flaxseed powder (gm)	-	10	20	30
Brown sugar (gm)	60	60	60	60
Butter (gm)	50	50	50	50
Baking Powder	A Pinch	A Pinch	A Pinch	A Pinch

Table 2. Physicochemical parameters of flaxseed powder

S. No.	Parameters	Values
1.	Ash (%)	3
2.	Moisture (%)	6
3.	Bulk density	0.12
4.	True density	1.42
5.	Porosity	91

true density, bulk density and porosity were analyzed and the values are given in Table 2.

The ash content of flaxseed powder was found to be 3 g%, the moisture content was 6 g%, bulk density was 0.12, true density was 1.42 and the porosity of the flaxseed powder was found to be 91.

3.2 Acceptability of Flaxseed Incorporated Cookies

The standard and flaxseed powder incorporated cookies were organoleptically evaluated by the panel members and the mean scores obtained are presented in Table 3.

The overall acceptability score of C1 i.e. 10% flaxseed powder incorporated cookies was the highest i.e. 8.71 followed by standard cookies. C3 i.e. 30% flaxseed powder incorporated cookies received the lowest score of 8.2. The overall acceptability of C2 i.e. 20% flaxseed powder incorporated cookies was 8.29. Therefore C1 (10% flaxseed powder incorporated cookies) was selected as the best variation.

Table 3. Mean acceptability scores of flaxseed powder incorporated cookies

Criteria	Mean ± Standard Deviation			
	C0	C1	C2	C3
Appearance	8.65±0.58	8.8±0.41	8.4±0.68	8.25±0.78
Color	8.7±0.47	8.75±0.44	8.5±0.68	8.45±0.82
Flavor	8.5±0.82	8.65±0.67	8.1±0.85	8.1±0.91
Taste	8.6±0.59	8.65±0.67	8.15±0.98	7.9±1.11
Texture	9.0±0.0	8.7±0.57	8.3±0.86	8.3±0.97
Overall Acceptability	8.69±0.19	8.71±0.07	8.29±0.2	8.2±0.21
Group Compared		C_0 and C_1	C_0 and C_2	C_0 and C_3
t-value		0.2242^{NS*}	3.5485^{**}	3.8904^{**}

*-NS-Not Significant

**-Significantat1% level

3.3 Comparison of Nutrient Content of Standard and Flaxseed Powder Incorporated Cookies

The nutrient content of 100 g of standard cookies and 10% flaxseed incorporated cookies were presented in Table 4.

The dietary fiber of 100 g of standard cookies was found to be 2.4 g whereas the 10% flaxseed incorporated cookies was about 2.8 g. The iron content of standard was found to be 1.2 mg whereas 10% flaxseed incorporated cookies was higher (2.1 mg). The phosphorous content of standard cookies was found to be 105 mg whereas 10% flaxseed incorporated cookies had 114 mg. The potassium content of the standard cookies was found to be 110 mg whereas 10% flaxseed incorporated cookies had 121 mg. The folic acid content for standard cookies was found to be 5.6 mcg whereas 10% flaxseed cookies had about 7.2 mcg.

3.4 Antioxidant DPPH Assay

DPPH assay is used to predict antioxidant activities by mechanism in which antioxidants act to inhibit lipid oxidation. The results of antioxidant DPPH assay are represented in the Table 5.

For the concentration of samples ranging from 100 to 500, the inhibition % for the standard wheat cookies ranged from 7.2% to 54.1%. The inhibition % for the10% flaxseed incorporated cookies ranged from 9.0% to 57.2%. The IC_{50} values for the standard were higher

Table 4. Nutrient content of standard and flaxseed cookies

Nutrients	Nutrient Content (per 100 g)	
	Standard	10% flaxseed incorporated cookies
Dietary fiber (g)	2.4	2.8
Iron (mg)	1.2	2.1
Phosphorous (mg)	105	114
Potassium (mg)	110	121
Folicacid (mcg)	5.6	7.2

Table 5. Antioxidant DPPH assay

Concentration	Inhibition (i%)	
	Standard	10% Flaxseed cookies
100 mg	7.2%	9.0%
200 mg	18.8%	21.2%
300 mg	29.5%	33.0%
400 mg	42.6%	45.4%
500 mg	54.1%	57.2%
IC_{50}	466 mg	440 mg

Table 6. Cost calculation for standard wheat cookies

Ingredients	Amount (g)	Cost (Rs.)
Wheat flour (g)	100	6
Butter (g)	50	33
Brown sugar (g)	60	7.5
Baking powder (g)	2	0.5
	Total cost	47.0

Table 7. Cost calculation for10% flaxseed incorporated cookies

Ingredients	Amount (g)	Cost (Rs.)
Wheat flour (g)	90	5.4
Flaxseed (g)	10	2.6
Butter (g)	50	33
Brown sugar (g)	60	7.5
Baking powder(g)	2	0.5
	Total cost	49.0

than the 10% incorporated cookies due to the addition of flaxseeds.

3.5 Cost Calculation of Cookies

The cost calculations of standard and flaxseed incorporated cookies are presented in the Tables 6 and 7.

Tables 6 and 7 reveal that the cost of production of flaxseed incorporated cookies was not much different from that of standard wheat cookies.

4. Conclusion

It is concluded from the above findings that 10% flaxseed incorporated cookies was found to be highly acceptable. The nutrient content and anti-oxidant activity of the flaxseed incorporated cookies were found to be higher than the standard wheat cookies. Hence intake of flaxseed incorporated cookies as snacks instead of plain cookies will help to improve the health status of children.

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