

Development of Lemongrass Flavored High Nutrient Cookies by Fortification of Flaxseed and Poppy Seed Flour

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Abstract: Flaxseed is source of health beneficial nutrients: α -linolenic acid, omega 3-fatty acid, lignan and dietary fibre, while poppy seed is reported to contain morphine and codeine alkaloids. Both the raw materials are reported to possess antioxidant function, anti-diabetic function and antimicrobial properties because of their biomolecules content. In present work an attempt to incorporate flaxseed and poppy seed flour for preparation of the cookie. Three cookies formulations were prepared by partially replacing refined wheat flour with flaxseed and poppy seed flour in the ratio 5:15% (w/w), 10:10% (w/w) and 15:5 % (w/w) and they were marked FPC1, FPC2 and FPC3 respectively. These cookies were compared with sole refined wheat flour prepared cookie (C0). Cookies were tested for moisture, ash, protein, fat, crude fibre, calorific value, alkaloid and mineral by using standard laboratory methods. The Physico-chemical and sensory parameters of three formulated cookies were compared with a control cookie. Result showed the FPC2 cookies prepared by replacing 20 % of refined wheat flour with 10 % each of flaxseed and poppy seed flour were found to be higher in nutrient and were sensory at par with Co cookie. The calorific value protein content, fat content and fibre content of FPC2 cookie were reported to be increased by 1.2 fold, 3.5 fold, and 9.5 folds respectively with respect to control cookie. Morphine content (22.42 μ g/g) of FPC2 cookie was found to be within permissible limit. Study suggests that overall 20% wheat flour can be partially replaced to prepare fortified flour cookies at par with refined wheat flour cookie.

Keywords: Flaxseed Flour, Poppy seed flour, Fibre and mineral.

I. INTRODUCTION

The food industry is facing the challenge of developing bakery products with special health enhancing characteristics. The nutraceuticals are present in variety of plant consumable products^[1]. Functional foods are targeted to provide selective protection against some of the most common disease risks such as cardiovascular disease, cancer, digestive disorders and other disorders associated with lack of adequate nutrients^[2, 3, 4].

In India, flaxseed is still being consumed as food and as well as for medicinal purposes^[5]. Flaxseed belongs to the family Lineaceae. Flaxseed is one of the richest vegetarian source of α -linolenic acid (Omega-3 fatty acid) and soluble mucilage. Flax is the rich in fat, protein and dietary

fiber. Flaxseed flour is used commercially in breads in the United States, in muffins, cookie and other products^[6, 7, 8].

Poppyseeds are present in fruits of *Papaver Somniferum* L. (Papaveraceae), which are grown in the temperate tropical regions of the world. In India, the seeds are mainly grown in the states of Madhya Pradesh, Uttar Pradesh and Rajasthan^[9, 10, 11]. Traditionally the seeds are used in food preparations like curries, breads, sweets and confectionary^[12]. The presence of opiate alkaloids in poppyseed poses major concerns tended for use in food recently. Poppy is one of the most important medicinal plants and pain reliever^[13]. Poppy seed contain Protein- 22.8%, fat- 49.4%, carbohydrate- 1.4%. and fiber- 15.6% . Lemongrass is used as flavoring agent in various beverages, desserts, sauces. Lemongrass helps in digestion and possesses antimicrobial properties^[14].

The purpose of present study was to prepare bakery cookie of higher nutrients by partially incorporating flax seed and poppy seed flour.

II. MATERIAL AND METHODS

Preparation of flaxseed flour:

Flaxseeds were thoroughly cleaned to remove the impurities then roasted at 90°C for 10min prior to grinding and sieved through 250 μ m mesh. All the flour was stored in HDPE bags and kept in dry condition for further analysis.

Preparation of Poppy seed flour:

Poppy seeds were thoroughly cleaned to remove the impurities. Poppy seed were grinded to a fine powder. Flour was stored in HDPE bags and kept in dry condition for further analysis.

Preparation of Lemongrass Powder:

Lemongrass leaves were dried at 90°C for 10 min prior to grinding and then sieved through 250 μ m mesh. All the flour was stored in HDPE bags and kept in dry condition for further analysis.

Analysis of Nutritional Content:

Raw materials and formulated cookies were tested for Moisture content, Total ash content, Crude Fat, Crude Fiber and Protein, was determined as per standard methods

given by ^[15]. Calcium, sodium and potassium were determined by the use of Flame photometer (ELICO CL378). Calorific value was measured by using digital bomb calorimeter (model RSB6) while Morphine content was estimated by HPLC ^[16]

Physical parameters like diameter, thickness, spread ratio and % spread factor of cookies were also reported.

Cookies were sensory evaluated by using a nine point hedonic scale by experts of panels.

Preparation of cookies: Control cookies were prepared by using traditional creaming method. Recipe used in the preparation is shown in Table 1. Various parameters used for cookies making process are represented in Table 2.

Table 1: Recipe of control cookies

Ingredient	Quantity
Refined wheat flour (g)	100
Fat(g)	60
Sugar (g)	60
Skim milk powder (g)	5
Salt(g)	0.5
Water (ml)	8
Lemongrass powder (g)	1
Sodium bicarbonate (g)	1
Ammonium bicarbonate (g)	1
Tertiary Butyl hydroquinone, g	0.05

In present study, mix flour was incorporated in the formulation of cookies by partially replacing the refined wheat flour with flaxseed and poppy seed flour in the ratio 5:10%, 10:10% and 15:5% respectively and they were marked FPC1, FPC2 and FPC3 respectively. These cookies were compared with sole refined wheat flour prepared cookie (C0). The prepared cookies were then evaluated for chemical, physical and sensory parameters.

Table 2: Process parameters for cookies making

Parameter	Value
Pre-mixing time	12 min.
Mixing time	10 min.
Standing time	5 min.
Baking temperature	160°C
Baking time	25min.
Cooling time	15 min.

III. RESULT AND DISCUSSION

Physico-chemical characteristic of refined wheat flour:

Chemical analysis of refined wheat flour is shown in Table.no.3. The moisture content of used flour was 12.03% while it contained 9.5 % gluten content.

Table.no.3.chemical parameter of refined wheat flour.

Parameter (%)	Refined wheat flour
Moisture	12.03
Ash	0.53
Alcoholic Acidity	0.068
WAP	48
Gluten	9.5

Flaxseed flour analysis is shown in table.no.4.The moisture, crude fiber and protein of flaxseed flour was found to be 4.35%, 9.97% and 16.84% respectively.

Table.no.4. chemical parameter of flaxseed flour and Poppy seed flour.

Parameter	Flaxseed flour	Poppy seed flour
Moisture (%)	4.35	4.45
Ash (%)	2.35	2.85
Fat (%)	26.75	29.90
Protein (%)	16.84	11.64
Crude fibre (%)	9.97	10.05

Poppy seed flour composition is shown in table.no.4. The moisture, crude fibre and protein of flaxseed flour were reported to be 4.45%, 11.64% and 10.05% respectively.

Physicochemical Properties of Mix flour cookies:

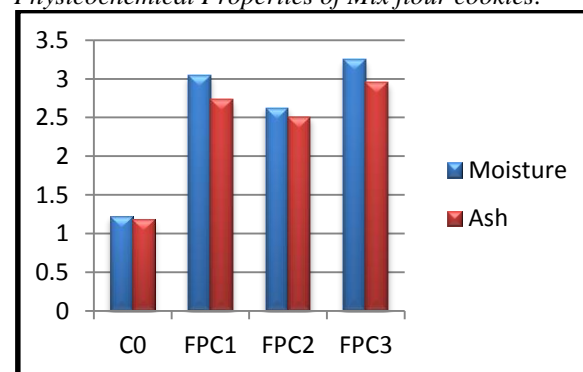


Figure1. Effect on Moisture and Ash Content

The addition of mix flour leads to the increase in moisture and ash content of cookies Fig.no.1. The FPC2 cookie has the highest moisture and ash content as compared to control cookies. The moisture and ash content of FPC2 cookies was 2.60 % and 2.51% which increased from 1.22 % and 1.19% in control cookies. The similar results were obtained by ^[17] the moisture content of Cookies increased with increase in the substitution of flaxseed and poppy seed flour level.

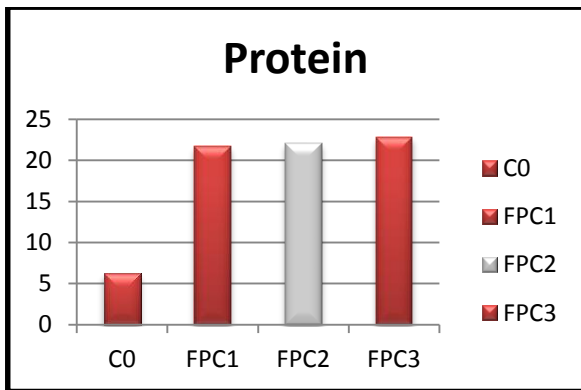


Figure.2. Effect on Protein Content

The addition of Flaxseed and Poppy seed flour affect the protein content of cookies. The protein content of FPC2 cookies was higher (22.09 %) as compare to the control cookies (6.21%). The similar result was obtained by [18] for 30% flaxseed bread protein content was increased by 13% (8 g), respectively, while carbohydrate content was decreased by 13% (53 g) reduction compare with control.

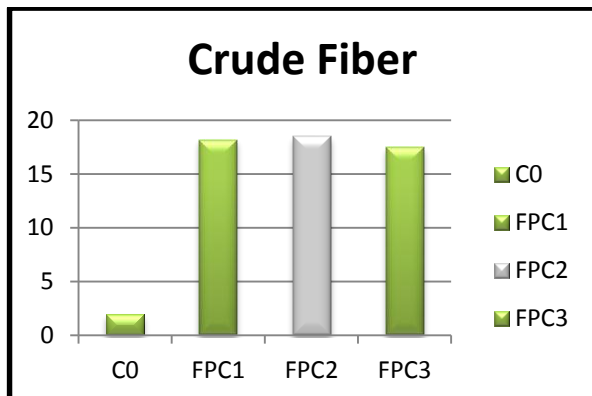


Figure.3. Effect on Crude Fibre Content

The fibre content of cookies increased with the increase in flaxseed and poppy seed flour level. The fibre content of FPC2 cookies was higher (18.51%) as compare to the control cookies (1.94%).The similar result obtained by [18] the muffins were reported to be improved in fiber and essential fatty acid.

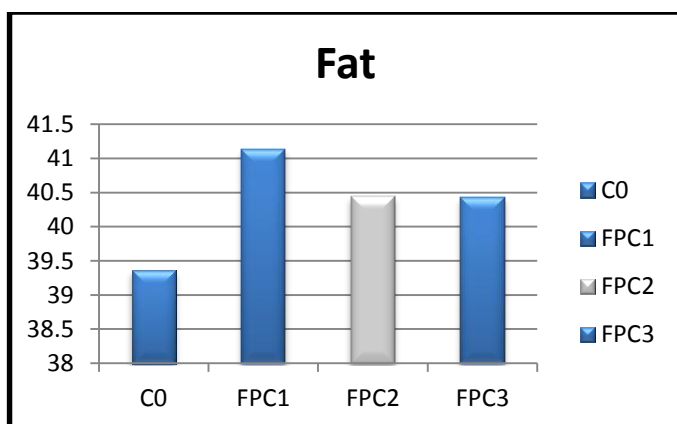


Figure.4. Effect on Fat Content

The fat content of cookies increased with the increase in flaxseed and poppy seed flour level. The Fat content was highest for FPC2 cookies (40.43%) as compare to control cookies 39.36%.It is because oil seed content in formulation.

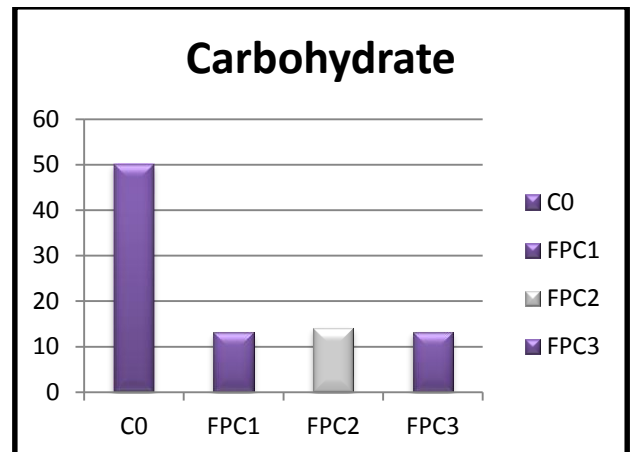


Figure.5. Effect on Carbohydrate Content

The carbohydrate content of cookies decreased with the increase in flaxseed and poppy seed flour level. The similar result obtained by [18] for 30% flaxseed bread protein content was increased by 13% (8 g), respectively, while carbohydrate content was decreased by 13% (53 g) as compared with control.

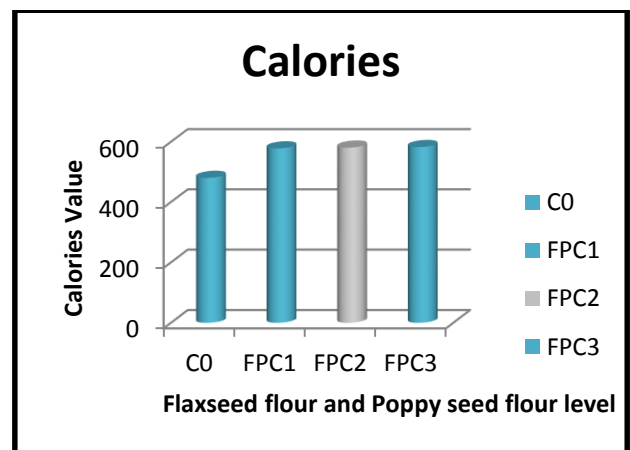


Figure.6. Effect on Calories Content

The calorific value of cookies was increasing as the level of flour substitution was increasing in cookies formulation. The increased calorific value indicates that the addition of flaxseed and poppy seed flour. The protein, fibre and fat content and calorific value of mix flour substituted cookies were comparatively reported to be increased. The calorific value of FPC2 cookies was 580.3 Kcal/100gm which was higher than the control cookies (480.01kcal/100g) and it contained higher Ca (155.55 mg/100gm), K (147.76 mg/100gm) and Na (11.13 mg/100gm).

Characterization

HPLC Method – Estimation of morphine content

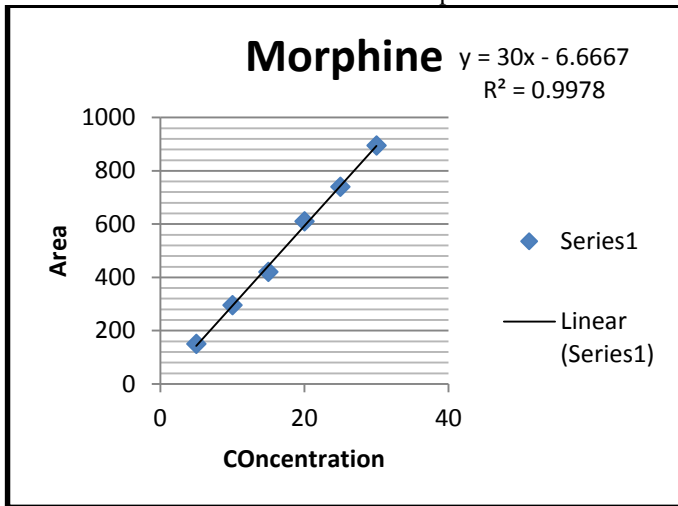


Figure.7. Curve for extraction of morphine from poppy seed (eluent volume vs. morphine conc.)

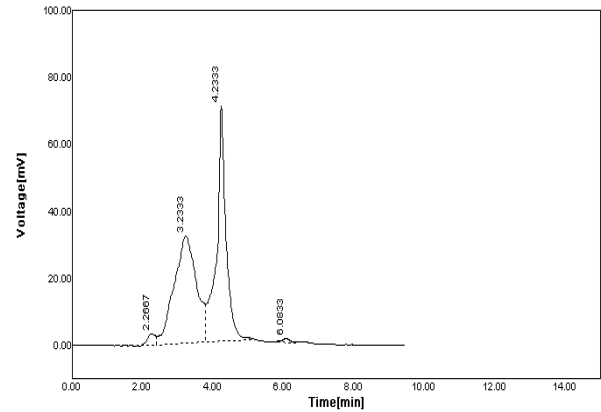


Figure.10.HPLC chromatogram of morphine in FPC3 sample (13.82 µg/g)

Cookies FPC1, FPC2 and FPC3 also reported morphine content level at 15.22µg/g, 17.88µg/g, and 13.82µg/g at standard retention time 3.23min, 3.21min and 3.20min respectively. The similar result obtained by [16] the average morphine content was calculated as 23.67µg/g.

Physical Analysis:

Effect of different level of mix flour incorporation on physical characteristics of control cookies is shown in table no.5.

Parameter	C0	FPC1	FPC2	FPC3
Diameter, mm	54.95	60.10	63.40	67.80
Thickness, mm	5.96	7.86	7.9	7.8
Spread Ratio	9.21	7.6	8.0	8.65
Spread Factor (%)	100	83.02	87.07	93.70

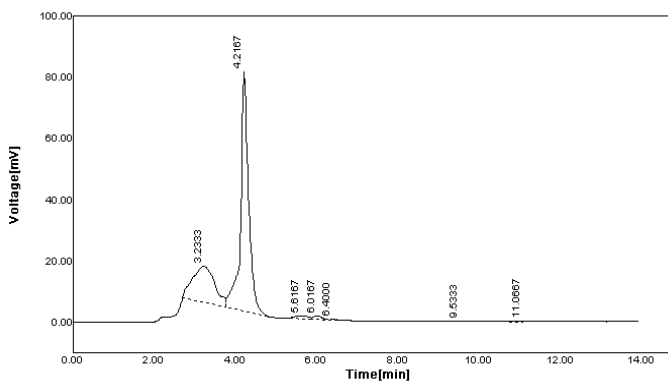


Figure.8.HPLC chromatogram of morphine in FPC1 sample (15.22 µg/g).

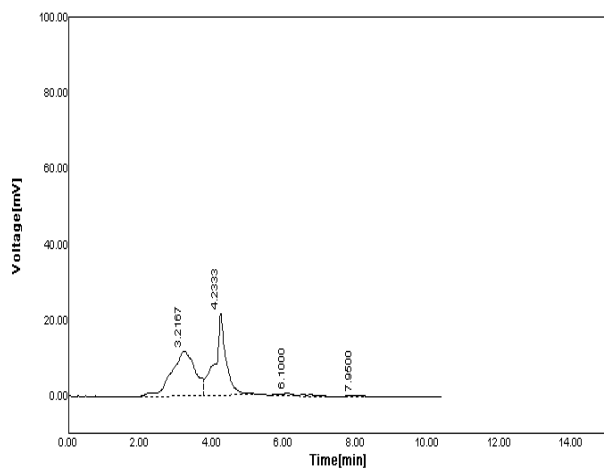


Figure.9.HPLC chromatogram of morphine in FPC2 sample (17.88µg/g).

The average thickness of the cookies was reported to be decreased with the increase in level of mix flour. The diameter and spread factor of mix flour fortified cookies was greater than that of control cookies for all the level of mix flour incorporated and results are similar to earlier reported [20].

Sensory Evaluation of Mix flour cookies:

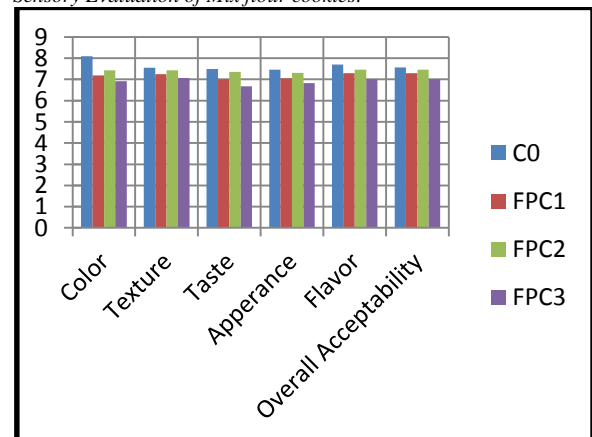


Figure.11. Effect of different level of mix flour on overall acceptability of control cookies

Figure.11. shows the sensory evaluation of mix flour cookies formulations respectively. The color score decreased with increasing flaxseed flour level which is similar to earlier reported [20]. Among all cookies formulations FPC2 cookies were most acceptable and at par with refined wheat flour cookie.

IV. CONCLUSION

It is concluded FPC2 cookies prepared by mixing flaxseed and poppy seed flour in the ratio 10: 10 w/w % were acceptable and nutritionally better. FPC2 cookies are reported to contain comparatively higher protein, crude fiber, Crude Fat and Calories and moisture by 26.65%, 85.46%, 93.39% and 2.74% respectively. This cookie is source of Ca (155.55 mg/100gm), K (147.76 mg/100gm) and Na (11.13 mg/100gm). Morphine content of acceptable cookie (22.45µg/g) was also within permitted limit(23.67µg/g).

V. REFERENCES

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