

FORMULATION, STANDARDISATION AND SENSORY EVALUATION OF NUTRI LADDU USING FLAXSEEDS

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Abstract: Functional foods are foods or dietary components that may provide health benefit beyond basic nutrition. Functional foods deliver a health boost beyond what is expected from their traditional nutrient content. Flaxseed is considered to be as a complete food due to the presence of alpha-linolenic acid. In the present study flaxseeds were incorporated into laddu along with groundnuts and gingelly seeds at 5g, 10g, and 15g. The variations are rich in fibre content. Nutrients such as protein, fat, carbohydrates are calculated and are similar in basic and all variations. There was a slight decrease in energy, calcium and iron. The developed products were subjected to sensory evaluation. It was found that the variation containing 10g flaxseed was most accepted. The developed Nutri laddu contains good amount of fibre, calcium and phytoestrogens. Hence it can be consumed as snack by post menopausal women and also by all the age groups.

Index Terms: Functional foods, Flaxseed, Sensory Evaluation, Nutritive value, Nutri Laddu

1. INTRODUCTION

Functional foods or Nutraceuticals are foods or dietary components that may provide a health benefit beyond basic nutrition. Functional foods deliver a health boost beyond what is expected from their traditional nutrient content. Functional attributes of many traditional foods are being discovered, while new food products are being developed with beneficial components.^[2] In this regard the demand for flax seeds in food and beverages, functional foods and dietary supplements has risen dramatically. Flax seed is considered to be a complete functional food due to the presence of alpha-linolenic acid.^[7]

Flax seed (*Linum usitatissimum*) commonly known as linseed is a member of the genus *Linum* in the family *Linaceae*. Flax is an oldest agronomic crop having more than 300 species and which are cultivated for food and fibre since ancient times. Flax seed is recognised either by variety or by colour (brown and yellow). Brown coloured flaxseeds is the most common and high in alpha-linolenic acid, while there are two types of yellow coloured flaxseed: omega and Linola.^[4]

Flax seeds come from flax plant. It is a blue flowering crop grown on the prairies of Canada as well as in India for its oil rich seeds. The seeds of flax are tiny, smooth and flat and range in colour from light to reddish brown. Flax seed has nutty taste.^[3]

Flax seed is rich in the essential omega-3 fatty acid, alpha linolenic acid.^[2] Researchers are interested in omega -3 fatty acid for their roles in proper infant growth and development, reducing risk factors for heart disease and stroke, immune and inflammatory disorders.^[3] Flaxseed oil is low in saturated fatty acids (9%), moderate in monounsaturated fatty acids (18%), and rich in polyunsaturated fatty acids (73%).^[1]

The protein content of the flaxseed varies from 20 to 30% constituting approximately 80% globulins and 20% glutelin. The amino acid pattern of flax protein is similar to that of soya bean protein which is viewed as one of the most nutritious of the plant proteins.^[1]

Flax seed is low in carbohydrate.^[2] Flax contains both soluble and insoluble dietary fibre.^[2] It aids digestion by increasing bulk, reducing the time that waste remains in the body and preventing constipation.^[3]

Flaxseed contains several water and fat soluble vitamins. Vitamin E is present abundantly in flax primarily as gamma-tocopherol. Gamma-tocopherol is an antioxidant that protects cell proteins and fats from oxidation. Flax contains a small amount of vitamin K in the form of phyloquinone, which is the plant form of the vitamin.^[3] It contains good amount of calcium, magnesium and phosphorus.^[1]

Lignans are the plant based compounds that can block oestrogen activity in cells, reducing the risk of certain cancers. Lignans are phytoestrogens meaning they are similar to but weaker than the oestrogen that a woman's body produces naturally. Therefore they may alleviate menopausal discomforts such as hot flashes and vaginal dryness. They are also antibacterial, antifungal and antiviral.^[3]

Table 1 Fatty acid composition of groundnut, gingelly seeds and flaxseed

Ingredients	Total fat (g)	Saturated fat (g)	Monounsaturated fat (g)	Polyunsaturated fat (g)
Ground nut	100	17	46	32
Gingelly seeds	100	14	39.7	41.7
Flaxseeds	100	9	18	73

Source-<https://flaxcouncil.ca>, <https://en.wikipedia.org>

The main objective of the study was to develop a nutritious product using flaxseeds, to do nutritive value calculation and subject to sensory attributes of the developed product.

2. METHODOLOGY

This section enlists the materials used and elaborates the processing techniques, sensory evaluation and nutritive value calculation for the developed product.

Procurement of raw materials:

The materials required for the product were purchased from the local market of Hyderabad.

Processing of raw materials:

The raw materials purchased from the local market were subjected to cleaning process in order to remove stones, spoiled seeds and other impurities.

Development of the product:

Table 2 ingredients for the Nutri Laddu

Ingredients	Basic	Variation 1	Variation 2	Variation 3
Ground nut	40g	35g	35g	35g
Gingelly seeds	30g	30g	25g	20g
Flaxseeds	-	5g	10g	15g
Jaggery	30g	30g	30g	30g
Ghee	2.5g	2.5g	2.5g	2.5g

Method of preparation:

1. Roast the ground nut, gingelly seeds and flaxseeds separately.
2. Now bring them to normal room temperature.
3. Grind them into fine powder in a mixer grinder for 1min.
4. Take a bowl add jaggery and 2ml of water and boil for 5min till the syrup reaches soft ball stage[112-115°C]
5. Add ghee and powders into the jaggery syrup.
6. Mix well and make them into laddu and serve.

Nutritive value calculation:

Nutritive value of the developed product was calculated using Indian Food Composition Tables. The nutrients calculated were energy, carbohydrate, protein, fat, fibre, calcium and iron.

Sensory evaluation:

15 Panellists were selected for the evaluation of the sensory attributes of the developed product like appearance, texture, flavour, colour, taste and overall acceptability. The panellists included were the students from the Department of Food and Nutrition, University College for Women, koti. The sensory evaluation was done using 5 point hedonic rating scale.

3. RESULTS AND DISCUSSION

Nutritive value calculation:

Table 3 Nutritive value of Nutri laddu

Nutrients	Basic	Variation 1	Variation 2	Variation 3
Energy[kcal]	492	488	484	460
Protein[g]	16	16	16	15.5
Fat[g]	31	31	31	30.4
Carbohydrate[g]	35.5	35.1	35.19	35.1
Total Fiber[g]	9.07	9.97	10.4	10.8
Calcium[mg]	439	449	398	345
Iron [mg]	7.2	7.3	6.8	6.4

From the above table it is evident that there is an increase in the fibre in all the three variations compared to the basic, as flaxseeds are rich in both soluble and insoluble fibre. The protein, fat, carbohydrate remains same as basic in all the three variations. There is a minimal decrease in the energy, calcium and iron in all the variations when compared to the basic. It is evident from the study that there was a drastic change in the crude fibre content after addition of flaxseed flour as compared to the control sample (Kelapure et al 2018).

Sensory evaluation:

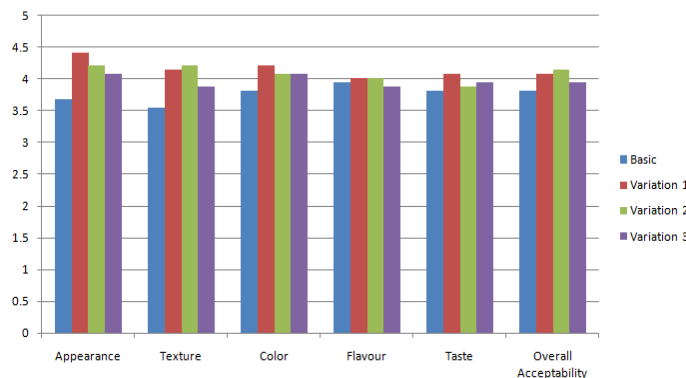


Figure 1 Sensory attributes of Nutri laddu

Sensory attributes for the basic, variation1, variation2, variation3 were evaluated using a five point hedonic rating scale. It was found that mean score for appearance was found to be high for variation1 (4.4), followed by variation2 (4.2), variation3 (4) and basic (3.6). The mean score for the colour was found to be high for variation1 (4.2) followed by variation2 (4), variation3 (4) and basic (3.8). The mean score for the taste was found to be high for variation1 (4) followed by variation3 (3.93) variation2 (3.86) and basic (3.8). The mean score for the texture was found to be high for variation2 (4.2) followed by variation1 (4.1), variation3 (3.8) and basic (3.5). The mean score for the flavour was found to be high for both variation1 (4) and variation2 (4) and for variation3 (3.8) and basic (3.9). The mean score for overall acceptability was found to be high for variation2 (4.13) followed by variation1 (4.06), variation3 (3.93) and basic (3.8). It is evident from the study that the sample with 10% flaxseed flour supplemented cookies were found to be the best sample among the all. (Kelapure et al 2018).

4. CONCLUSION

Addition of flaxseeds to the laddu made the product more nutritious and wholesome without affecting the sensory attributes of the developed product. Based on sensory evaluation flaxseed incorporated at 10g was found to be more accepted. The nutritive value of the developed product is enhanced. The product contains good amount of calcium and phytoestrogens that can be consumed by post menopausal women and also by all the age groups. So flaxseeds can be incorporated into various food items in order to prevent non communicable diseases.

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