



## DEVELOPMENT AND ACCEPTABILITY OF SNACK RECIPE INCORPORATED WITH FLAX SEED (*Linum usitatissimum*) POWDER

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### ABSTRACT

*Linum usitatissimum*, the specific name for flax within the family Linaceae, aptly describes its usefulness and versatility. In fact, the name Linum originated from the Celtic word Lin or “thread,” and the name usitatissimum is Latin for “most useful”. Traditional flaxseed varieties consumed by humans are rich in alpha-linolenic acid (ALA), the essential omega (ω)-3 fatty acid, which constitutes about 57 percent of the total fatty acids in flax. Many health-claims have been made for whole flax seed, flax meal and milled flax. Flax seed also have a functional food and nutraceutical properties. Flax continues to surge forward in its recognition as a functional food and has recently gained attention in the area of cardiovascular disease primarily because it is the richest known source of alpha-linolenic acid, the phytoestrogen, lignans, as well as being a good source of soluble fiber. ALA is beneficial for infant brain development, reducing blood lipids and cardiovascular diseases. Different type of Ribbon pakkoda with varying proportion of flax seed powder (5%, 10%, and 15%) was developed along with control. The organoleptic evaluation of the flax seed powder incorporated ribbon pakkoda was carried out using 9 point Hedonic Scale. The data obtained was analyzed statistically. Organoleptic evaluation of prepared Flax seed incorporated Ribbon pakkoda revealed that sample T2 (10%) incorporation score highest overall acceptability ( $8.5 \pm 0.65$ ).

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### INTRODUCTION

*Linum usitatissimum*, the specific name for flax within the family Linaceae, aptly describes its usefulness and versatility. In fact, the name Linum originated from the Celtic word Lin or “thread,” and the name usitatissimum is Latin for “most useful”<sup>(1)</sup>. Flax is rich in fat, protein and dietary fiber. An analysis of brown Canadian flax averaged 41% fat, 20% protein, 28% total dietary fiber, 7.7% moisture and 3.4% ash, which is the mineral-rich residue left after samples are burned<sup>(2)</sup>. Traditional flaxseed varieties consumed by humans are rich in alpha-linolenic acid (ALA), the essential omega (ω)-3 fatty acid, which constitutes about 57 percent of the total fatty acids in flax. Solin is a generic term for flax varieties that contain less than 3 percent ALA<sup>(3)</sup>.

Many studies revealed that consuming traditional milled flax or partially defatted flax decreased total cholesterol, low-density lipoprotein (LDL) cholesterol without a significant decrease in high-density lipoprotein (HDL) cholesterol. Flaxseed was recommended as an antitumor (in combination with sweet clover), pain and cough relieving, and anti-inflammatory remedy<sup>(4)</sup>. Lignan act as antioxidants in humans. Flax seed provides 800 times more lignans than any other plant

seed (except sesame seeds which has 47 times less lignan than flax seed), thus it is considered as one of the richest sources of plant lignans. On consumption of flax, lignans are converted into phytoestrogenic compounds. Studies have revealed that the chemical release of phytoestrogenic compounds is believed to block the action of hormone sensitive cancers<sup>(5)</sup>.

The health benefits of all ω-3 fatty acids (ALA, EPA and DHA) have been widely reported for several conditions including cardiovascular disease, hypertension, atherosclerosis, diabetes, cancer, arthritis, osteoporosis, autoimmune and neurological disorders. Flaxseed has also been reported to act as anti-arrhythmic, anti-atherogenic, and anti-inflammatory agent in addition to improving vascular function<sup>(6)</sup>.

#### Objectives

1. To prepare and analyse the nutritive value of ground flax seed powder.
2. To standardize the flax seed powder incorporated snack recipe.
3. To analyse the nutritive value of flax seed incorporated snack recipe.
4. To analyse the acceptability of selected flax seed incorporated snack recipe.

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## MATERIALS AND METHODS

The present study is carried out in Department of Nutrition and Dietetics, Jamal Mohamed College, Tiruchirappalli. The material used and methods adopted for the present investigations are presented under suitable heading.

### Materials

The different materials required for the entitled project like Bengal gram flour, rice flour, flax seed, chili powder, garlic, oil were collected from local market, Tiruchirappalli.

### Methods

Flax seed powder was prepared by some food processing method.

#### Preparation of Flax Seed Powder

##### Procurement of Raw Materials

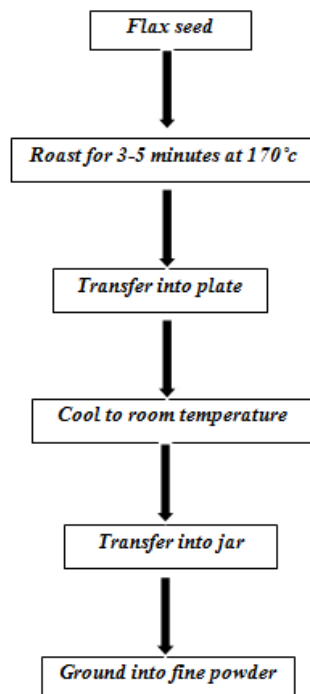
Flax seed *linum usitatissimum* was collected from the Ayurveda shop of Tiruchirappalli district.

##### Treatment of the flax seed

Flax seed *linum usitatissimum* was sieved manually to remove the dust particles.

##### Preparation of Flax Seed powder

Flax seed *linum usitatissimum* was roasted at 170 degree centigrade for 5 minutes then the flax seed was cooled to room temperature and the flax seed was ground into a fine powder by the food processor.

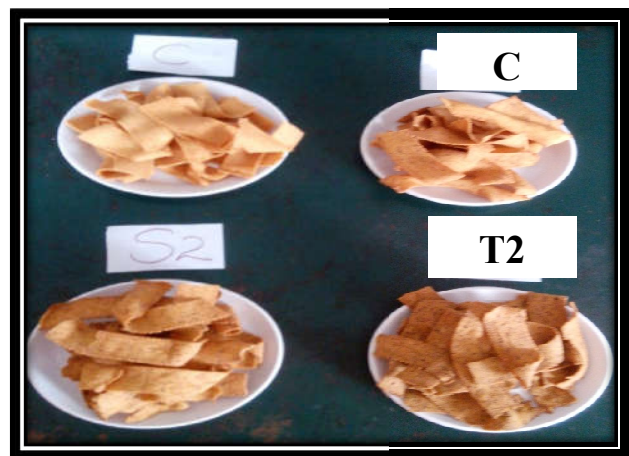
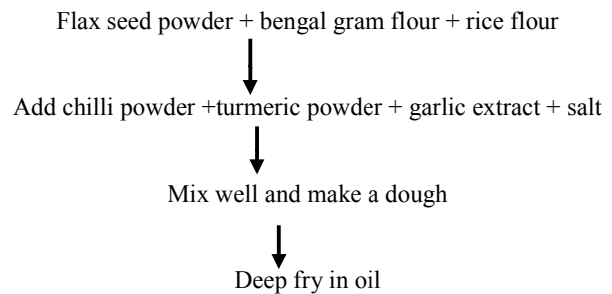


**Fig 1** Flow chart of the preparation of flax seed powder  
**Preparation of Ground Flax Seed Ribbon Pakkoda**

In which first sample was made with the standard specifications and held as the control sample. In other samples variation in the flax seed powder were carried out in the range like 5%, 10% and 15% respectively.

**Table 1** Ingredients for Flaxseed flour Incorporated Ribbon pakkoda

Percentage of incorporation	Bengal gram flour (g)	Rice flour (g)	Flax seed powder (g)	Oil (ml)
Control	100	60	0	10
T1 – 5%	95	60	5	10
T2 – 10%	90	60	10	10
T3 – 15%	85	60	15	10



Test 1 = 5%, Test 2 = 10%, Test 3 = 15%

## RESULTS AND DISCUSSION

Clinical studies on rats and other animals reported that flax has antioxidant effects and decreases blood lipids and inflammation <sup>(7)</sup>. Many studies revealed that consuming traditional milled flax or partially defatted flax decreased total cholesterol, low-density lipoprotein (LDL) cholesterol without

a significant decrease in high-density lipoprotein (HDL) cholesterol<sup>(8)</sup>.

Ayurveda and traditional Chinese medical system share many common approaches and have a long history of practice<sup>(9)</sup>. Ayurvedic literature describes more than 200 herbs, minerals and fats for skin care. Flaxseed oil is believed to bring mental and physical endurance, by fighting fatigue and controlling aging process. According to Ayurveda, flaxseed has properties like Madhura (balances the skin pH), Picchaila (lubricous) Balya (improves tensile strength or elasticity of the skin), Grahi (improves moisture holding capacity of skin), Tvagdoshahrit (removes skin blemishes), Vranahrit (wound healing) and useful in Vata (skin) disorders including dryness, undernourishment, lack of luster/glow<sup>(10)</sup>.

Flaxseed was recommended as an antitumoral (in combination with sweet clover), pain and cough relieving, and anti-inflammatory remedy<sup>(11)</sup>. It was also used for the treatment of freckles (in a mixture with soda and figs) and nail disorders (with garden cress and honey)<sup>(11)</sup>.

**Table 2** Nutritive and Anti-nutrient content of Flax Seed Powder per 100g

NUTRIENTS	VALUE
Energy (kcal)	408.45
Carbohydrate (g)	56.89
Total fat (g)	16.38
Protein (g)	22.58
Dietary fibre (g)	8.22
Omega 3 fatty acid (g)	12.35
Omega 6 fatty acid (g)	2.56
Lignan (mg)	412

ANTI NUTRIENT	VALUE
Cyanogenic glycosides(mg)	0.56
Linamarin (mg)	0.24

Cyanogenic glycosides and linatine an antipyridoxine factor these are the compound which called anti-nutrient that present in flax seed. Release of hydrogen cyanide from flaxseed would be minimal and below toxic lethal dose. At the recommend daily intake of about 1–2 table spoons, approximately 5–10 mg of hydrogen cyanide is released from flaxseed, which is well below the estimated acute toxic dose for an adult of 50–60 mg inorganic cyanide and below the 30–100 mg/ day humans can detoxify<sup>(12)</sup>.

**Nutritional Evaluation**

**Table 3** Nutrient content of Ground Flax Seed Ribbon Pakkoda

Product	Energy (k.cal)	Protein (g)	Fat (g)	Fibre (g)	Iron (mg)	Omega 3 fatty acid (mg)	Omega 6 fatty acid (mg)
CONTROL	541.55	13.84	22.88	1.51	3.59	-	-
T1	544.72	15.16	23.67	1.91	3.68	0.61	0.12
T2	547.85	15.41	24.46	2.31	3.78	1.23	0.25
T3	586.76	17.79	25.54	2.77	4.37	1.85	0.38

**Sensory Evaluation**

Ribbon Pakkoda with various proportion of flax seed powder (5%, 10% and 15%) were developed along with a control. The sensory evaluation of different treatments of flaxseed incorporated ribbon pakkoda for various attributes including

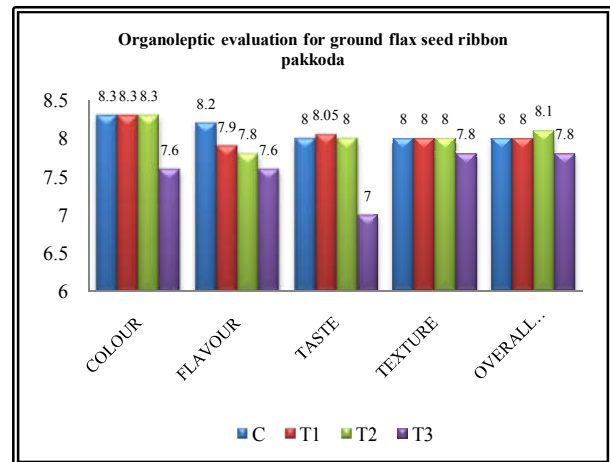
color, flavor, taste, texture and overall acceptability was carried out using panel members. On the day of evaluation, flaxseed incorporated ribbon pakkoda were placed in plates, labeled with various code C, T1, T2 and T3. Judgments were made through rating products on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 like extremely to 1 dislike extremely.

**Table 4** Sensory Evaluation for Flax Seed powder incorporated Ribbon Pakkoda

Sensory Attributes	Color	Flavor	Taste	Texture	Overall acceptability
C	8.3 ± 0.75	8.2 ± 0.55	8 ± 0.69	8 ± 0.69	8 ± 0.69
T1	8.3 ± 0.83	7.9 ± 0.76	8.05 ± 0.64	8 ± 0.8	8 ± 0.84
T2	8.3 ± 0.80	7.8 ± 0.81	8 ± 0.77	8 ± 8.0	8.1 ± 0.73
T3	7.6 ± 0.92	7.6 ± 0.92	7 ± 0.89	7.8 ± 1.2	7.8 ± 1.04

Test1= 5%, Test2 = 10%, Test3=15%

Organoleptic evaluation of ground flax seed Ribbon Pakkoda revealed that sample T2 (10%) incorporation scored highest in Color (8.3 ± 0.80), Flavor (7.8 ± 0.81), Taste (8 ± 0.77), Texture (8 ± 8.0) and Overall acceptability (8.1 ± 0.73).



**Fig 3** Mean score of organoleptic evaluation for Ground Flax Seed Ribbon Pakkoda

The above graph shows that the average scores for colour for T2 is (8.3) which is the maximum and the least score is for T4 (7.6). The results indicate that colour and appearance are highly affected by the concentration of Flax seed powder. T2 scored the maximum value in taste with an average of (8.05) followed by (7) for T3 as clearly revealed by the graph with response from the panelists. The overall acceptability T2 stand at 8.1 which shows greater quality attributes to Flax seed incorporated Ribbon Pakkoda.

**CONCLUSION**

Flaxseed (*Linum usitatissimum*) has been used for centuries as a food ingredient with medicinal properties<sup>(13)</sup>. Flaxseed has been found to be stable under normal processing and storage conditions, and Manthey *et al.* (2002) reported that linolenic acid remained stable during processing and cooking of spaghetti fortified with ground flaxseed. The Calorie, Carbohydrate, Protein, Fat, Dietary fibre, Iron, Omega 3 fatty acid and Omega 6 fatty acid content of Ribbon pakkoda were enriched in incorporation of Flax seed powder. The effect of incorporation of full fat flaxseed powder on the sensory and nutritional utilities of snack recipe was investigated. The result

of the organoleptic evaluation shows that the incorporation of flaxseed powder 10 % is found to be most acceptable to obtain Snack recipe with improved nutritional quality and satisfactory sensory attributes.

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