



DEVELOPMENT OF FLAXSEED ENERGY BAR RICH IN OMEGA SFA

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ABSTRACT: Energy bar sample were prepared with flaxseed in addition to oats, coconut powder, jaggery, dark chocolate, peanuts and dry fruits to deliver a nutritious food to the consumer. The developed bars were evaluated for textural, colour, nutritional quality, sensory attributes and total microbial load. Different levels of flaxseed and sweeteners significantly affected the hue and chroma values of the energy bar. In general, the level of flaxseed in energy bar did not affect the hardness but it was decreased with increasing level of sweeteners except in control sample. The total calories obtained from the energy bar showed significant increase with the increasing levels of flaxseed, the maximum (397.95 kcal) being for bars with 20% flaxseed and 45% sweeteners. The overall mean sensory score for overall acceptability for samples with 10% flaxseed and 55% sweeteners and 15% flaxseed and 45% sweeteners were at par but the omega-3 and other nutrients in the later sample was higher than the former sample, hence, 15% flaxseed and 45% sweeteners along with other ingredients may be considered for production of acceptable quality omega-3 fatty acid rich energy bar at commercial scale, which also stored well at refrigerated condition.

Although flaxseed contains all sorts of healthy components, it owes its primary healthy reputation to three of them:

- **Omega-3 essential fatty acids**, "good" fats that have been shown to have [heart](#)-healthy effects. Each tablespoon of ground flaxseed contains about 1.8 grams of plant omega-3s.
- **Lignans**, which have both plant [estrogen](#) and [antioxidant](#) qualities. Flaxseed contains 75 to 800 times more lignans than other plant foods.
- **Fiber**. Flaxseed contains both the soluble and insoluble types.

Keywords – flaxseed, omega – fatty acid, sweeteners

1. INTRODUCTION:

1.1 Flaxseed

Flax (*Linum usitatissimum*) belonging to family Lineaceae, is a blue flowering annual herb that produces small flat seeds varying from golden yellow to reddish brown color. Flaxseed possesses crispy texture and nutty taste (Morris 2007; Rubilar et al. 2010). Flaxseed is also known as linseed and these terms are used interchangeably. Flaxseed is often used to describe flax when consumed by humans while linseed denotes when it is used specifically for industrial applications (Morris 2007). Almost all parts of linseed plant are utilized for various purposes. Seed contains oil which after refining is used for edible purpose (Singh et al. 2011a, b). The stem yields fiber of good quality possessing high strength and durability. Humans have been consuming flaxseed since ancient times. It has been cultivated for fiber as well as for medicinal purposes and as nutritional product (Tolkachev and Zhuchenko 2000). Currently, it is cultivated in more than 50 countries, predominantly in the Northern hemisphere. Canada is the world's largest producer and exporter of flaxseeds (Oomah 2001). The important flaxseed growing countries include India, China, United States, and Ethiopia (Oomah and Mazza 1998; Singh et al. 2011a, b). India ranks first among the leading flaxseed producing countries in terms of acreage accounting 23.8 % of the total and third in production contributing to 10.2 % of the world's production (Singh et al. 2011a, b). 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 (Shakir and Madhusudan

2007). It enjoys a good status among oilseeds because of its versatile uses. It has emerged as an attractive nutritional food because of its exceptionally high content of alpha-linolenic acid (ALA), dietary fiber, high quality protein and phytoestrogens. Flaxseeds contain about 55 % ALA, 28–30 % protein and 35 % fiber (Carter 1993; Rubilar et al. 2010; Rabetafika et al. 2011). Flaxseed has been the focus of growing interest for the nutritionists and medical researchers due to its potential health benefits associated with its biologically active components—ALA, lignan-Secoisolariciresinol diglycoside (SDG) and dietary fiber (Toure and Xueming 2010). Flaxseed is establishing importance in the world's food chain as a functional food. Functional food can be defined as the food or food ingredients that may provide physiological benefits and helps in preventing and/or curing of diseases (AIOkbi 2005). Presently, flaxseed has new prospects as functional food because of consumer's growing interest for food with superb health benefits. Owing to its excellent nutritional profile and potential health benefits, it has become an attractive ingredient in the diets specially designed for specific health benefits (Oomah 2001). ALA is one of the essential polyunsaturated fatty acid and reported to exhibit antiinflammatory, anti-thrombotic and anti-arrhythmic properties (Simopoulos 1999). Nutritionists all over the world suggest incorporation of omega 3 fatty acid sources in the diet. Flaxseed serves as the best omega 3 fatty acid source to the non-fish eaters. Edible flaxseed products include the whole flaxseed, ground meal and extracted oil or mucilage. These products have been proposed as nutritional additives in the preparation of a number of dietary items such as baked cereal products, ready to eat cereals, fiber bars, salad toppings, meat extenders, bread, muffins and spaghetti (Singh et al. 2011a, b). In spite of the multiple clinical evidences of flaxseeds, people are still unaware about its nutritional as well as therapeutic benefits.

Table-1: Nutritional composition of flaxseed

Nutrients	Amount per 100 g of edible flaxseed
Moisture (g)	6.5
Protein (N×6.25) (g)	20.3
Fat (g)	37.1
Minerals (g)	2.4
Crude fiber (g)	4.8
Total dietary fiber (g)	24.5
Carbohydrates (g)	28.9
Energy (kcal)	530.0
Potassium	750.0
Calcium (mg)	170.0
Phosphorous (mg)	370.0
Iron (mg)	2.7
Vitamin A (µg)	30.0
Vitamin E (mg)	0.6
Thiamine (B1) (mg)	0.23
Riboflavin (B2) (mg)	0.07
Niacin (mg)	1.0
Pyridoxine (mg)	0.61

*Morris 2007; Gopalan et al., 2004; Payne, 2000

1.2 Health-promoting properties of flax

Flax oil, flax seeds, and the omega-3 fatty acids they contain are good for your health. Here are some of the ways flax helps your body.

- 1) Flax promotes cardiovascular health. The ultra-high levels of omega-3 fatty acids lower LDL(bad) cholesterol levels. Fish oils and algae are also good sources of essential fatty acids.
- 2) Flax promotes colon health. It has anti-cancer properties and, as a natural lubricant and a rich
- 3) fiber source, it lowers the risk of constipation.
- 4) Flax supplements can boost immunity. One study showed that school children supplemented with less than a teaspoon of flax oil a day had fewer and less severe respiratory infections than children not supplemented with flax oil.
- 5) Flax provides fats that are precursors for brain building. This is especially important at the stage of life when a child's brain grows the fastest, in uterus and during infancy. A prudent mom should consider supplementing her diet with a daily tablespoon of flax oil during her pregnancy and while breastfeeding.
- 6) Flax promotes healthy skin. I have used flax oil as a dietary supplement in my patients who seem to have dry skin or eczema, or whose skin is particularly sun-sensitive.

- 7) Flax may lessen the severity of diabetes by stabilizing blood-sugar levels.
- 8) Flax fat can be slimming. Fats high in essential fatty acids, such as flax, increase the body's metabolic rate, helping to burn the excess, unhealthy fats in the body. Eating the right kind of fat gives you a better fighting chance of your body storing the right amount of fats. This is called thermogenesis , a process in which specialized fat cells throughout the body (called brown fat) click into high gear and burn more fat when activated by essential fatty acids, especially gammalinolenic acid (GLA).

2.MATERIALS AND METHODS:

2.1 Raw materials:

- Oats
- Flaxseeds
- Jaggary
- Dry fruits – almond, raisins, walnut, cashews

Table 2 Glasswares & Instruments

Glasswares	Instruments
Beaker Conical flask Burette Measuring cylinder Stirrer Test tube Petri plate Crucible	Digital thermometer Analytical balance Incubator Autoclave Hot air oven Muffle furnace

2.2 METHOD

- Roast oats
- Roast flaxseed & Grind
- Roast almond, walnut, cashews and don't grind raisins
- chop dry fruits in small pieces
- In a pan take a jaggery and heat on medium flame
- Now add flaxseed powder and roasted oats
- Then add dry fruits
- Combine well keep mixing
- Transfer the prepared mixture into a greased plate
- set well forming a block
- allow setting for 20mins
- now unmould and cut into pieces
- finally, serve energy bar or store in an airtight container for a month in the refrigerator
- packaging

2.3 Sensory Evaluation

Energy-bar was evaluated for different sensory attributes by a group of five panellists. Sensory attributes like appearance, taste, texture, and over all acceptability for all the samples were assessed using nine-point hedonic scale.

SCORES TO BE GIVEN AS FOLLOWS:

1. Liked extremely – 9
2. Liked very much – 8
3. Liked moderately – 7
4. Liked slightly – 6
5. Neither liked nor disliked – 5
6. Disliked slightly – 4
7. Disliked moderately – 3
8. Disliked very much – 2
9. Disliked extremely – 1

3. RESULTS AND DISCUSSIONS:

3.1 Physicochemical analysis

Physio-chemical parameter of selected Nutri-bar

Parameters	Value
Moisture (%)	3.74 ±0.05
Ash (%)	3.97±0.06
Protein (%)	24.32±0.05
Fat (%)	0.10±0.07
Curde fiber	2.9±0.05
Carbohydrates (%)	68.71±0.07
Energy (Kcal)	475.35

3.2 Microbial analysis of energy-bar

Total plate count (TPC) of energy-bars: The mean values for TPC of Nutri-bar samples vary from 3.26 to 2.72 Log₁₀ cfu/g. The maximum value was observed in F4 (3.26 Log₁₀ cfu/g). With different treatment there is a significant difference in TPC. Al-Hooti et.al. observed that TPC significantly varied from 1.00 to 2.18 Log₁₀ cfu/g in date bar samples.

Total mold count of energy-bar: The mean values for mould count of Nutri-bar sample ranged from 2.65 to 3.01 Log₁₀ cfu/g. The maximum count was found in F4 (3.01 Log₁₀ cfu/g) and minimum count in F1 (2.65 Log₁₀ cfu/g). With different treatments there is a significant difference in mold counts. Al-Hooti et.al. observed that mold varied significantly in date bars from 2.6 to 3.00 Log₁₀ cfu/g.

4. CONCLUSION:

The present study results that from all the formulation containing different concentration of flaxseeds , oats , cashewnut, jaggery,almond, walnut , raisins. Sample 2 was found to be more acceptable along all the other samples . nutri bar with sample 3 standardization contains 2.9 % /100g crude fibre, 3.97%/100g total ash , 24.32 %/100g protein, 3.74 %/100g moisture, 0.10 g % /100 g Total fat .The prepared nutritional rich bar provide sufficient amount of energy, protein & vital nutrients which are essential for human body at micro amount .Jaggery provides energy as well as iron to body & work as binding agent in bars. It is healthy option to replace unhealthy foods which affects to body . These energy bars are a convenient source of nutrition and come in a wide variety of flavors to satisfy different palates. These are often fortified with vitamins and minerals, which can help fill nutritional gaps. These energy bars are low in saturated fat and sugars, with a decent amount of protein and fiber, can provide a nutritious, satisfying pick-me-up. Others can closely mimic a candy bar. These bars are aiming to reduce calories and therefore control your portions, high protein nutrition bars help with balancing regular food servings while also keeping you away from the rapid sugar spikes that are associated with eating unhealthy snacks. The protein and added carbohydrates in these nutri bar can provide energy to get you through your workout or training. it also provide the post-workout nutrition your body requires to build new muscle tissue, fixing whatever minute muscle tears occurred in the course of your exercise. It can also be called as meal replacement bar as it provides enough energy and nutrients to the body

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