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Research Article

**PHYTONUTRITION – FLAXSEEDS A VEGETARIAN SOURCE
NUTRACEUTICAL SUPPLEMENT FOR COMPLETE HEALTH
AND WELLNESS****A.Rajendran^{1*}, R.Sudeshraj² and S.Sureshkumar³**¹Lifecare phytoremedies, Ayyappanthangal, Chennai, India – 600056²Lifecarephytolabs, Perambalur, India - 621212³Department of Chemistry, Rajalakshmi Engineering College, Chennai, India - 602105**Abstract:**

Flaxseeds are cultivated worldwide for medicinal purpose, oil and nutritional purpose as it contains active phytochemicals which are considered as bioactive molecules for food supplements. The objective of this review article is to provide comprehensive details on flaxseeds for medicinal purposes and nutritional product. Recent literatures from various journals were collected using the following keywords: flaxseeds, functional properties, alphanolonic acid, lignans, and nutritional values. The research articles indicated that the flaxseeds have active biomolecules such as lignans, essential fatty acids, and dietary fibers which could reduce the risk of heart disease, lowering blood cholesterol, and improve digestion etc.

Keywords: *Flaxseed, lignans, Alpha-linolenic acid, micronutrients, functional properties*

Corresponding author:**A.Rajendran^{*},**

Lifecare phytoremedies,

Ayyappanthangal, Chennai,

India – 600056

rajendran_dr@hotmail.com,sureshkumarbhc@gmail.com

QR code



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INTRODUCTION:

Linum usitatissimum L is the botanical name of flaxseed. The flax seeds are obtained from flax plant. The flax plant belongs to the family of Linaceae. The name flaxseed means very useful which is originally arrived from Latin. The physical appearance of flaxseed is elliptical up to 4–6 mm size and having flat structure. The following countries like Asia, Europe, and North America people has been using this flaxseed as part of their diet for thousands years. Predominantly the flaxseeds have been cultivated for oil production. Statistically, the flaxseeds production is 2.6 million tonnes when compared to other oil crops. Presently, focus on flaxseed has been increased due to its various health benefits. The flax seeds have active biomolecules such as α -linolenic acid, dietary fiber and lignans [1]. The compound lignans is a class of bioactive polyphenolic agents, and are widely distributed among plant kingdoms [2]. There are 2 different types of lignans based on origin. One type of lignans is isolated from plants seeds such as isolariciresinol, secoisolariciresinol diglucoside, and matairesinol, lariciresinol. Another type lignans are isolated animal source is known as mammalian lignans [3]. The compounds lignans generally found in fiber rich plants such as pumpkin seeds, sesame seeds, lentils and soybeans etc., Among the fiber rich compounds, flaxseed has lignans is about 9–30 mg/g. This yield is 75–800 times greater than that of other oil seeds [4].

Flaxseeds often mixed with traditional cereal based mediums like bread, pasta as a ready to eat snack for human consumption [5]. Flaxseeds sprouts are stable but when it ground well it undergo rancid at room temperature. The grounded flaxseeds sealed in a container can be stored in refrigerator for long time stability. Consumption of flaxseeds provides several health benefits including prevent from chronic, cardiovascular, obesity and cancer. However, consumption of poor quality of seed would offer several risk considering the effects of lignans in both men and women. This review article provides comprehensive details about the active chemical constituents of flaxseeds and their health benefits.

Health benefits of flaxseeds

Flaxseeds contain high amount of fiber which is good for digestive system. Since the flaxseeds contain active compounds such as lignans, omega-3, omega-6 and micronutrients, which could

- Reduce cholesterol level
- Support weight loss
- Support healthy hair
- Helpful for gynaecological disorder
- Reduce the risk of osteoporosis
- Improve mental alertness & IQ

Active chemical constituents of flaxseeds

Flaxseeds are a good source of bioactive molecules like alpha-linolenic acids, protein, fiber, phenolic compounds, micronutrients and lignans.



Figure 1: *Linum usitatissimum* L (a) flaxseeds, (b) Flax plant, (c) Flax oil and (d) Omega -3 soft capsule from flaxseeds, (e) Omega -3 hard gelatine capsules from flaxseeds and (d) Hard gelatine capsules from Flaxseeds

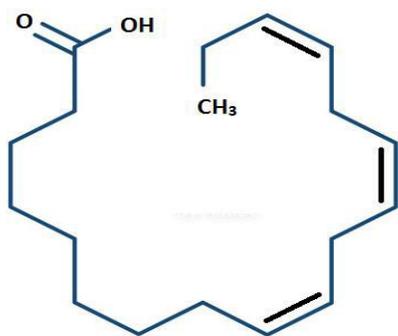
Alpha-linolenic acid and its health benefits

Figure 2: Alpha-linolenic acid (Omega-3 fatty acid)
Flaxseeds are rich Alpha-linolenic acid which is the main sources of omega-3 fatty acid present in vegetarian diets. The oil obtained from flaxseeds rich in alpha-linolenic as well as linolenic fatty acids. The fatty acids are essential element required for body as our body can't able to synthesise, thus these acids needs to be supplied through diet [6,7]. .

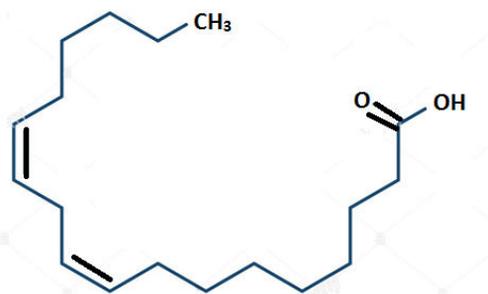


Figure 3: Molecular structure of linoleic acid (Omega – 6 Fatty acid)

Omega-3 fatty acid is responsible to reduce the growth of cancer cells. It also prevent from cancer cell development by consuming omega-3 oils while take orally. It is reported that the omega-3 boost heart health.

Lignans and its health benefits

Lignans is a phytoestrogens found rich in flaxseeds. When we consume the lignan converted into enterolactone, enterolignan and enterdiol by the bacteria present in intestine. Secoisolariciresinol diglucoside (SDG) is the precursor present in flaxseeds has antioxidant properties [8]. Research article revealed that the SDG extracted from flaxseeds able to be a substitute to angiotensin converting enzyme for hypertension treatment [9]. There is a report by Adolphe et al. has summarized that SDG supplementation had protective action against development of cancer, chronic diseases, and diabetes [10-14]. .

Health benefits of micronutrients in flaxseeds

Flaxseeds are a good source of micronutrients like phosphorous, magnesium, calcium, and sodium. The approximate quantitative information micronutrients are listed in table 1. .

Table 1. Health benefits of micronutrients in flaxseeds

S.No	Micronutrients	Qty (mg/100g)	Health benefits
1	Phosphorous	650	Sodium, potassium are the essential minerals required to
2	Magnesium	350–431	balance water in body. The minerals like calcium,
3	Calcium	236–250	phosphorus, and magnesium are the essential elements for
4	Sodium	27	healthy bones and also for healthy skin, and nails
5	Potassium	5600–9200	
6	γ - tocopherol	39.5	γ - tocopherol is great antioxidant, it provides protection to cell proteins, fat from oxidation and lowering blood pressure, and heart disease.

CONCLUSION:

Flaxseed has essential chemical constituents like micronutrients, lignans and omega-3 and omega-6 fatty acids. These essential components from flaxseeds make the healthy human diet for their health maintenance. These active constituents are possessing anti-oxidant, anti-inflammatory, and anti-carcinogenic activities which can reduce cholesterol level, and reduce the risk of cardiovascular disease and also prevent from diabetes. Even though the flaxseeds have enormous health benefits, it contains minute amount of adverse compounds such as cadmium, cyanogenic glycosides and trypsin inhibitors. These adverse compounds however, can be removed by mechanical and thermal processing, autoclaving, boiling techniques.

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