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## Review Of Flaxseed

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### **ABSTRACT:-**

Flaxseed (Liour usitatissiou), derived from the dried seeds of the Linacea, family, is commonly referred to as linseed due to its high content of omega-3 fatty acids. These acids provide essential proteins and nutrients for hair follicles, enhance scalp circulation, and reduce follicle sensitivity that can lead to hair loss. Cultivated globally for both its fiber and seeds, the primary producers include Morocco, Argentina, Belgium, Hungary, the United States, and India. Additionally, flaxseed offers various health benefits, including aiding weight loss, cancer treatment, and improving digestive health.

Methods:- Literature was gathered from PubMed, Google Scholar, Web of Science, and a library. This review provides updated information on the botany, health benefits, photochemistry, and pharmacological properties of flaxseeds.

Results:- The bioactive components found in flaxseeds demonstrate a diverse range of activities, including anticoagulant, anticancer, antihypertensive, antibveedinidenis antioxidant, and antiachxtbois effects. These seeds are increasingly categorized for their applications in pharmaceuticals, food, and cosmetic products.

Conclusion:- The existing literature supports the potential health benefits of flaxseeds from both nutritional and medicinal perspectives.<sup>[1]</sup>

**Keywords:-** Flaxseeds, Food nutrients, Health Benefits, Phytochemistry.

### **I. INTRODUCTION:-**

The seed of the flax plant, an annual member of the Linaceae family, is called flax. It grows best in deep, damp soils that are high in clay, silt, and sand. This species is indigenous to an area that includes the Middle East, India, western Asia, and the eastern Mediterranean. Flax has two primary varieties: brown and yellow or golden (sometimes called golden flax), and its Latin name (Linum usitatissimum L.) means "very useful".<sup>[1]</sup>

Flaxseed is becoming a vital component of useful ingredients since it contains lignans, digestible proteins, and oil that is rich in omega-3 fatty acids. Apart from being one of the best sources of lignans and  $\alpha$ -

linolenic acid, flax is also a considerable source of soluble fiber, high-quality protein, and phenolic compounds<sup>[2]</sup>. Flax is rich in 'H-3 fatty acids, including diglycoside-SDG proteins, phytoestrogen lignans (secoisolariciresinol), soluble and insoluble fibers, polyunsaturated short-chain fatty acids (PUFA),  $\alpha$  linolenic acid (ALA), and several antioxidants. In addition, flaxseed is rich in fatty acids and antioxidants that help prevent pollutants and dead cells from accumulating on the scalp.

As a moisturiser, flaxseed gel can be used to the scalp and hair to promote hair development and strengthen existing hair. Flax is becoming more significant in the global food chain as a functional food. Foods or dietary components that offer physiological advantages and aid in the prevention and/or treatment of disease are referred to as functional foods [4]. About 55% ALA, 28%–30% protein, and 35% fiber are found in flaxseeds. Anti-inflammatory, anti-thrombotic, and anti-arrhythmic characteristics are some of the major polyunsaturated fatty acids, including ALA<sup>[2]</sup>

## II. TAXONOMY:-

The Linaceae family, which consists of roughly 14 genera, contains roughly 230 species, including *Linum usitatissimum*. About two-thirds of all species in the Linaceae family belong to the genus *Linum*, which includes *L. usitatissimum*, an annual herb. Flaxseed is classified as follows<sup>[3]</sup>.

### **Classification of Flaxseeds:-**

Sr. No.	Taxonomic Rank	Nomenclature
1.	Domain	Eukaryota
2.	Kingdom	Plantae
3.	Subkingdom	Tracheophyta
4.	Phylum	Spermatophyta
5.	Subphylum	Angiospermae
6.	Division	Magnoliophyta
7.	Class	Dicotyledonae
8.	Subclass	Rosidae
9.	Order	Linales
10.	Family	Linaceae
11.	Genus	<i>Linum</i> L.
12.	Species	<i>Linum usitatissimum</i>
13.	Common Name	Flax seed, linseed, Alsi or teesi

Language Name	Vernacular Name	Language Name	Vernacular Name
Hindi	Alsi	Oriya	Atushi, Peso
Marathi	Alashi	Sanskrit	Atasi, Jawas, Uma
Bengali	Masina	Tamil	Alshi, Ali, Virai
Malayalam	Agastha	Arabic	BAzrul katan

Kannada	Agasebeeja	Urdu	Alsi, Katan
Punjabi	Alish	Deccan	Alshi, Javas



### Growing of Flaxseed

### Physical characteristics of Flaxseed



### Type of Flaxseed

Colour	Reddish Brown
Odour	Characteristic Odour
Shape	Oval and strongly fattened
Length	4-6 mm
Width	2-3 mm

There are two primary types of flaxseed: brown and yellow or golden (sometimes known as golden flax). The majority of varieties contain the same amounts of short chain omega-3 fatty acids and comparable nutritional traits. The exception is a kind of yellow flax known as solin (marketed under the brand Linola), which has a very low omega-3 FA content and an entirely different oil profile<sup>[4]</sup>.



**Cultivation of Flaxseed**

### **III. PHYTOCHEMISTRY OF FLAXSEED:-**

It is composed of 40% lipids, 30% nutritious fiber, and 20% protein. While endosperm contains the most effective 23% of lipids and 16% of protein, cotyledons contain 75% of lipids and 76% of protein<sup>[10,11]</sup>. Additionally, it contains 2.7 mg/100g of iron, 0.17% calcium, 0.37% phosphorus, 4.8% fiber, 28.8% carbs, 37% fatty oil, and 2.4% mineral matter. It also contains pantothenic acid, choline, carotene, thiamine, niacin, and vitamin E. It also contains lignins, flavonoids, phenolic acid, and cinnamic acid<sup>[13,14]</sup>. Linseed oil is a yellowish-brown drying oil that has a tasteless smell<sup>[5]</sup>.

**Nutritional value of Flaxseed.**

NUTRIENTS	QUANTITY
Calories	55g
Fat	4.3g
Sodium	3.1mg
Carbohydrates	3g
Fiber	2.8g
Sugar	0.2g
Protein	1.9g

**1.Carbohydrates**

Flax seeds contain two different kinds of carbohydrates. About 3 grams of fiber per tablespoon of whole flax make up the majority of the carbs in flax. In addition to supporting healthy digestion, fiber also lowers blood cholesterol and increases satiety, or the sensation of fullness following a meal. Flaxseeds include a very little quantity of naturally produced sugar, which provides the remaining carbs. Flax has an estimated glycemic load of zero. In order to determine how a certain food or beverage will affect your blood sugar, glycemic load considers the portion size. For those who choose foods based on how they affect blood sugar, it is thought to be more helpful than simply utilizing the glycemic index <sup>[6]</sup>.

**2.Fats**

There are slightly more than 4 grams of fat in a tablespoon of flaxseed and slightly less in a tablespoon of ground flaxseed. The "good" fat found in flaxseed oil is mainly monounsaturated fat. When trans-fats are substituted for healthy fats (like saturated fats) in your diet, it can help your heart. Polyunsaturated fatty acids (PUFAs) come in two varieties, and flaxseed has both. Flax seeds are a good source of plant-based fatty acids since one tablespoon contains 606 milligrams of linoleic acid, also known as omega6 fatty acid, and 230 milligrams of  $\alpha$ -linolenic acid (ALA), an omega-3 fatty acid. A single serving of flaxseed contains 0.4 grams of saturated fat and slightly less than 1 gram of monounsaturated fat <sup>[7]</sup>.

**3.Protein**

Although it no longer significantly increases your protein consumption, adding flaxseed to a salad or smoothie can help. Two grams of protein per tablespoon from flaxseed provides 4% of your daily goal (if you follow a 2,000 calorie diet).

**4.Vitamins and Minerals**

The vitamins included in flaxseed are essential. However, because the serving size is typically tiny, the nutritional benefit of eating the seeds will only slightly offset your daily dietary requirements for minerals and other nutrients.

For instance, a serving of flaxseed provides 11% of the daily recommended intake (DRI) of thiamin, based mostly on a diet of 2,000 calories per day <sup>6</sup>. The body uses thiamin, a water-soluble B vitamin, to metabolize carbohydrates and branched-chain amino acids <sup>[8]</sup>.

Additionally, a tablespoon of flaxseed contains 2% of the DRI for folate, vitamin B6, and niacin. In terms of minerals, a tablespoon of flaxseed has roughly 10% of the DRI for magnesium and 13% of the DRI for manganese. Other minerals found in flaxseed include copper (6%), selenium (4%), and phosphorus (7% of RDI).

## Health Benefits

### Flaxseed Oil

Many people believe that flaxseed and flaxseed oil can aid or perhaps cure a variety of illnesses. Many people also believe that flaxseed products can reduce your risk of developing certain ailments.

Although there is some scientific support for such claims, flaxseeds are not a panacea. Flaxseed, for instance, has been studied as a treatment for hot flashes, especially during the menopause. Phytoestrogens, which may resemble the hormone oestrogen, are found in seeds. However, research has shown little evidence to support the use of flaxseed for menopausal symptoms, including warm flashes. Furthermore, some people with arthritis use flaxseed to relieve the pain that comes with the disease.

Once more, however, there is little evidence to believe that the seeds will provide assistance. Flaxseed is also occasionally used to treat diverticulitis, eczema, acne, psoriasis, stomach distress, ADHD, and bladder inflammation. There isn't much evidence to support their uses at the moment. Nonetheless, research is being conducted by the National Institutes of Health's National Centre for Complementary and Integrative Medicine to understand how flaxseed may also be used as a treatment for inflammation, asthma, metabolic syndrome, diabetes, cardiovascular disease, and ovarian cancer <sup>[9]</sup>.

#### **1.Improves Heart Health**

Studies suggest that flaxseed may benefit the coronary heart in at least the following ways: In addition to lowering blood pressure, it can slow the progression of atherosclerosis, at least in animals.

#### **2.Protects Against Some Cancers**

Flaxseed consumption may be linked to a lower incidence of breast cancer and breast cancer-related death, according to research conducted on both humans and animals. Flaxseed has also showed promise in studies on various malignancies, including those of the liver, ovary, colon, lung, and prostate <sup>[10]</sup>.

#### **3.Skin and Hair Health**

According to a study, linseeds increase hair length by 26% while also having a minor positive impact on hair width. Consuming linseed has a positive effect on hair density.



#### **4.Loss of Weight**

The effects of flaxseed flour on obese persons have not been well studied. Although flax may help reduce inflammation linked to obesity, early research has not demonstrated any benefits in terms of weight loss or BMI reduction. One study found that HIV patients who consumed alpha-linolenic acid (from flax) along with arginine and yeast RNA gained weight <sup>[11]</sup>.

## 5.High in omega-3 fatty acids

Alpha-linolenic acid (ALA), a kind of omega-3 fatty acid that is mostly present in plant foods and is crucial for heart health, is abundant in flaxseed. According to research on animals, flax's ALA can help lower inflammation and stop cholesterol from accumulating in the blood arteries that supply your heart. A recent study of 8,866 individuals found that consuming more ALA was associated with lower cholesterol, a lower risk of coronary heart disease (caused by artery narrowing), and a decreased risk of type 2 diabetes <sup>[12]</sup>.

## 6.May help protect against cancer

Lignans, which are abundant in flaxseed, may be plant chemicals that have been researched for their potent anti-cancer effects. It's interesting to note that this seed has 75–800 times more lignans than other plant meals.

## 7.Rich in fiber

Two grams of fiber, or around 5% and 8% of the daily required requirement for men and women, respectively, may be found in just 1 tablespoon (7 grams) of ground flaxseed. Additionally, the soluble and insoluble fibers included in flaxseed are fermented by intestinal bacteria to promote intestinal health and regularity. Insoluble fiber gives the stool more volume, which may help avoid constipation and encourage regular bowel movements, but soluble fiber absorbs water in your intestines and slows down digestion, which may help control blood sugar levels and lower cholesterol <sup>[13]</sup>.

## IV. PHARMACOLOGICAL ACTIVITY OF FLAXSEED:-

Clinical and epidemiological evidence has demonstrated that flax seeds contain a variety of bioactive compounds that are good for people. Strong evidence supports the health impacts and its implications in avoiding or lowering the risk of cardiovascular diseases, strokes, diabetes, and cancer, even if further human research is necessary. The following are some of flaxseed's pharmacological activities:

1. Antiarrhythmic effects
2. Anticoagulant and antiplatelet effects
3. Antidiabetic effects
4. Antilipidemic effects
5. Antineoplastic effects
6. Hormonal effects
7. Antihypertensive effects
8. Antioxidant effects
9. Arterial compliance
10. Inflammation/immune function
11. Laxative effects

### 1.Antiarrhythmic Effects

Omega-3 fatty acids and ALA may have an antiarrhythmic effect, according to scientific reviews and limited human research. Nevertheless, another study discovered that DHA and EPA, but not ALA, increased the antiarrhythmic effects in a concentration dependent manner. In both men and women, a lower risk of unusually prolonged repolarization may be link to higher dietary linoleic acid consumption<sup>[14]</sup>

## 2. Antidiabetic Effects

The effects of flax on blood sugar have been investigated, however the results are conflicting. In one case series, eating flaxseed after meals resulted in a 27% decrease in postprandial glucose. 'Nestel et al'. found that a four-week diet high in alpha-linolenic acid (ALA) (20g from flax oil-based margarine products) reduced insulin sensitivity in a case series involving 15 obese patients. Consuming omega-3 fatty acids, which are not unique to flax, increased fasting blood glucose levels and mixed meal blood glucose levels by 22% in males with type 2 diabetes. [15]

## 3. Antioxidant Effects

Flaxseed contains a plant lignans called secoisolariciresinol diglycoside (SDG), which has been shown to have antioxidant qualities. Flaxseed may promote oxidative damage by increasing lipid peroxidation. Protein thiol groups have been found to diminish in diets supplemented with defatted flaxseed, indicating an increase in oxidative stress.

## 4. Anticoagulant and Antiplatelet Effects

There is conflicting information available about the effects of flaxseed on platelet function. Flaxseed differs from fish oil in that it contains up to 20% omega-6 fatty acids, and its omega-3 fatty acids need to be processed into eicosapentanoic acid (EPA) and docosahexanoic acid (DHA). Flaxseed oil reduced collagen-stimulated platelet aggregation and bleeding time, according to two trials that compared it to a linoleic acid control (one involving rheumatoid arthritis patients (N=22) and the other involving healthy volunteers (N=11)). Additionally, thrombin-stimulated platelet aggregation was reduced by using a flaxseed supplement. In contrast, a crossover study in which 10 healthy individuals followed a standardized weight reduction regimen without supplements and one who took flaxseed oil found that flaxseed oil had no effect on prothrombin time, bleeding time, or partial thromboplastin time [16]

## 5. Antineoplastic Effects

Flaxseed was one of the most widely utilized products for breast cancer treatment in 2005. The percentage of flaxseed in processed foods often has a linear relationship with the amount of lignans produced. Additionally, a number of researchers pointed out that the effects of phytoestrogens on breast cancer modulation depend on genetic composition, background nutrition, and exposure timing during the life cycle [17].

## 6. Hormonal Effects

Plant lignans are abundant in flaxseed (not flaxseed oil). The effects of lignans, also known as phytoestrogens, on hormone-sensitive malignancies such breast, uterine, and prostate cancer are unknown, however they may have agonist or antagonistic effects on the oestrogen receptor. Flaxseed and its lignans have been suggested to have strong antioestrogenic properties against breast cancer that is oestrogen receptor-positive. Enterolactone and enterodiol, which are metabolized from flaxseed in the intestines, may reduce the risk of hormone-sensitive malignancies such as breast and prostate cancers by inhibiting aromatase, 5-alpha-reductase, and 17-beta-hydroxysteroid dehydrogenase activity and reducing cell proliferation [18]

## 7. Antilipidemic Effects

Flaxseed (today known as flaxseed oil) was thought to have lipid-reducing properties because of its fiber content, which includes galactose, d-xylose, l-galactose, l-rhamnose, and d-galacturonic acid. Defatted flaxseed, which is the same as the fiber component of flaxseed, has been shown to dramatically lower triglyceride, low-density lipoprotein (LDL). [19] and total cholesterol levels. By improving stomach

emptying time, changing transit time, obstructing bulk-phase fat transport, and raising bile acid excretion, the fiber component of flaxseed has been shown to have lipid-lowering benefits. [20]

## **V. CONCLUSION:-**

Flax has a nutritional profile that may be beneficial to health. Nonetheless, a lot of individuals are still ignorant of the nutritional applications and possible health advantages of flax seeds. Food technologists are drawn to the lignans (particularly SDG), fiber, and ALA (omega-3 fatty acid) content to thoroughly investigate its potential in commercial food production. Alpha-linolenic acid, lignans, soluble fiber, and protein are among the essential components of flaxseed that have been shown to have beneficial and bioactive effects in preventing some chronic, nontransmissible diseases. Because of these characteristics, flaxseed is a desirable source of useful ingredients for dietary training.

In reality, flaxseed can help people lose weight and maintain their fitness because of its necessary amino acid, polyunsaturated fatty acid, vitamin E, lignans, and nutritious fiber content. Flaxseeds can now be obtained in a wide range of forms with unique nutritional benefits for today's health-conscious consumers thanks to recent processing developments that have increased its use as an ingredient.

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