



Flax Seeds and Their Role in Human Health

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Abstract

When it arrives at human health benefits flax seeds play an essential part. Flax seed or linseed (*Linum usitatissimum*) derived from flax plants has several medicinal properties when consumed. Flaxseeds are abundant in lignans, linolenic acid, omega-3 fatty acids, secoisolariciresinol, and other nutrients and proteins that aid in the prevention of illnesses such as cardiovascular disease, cancer, and diabetes. Linen fibre is derived from flax plants, which are employed in the textile industry, in addition to nutritional advantages. Flax seeds are utilized in a variety of food processing products (bakery, dairy, snack, fermented) because they have physicochemical, phytochemical, and sensory qualities. Flax seed is a potential nutraceutical that may be used to make preventive, therapeutic, and medicinal foods. Flax seeds are anti-inflammatory and antioxidant. This article addresses the nutritional health benefits and dietary fibre of flax seeds.

Keywords: Flaxseeds; Alpha-Linolenic Acid; Lignans; Dietary Fibre; Omega-3-Fatty Acid

Introduction

ago and was utilised for various functions [1] as shown in Table 1.

History: The flaxseed plant originated thousands of years

Time Span	Development
30,000 BC	Flax fabric fibres were found in turkey
6000 BC	Linseed first recorded for food consumption
2000 BC	Babylonians used flax threads for weaving
1000 BC	Egyptians used linseed oil for preserving the body after death and linen fibre used to wrap mummies
500 BC	Hippocrates used linseed as medicine for digestion and laxative
800 AD	Emperor Charliemagne officially passes the law to the people of France to grow and consume linseed for their health
1600 AD	Nicolas Culpeper, herbalist explained cold drawn processes from linseed as treatment for inflammation tumours and infections
1940 AD	Flax plants are grown for fibre which is used for parachute harness and clothing
1950 AD	In modern era linseed is used as functional food. Johanna Budwig followed combine cold-press linseed oil cottage cheese in treatment of arthritis, cancer, diabetes, and digestion. Catherine Kousmine prescribed cold-press linseed oil for diet in India. Flax is cultivated for fibres and oil

Table 1: History of discovery and usage of flax seeds.

Chemical Composition of Flaxseeds

Various chemicals are present in the flax seeds shown in the Tables 2-7 stratified based on their nature [2].

Fatty acids	Grams Per 100 Grams of Flax Seeds
Palmitic acid	2.1
Oleic acid	7.3
Steric acid	1.3
Linolic acid	23
Alpha linolic acid	22.8

Table 2: Fatty acids and their weight present in 100 grams of flax seeds.

Minerals	Milligrams Per 100 Grams of Flax Seeds
Calcium	2.36
copper	1
iron	5
magnesium	431
phosphorus	622
potassium	831
sodium	27
Zinc	4

Table 3: Minerals and their weight present in 100 grams of flax seeds.

Vitamins	Milligrams Per 100 Grams of Flax Seeds
Ascorbic acid/vitamin c	0.5
Niacin/nicotinic acid	3.2
Pantothenic acid	0.6
Pyridoxine/vitamin B6	0.6
Riboflavin/vitamin B2	0.2
Amino acids	Grams per 100 grams of flax seeds
Aspartic acid	9.3
Arginine	9.2
Cysteine	1.1
Histidine	2.2
Isoleucine	4
Methionine	1.5
Leucine	5.8
Lysine	4
Proline	3.5
Serine	4.5
Threonine	3.6
Tryptophan	1.8
Tyrosine	2.3
Valine	4.6

Table 4: Vitamins and their weight present in 100 grams of flax seeds.

Amino acids	Grams Per 100 Grams of Flax Seeds
Aspartic acid	9.3
Arginine	9.2
Cysteine	1.1
Histidine	2.2
Isoleucine	4
Methionine	1.5
Leucine	5.8
Lysine	4
Proline	3.5
Serine	4.5
Threonine	3.6
Tryptophan	1.8
Tyrosine	2.3
Valine	4.6

Table 5: Amino acids and their weight present in 100 grams of flax seeds.

Carbohydrates	Milligrams Per 100 Grams of Flax Seeds
Neutral arabinoxylan fraction	1.2
Rhamnogalacturonan fraction	0.4

Table 6: Carbohydrates and their weight present in 100 grams of flax seeds.

Dietary fibres	Grams per 100 grams of flax seeds
Soluble fibres	4.3-8.6
Insoluble fibres	12.8-17.1

Table 7: Carbohydrates and their weight present in 100 grams of flax seeds.

Nutritional Benefits

Flax seeds contain many nutrients and nutraceuticals which provide health benefits to human beings and animals. It consists of polyunsaturated fatty acids, ω -3- fatty acids, Dietary fibres, lignans, proteins, carbohydrates, amino acids [3].

10 grams of flax seeds contain 55 calories of energy, 7% of water, 1.9 % of proteins, 3 grams of carbohydrates, 0.2 grams of sugars, 2.8 grams of fibre and 4.3 grams of fat. The percentage contribution by various nutrients is shown in Figure 1 [4,5].

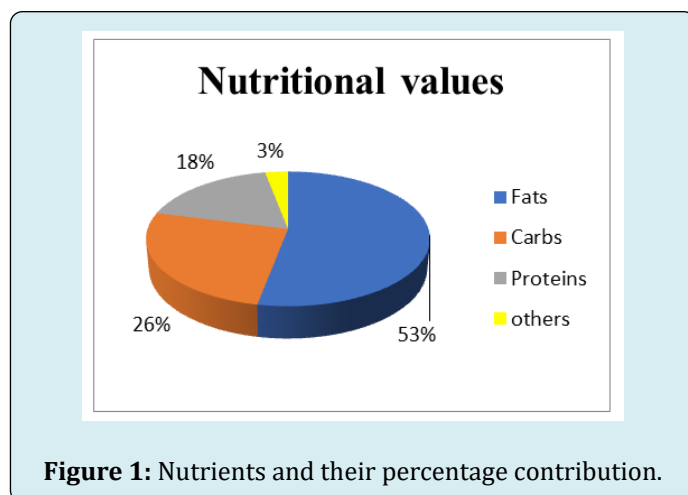


Figure 1: Nutrients and their percentage contribution.

Micronutrients

Flax seeds are the source of vitamins and minerals like calcium, magnesium, and potassium and are also abundant in vitamins like Niacin and tocopherols (α , β , γ) [6].

Omega-3-Fatty Acids

Flax seeds rich source of omega -3- fatty acids i.e., ACA (53%), oleic acid (19%), linolic acid (17%), palmitic acid (5%), stearic acid (3%), among these ACA has greater bioavailability, omega fats are omega-3, omega-6 fatty acids. 3 types of ω -3- fatty acids include linoleic acid, eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA). By intake of omega-3-fatty acids, it helps to reduce B.P. in hypertension Patients. Polyunsaturated fatty acids are essential for humans. Flaxseed oil contains high antioxidants such as tocopherols, beta-carotene. Flaxseed oil gets easily oxidized after extraction and purification [7].

Dietary Fibre

Flax fibres consist 25 % of soluble and insoluble dietary fibres, 75 % of soluble fibre fractions of are mucilage gum and insoluble fibre fractions consist of cellulose and lignin contributing 75 percentage. 1 gm of soluble fibre and 3 gm of insoluble fibres increases the daily fibre intake in a daily diet of 10 g of flaxseed [8].

Lignans

These are plant compounds present in almost all plants and have antioxidant, antifungal properties. Also acts as phytoestrogens, which are similar to the female sex hormone estrogen. Lignans have anticancer properties for reducing the growth of cancerous tumors. These are fermented by bacteria and reduce the growth of cancers like breast,

uterus and prostate cancer. Lignans are 800 times more in flaxseed when compared with other plant foods. Lignan content composed of secoisolariciresinol diglycoside (SDG) lariciresinol and pinoresinol [9].

Proteins

The protein content of flaxseed is 18%. Flax seeds are a good source of plant-based protein. They are rich in amino acids- Arginine, aspartic acid and glutamic acid. Flaxseed protein improves immunity, prevents cancer, lower cholesterol and has antifungal property. It comprises 80% of globulins (linin, Conlinin) and 20% glutelin. They lack amino acid- lysine hence called incomplete protein [10].

Carbohydrates

Most of the carbohydrate in flaxseed is fibre. This fibre regulates blood cholesterol and boosts immunity and makes

a feeling of fullness after eating [11]. Other carbohydrates come from sugar [12].

Vitamins and Minerals

Flax seeds are a good source of both vitamins and minerals. Thiamine- water-soluble vitamin needed by body Niacin. Vitamin B6 and folate are present in high content essential for the functioning of nerves. Minerals in flax seeds include mainly Copper, important for growth and functioning, Magnesium and Molybdenum [13].

Health Benefits and Medicinal Value of Flax Seeds

Flax seeds provide several health benefits to mankind as shown in Table 8.

Constituent	Health Benefit
Omega-3-fatty acid	Reduces blood pressure and chances of heart attack and stroke [14]. It has antioxidant, anti-ulcer and anti-inflammatory activities [15].
Proteins	Have properties of lowering cholesterol [16] dyslipidemia prevention [17], improving immunity, preventing tumors [18], preventing hypersensitivity and show antifungal properties.
Dietary fibres	Regulate blood sugar and cholesterol levels and suppress hunger [19]. Provide glycemic control [20]. Insoluble fibres prevent constipation [21].
Vitamins and Minerals	Decrease blood pressure and elicit antioxidant properties [22].
Lignans	Reduce the risk of all cancers, control hypertension [23] and other cardiovascular diseases and elicit antioxidant properties [24]
Omega -3-fatty acid, lignans, dietary fibres.	Improve heart health and protect skin from harmful radiations and decrease the hot flashes in post-menopausal women [25].

Table 8: Health Benefits and Medicinal Value of Flax Seeds.

Miscellaneous Applications of Flax Seeds

Flax seeds are consumed in different forms which help to treat health problems [26].

1. Flaxseed tea used against cough, asthma, bronchitis [27].
2. Flaxseed drink used against/ helps out in constipation [28].
3. Flaxseed flour strengthens the nervous system, improves memory, cures mental illness and cures abdominal pain and stomach ulcers [29].

Flax seeds also reduce osteoporosis [30], aid in losing weight, reduce hair loss, prevent diarrhea and constipation and also used in conditions like acne, sore throat, respiratory tract infections and kidney problems.

Conclusion

Functional food and nutraceutical provide reduce the burden on the health system. Plant foods have greater importance in health care. Flaxseed is one of the emerging food which has nutritive and functional ingredients. Many clinical trials proved that flax seed constituents provide preventive and therapeutic benefits. These are used as herbal medicines which consist of a high amount of lignan, alpha-linolenic acid, fibre. Also have greater potential in the prevention of diseases like cardiovascular disease, osteoporosis, cancer, rheumatoid arthritis. Being a rich source of alpha-linolenic acid, it reduces serum and LDL concentration. Every part of the flax plant is used therefore it results in no wastage.

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