ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

Chemical analysis on Linseed seed in Lab

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DOI: https://doi.org/10.51584/IJRIAS.2025.100800077

Received: 26 August 2025; Accepted: 31 August 2025; Published: 15 September 2025

ABSTRACT

Flax seed are anti-inflammatory and antioxidant. Three common forms of flaxseed available for human consumption include whole flaxseed, ground flaxseed and flaxseed oil. Flax or flaxseed oil could be incorporated into various food products such as backed foods, dry pasta products, juices, macaroni, meat, milk products. Flaxseed has been classified as a "superfood", that is a food of natural origin with various bioactive components and many health-promoting benefits. Flaxseed consumption can be an important factor in the prevention of disease, particularly related to nutrition. The regular consumption of flaxseed may help to improve lipid profile and lower blood pressure, fasting glucose and insulin resistance index. The high nutrient profile of linseed is determined mainly by high-quality oil with a balance ratio of omega-3 and omega-6 essential fatty acids, protein with an amino acid profile similar to soybean protein and the high content of soluble fibres. Flaxseed oil contains about 53% of alpha Linolenic acid, making it the richest plant sources of this compound and 19% of oleic acid.

Flaxseed is very important for the human health and medicinal uses. Flaxseed oil, fibres and flax lignans have potential health benefits such as in reduction of cardiovascular disease, atherosclerosis, autoimmune, cancer, arthritis, osteoporosis, autoimmune and neurological disorders. Flaxseed protein helps in the prevention and treatment of heart disease and in supporting the immune system. Flax seed contain a good amount of dietary fibre, B vitamins and minerals like iron, calcium, magnesium, phosphorus and potassium.

Keyword: Flaxseed, antioxidant, superfood, nutrition, neurological disorder and dietary fibre.

INTRODUCTION

Flaxseed is one of the oldest and most useful crops. Cultivar development of flax is currently focused on enhancing the oil content and nutritional value to meet the demand of nutraceutical market supply, as an alternate source of fish oil, a rich source of eicosapentaenoic acid and docosahexaenoic acid. Flaxseed is also rich in soluble and insoluble fibres and lignans, makes it useful as a dietary supplement (Jhala and Hall, 2010). 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 fibre. The flax lignans influence the early risk markers of mammary and colonic carcinogenesis in animal models. The flaxseed supplementation in diet revealed potential health benefits in situations like cardiovascular risk, certain types of cancers and other metabolic disorders (Katare *et.al,* 2012). Flaxseed is a plant that grows and is cultivated in more than 50 countries: the main flax producer countries are Canada, china, the United States and India. The main constituents of flaxseed include lipids, protein, lignans, fibers and minerals. Flaxseed is full of antioxidants such as tocopherols, betacarotene, cystein and methionine which result in a decrease in blood pressure, heart disease, hepatic and neurological disorders and increased insulin sensitivity.

Source: Adobe stock- flaxseed image.

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Flax seed is important in the food chain throughout the world because of its physiological advantages in preventing or treatment of disease as a functional food (Ebrahimi *et.al* 2021). Flaxseed is cultivated in many parts of world for fiber, oil as well as for medicinal purposes and also as nutritional product. It is a native of Egypt but also cultivated in india, Holland, Russia and Britannia mainly for the purpose of its oil and fiber and is best adapted to fertile, fine textured, clay soils. Flax was valued in Ancient and Early modern times as both a food and medicine (Soni *et.al*, 2017). Human 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). Almost all parts of linseed plant are utilized for various purposes. Seed contains oil which after refining is used foe edible purpose (Singh *et.al*, 2011a,b). The whole flaxseed is flat and oval with pointed tips and contains a seed coat or true hull (also called testa), a thin endosperm, two embryo and an embryo axis (Morris, 2007). Whole flaxseeds are chemically stable, but ground flaxseed can go rancid at room temperature in as little as one week, although there is contrary evidence, Refrigeration and storage insealed containers will keep ground flax from becoming rancid for a longer period. Milled flax is remarkably stable to oxidation when stored for nine months at room temperature if packed immediately without exposure to air and light and for 20 months at ambient temperatures under warehouse condition (Malcolmson *et.al*, 2000).

Nutritional benefits of flaxseeds

Flaxseeds contain many nutrients and nutraceuticals which provide health benefits to human beings and animals. 10 grams of flaxseeds 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 (Kajla *et.al*, 2015).

Omega-3-fatty acids

Flaxseeds rich source of omega-3- fatty acids ACA (53%), oleic (19%), linolic acid (17%), palmitic acid (5%) and stearic acids (3%). Omega-3-fatty-acids it helps to reduce B.P. in hypertension patients. Polyunsaturated fatty acids are essential for humans (Bernacchia *et.al*, 2014). Omega-3 essential fatty acids are “good” fats that have been showm to promote heart health. Each tablespoon of ground flaxseed contains about 1.8 grams of plant omega-3s (Haase, 2022).

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 3gm of insoluble fibres increases the daily fibre intake in a daily diet of 10 g of flaxseed (Nowak *et.al* 2023).

Lignans

These are plant compounds present in almost all plants and have antioxidant, antifungal properties. 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 (Bekhit *et.al* 2018). Lignans also have antioxidant properties, meaning they protect your cells from damage. Flaxseed happens to boast 75-800 times more lignans than other plant foods (Haase, 2022).

Proteins

The protein content of flaxseed is 18%. Flaxseeds 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 (Lorenc *et.al*, 2022). Flax protein ranges from 20%-30%, consisting of around 80% globulins and 20% glutelin (Conlin in and linin) (Hall *et.al*, 2006). Flaxseed protein is considered as incomplete protein as it doesn’t contain all essential amino acids and has a rich amount of lysine (Chung *et.al*, 2005).

Carbohydrates

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

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makes a feeling of fullness after eating (Mahesh *et.al*, 2020). Flaxseed primarily contains non-digestible carbohydrates and low levels of digestible carbohydrates usually found as soluble sugar and the major portion of non-digestible carbohydrates, comprises soluble and insoluble fiber (Rajju *et.al*,2016).Lignan and cellulose are the insoluble portions of flaxseed carbohydrates (Arion and Morris, 2003).

Vitamins and Minerals

Flaxsees 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 (Kakkar *et.al*, 2021). Flaxseeds are effective sources of vitamins and minerals and the aforementioned components (Kajla *et.al*, 2015). Among the multivitamins, flaxseed is rich in niacin and tocopherols content. Approximately-0.039% of vitamin e is present in flaxseeds (Kajla *et.al*, 2015).

Flax Seeds - Nutritional Facts per 100 g

Nutrients	Mg	Percentage
Omega 3	22,4 g	938%
Folates	87 µg	22%
Niacin	3.08 mg	19%
Pantothenic acid	0.985 mg	20%
Pyridoxine	0.473 mg	36%
Riboflavin	0.161 mg	12%
Thiamin	1.64 mg	137%
Vitamin A	0 IU	0%
Vitamin C	0.6 mg	1%
Vitamin E	19.95 mg	133%
Vitamin K	4.3 µg	3.5%
Sodium	30 mg	2%
Potassium	813 mg	17%
Calcium	255 mg	22.5%
Copper	1.12 mg	124%
Iron	5.73 mg	72%
Magnesium	392 mg	98%
Manganese	2.48 mg	108%
Zinc	4.34 mg	39%

Source: Pinterest- Pin on healthy

Health benefits of flaxseed

Flaxseeds exhibits health benefits due to its high amount of omega-3 linolenic acid, dietary fibers and lignins. Fatty acids (ALA, DHA and EPA) may have health benefits against several diseases such as neurological disorders, atherosoclerosis, cardiovascular disease, cancer, ostherosclerosis, immunology, arthritis, diabetes and hypertension (Gogus and Smith, 2010; Simopoulos, 2000). Numerous clinical research has shown that EPA and DHA are crucial in easing the symptoms of depression (Kajla *et.al*, 2015). Flaxseeds enable weight loss these fibre-rich seeds make your feel full, spacing out your hunger pangs. Flaxseed daily can reduce total cholesterol and low-density lipoprotein cholesterol levels. The alpha-linolenic acid found in flaxseed might benefits people with heart disease. Fiber-rich flaxseeds are considered a low-glycemic food. This means that consuming them won't spike your blood sugar levels (Mishra, 2023). Flaxseed is a plant food that provides healthy fats, antioxidants and fiber (Lee *et.al*, 2021). Flaxseed is available in the form of seeds, oil powder and tablets (Shim, Gui *et.al*, 2015). Bioactive compounds found in flaxseed include lignans, antioxidants, fiber, protein and polyunsaturated fatty acids such as ALA (Rubilar *et.al*, 2010).

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Source: PaisaWapas.com- Health benefits of flaxseeds.

Medicinal uses of flaxseed

Flaxseed is used for constipation, diabetes, high cholesterol, obesity and swelling of the kidneys in people with lupus (WebMD, 2020). Flax also had many medicinal uses. The sticky sap or gum that flax produces was applied to boils and wounds and used for toothache. Flax leaves were used in binding broken bones and matted leaves were used as dressings. Flax root juice was routinely applied to wounds as a disinfectant (Department of conservation, 2024).

Constipation

Flaxseed is a good source of dietary fiber. Eating flaxseed in muffins or other foods seems to increase bowel movements in young adults and people with diabetes (WebMD, 2020).

Diabetes

Taking flaxseed by mouth might slightly improve blood sugar control in people with type 2 diabetes. Benefits seem to be greatest with ground flaxseed and when used for at least 12 weeks (WebMD, 2020).

High cholesterol

Taking flaxseed by mouth seems to help reduce total cholesterol and low-density lipoprotein (LDL or “bad”) cholesterol. Taking flaxseed doesn’t seem to improve high-density lipoprotein (HDL or “good”) (WebMD, 2020).

High blood pressure

Taking flaxseed by mouth may slightly reduce blood pressure in people with high blood pressure (WebMD, 2020)

Obesity

Taking flaxseed by mouth may help reduce body weight, body mass index and waist size in adults who are overweight or obese. Taking at least 30 grams of flaxseed daily for at least 12 weeks seems to work best (WebMD, 2020).

Swelling of the kidney in people with lupus

Taking whole or ground flaxseed by mouth seems to improve kidney function in people with SLE (WebMD, 2020).

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Source: Sugar cosmetics- 6 fantastic beauty benefits of flaxseeds

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