

Flaxseed: The New Wonder Food

**Ankit Saroha, Ankur
Sharma, Vikender Kaur,
Mamta Singh and
Dhammaprakash P.
Wankhede***

ICAR - National Bureau of Plant
Genetic Resources, Pusa
Campus, New Delhi - 110012



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*Corresponding Author

Dhammaprakash P. Wankhede*

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INTRODUCTION

Flaxseed is a multipurpose crop known for seed oil and fibre. In recent years, flaxseed had gained popularity owing to the potential health benefits associated with some of its biologically active components such as Omega-3 fatty acid, short chain polyunsaturated fatty acids (PUFA), soluble and insoluble dietary fibres, lignans, proteins and antioxidants. There are several health benefits associated with flaxseed. Present article gives an overview of health benefits of flaxseed.

Nutritional profile of flaxseeds

Flaxseed is mainly consumed as whole seed, milled seeds, roasted seeds, flaxseed oil and partially defatted flaxseed meal. A new form available is the flaxseed “milk” which is an alternative to milk and has no cholesterol or lactose. It is also suitable for people allergic to soy, nuts and gluten.

Flaxseed is a multicomponent system with bio-active plant substances such as oil, protein, dietary fiber, soluble polysaccharides, lignans, phenolic compounds, vitamins (A, C, F and E) and mineral (Ca, P, Mg, K, Na, Fe, Cu, Mn and Zn).

Flaxseed is the richest plant source of the Omega-3 fatty acid (alpha-linolenic acid, ALA). Flaxseed oil is low in saturated fatty acids (9%), moderate in monosaturated fatty acids (18%), and rich in polyunsaturated fatty acid (73%). Of all lipids in flaxseed oil, α -linolenic acid is the major fatty acid ranging from 39 to 60%.

Flaxseeds contain 20 to 30% protein content, constituting approximately 80% globulins (linin and conlinin) and 20% glutelin. Flaxseed has an amino acid profile comparable to that of soybean and contains no gluten. Although flax protein is not considered to be a complete protein due to the presence of limiting amino acid lysine.

Flax dietary fibres include both soluble and insoluble dietary fibres. Only 10 g of flaxseed in the daily diet increases the daily fibre intake by 1 g of soluble fibre and by 3 g of insoluble fibre. Insoluble fibre helps improve laxation and prevent constipation, mainly by increasing faecal and reducing bowel transit time. On the other hand, soluble fibre helps in maintaining blood glucose levels and lowering the blood cholesterol levels.

Flax contains up to 800 times more lignans than other plant foods. Lignan content in flaxseed is principally composed of secoisolariciresinol diglucoside (SDG), matairesinol, lariciresinol and pinoresinol. Flax lignans have shown promising effects in reducing growth of cancerous tumours, especially hormone-sensitive ones such as those of the breast, endometrium and prostate.

Flaxseed as an ayurvedic medicine

Ayurveda remains one of the most ancient and yet alive tradition practiced widely in India and other countries. Flaxseed oil is believed to bring mental and physical endurance by fighting fatigue and controlling aging process. According to *Ayurveda*, flaxseed has properties such as *Madhura* (balances the skin pH), *Picchaila* (lubricous), *Balya* (improves tensile strength or elasticity of the skin), *Grahi* (improves moisture holding capacity of skin), *Vranahrit* (wound healing) and useful in *Vata* (skin) disorders including dryness, under-nourishment, lack of lustre/glow.

Flaxseed and Cardiovascular disease

In animal models of heart disease, flaxseed has decreased the progression of atherosclerosis induced by high dietary cholesterol or high dietary trans-fat content via an anti-inflammatory action provided through its ALA content. Flaxseed can also lower circulating trans fats levels. In humans exhibiting symptoms of cardiovascular disease, dietary flaxseed has displayed powerfully protective effects. Most impressive involves the decrease in both systolic and diastolic blood pressure in patients with peripheral arterial disease (PAD). In a trial, PAD patients fed 30 g of milled

flaxseed every day for 6 months, shown significant decrease in both systolic and diastolic blood pressure (Rodriguez-Leyva et al., 2013).

Flaxseed and Diabetes

Flaxseed intake also has positive effect on diabetes which is growing in incidence across the globe. Dietary fibres, lignans, and ALA in flaxseed have a protective effect against diabetes. Flaxseed lignan SDG has been shown to inhibit expression of the phosphoenolpyruvate carboxykinase gene, which codes for an enzyme responsible for glucose synthesis in the liver. Supplementation of diet of type 2 diabetics with 10 g of flaxseed powder for a period of 1 month reduced fasting blood glucose by ~19% and glycated hemoglobin by ~15%. It could be due to lower content of glycemic carbohydrates and higher content of dietary fibres of flaxseed (Soltanian et al., 2018).

Flaxseed and Cancer

Flaxseed is already used extensively in animal studies to treat a variety of cancers. Most studied cancer with respect to the impact of dietary flaxseed is the breast cancer. In the experimental animal studies and in human trials, dietary flaxseed has significant protective effects against the breast cancer. In 10 human trials, consumption of flaxseed reduced tumour growth in women with breast cancer. It was also found evidence in support of flax-associated protection against primary breast cancer as well as reduction in mortality of women living with breast cancer. Beneficial effects were observed with 25 g doses of milled flaxseed, daily. Breast cancer is not the only cancer that has shown sensitivity to dietary flaxseed or its components. Cancer of the prostate gland, lung, colon, ovary, endometrium, hepatocellular and cervix have also been reported inhibited by flaxseed (Calado et al., 2018).

Prevention of Kidney diseases

Chronic Kidney Disease (CKD) is one of the major health problems among older adults and can lead to end-stage renal disease with its

need for dialysis or transplantation for survival. Due to the anti-inflammatory properties of ALA, it has been suggested that these nutrients may protect the kidneys from damage in adults. It is observed that PUFA supplementation reduces renal inflammation and fibrosis in animal models (Gopinath et al., 2011).

Flaxseed and the Brain health

Omega-3 fatty acid also play role in brain development. Research has established an essential role of omega-3 fatty acids docosahexaenoic acid (DHA) in pre- and post-natal brain development, while the eicosapentaenoic acid (EPA) modulates behaviour and mood. A loss of brain DHA content has been associated with poorer performance in spatial and learning tasks. Dietary flaxseed may also improve aspects of brain function during conditions of neural disease. Supplementation to the diet with flaxseed lignans such as SDG have shown anti-depressant effects in mice subjected to chronic stress (Lauritzen et al., 2016).

Flaxseed and Female hormonal status

Dietary flaxseed may also exhibit a protective effect against menopausal symptoms. Several studies have examined the effects of flaxseed or its bioactive ingredients on the quality of life and the frequency and severity of hot flashes in post-menopausal women. Estrogenic action of certain metabolites of flaxseed suggested a potentially positive effect on post-menopausal symptoms (Cetisli et al., 2015).

Natural treatment of bowel syndrome

In Western societies, constipation remains a major health problem mostly due to the refined diet. A sufficient amount of dietary fibre has beneficial effects in the prevention and treatment of constipation. Metabolism of flaxseed fibre can be stated as with any dietary fibre.

Flaxseed toxicity

Although no toxicity has ever been reported in clinical studies with dietary supplementation of flaxseed, some compounds within flaxseed such as cyanogenic glycosides, linatine, phytic

acid and trypsin inhibitor are identified as anti-nutritional factors. Therefore, nutritionists suggest eating flaxseed in moderation (Touré and Xueming, 2010).

CONCLUSIONS

It's been long journey of flaxseed from a medicine in ancient times to the health food in 21st century. Flaxseed can contribute in improving the availability of healthy food choices, specifically by improving the nutrient profile of foods. Inclusion of flaxseed in our diet can contribute to the physical and mental wellbeing.

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