

Role of flaxseeds in human health

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ABSTRACT

Flaxseed is not consumed as part of the regular diet in India even when flax plant has long been used as industrial oil and fibre crop. The plant is widely distributed throughout India, easily available and is very cheap. It has various medicinal properties. It is also classified as functional food. Hence, this crop can be utilized for various product formulations. Baked products especially bread and biscuits are gaining wide popularity as processed foods are quite common among all economic groups, in rural as well as urban population. So, by using this functional ingredient with medicinal and nutritional benefits in day today life we can utilize various health benefits at no cost addition to our budget.

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Flaxseed (*Linum usitatissimum*) has been used for centuries as a food ingredient with medicinal properties (Carter, 2008). During the eighth century, King Charlemagne passed laws requiring the consumption of flaxseed by his subjects to ensure their good health. Over more recent centuries, flaxseed use has grown across Europe, Africa and now to North America. In spite of all this history, flaxseed is still a mystery to many. It, along with soy, is just starting to gain in popularity in the world of nutrition.

Throughout history, flaxseed has been primarily used as a laxative. The seeds and oil of the plant also contain substances that promote good health. It is now widely used as a bakery ingredient and has gained popularity in North America (Fitzpatrick, 2007). It has prompted investigators to study the versatility, stability and acceptability of flaxseed in foods.

Flaxseed is classified as a functional food (Carter 1993; Lee 2006) because of its high fibre (27.3/100 g); protein (18.3/100 g); potassium (813 mg/100 g); linolenic acid, an n-3 fatty acid (22.8/100 g) (United States Department of Agriculture 2007); and lignan content (6.1 to 13.3 mg/g) (Johnsson *et al.*, 2000). Flaxseed can be incorporated into the diet through oil, milled or ground flaxseed or through eggs and meats produced by animals fed flax meal (Vaisey-Genser and Morris, 1997).

Flax is nature's miraculous cure for our heart, blood, joints, colon, aging, brain and even peace of mind!

Flaxseed is of two basic varieties brown and yellow or golden with most types having similar nutritional values and equal amount of short chain omega-3 fatty acid. Omega 3 is a polyunsaturated fatty acid which, as it passes through the digestive tract in the human body, it breaks down existing cholesterol and deposits a thin barrier to prevent its reformation. Omega 3 works to fight against the main cholesterol deposits that cause clotting of the blood. These clots then block blood vessels causing heart attacks or strokes if they reach the brain. The American Heart Association recommends a daily intake of 1000 mg. of Omega 3 for measurable benefits in heart health and vegetarians has to face problem to supply this fatty acid to the body.

Flaxseed is emerging as one of the key sources of phytochemicals in the functional food arena. In addition to being one of the richest sources of α -linolenic acid oil and lignans, flaxseed is an essential source of high-quality protein and soluble fibre and has considerable potential as a source of phenolic compounds. Flaxseed contains both soluble and insoluble fibre (about 28 g/100 g of flaxseed). About one third of fibre is soluble. Studies have found the fibre in flaxseed like found in oat bran and fruit pectin can help to lower cholesterol. Soluble fibre has been found to regulate blood sugar level. 1/3 insoluble fibre aids in digestion and preventing constipation. Flaxseed proteins are potent multi-functional ingredients for food formulation owing to their techno-functionalities, food preservation

capacity, and health benefits.

According to Lylas G.Mogk, MD, director of the Henry Ford Visual Rehabilitation and Research Centre in Detroit: the flax seed is

“The healthiest seed in the world”

“The super food of the 21st century”

Food rating system chart:

- In order to get better help one should identify foods that feature a high contribution of nutrients for the calories they contain. U.S. Food and Drug Administration created a Food Rating System. This system allows us to highlight the foods that are especially rich in particular nutrients. Table 1 shows the nutrients for which this food is either an excellent, very good or good source. If a nutrient is not listed in the chart, it does not necessarily mean that the food doesn't contain it.
- The chart itself you can look next to the nutrient name in order to find out the nutrient amount it offers, the per cent daily value (DV%) that this amount represents, the nutrient density that we calculated for this food and nutrient and the rating U.S. Food Drug Administration established in rating system. For most of nutrient rating adopted the government standards for food labeling that are found in the U.S. Food and Drug Administration's 'Reference values for Nutrition Labeling'

Flax seed helps in:

- Balances blood pressure
- Improves smooth muscle action
- Lowers the cholesterol level
- Stabilizes insulin and blood sugar levels
- Increases production of B vitamins by re-establishing beneficial microflora often antibiotic treatment

Table 2 : Nutritional components of flaxseed	
Nutrients	Per 100 g
Calories (kcal)	492.00
Total fat (g)	34.000
Saturated fat (g)	3.196
Polyunsaturated fat (g)	22.440
Linoleic (g)	4.318
Linolenic (g)	18.122
Monounsaturated fat (g)	6.868
Oleic (g)	6.868
Trans fatty acids (g)	0
Cholesterol (mg)	0.000
Phytosterols (mg)	0.000
Sodium (mg)	34.000
Potassium (mg)	681.000
Total carbohydrate (g)	34.000
Dietary fibre (g)	27.900
Sugar (g)	0.000
Protein (g)	19.500
Vitamin A (MCGRE)	0.000
Vitamin C (mg)	1.300
Vitamin E (mg)	5.000
Thiamine (mg)	0.170
Riboflavin (mg)	0.160
Niacin (mg)	1.400
Vitamin B6 (mg)	0.927
Folate (mcg)	278.000
Vitamin B12 (mcg)	0.000
Pantothenic acid (mg)	1.530
Calcium (mg)	199.00
Chromium (mcg)	0.000
Copper (mg)	1.041
Iron (mg)	6.220
Magnesium (mg)	362.000
Manganese (mg)	3.281
Phosphorus (mg)	498.000
Selenium (mcg)	5.500
Zinc (mg)	4.170

Table 1 : Food rating system chart (Flaxseed, 2.00 table spoon, 19.38 g)

Nutrients	Amount	DV(%)	Nutrient density	World's healthiest foods rating	
Omega 3 fatty acids	3.51 g	146.3	27.6	Excellent	
Manganese	0.64 mg	32.0	6.0	Very good	
Dietary fibre	5.41 g	21.6	4.1	Very good	
Folate	53.86 mcg	13.5	2.5	Good	
Copper	0.20 mg	10.0	1.9	Good	
Phosphorus	96.49mg	9.6	1.8	Good	
Vitamin B6 (pyridoxine)	0.18 mg	9.0	1.7	Good	
World's healthiest foods rating					
Excellent	DV>=75%	OR	DENSITY>=7.6	AND	DV>=10%
Very good	DV>=50%	OR	DENSITY>=3.4	AND	DV>=5%
Good	DV>=25%	OR	DENSITY>=1.5	AND	DV>=2.5%

- Provides lignans as anticancer agents
- Decreases the effects of acids on ulcers
- Strengthens the immune system compounds that act as antioxidants

Acne, migraine headache, asthma, skin cancer, attention deficit disorder, depression, eating disorders, high cholesterol, high blood pressure, heart disease, inflammatory bowel disease, arthritis, burns and menstrual pain may be helped by consuming omega-3 fatty acids found in flaxseed.

Flaxseed ingestion has been linked to reduced risk for cardiovascular disease (Carter 1993; Mantzioris *et al.*, 2000; Paschos *et al.*, 2007; also, there is a potential role for flaxseed in the management of diabetes and hypercholesterolemia (Zhang *et al.*, 2007). Flaxseed is the richest source of lignan (secoisolariciresinol diglucoside), a phytoestrogen (Adlercreutz *et al.*, 1999; Johnsson *et al.*, 2000), and thus its supplementation to one's diet offers a possible alternative to hormone therapy (Pruthi *et al.*, 2007). Flaxseed lignans are structurally similar to endogenous estrogens (Borrielli *et al.*, 1985) and have a high affinity to the sex steroid binding protein (Martin *et al.*, 1996). Lignan has been shown to have a chemo-protective effect against cancer (Chen *et al.*, 2007), and because flaxseed contains high amounts of insoluble fibre, it relieves constipation by increasing the stool bulk and promoting gut motility (Council on Scientific Affairs 1989).

Flax seeds can also help to clear acne. Its fatty acids help to control the production of excess androgens (hormones that peak during the teen-age years). The androgens cause excess sebum oil to clog hair follicles and can contribute to creating more acne. Because of this androgen control, flax seeds may also help with building muscle and burning fat and reducing water bloating (and possibly hair loss) that is sometimes caused through excess androgens.

Omega-3 may also be a good nutrient for the brain and concentration. Omega-3 fats seem to work by making the thin fatty membranes that surround the nerve cells in the brain more flexible. This allows more neurotransmitters to be successfully transmitted between nerve cells, increasing our ability to think faster and concentrate better. Omega-3 has also been shown to have a number of other effects that control harmful inflammation (arthritis) and even possibly prevent depression.

It appears that compounds in flaxseed influence levels of hormones in the body such as estrogens and perhaps testosterone. The exact nature of this influence is still being evaluated. Mice fed plenty of flaxseed seem to be protected against the worst forms of prostate cancer, which suggests

flaxseed contains some protective components.

Studies reveal that flaxseed a rich plant source of omega-3 fatty acids that have been shown to lower both systolic and diastolic blood pressure (1-2tsp/day). Epidemiological studies have shown that subjects with high intake of linolenic acid (n-3) have been shown to have a 50 per cent reduced risk of heart disease which may be partly due to beneficial effects on blood pressure cholesterol level blood clotting and heart rhythm. Indeed omega-3 fatty acids are known to reduce thromboxane activity, which could explain the benefits of omega-3 in reducing platelets aggregation (blood clotting) and blood vessel constriction.

Flaxseed has been found to be stable under normal processing and storage conditions. Manthey *et al.* (2002) reported that linolenic acid remained stable during processing and cooking of spaghetti fortified with ground flaxseed. Also, lignan in flaxseed was found to be stable in bakery (Hyvarinen *et al.*, 2006a) and dairy products (Hyvarinen *et al.*, 2006b). Flaxseed lignan content was unaffected by baking temperature and storage temperature at -25°C when tested after incorporating flaxseed into rye breads, graham buns and muffins (Hyvarinen *et al.*, 2006a). Similarly, flaxseed lignan was stable when subjected to high-temperature pasteurization, fermentation and milk renneting (Hyvarinen *et al.*, 2006b).

Ground or whole flaxseed can be added to almost any baked product to add a nutty flavor to bread, waffles pancakes and other products. Flaxseed flour is used commercially in breads in the United States, in muffin; cookie and other mixes (Carter, 1993) Flaxseed can be added to baked product as a whole seed, imparting healthy appearance and increased texture quality. Flaxseed is high in mucilage (gums) that can increase the water absorption properties of the dough which can impact mixing time and dough handling characteristics. American Institute of Baking recommends additional formula water at rate of 75 per cent of the added ground flaxseed by weight.

Flaxseed can be used to reduce the oil or shortening specified in a recipe because of its high oil content. If a recipe call for 1/3 cup of oil, replace with 1 cup of ground flaxseed a 3:1 substitution ratio. As an alternative, the flour specified in a recipe can be reduced by 25 per cent and replaced with ground flaxseed. Baked goods tend to brown more quickly if flaxseed is substituted in the recipe. Whole flaxseed can be used to add crunch and taste to bread dough, cookies mix and also nutritive value to diet.

A good idea is to grind the flaxseed prior to use. Mill

them with a food processor or a blender or coffee grinder. Roasted flaxseeds can be enjoyed direct from the bag, or sprinkled on cereal, yogurt and other foods, or used in baking.

- If a person decided to give flaxseed a try, it is important to note that one should ease it into the diet slowly.
- Start out using half of a tablespoon per serving and slowly increase from there. As there is no precise recommended daily amount determined at this time, it is best to use flaxseed in moderation. Current studies indicate that tremendous health benefits, especially to the cardiovascular system, can be gained by adding two tablespoons a day to our diet.

Flax facts:

- Store whole seeds at room temperature for up to one year. If one suspects that they are old, taste a few. If they are off in flavour and not pleasantly nutty, discard them.
- Ground flaxseed should be stored in an airtight opaque container and refrigerated or frozen. Refrigerated ground flaxseed should be used within 30 days.
- Store flax oil in the refrigerator in a container that blocks light.
- Stir 1-tablespoon ground flax per serving into our morning hot cereal after cooking.
- Sprinkle ground flax over a salad, cooked vegetables or cold breakfast cereal.

Note :

- There is no RDA yet for omega-3 fatty acids or lignans, but the World Health Organization and others have made recommendations. Try starting with about 1 tablespoon of whole ground flaxseed per day, and work the way up to somewhere between two tablespoons and 1/4 cup.
- Make sure to get extra fluids to help the body handle the extra fibre.
- Flaxseed has no known warnings or contraindications.

Name for flax in other Indian languages:

Flaxseeds are known as Alsi in Hindi, Gujarati, and Punjabi; Agase in Kannada; Ali Vidai in Tamil, Jawas and Alashi in Marathi, Tishi in Bengali, Pesi in Bengali, Avise ginzalu in Tamil and Cheruchanavith in Malayali.

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