



A short voyage towards flaxseed

Kayalvizhi seralthan*, Hemamalini baskaran

Faculty of pharmacy, Dr.MGR educational and research institute ,Mathuravoyal Chennai

Abstract :

Flaxseed is commonest dietary fibre that is utilized by humans. Apart from the nutrition, natural depression of linseed the flax had several medical applications by treating various disorders. The flax has been exploitation from past period for both food and medicines. The oil obtained from the seed contains omega -3- fatty acids. This kind of fatty acids usually improve the health condition of human. Oil may be used for topical for the pharmaceutical purpose. Presences of supermolecule, fibre, sugar, engery, fats in flax heals the harmful diseases.thus, and the present review is concentrated on the medical uses, pharmacuticla formulation and chemical composition of flaxseed.

Keywords: flaxseed, pharmaceutical-uses, chemical composition, traditional cereals.

INTRODUCTION

Flax means very useful which produces small flat seeds¹. The richest source of flaxseed includes ALA, omega-3 polyunsaturated fatty acid (PUFA), phytoestrogen lignans, secoisolariciresinol diglucoside (SGD)^{2,3}. The overall composition of flaxseed contains 32% to 45% oil, 2.35 g ALA, 28% dietary fiber, 21% protein^{2, 4}. The fibre & durability content is yield from the stem of flaxseed plant. Specifically the flaxseed is considered for its chemical compound which is phenolic derivative⁵. The flaxseed is major used in formulation for its essential oil content, thus it is obtained by extraction method of steam distillation due to hydrophobic liquids, which are easily concentrated. Thus the concentrate contains volatile oil (ketones, alcohols, aromatic phenols, esters, lactones, aldehydes, mono terpenes and sesquiterpenes)⁶ The isolated essential oil have broad spectrum in food flavouring and preservatives industries and this is responsible for antibacterial, antiviral, antifungal activities⁷. Thus flaxseed is used in industrial purpose (i.e. production of paints, cosmetics, linoleum, inks and varnishes)⁸ The phytochemical which is analysed in flaxseed includes triterpenoids, proteins, steroids, vitamin c, saponins, alkaloids, glycosides, flavonoids, tannins, free amino acids and carbohydrate⁹ many research studies explains that flax has an effect on CVD, mental disorder due to action of docosahexaenoic acid (DHA) and eicosapentaenoic acid which is active moiety of ALA¹⁰ Topical formulations embrace oils, creams, ointments, pastes and gels out of that gels are becoming a lot of widespread currently a days as a result of they're a lot of stable and can also give controlled unharness than different solid preparations (D. Manjula et.al.2018)

NUTRITIONAL VALUE FOR FLAXSEED⁵

Nutritional	Quantity per serving(5 gm)	Quantity per serving(100 gm)
Lignans	25-50mg.	500 - 1000mg
Dietary fibre	1.95g	39g
Monounsaturated	0.08g	1.5g
Polyunsaturated	0.35g	7g
Energy	82kj	1635 k j
Protein	1.6g	32g
Total Fat	10g	10g
Omega 3(ALA)	0.25g	5g
Sugar	0.07g	1.4g
Soluble fibre	0.4g	8g
Insoluble fibre	1.55g	31g

HISTORY OF FLAXSEED

The flaxseed has been originated from the stone ages. The health benefits of flaxseed was broadly developed from the ancient Greece. However, at Rome Empire the flaxseed developed has been fallen. After 17th century, the flaxseed was planted in Canada and its beneficial role was spread all over the world¹¹. The flaxseed can be classified into brown; and golden or yellow. This types have equal amount of omega 3-fatty acids content¹² Day by day, incorporation of linseed in food and in food product has been increasing because of its high content of essential omega-3 fatty acid carboxylic acid, alphalinolenic acid (ALA), dietary fiber and natural synthetic resin antioxidants. Linseed is rising united of the key sources of phytochemicals (Shahzad et al., 2006).These phytochemicals (phenolic acids, cinnamic acids, flavonoids and lignins) square measure antioxidants and has an effect on the cell growth and viability. Linseed is a vital supply of prime quality super molecule and soluble fibre and has significant potential as a supply of synthetic resin compounds (Amin and Thakur, 2014). Plant lignans square measure the biologically vital category of synthetic resin compounds, the degree of lignans in food vary widely; the richest supply is linseed, the prevailing lignan within the linseed is secoisolariciresinol diglucoside (SDG). There square measure few studies on the soundness of lignans through food method showed that SDG levels remained unchanged throughout the manufacture of breads and cookies that contained linseed (Cardoso et al., 2012) one in every of the elements dietary fibers reduces blood serum cholesterin and flattens the blood sugar profile, similar to gum, oat gum and different viscous fibers (Jenkins 1995). The presence of flavonoids in oilseed aerophilic cell injury, suggesting antiseptic, anticancer, antiinflammatory result and delicate susceptible properties (Pruthi, 2007).

EXTRACTION OF OIL

Commercially majority of the oilseed is processed for extraction of oil that is then used for paints, coatings, linoleum, inks, floor coverings, etc. (Tolkachev and Zhuchenko 2000). Industrial oil isn't appropriate for food or feed, however the residual meal will be used as feed for cattle. The terribly high content of omega-3 content of oilseed build it liable to autoxidation, resulting in deterioration of quality, thus oil extraction has been done by cold pressing and solvent extraction strategies. Even

once cold extraction of flax oils, it's powerfully counseled that oil ought to be hold on in dark glass bottles, supplemented with antioxidants to avoid quality deterioration (Lukaszewicz et al. 2004) In Republic of India, numerous techniques are used for the extraction of oil, specifically bullock driven ghanis (Kohlu), power driven rotary ghanis press and screw-press oil expellers (Singh et al. 2011a, b). oil is mostly screw ironed while not heat treatment similarly no processing is finished apart from deposit and filtration (Wiesenborn et al. 2005). recent unrefined oil includes a pleasant nutty flavor and enticing golden color. The oil recovery victimization double stage compression screw press ranges from eighty six to ninety two nada. However, numerous pretreatments viz., the adjustment of wetness content, (Singh and Bargale 2000) use of enzymes (Shankar et al. 1997) steam treatment, preparation (Singh et al. 2011a, b) before pressing ends up in vital improvement in oil recovery. Decreasing the wetness content of the flaxseeds from thirteen.8 and 6.5 nada resulted in vital increase in oil recovery variable from forty four.4 and eighty one nada (Singh et al. 2011a, b). Solvent extraction of oilseeds victimization resolvent is sometimes meted out for recovery of prime quality oil and retention of polar lipids

(Nash and Frankel 1986). Cold pressing ends up in solely partial recovery of the oil; thus, pressing of the seeds is followed by solvent extraction at high temperatures to realize most oil recovery. however the omega-3 is degraded by exposure to high temperature; thus, critical fluid extraction technique will be a boon to such oils. critical greenhouse gas (SC-CO₂) is that the most frequently used critical fluid for purpose of oil extraction because the low vital temperature of greenhouse gas (31 °C) permits extraction of warmth sensitive compounds while not quality deterioration. lipide composition of the oilseed oils obtained by each SC-CO₂ and crude ether extraction were studied and it absolutely was found that the omega-3 content was higher just in case of the oil extracted victimization SC-CO₂ as compared to grease extracted victimization crude ether (Bozan and Temelli 2002). In audible power is additionally used for the extraction of oil. A study unconcealed that inaudible assisted extraction of oil resulted in increased recovery of oil with enlarged inaudible power. In audible assisted extraction saves time and lesser solvent consumption (Zhang et al. 2008).

MEDICAL APPLICATION OF LINSEED

S.NO	Diseases treated with flax	Dose	Results	References
1.	Constipation, Irritable Bowel Syndrome and Diverticular	dietary fiber was > 25 g.	Treating diverticular disease, irritable, constipation and bowel syndrome	Makharria, G., P. Gibson, J. Bai, S. Crowe, T. Karakan, Y.Y. Lee, L. McNamara, J. Muir, N. Oruc, E. Quigley 23. and C. Tuck, 2018. Diet and the Gut
2.	Cancer	10g of dietary fibre (3g insoluble fibre and 1 g soluble fibre)	Ovarian, prostate, lung and colorectal is treated	Peters, U., R. Sinha, N. Chatterjee, A.F. Subar, R.G. Ziegler, M. Kulldorff, R.Bresalier, J.L. Weissfeld, A. Flood, A. Schatzkin and R.B. Hayes, 2003. Dietary fibre and colorectal adenoma in a colorectal cancer early detection programme. Lancet, 361: 1491-1495.
3.	Diabetes	25 g of flaxseed	Decreased blood glucose response curve by 27 % compared to oral glucose alone.	Kodama, T., T. Miyazaki, I. Kitamura, Y. Suzuki, Y.Namba, J. Sakurai, Y. Torikai and S. Inoue, 2005. Effects of single and long-term administration of wheat albumin on blood glucose control: randomized controlled clinical trials. European Journal of Clinical Nutrition, 59: 384
4.	Cardiovascular Disease and Serum Lipids	50 g of ground raw flaxseed	Total blood cholesterol reduced by 9 % and LDL by 18 %.	Cunnane, S.C., M.J. Hamadeh, A.C. Liede, L.U. Thompson and T.M.S. Wolever, 2003. Nutritional attributes of traditional flaxseed in healthy young adults. American Journal of Clinical Nutrition, 61: 62-68
5.	Cholesterol	40 to 50 g of flaxseed	total blood cholesterol was reduced by 5 to 9%	Lucas, E.A., S.A. Lightfoot, L.J. Hammond, L. Devareddy, D.A. Khalil, B.P. Daggy and B.H. Arjmandi, 2004. Flaxseed reduces plasma cholesterol and atherosclerotic lesion formation in ovariectomized Golden Syrian hamsters. Atherosclerosis, 173(2): 223-229.
6.	Menopause	chronic ingestion of flaxseed	Decreases endometrial cancer in post-menopausal women, and reduce the causes of osteoporosis.	Sadia Chishty , Monika Research Scholar, Department of Home Science, University of Rajasthan. Health Benefits and Nutritional Value of Flaxseed- a Review. Volume : 6 Issue : 1 JANUARY 2016 ISSN - 2249-555X
7.	Colon and skin cancer	flaxseed oil	Decreased tumour development in rats	(Clifford hall III, 2006). Flaxseed Health Benefits & Applications By Radha Mantri, Sachin Sonavane & Shalini on Arya 12 February 2014.

PHYTOCHEMICAL ANALYSIS OF OILSEED (HARBORNE, 1973)

Steroids: Associate degree aliquot of the seed extract (1ml) was dissolved in ten cubic centimeter of chloroform and equal volume of targeted oil of vitriol was accessorial by sides of the tubing. The higher layer turns red and oil of vitriol layer showed yellow with inexperienced visible radiation. This indicated the presence of steroids.

Terpenoids: Associate in Nursing aliquot of the seed extract (2ml) was other to 2ml of anhydride and focused H₂SO₄. The formations of blue inexperienced ring indicate the presence of terpenoid.

Tannins: Associate aliquot of the seed extract (2ml) was supplementary to few drops of 1 Chronicles dye, and also the xanthous precipitate indicated the presence of tannins.

Saponins: Associate aliquot of the seed extract (5ml) was mixed with 20ml of water then agitated in a very graduate for quarter-hour. Formation of froth indicates the presence of Saponins.

Anthocyanins: Associate degree aliquot of the seed extract (2ml) was additional to 2ml of two N HCl and ammonia. the looks of pink-red that turns to blue-violet indicates the presence of anthocyanins.

Glycosides: Concentrate H₂SO₄ Test: 2ml. glacial carboxylic acid, one drop of fifty FeCl₃ and conc. H₂SO₄ were further into 5ml extract, the looks of brown ring indicates the presence of glycosides.

Emodins: 2 cubic centimetre of NH₄OH and three cubic centimetre of aromatic hydrocarbon were additional to the extract. look of red color indicates the presence of emodins.

Alkaloids: a Mayer's test: To the acidic resolution, Mayer's reagent (Potassium mercurous halide solution) was additional. Cream collared precipitate indicates the presence of organic compound.

Phenols: 0.5 millilitre of FeCl₃ (w/v) answer was supplementary into a pair of millilitre of check answer, formation of AN intense color indicates the presence of phenols.

Flavonoids: associate degree aliquot of the seed extract (2-3ml) and few drops of caustic soda answer were side into a tube. Formation of intense yellow color that became colourless on addition of few drops of dilute HCl indicates the presence of flavonoids.

ANTIOXIDANT ACTIVITY OF FLAXSEED

The antioxidant activities of the dissolving agent (70%), methyl alcohol (70%), fermentation alcohol (70%) and water extracts were assessed by measure radical scavenging activity via the discoloration of those solvents of the radical one, 1 diphenyl-2picrylhydrazyl (DPPH) as delineated by complete – (Williams et al. 1995) as follows: 2 ml of dissolving agent (70%), methanol, fermentation alcohol (70%) and water solution of either test material at numerous concentrations (1-64 µg/ml) and methyl alcohol resolution used as control were intercalary to 2 ml solution of DPPH (25mg/L) in methyl alcohol, and therefore the reaction mixture was agitated smartly and left darkly for thirty min. Finally, the absorbance of the

mixture was measured against pure methyl alcohol (blank) at 517 nm T80 UV/Vis spectrophotometer. the proportion of radical scavenging activity was calculated victimization the following formula: Radical scavenging (%) = [(A₀ – A₁/ A₀) x 100] Where: A₀ is that the absorbance of control and A₁ is that the absorbance of the sample extracts. the 500 the five hundred concentration value (IC₅₀) is indicated because the effective concentration of the sample that's required to scavenge five hundredth of the DPPH free radicals. The result were in agreement with Shabbir et al. (2011) who found that the liquid methyl alcohol was the foremost effective solvent extracting the most with efficiency antioxidants from barks of some native trees.

Antidepressant Activity

the study conducted to gauge the medication activity of extract of genus *Linum usitatissimum* in wistar rats. Locomotors activity, forced swimming check and tail suspension test were used for assessing antidepressant drug activity. They rumored the diminished medication activity as compared to standard medication selective-serotonin reuptake inhibitor, neuroleptic drug and tricyclic antidepressant drug (Rath B.P et. al-2012).

Anti hyperglycemic activity

In a study, the result of ethanolic extract of seeds of *Linum usitatissimum* (EELU) was evaluated in hyperglycaemia associated gas reactive species (ROS) production in peripheral blood mononucleate cells and exocrine gland cells (PBMNCs) and exocrine gland inhibitor enzymes in alloxan elicited diabetic rats. The result showed that treatment of the EELU (200 mg and 400 mg/kg) considerably reduced blood serum aldohexose level in each acute and sub acute study¹³

Anti-peptic lesion activity

In a recent study, Esmaeilzadeh Mahdi et al-2013 evaluated the anti-peptic lesion action of the water extract of whole seed of plant genus *usitatissimum* Linn. They according that the extract was discovered to indicate vital antispasmodic agent activity and protecting impact against experimental ulcerogenesis¹⁴. In another study each linseed oil and linseed mucilage was found to possess vital protecting activity against plant product evoked peptic ulcer. The results show that pre-treatment of rats with linseed oil and linseed mucilage considerably reduced the quantity and length of viscus ulcers evoked by plant product. linseed oil was simpler than linseed mucilage in reducing the quantity of ulcers. The reduction in lesion severity (cumulative length in mm) provided by associate oral dose of linseed oil (5 ml/kg) was additional distinguished than that obtained by antacid (50 mg/kg). This study indicates that each linseed oil and linseed mucilage will offer a cytoprotective impact against ethanol-induced viscus ulcers in rats¹⁵. Gaurav Kaithwas and Dipak K. Majumdar in 2010 had planned a study with associate aim to judge the antiulcer activity of plant genus *usitatissimum* oil against pain pill, nonsteroidal anti-inflammatory drug, ethanol, reserpine, monoamine neurotransmitter and stress- evoked viscus ulceration in rats and amine evoked viscus ulceration in guinea pigs.

makes an attempt were additionally created to judge the in vitro anticholinergic and antihistaminic activity and in vivo antisecretory and antiulcer activity of oil following porta ligature in rats. *L. usitatissimum* oil exhibited vital antiulcer activity against completely different ulcerogens in experimental animal models. The oil considerably reserved neurotransmitter and histamine-induced contraction of guinea pig and rat ileums, severally, suggesting its opposing cholinergic and antihistaminic activity. The oil additionally exhibited vital restrictive impact on viscus secretion/total acidity and aspirin-induced viscus ulceration in pylorus-ligated rats. The lipoxigenase restrictive, amine antagonistic and antisecretory (anti cholinergic) effects of the oil might in all probability have contributed towards antiulcer activity. *L. usitatissimum* oil could also be thought of to be a drug of natural origin that possesses vital antiulcer activity. The current observation is that the first experimental knowledge showing antiulcer activity of *L. usitatissimum* fastened oil¹⁶

Infant allergies and respiratory diseases

In a paper "Role of dietary long-chain unsaturated fatty acids in baby allergies and respiratory diseases" Lynette P. Shek et al throughout had examine the role PUFAs consumption throughout maternity and infancy and its influence on allergic reaction and respiratory diseases because the long-chain unsaturated fatty acids are reportable to own immunomodulatory effects. Minimized consumption of omega-6-PUFAs, in favor of additional medicine omega-3-PUFAs (flax is made in ALA that could be a biological precursor to omega-3-fatty acid) in trendy diets, has incontestable the potential protecting role of allergic and metabolism diseases. PUFAs act via many mechanisms to modulate immune perform. Omega-3-PUFAs might alter the T CD4 T cell balance by inhibiting protein production that successively inhibits immune globulin synthesis and T helper a pair of cell differentiations. PUFAs might additionally modify cellular membrane, induce eicosanoids metabolism, and alter factor expression¹⁷

Cancer

A pilot study was done at dietary fat restriction and linseed supplementation in twenty five prostatic adenocarcinoma patients. The patients were asked to require thirty g/day of ground linseed and to possess an occasional fat diet of twenty you look after total kilocalories or less. The study lasted a mean of thirty four days and there was a major decrease in total androgen (422 ± 122 ng/dL to 360 ± 128 ng/dL), total sterol ($201 \pm$ thirty-nine mg/dL to $174 \pm$ forty two mg/dL) and free steroid index ($36.3 \% \pm 18.9 \%$ to $29.3 \% \pm 16.8\%$) ($p < 0.05$), a decrease within the mean proliferation rate (7.4 ± 7.8 historic controls vs. 5.0 ± 4.9 for treated patients, $p = 0.05$), the distribution of the apoptotic indexes differed considerably ($p = \text{zero}.01$) and therefore the proliferation rat and caspase-mediated cell

death were considerably related to the amount of days on the diet ($p = \text{zero}.049$ and $p = \text{zero}.017$) (Azhar Jabeen et.al. 23/09/14).

CONCLUSION:

Flaxseed has several health advantages also as wealthy of nutrients. Actually the content Fiber, proteins, Amino acids, fat-soluble vitamin and lignans gift in linseed satisfy basic desires within the human diet. linseed additionally has healthy properties that stop from upset, issues associated with biological time and plenty of a lot of sickness.

REFERENCES

1. <https://www.cdc.gov/nchs/fastats/leadingcauses-of-death.htm>
2. Nutr Rev. 2004;62(1):18–27
3. J Cardiovasc Pharmacol. 2009;54(5):369–77
4. Canadian Journal of Cardiology. 2010;26(9):489–96
5. Sadia Chishty , Monika Research Scholar, Department of Home Science, University of Rajasthan. Health Benefits and Nutritional Value of Flaxseed- a Review. Volume : 6 | Issue : 1 JANUARY 2016 ISSN - 2249-555X
6. N.R. Ahmad, M.A. Hanif, U. Rashid. (2005). Chemical compositional and intra provenance variation for content of essential oil in *Eucalyptus crebra*. Asian J. Plant Sci. 4(5): 519-523
7. I. Ahmad, M.A. Hanif, R. Nadeem, M.S. Jamil, M.S. Zafar. (2008). Nutritive evaluation of medicinal plants being used as condiments in South Asian Region. JOURNAL OF THE CHEMICAL SOCIETY OF PAKISTAN. 30(3): 400-405.
8. Z.-S. Zhang, L.-J. Wang, D. Li, S.-S. Jiao, X.D. Chen, Z.-H. Mao. (2008). Ultrasound-assisted extraction of oil from flaxseed. Separation and Purification Technology. 62(1): 192-198.
9. O. Okoh, A. Sadimenko, A. Afolayan. (2010). Comparative evaluation of the antibacterial activities of the essential oils of *Rosmarinus officinalis* L. obtained by hydrodistillation and solvent free microwave extraction methods. Food Chemistry. 120(1): 308-312.
10. A. Martinchik, A. Baturin, V. Zubtsov, V. Molofeev. (2012). Nutritional value and functional properties of flaxseed. Voprosy pitaniia. 81(3): 410.
11. Vaisey-Genser, M. and D.H. Morris, 2003, Introduction: history of the cultivation and uses of flaxseed. In Flax (pp: 13-33). CRC Press.
12. Bhatta,R.S., 1993. Extraction and enrichment (1 lead to 3), (1 lead to 4)-beta-D-glucan from barley and oat brans. Cereal chemistry (USA).
13. Bhatia AL, Manda K *et al.* Prophylactic Action of Linseed (*Linum usitatissimum*) Oil Against Cyclophosphamide-Induced Oxidative Stress in Mouse Brain. J Med Food 2006; 9(2): 261-265. <http://dx.doi.org/10.1089/jmf.2006.9.261>
14. Madhi E, Fariba K. Evaluate the possible anti-peptic ulcer action of the water of *Linum usitatissimum*. Life Science Journal 2013; 10(3): 509- 511.
15. Dugani A, Auzzi A, Naas F *et al.* Effects of the Oil and Mucilage from Flaxseed (*Linum usitatissimum*) on Gastric Lesions Induced by Ethanol in Rats. Libyan J Med 2008; 3(4): 166-169. <http://dx.doi.org/10.4176/080612>
16. Kaithwas G, Majumdar DK. Evaluation of antiulcer and antisecretory potential of *Linum usitatissimum* fixed oil and possible mechanism of action. Inflammopharmacol 2010; 18: 137–145. <http://dx.doi.org/10.1007/s10787-010-0037-5>
17. Shek LP *et al.* Role of dietary long-chain polyunsaturated fatty acids in infant allergies and respiratory diseases. Clinical and Developmental Immunology; 2012. p. 8