

## Pharmaceutical, Pharmacological Activities, And Therapeutic Potential of --“Flaxseed” –A Review

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**Abstract:-** Flaxseed or linseed (*Linum usitatissimum L.*) Comes from the flax plant an annual herb of family linaceae is one of the most important medicinal plants traditionally used for various health as well as nutritional purposes. The flax plant is not a new crop and is native to west Asia and the Mediterranean. Flax was valued in ancient and early modern times as both a food and medicine. Plant growing up to 60-120 cm of height. Flaxseed is a cold temperate herb with erect, slender stem. Leaves are alternate, lance- like and greyish green with three veins. This review summarizes the information about the phytochemistry, pharmacological activity and toxicity of Flaxseeds.

**Keywords :-** Flaxseed, linseed phytochemistry, pharmacological activities and toxicity.

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### I. Introduction :-

Flaxseed is the seed from the flax plant an annual herb which is a member of the Linaceae family.[1] It grows up to 60-120 cm height. The flower are small blue, bluish violet or white in terminal panicles. Fruit is capsular having 10 seeds. [2] The genus linum has 230 species approx but flax is the only species of economic importance.[3][4] Cultivated for fibre and oil. It contains both soluble and insoluble fibres. The soluble fibre {mucilage gum(26)} helps to reduce cholesterol and regulate blood sugar level. While the insoluble fibre helps in digestion by increasing bulk and preventing constipation.[5] It is a primary source of phenols, flavonoids and lignins, which affects the growth and viability of the cells in the body [6]. Flaxseed is helpful in treating cardiac disorders, cancer, arthritis, wounds, abscesses, diabetic and digestive disorders [7].



Flax plant is a native of Egypt [9,10]. Some consider it to be indigenous to localities between the Persian gulf and the Caspian and black seas, while others ascribe it's origin to India.

**Vernacular names [11] :-**

Sanskrita –Uma, Ksuma  
Hindi –Alsi  
Gujrati – Alahi, Arasi  
Bengali – Masina, Atasi  
Kannada – Agasebeeja, Semeagare, Agasi  
Kashmiri– Alsi  
Malayalam – Agastha, Agasi, Cheri, Charm  
Marathi – Atasi  
Punjabi – Ali Tamil – Ali, Virai  
Telugu – Avisa  
Urdu – Alsi, Katan

**Taxonomy :-** L. usitatissimum is an annual herb. Flax taxonomy is given below [12].

Kingdom – Plantae  
Subkingdom – Tracheobionta  
Superdivision – Spermatophyta  
Division – Magnoliophyta  
Class – Magnoliopsida  
Subclass – Rosidae  
Order – Linales  
Family – Linaceae  
Genus – Linum L.  
Species – Linum Usitatissimum L.

**Classification [13,14,15] :-** It includes in Ahara - varga (Shimbidhanya varga) and Taila- varga.

**Useful Parts :-** Flower, seed and oil.

**Cultivation :-** Linseed is being cultivated in Egypt, Europe and India since pre- historic times.linseed are developed mostly as a rain fed, cold season rahi crops. It grows in most sorts of soil where sufficient humidity is out there. In India, it's sown within the month of September- October and harvested in February and March before the capsules are dry. The herb is dried [2]. The ripe seeds are recovered from the capsules by threshing [16].

**Morphology :-** Flax is erect, annual herb branches corymbosly above the main stem. It is hermaphrodite and pollinated by insects and is self fertile [17].

**Leaves :-** They are 3.8 cm long, linear, lanceolate [19,9].it has smooth edge and is greyish green in colour [16].

**Flower :-** Inflorescence is loose terminal raceme or cyme . Flowering is from June to July [2,12]. It is usually blue in colour [20, 21] may be bluish violet or white [20].

**Fruits :-** The fruit is a capsule, composed of five carpels and may contain up to 10 seeds [12].

**Seeds :-** The seeds are capsular and small. They are oval, lenticular, 4-6 mm long with a smooth, shiny surface, and is brown to golden colour.

**Use :-** Traditionally, used as the source of linen fibre while Flaxseed oil, in the manufacture of paints varnishes, inks and linoleum, because of its fast polymerization properties [22].The Flaxseed retains the heat, providing relief to the infected area [23]. It is also used to sprinkle as salad and to prepare chutney [10].

**Phytochemistry :-** It contains 20% protein, 30% dietary fibre and 40% lipids. Cotyledons contain 75% of the lipids, and 76% of protein while endosperm contains only 23% of the lipids and 16% of protein [24,25].

It also contain 37% fatty oil, 28.8% carbohydrates, 4.8% fibre, 2.4% mineral matter, 0.17% calcium, 0.37% phosphorus and 2.7mg/100gm iron. It also contain Niacin, thiamine, carotene, choline, pantothenic acid and vitamin E [2].

It also contains cinnamic acid, flavonoids, phenolic acid and lignins [26, 27].

Linseed oil is yellowish - brown drying oil with a smell and bland taste (<175).It contains glycosides of unsaturated acids alpha - linolenic acid, C<sub>17</sub>H<sub>29</sub>COOH (36-50%), linoleic acid C<sub>17</sub>H<sub>31</sub>COOH (23-24%), oleic acid C<sub>17</sub>H<sub>33</sub>COOH (10-18%), in considerable amount together with some saturated acids-myristic, stearic and palmitic (5-11%), [28]. Other constituents which are present in linseed are resin, wax, lecithin, pigments, malic acid, ethanoic acid and phytin.

It also have essential amino acid like Histidine, Isoleucine, Leucine, Lysine, Methonine, Valine, Threonine Which has a vital role in maintenance and repair the wear and feas of the cell tissue and organs.

**Pharmacological effect :-** it shows the following effects prominently :

**(a). Anti - arrhythmic effect :** Study and scientific reviews suggest a possible anti - arrhythmic effect of ALA and Omega - 3 fatty acids [29,30,31]. Higher intake of dietary linolenic acid might be associated with a reduced risk of abnormally prolonged repolarization in men and women [32].

**(b). Anticoagulant and anti - platelet effect :** Due to the presence of alpha - linolenic acid in oil it has protective effects against cardiovascular disease and has the ability to decrease the tendency of platelets to aggregate [33, 34].

**(c). Antidiabetic effect :** Studies suggest that after removing oil, the flax cake mixed with antioxidant (chilli) could serve as a supplement to the poorest of poor suffering from diabetes in rural population which reduced the postprandial glucose level by 27% [35,36,37].

**(d). Cardiovascular Diseases :** GK Paschos et al-2007 [36] in their study “Dietary supplementation with Flaxseed oil lowers blood pressure in dyslipidaemic patients” reported that examine the effect of increased ALA intake on blood pressure in man. A proportionate effect on blood cholesterol concentration and low - density lipoprotein fraction has been linked with higher concentrations of Flaxseed in the diets indicating greater reduction in LDL protein, serum and liver cholesterol [37,38].

**(e). Anti- lipemic effects :** Due to the presence of lignans flaxseed show favourable effect an atherosclerotic plaque [39].

**(f). Cancer :** Flaxseed lignans are very much similar to endogenous sex steroid hormones which changes the metabolism of hormones and reduces the risk of cancer in postmenopausal women, prostate cancer in men and other hormone sensitive cancers [40,41,42].

**(g). Antioxidant effects :** Phenolic Contents which are present in flax seeds are antioxidant in nature and they increase the lipid peroxidation (43).

**(h). Laxative effects :** It is reported that Flaxseeds produce laxative effects by increasing fecal volume and fecal weight and stimulate peristalsis due to stretch reflexes and is therefore used as laxative (as it is rich in fibre)[44].

**(i). Renoprotective effects :** It was reported that rats with polycystic kidneys when fed with flaxseeds increases citrate excretion and reduces histological damage [45].

**(j). Bone development :** Lignans present in flaxseeds influence the development of bones [46].

**(k). Hair Growth :** Study show that linseed enhance hair length (+26%) and increase the hair diameter. Its intake increase the hair density [47] .

**Toxicity :-** Flaxseed when consumed in excessive quantity cause few side effects like gastric disturbance, bloating, internal bleeding, stomach pain, nausea, loose stool, prostate cancer risk etc. [48,49].

## **II. Conclusion :-**

Flaxseed is an annual herb and it is a rich source of food, feed, fibres, and medicine. Flaxseed oil provides health benefits mainly due to its high content of Omega-3 alpha linolenic acid.

The plant shows diverse biological and pharmacological activities like antioxidant, antidiabetic, anti-arrhythmic, anticoagulant and anti- platelet, cardiovascular, hormonal effects.

This review provides available information on phytochemistry, pharmacological action and toxicity of flaxseed.

## **Reference :-**

- [1]. Daun JK, Barthet VJ, Chornick TL, Daguid S. Structure, composition and variety development of Flaxseed in human nutrition Thompson LU, Cunnane SC 2003; 1-40.
- [2]. Anonymous. The wealth of India - a dictionary of Indian raw materials and industrial product. (L–M). Publication and Information Directorate, CSIR, New Delhi, 1962; VI: 119-140.
- [3]. Rowland, G.G., McHughen, A., Bhatta, R.S., Mackenzie, S.L. and Taylor D.C.(1995): The application of chemical mutagenesis and biotechnology to the modification of linseed (*Linum usitatissimum* L.). *Euphytica*, 85: 317- 321.
- [4]. Tadesse, T., Parven, A., Singh, H. and Weyessa, B. (2010): Estimates of variability and heritability in linseed germplasm. *International journal of sustainable crop production*, 5(3): 8-16.
- [5]. Institute of medicine. 2002. Dietary Reference intakes for energy, Carbohydrate, Fibre, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids, Nat. Acad. Press Washington DC. pp. 7-1—7-69 (dietary fibre). 8-1—8-97 (fat and fatty acids). Invest. 9: 29.
- [6]. Shahzad H, Anjum F M, Butt M S, Khan M I and Asghar A, Physical and sensoric attributes of Flaxseed flour supplemented cookies, *Turkish Journal of Biology*, 30, 2006, 87-92
- [7]. Bloeden LT et al. Flaxseed and cardiovascular risk factors: results from a double- blind, randomized, controlled clinical trial. *J Am Coll Nutr* 2008; 27: 65-74.
- [8]. Coskuner, Y., Karababa E. 2007. Some physical properties of Flaxseed (*Linum usitatissimum* L.). *J. Food Eng.* 78, 1067-1073.
- [9]. Kirtikar KR, Basu BD, *Indian medicinal plants*. ed. Shiva offset press, Dehradun. 1991; 1(2):408-410.
- [10]. Nadkarni KM. *Indian materia medica*. Vol. I. Bombay Popular prakashan Pvt Ltd, Mumbai, 1982, 743-746.
- [11]. Dr. Gangashaya Pandeya, Bhavprakash Nighantu, Dhanyavarga, Atasi Chaukhambha Bharti Academy, 2008: 640-41.
- [12]. WWW.inspection.gc.ca— The biology of *Linum usitatissimum* L.(flax)-Canadian Food Inspection Agency.

- [13]. Acharya Vidhyadhar Shukla, Charak samhita, Sutrasthana, Annapanvidi adhyaya27/292 Chaukhambha prakashan Delhi, 2015.
- [14]. Kaviraj Ambikadutta Shastri, Sushruta samhita, Sustrasthan, Annapanvidhi Adhyaya 46/48 Chaukhambha Sanskrit Sansthan Varanasi.
- [15]. Kaviraj Atridev Dev, Vagbhata samhita, Sustrasthan, Annaswaroopvig yaniya Adhyaya, 6/24, Chaukhambha prakashan, Chaukhambha prakashan Varanasi.
- [16]. Anonymous.PDR for herbal medicines.2nd ed. Medical Economic Company. New Jersey ( Montvale), 2000, 313-315.
- [17]. [http://pfaf.org/user/plant.aspx?Latin Name= Linum + usitatissimum](http://pfaf.org/user/plant.aspx?Latin+Name=Linum+usitatissimum)– Linum usitatissimum Flax, common flax PFAF Plant Database.
- [18]. Gill,K.S. (1987): Linseed. Indian Council of Agricultural Research, New Delhi.
- [19]. Anonymous.Standardisation of single drugs of Unani medicine. Part II. CCRUM, New Delhi, 1992, 276-281.
- [20]. Anonymous. The wealth of India - dictionary of Indian raw materials and industrial product. Vol. VI (L-M). Publication and Information Directorate, CSIR, New Delhi, 1962, 119-140.
- [21]. Chatterjee A, Pakrashi SC. The treatise on Indian medicinal plants. Publication and Information Directorate, CSIR, New Delhi.1994; 3: 125-126
- [22]. Coskuner Y., Karababa, E. (2007). Some physical properties of Flaxseed (*Linum usitatissimum* L.). *Journal of Food Engineering*, 78(3), 1067-1073.
- [23]. Q LIFE Health & Beauty products: Flaxseed (Linseed) properties and benefits [www.frontiernet.net/~batory/properties.html](http://www.frontiernet.net/~batory/properties.html).
- [24]. Daun, J., Barthet, V., Chornick, T., Duguid, S. 2003. Structure, composition, and variety development of Flaxseed. In: Thompson,L., Cunanne, S. edition. Flaxseed in Human Nutrition. 2nd edition Champaign, Illinois. pp. 1-40.
- [25]. Oomah, B., 2003. Processing of Flaxseed fibre, oil, protein, and lignan. In: Thompson, L., Cunanne, S. Editores. Flaxseed in Human Nutrition. 2nd . Edn. Champaign, Illinois. 363-386.
- [26]. Amin T, Thakur M. A comparative study on proximate composition, phytochemical screening, antioxidant and antimicrobial activities of *Linum usitatissimum* L. (Flaxseed). *Int J Curr Microbial App sci*. 2014; 3(4): 465-481. *Linum usitatissimum* L. (Flaxseed) a multifarious functional food. *Int Interdisciplinary Research Journal*. 2014; 4(1): 220-235.
- [27]. Yadav RN. Agarwala M. Phytochemical analysis of some medicinal plants. *J Phytol* 2011; 3: 10-14.
- [28]. Evans, WC. Trease and Evans Pharmacognosy, 16th edn . Saunders Elsevier Edinburgh London New York Philadelphia St Louis Sydney Toronto. 2009; 88.
- [29]. Christensen, J.H., Schmidt, E.B. Molenberg, D., and Toft, E. Alpha linolenic acid and heart rate variability in women examined for coronary artery disease. *Nutr Metab Cardiovasc Dis* 2005; 15(5):345-351.
- [30]. Matthan, N. R., Jordan, H., Chung, M., Liechtenstein, A. H., Lathrop, D.A., and Lau, J.A systematic review and meta - analysis of the impact of Omega -3 fatty acids on selected arrhythmia outcomes in animal models. *Metabolism* 2005;54(12):1557-1565.
- [31]. Mozaffarian, D. Does alpha -linolenic acid mtake reduce the risk of coronary heart disease? A review of the evidence. *Altern ther Health Med* 2005;11(3):24-30.
- [32]. Djousse L, Rautaharju PM, Hopkins PN, Whitsel EA, Arnett DK, Eckfeldt JH et al. Dietary linolenic acid and adjusted QT and JT intervals in the National Heart, Lung, and Blood Institute Family Heart study. *J Am Coll Cardiol*. 5-17-2005;45(10):1716-1722.
- [33]. Allman MA Pena, MM, Pang D. Supplementation with Flaxseed oil versus sunflower seed oil in healthy young men consuming a low fat diet: effects on platelet composition and function. *European Journal Clinical Nutrition*. 1995;49(3):169-178.
- [34]. Bierenbaun ML, Reichstein R, Watkins TR, and et al. Reducing atherogenic risk in hyperlipemia humans with flax seed supplementation: a preliminary report. *J Am Coll Nutr.*, 1993; 12: 501-504.
- [35]. Cunnane, S.C. Ganguli, S., Menard, C., Liede, A.C., Hamadeh, M.J., Chen, Z.Y., Wolevere, T. M., And Jenkins, D. J. High alpha- linolenic acid Flaxseed (*Linum Usitatissimum*): some nutritional properties in humans. *Br J Nutr.*, 1993; 69(2):443-453. 8098222.
- [36]. Paschos GK, Magkos F et al. Dietary supplementation with Flaxseed oil lowers blood pressure in dyslipidaemic patients. *European Journal of Clinical Nutrition* 2007; 61: 1201-1206. <http://dx.doi.org/10.1038/aj.ejcn1602631>.
- [37]. Cinitra DEC, Costa AGV, Peluzio MCG, Matta SLP, Silva MTC, Costa NMB. Lipid profile of rats fed high- fat diets based on flaxseed peanut, trout, or chicken skin. *Nutrition*. 2006; 22(2): 197-205.
- [38]. Gambus H, Mikulec A, Gambus F, Pisulewski P. Perspectives of linseed utilization in baking. *Pol J Food Nutr Sci.*, 2004; 13(54): 21-27.
- [39]. Prasad, K. Dietary flax seed in prevention of hypercholesterolemic atherosclerosis. *Atherosclerosis* 7- 11- 1997; 132(I): 69-76. 9247361.
- [40]. Serraino M, Thompson LU. Flaxseed supplementation and early makers of colon carcinogenesis. *Cancer Letter*, 1992; 63(2): 159-65.
- [41]. Serraino M, Thompson LU. The effect of flaxseed supplementation on early risk makers for mammary carcinogenesis. *Cancer Letter*, 1991; 60(2): 135-142.
- [42]. Jenkins, D.J., Kendall, C.W., Vidgen, E., Agarwal, S., Rao, A. V., Rosenberg, R. S., Diamandis, E.P., Novokmet, R., Mehling, C.C., Perera, T., Griffin, L.C.and Cunnane,S. C. Health aspects of partially defatted flaxseed, including effects on serum lipids, oxidative measures, and ex vivo androgen and progestin activity: a controlled crossover trial. *Am J Clin Nutr.*, 1999; 395-402. 10075322.
- [43]. Hutchins, A. M., Martini, M. C., Olson, B. A., Thomas, W., and Slavin, J. L., Flaxseed consumption influences endogenous hormone concentrations in postmenopausal women. *Nutr Cancer* 2001;39(1):58-65.
- [44]. Thompson, L. U., Chen, J. M., Li, T., Strasser-Weippl, K., and Goss, P. E. Dietary flaxseed alters tumor biological markers in postmenopausal breast cancer. *Clin Cancer Res.*, 5-15-2005; 11(10): 3828-3835. 15897583.
- [45]. Tsakok, A. D. Correspondence re: A. M. Hutchins et al., Flaxseed influences urinary lignan excretion in a dose-dependent manner in post- menopausal women. *Cancer Epidemiol. Biomark. Prev.*, 9: 1113-1118, 2000. *Cancer Epidemiol Biomarkers prev.*, 2001;10(5):569. 11352873.

- [46]. Ward WE, Yuan YV, Cheung AM, Thompson LU. Exposure to purified lignan from flaxseed (*Linum usitatissimum*) alters bone development in female rats. *British Journal of Nutrition*. 2001; 86(4): 499-505.
- [47]. Beroual K, Halmi S, Maameri Z, Benlaksira BS, Agabou A, Chibat M et al. Pharmacological aspect of *Linum usitatissimum*: Flax ingestion on hair growth in rabbits. *J Nat Prod Plant Resour*, 2014; 4(1): 4-7.
- [48]. Martin KR. Targeting apoptosis with dietary bioactive agents. *Exp Biol Med* 2006; 231: 117-29.
- [49]. Lampe JW. Spicing up a vegetarian diet: chemopreventive effects of phytochemicals. *Am J Clin Nutr* 2003; 78: 597S-83S.