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# Pharmacognostic studies on *Linum usitatissimum* L.

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**Abstract**
Common flax (*Linum usitatissimum* L.) was one of the first crops domesticated by man. Flax is thought to have originated in the Mediterranean region of Europe; the Swiss Lake Dweller People of the Stone Age apparently produced flax utilizing the fiber as well as the seed. Linen cloth made from flax was used to wrap the mummies in the early Egyptian tombs. Presently the major fiber flax producing countries are the Soviet Union, Poland, and France.
The seed is analgesic, demulcent, emollient, laxative, pectoral and resolvent. The crushed seed makes a very useful poultice in the treatment of ulceration, abcesses and deep-seated inflammations. An infusion of the seed contains a good deal of mucilage and is a valuable domestic remedy for coughs, colds and inflammation of the urinary organs. If the seed is bruised and then eaten straight away, it will swell considerably in the digestive tract and stimulate peristalsis and so is used in the treatment of chronic constipation. Therefore an effort is made to study its pharmacognosy.

**Keywords:** *Linum usitatissimum*, linseed, TLC, physicochemical, anatomical, microbial limits

## Introduction

*Linum usitatissimum* (Linaceae) is commonly called as linseed or flax seed. This has very good nutritional values. It is an erect annual plant growing to 120 cm tall, with slender stems. Possibly this plant is native to Europe. Belgium; Britain; China; Egypt; Germany; India; Iraq; Kurdistan; Mexico; Peru; Spain; Turkey; USA; Venezuela. It has many valuable phytocostituents along with carotenes, flavonoids, and other phytochemicals like lignans are shown to play an ever increasing role in numerous aspects of human health. Lignans are phytochemicals that protect against certain cancers, particularly those that are hormone sensitive. Lignans in flaxseeds are 200 to 800 times more concentrated than any other lignan source. Annual herb, 20 cm to 1 m tall. Stem erect, glabrous, branched at the base. Leaves alternate, linear to lanceolate, 1-3.5 cm long, 1.5-3 mm broad, 3-nerved. Flowers in corymbose racemes, blue; pedicel 1.5-2 cm long. Sepals imbricate, 5-8 mm long, ovate, acuminate, 3-nerved; margin white. Petals linear to lanceolate, c. 12 mm long, contorted. Stamens 5; staminodes absent; filament c. 8 mm long; anthers 2 mm long, bi-Lobed. Ovary ovoid, styles free, c. 3 mm long; stigma linear, 1.5 mm long. Capsule sub-globose, c. 1 cm long, beaked: seeds c. 5 mm long, ellipsoid, dark brown, shiny [1].
In a study conducted to evaluate the anti-oxidant activity of flax seed, lyophilized aqueous extract of flaxseed shell (AEF) as well as evaporated ethanolic extract of flaxseed shell (EEF) were subjected to various methods such as; DPPH, ABTS, DMPD and O2 •- scavenging effects where both extracts exerted good anti-oxidant activity with respect to the positive control, α-tocopherol, BHA, trolox, and BHT [2]. Chloroform, ethyl acetate, and methanol extracts of flax seed were assessed for their anti-cancerous property against human cervical cancer cell line (HeLa), ethyl acetate extract exhibited cytotoxic activity ($IC_{50}$) at 21 ± 1.5 µg/ml. Flow cytometric analysis, ethyl acetate extract demonstrate substantial number of pro and late apoptotic cells owing its activity to the presence of glabranine and naringenin phytoconstituents [3]. Various extracts of flax seed have been evaluated for their anti-microbial activity against *Escherichia coli, Salmonella paratyphii, Lactobacillus and Staphylococcus aureus, Proteus vulgaris, Klebsiella pneumoniae, Saccharomyces cerevisiae* [4], *Staphylococcus epidermidis, Propionibacterium acnes* [5], *Enterococcus faecalis, Bacillus cereus and Salmonella typhi* [6] *and Bacillus subtilis* [7].
In a study conducted where streptozotocin (STZ) induced diabetic rats were orally administered with aqueous extracts of flax seed in doses of 100, 200 and 400 mg/kg for 28 days showed deceased levels of Blood glucose further, significant reduction in the serum creatinine, BUN, AST, ALT and TC levels were seen thus can be concluded that aqueous extracts of flax seed showed dose dependant anti-diabetic activity [8]. Anti-inflammatory effect was checked by xylene method on 48 mice divided into groups as control group, positive control group (dexamethasone15 mg/kg) and experimental groups (42, 85, 170, and 340 mg/kg, respectively of flax seed extract), 170 mg/kg dose of the extract showed anti-inflammatory activity. Additional analgesic evaluation at 5, 15, 30, and 60 minutes was illustrated were the experimental groups consisted of (200 and 500 mg/kg extract). Both doses showed analgesic activity, the 200 mg/kg possessed higher effects [9]. In a test conducted to establish the relation between flaxseed and blood pressure revealed that supplementation of 1% flax seed showed significant effect on the blood pressure by decreasing systolic, diastolic blood pressure, mean arterial pressure and the heart rate in hypertensive rats [10].

In view of the medicinal significance of the aforementioned plant, a detailed pharmacognostic analysis was carried out to further authenticate and classify the plant, setting pharmacopoeial standards for the plant.

## Materials and Methods

### Voucher specimen

The plant materials were collected and Identity was confirmed with the voucher specimen using [11]. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, and water and alcohol-soluble extractives were calculated as per the Ayurvedic Pharmacopeia of India, [12].TLC fingerprinting profile carried as per [13]. For the Anatomical studies, transverse sections (TS) and powder microscopy studies were prepared and stained [14, 15]. A standard guideline for total microbial Limit count was provided by WHO [16].

## Results and Discussions

**Table 1:** Pharmacognosy features

| Physicochemical Constants | | | Organoleptic Characters | |
|---|---|---|---|---|
| **Parametrs** | **Values** | **Limit** | **Parametrs** | **Values** |
| TA | 3.4% | NMT 5% | Taste | Normal |
| AIA | 0.3% | NMT 2% | Color | Brownish |
| ASE | 33.4% | NLT 30% | Odour | Mild |
| WSE | 11.1% | NLT 15% | Texture | Rough |

TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble Extractive, NMT- Not More Than, NLT- Not Less Than Limit as prescribed by Ayurvedic Pharmacopeia of India

All the values except for water soluble extractive value were within the limit. The deviation from the parameter of water soluble extractive value could be due to the presence of exhausted materials or incorrect processing (table 1)

**Table 2:** TLC Profile

| TLC Finger Printing Profile | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Under Visible Light** | | | | | | | | |
| Rf Values | 0.12 | - | - | - | - | - | - | - |
| Sprayed with 10% $H_2SO_4$ | | | | | | | | |
| Rf Values | 0.3 | 0.46 | 0.53 | 0.66 | 0.89 | - | - | - |
| Sprayed with Anisaldehyde | | | | | | | | |
| Rf Values | 0.03 | 0.29 | 0.39 | 0.47 | 0.59 | 0.8 | 0.93 | - |
| Under Short UV (254 nm) | | | | | | | | |
| Rf Values | - | - | - | - | - | - | - | - |
| Under Long UV (366 nm) | | | | | | | | |
| Rf Values | - | - | - | - | - | - | - | - |

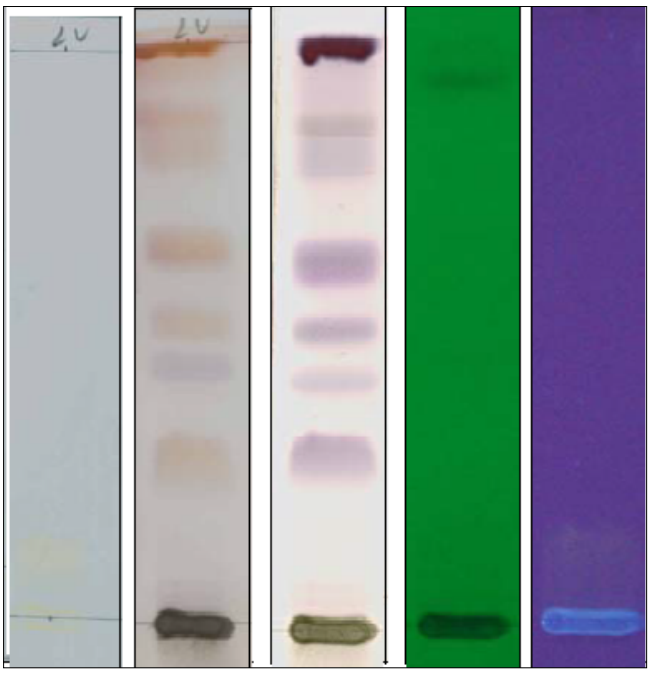

**Fig 1:** TLC Chromatograms

*Linum* showed 1 band under visible light, 5 bands when sprayed with 10% $H_2SO_4$ and 7 bands when sprayed with Anisaldehyde. Further, no bands were observed under short and long UV light respectively. The results are qualitative TLC finger print profile of plant under study (table 2, fig 1)

### Anatomical Characters

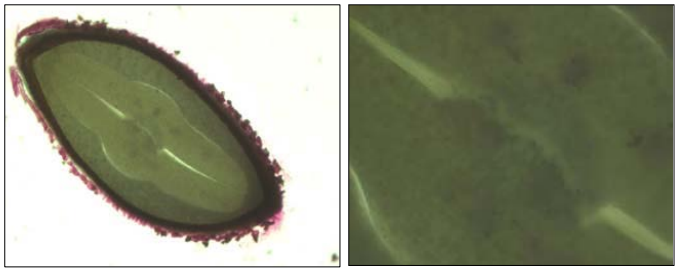

**Fig 2:** Anatomical Characters of *Linum*

Single layer epidermis, polygonal tabular cells with thin anticlinical walls filled with mucilage, One or two layer of cylindrical collenchyma, Inner integument sclerenchymatous layer longitudinally elongated lignified sclerides, wide, thick walled, pitted very small lumen, parenchymatous layer one or two layers, thin tangentially elongated, collapsed parenchymatous cells, Pigment layer single layer of flattened polygonal pigment cells with reddish brown contents, Endosperm – polyhedral, cellulosic parenchyma with oil globules and alureon grains, Alueron grains with globoid crystals, Cotyledon – cells and cell contents are similar to endosperm (fig2).

**Powder Characters:** Powder Colour: Lemon yellow:

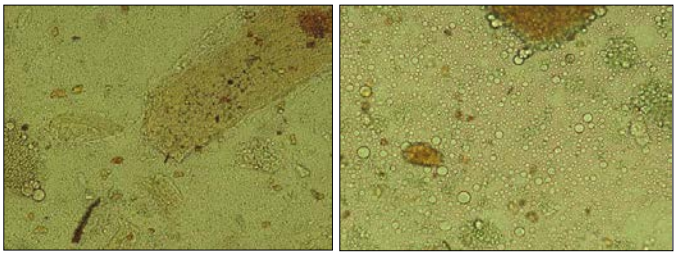

**Fig 3:** Powder characteristics of *Linum*

1. Tabular pigments cells filled with reddish brown in soluble substance,
2. Stone cells elongated and yellowish,
3. Oil globules numerous aleuron grains numerous.

Powder microscopy permits to acquire knowledge about the various broken bits of the sample that are specific and play a key role in the recognition of the raw sample (fig 3).

**Microbial Limit Test**

**Total Aerobic Bacterial Count (TABC):** 3.6 x $10^3$
**Total Yeast and Mould Count (TYMC):** 1.1 x $10^3$
(Microbial contamination limit for raw herbs - TABC: $<10^7$, TYMC: $<10^5$)
All criteria were within the limits specified by the WHO Guidelines and Indian Herbal Pharmacopeia.

**Conclusion**

In the current study, pharmacognostic approach was taken to set pharmacopeial standards of *Linum*, a medicinally important plant. Physicochemical values was not within the limit proposed by Ayurevedic Pharmacopeia of India, which may include the presence of adulterants. The TLC profile will behave as a fingerprint profile for the plant. Organoleptic, anatomical and powder microscopic examinations are plant specific. The microbial limit of the raw material was within the standard provided.

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