

## PERFORMANCE OF MORPHO-ANATOMICAL CHARACTERS OF *LINUM USITATISSIMUM* TO DIVERSE HABITAT CONDITIONS OF KHYBER PAKHTUNKHWA

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### ABSTRACT

Research on the medicinal plants was started by the researchers in the last century in order to allocate different valuable alternative resources to the increasing demands of population especially to those communities totally dependable on forests and other non renewable natural resources. *Linum usitatisimum* is a renowned medicinal herb of the world of herbaceous plants because of its multipurpose uses in different disease treatments. The study was conducted to elaborate the performance of morpho-anatomical characters of *Linum usitatisimum* to diverse habitat conditions of Khyber Pakhtunkhwa. Five years cultivation data of *Linum usitatisimum* is analyzed with the objective to find best habitat for the growth and maximum yield of *Linum usitatisimum* and also to give farmer an easy way to get maximum benefit of his land resources during the rabbi season. The study revealed that *Linum usitatisimum* shows maximum yield at D. I. Khan.

### INTRODUCTION

*Linum usitatisimum* (Family Linaceae) is used throughout the world in a variety of different ways and forms. It contains 36-42% oil and 34-35% proteins, though the oil percentage depends upon the method of extraction. The cake, contain adequate amount of calcium and is rich in phosphorus, 7-8% crude fiber, it is deficient in amino acids such as methionine, cytine and lysine. It is a beneficial source of vitamins such as thiamine, riboflavin, nicotinamide, pantothenic acid and choline.

Linseed is an annual plant that grows to a height of 30 to 95 centimeters. It has a distinct main stem with numerous branches at the top, which produce flowers. Branches from the base of the plant may also occur depending on variety, stand, and environment. The plant has a branched taproot system that may extend to a depth of 3 to 4 feet in coarse textured soil. Seeds up to 10 per capsule, yellow or light brown to dark brown, shining, varying in size, weighing from 3–12 gm per 1,000 seeds, flat, oval, one end rounded.

It is an excellent companion crop to help establish small seeded grasses and legumes. Plant characteristics that favor its use as a companion crop are (Chopra *et al.*, 1956) limited leaf area and short stature which allow much light to reach the forage seedlings, (Cheal and Winsor, 2008) early maturity, and (Devkota and Jha, 2009) less extensive root system than many crops which reduces competition for soil moisture. In Pakistan, linseed is successfully cultivated in Punjab, Sindh and NWFP. Adequate moisture, moderate summer temperatures and rainfall particularly during

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the period from flowering to maturity, seem to favor both high oil content and high oil quality.

The best seedbed for linseed is similar to the ideal seedbed for small seeded grasses and legumes. It should be well worked. The soil should be firm to avoid large air pockets. Fall plowing is preferred if erosion is not serious. The seedbed may be worked fairly shallowly, except where deeper plowing is required when flax follows corn. Cultivation following early fall plowing will aid in weed control. In the spring, shallow discing and harrowing are the usual practices of seedbed preparation. In most cases, a more uniform planting depth (and seedling emergence) will result if the field is rolled before planting and farmyard manure is thoroughly mixed in the soil. In plains, it is sown in October while in hilly areas it is sown in first week of February. Seedling flax plants have tolerance to light frost. Cultivation is sometimes delayed for weed control in fields where weeds may be a very serious problem. Late planting of flax may not cause as great yield reduction as it does with small quantity of seeds.

A seed rate of 15-20 kg/ha is recommended. Row to row distance is kept 30 cm and plant to plant distance is kept 3- 4 cm. Lower seeding rates often result in more severe weed problems, ½ to 1 inch planting depth is suggested in clay soils. Flax seed is comparatively small and may fail to emerge from greater depths, especially if crusting occurs. Inexperienced growers often plant too deep, especially if the soil is loose. Flax is usually sown with a grain drill. Press wheel-type grain drills are ideal. A roller type seeder often used to plant forage legumes may also be used. Linseed requires about the same soil fertilization program as small grains. Apply lime to maintain soil pH in the 6.0 to 6.5 range. Follow soil test recommendations for phosphorous and potassium fertilizer applications where soil tests for P and K are low (L) or very low (VL). These elements are especially important if a legume is being seeded with flax. If large amounts of fertilizer are required, it is commonly applied to the previous crop in the rotation.

Weeds are generally great problem in linseed cultivation. Growers should sow flax on relatively weed free land and where quack grass is not a serious problem. Use post-harvest tillage or herbicides in the previous season to suppress perennial weeds such as quack grass. Good weed control with a minimum of weed seed production in the preceding year's crop will facilitate a cleaner flax field. Delayed sowing of flax to permit additional spring tillage for weed control may be successful in some fields but the planting delay may be detrimental to the flax.

Linseed is cultivated for its fiber and oil. Linen is the most important product made from the fiber of the flax plant. Flax is soft, lustrous and flexible, although not so flexible or elastic as cotton or wool. It is stronger than cotton, rayon or wool, but weaker than ramie. Special skill is needed for spinning fine linen yarns and for weaving these yarns into fine linen fabrics. This work is done in limited areas of Ireland, Scotland, N. France, and Belgium, where a high degree of skill has been developed by many generations of workers.

Lower quality fiber is used in manufacturing of toweling, matting, rugs, twines, canvas, bags, and for quality papers, as for printing currency notes. Seeds contain 20–30% protein, and are the source of linseed oil, a drying oil, one of the oldest to have been used commercially. Paint and varnish industries consume about four-fifths of the linseed oil produced. It is also used in enamels, linoleum, oilcloth, and patent leather, and as waterproofing for raincoats, slickers, and tarpaulins. In some countries it is used as edible oil, and in soap manufacture.

Linseed oil is also used in printer's ink, for making sand forms for metal casting, and as spray on concrete roads to prevent ice and snow from sticking; linseed oil also preserves the concrete and prevents surface cracking and wear. Linseed cake or linseed meal is the flax seed with most of the oil pressed out; 3–6% of oil remains in the cake. It is used as feed for livestock and is prized for its high protein content. Cake is prepared for feeding by grinding to linseed meal or by making pellets suitable for feeding in outdoor feedlots or on the range. Flax straw from seed flax varieties is used in the manufacture of upholstery tow, insulating material, rugs, twine, and paper. Some of the better quality straw, produced in the more humid sections or under irrigation, is used in manufacture of cigarette and other high-grade papers. Flax straw is rarely fed to livestock. If mature and of good quality, it is about equal to oat or barley straw in feed value. It can be used safely as the only roughage for cattle. The fibers are digested like other fibrous materials and do not accumulate in the stomach to form indigestible balls.

*Linum* finds its way into folk remedies for boils, respiratory infection, burns, cancer, carbuncles, cold, conjunctivitis, corns, coughs, diarrhea, gonorrhea, gout, inflammation, intoxication, labor, rheumatism, scalds, sclerosis, swellings and tumor. Since linen has a long anticancer folk history, it is interesting to see that *Linum* contains the anticancer agents 3'-demethylpodophyllotoxin, podophyllotoxin and sitosterol.

Seeds are considered emollient, demulcent, pectoral, diuretic, and astringent. Crushed seeds make a good poultice, either alone or with mustard; lobelia seed added in the poultice for boils. Sometimes seed are roasted and used in a poultice. Sometimes employed as an addition to cough medicines. Linseed tea used for colds, coughs, irritation of the urinary tract (when honey and lemon juice may be added). Internally, oil given as a laxative. Linseed oil mixed with an equal quantity of limewater, known as carron oil, is applied to burns and scalds. Oil mixed with honey is used as a cosmetic for removing spots from the face. In veterinary medicine, oil is used as a purgative for sheep and horses, and a jelly formed by boiling seeds is often given to calves.

## **MATERIAL AND METHODS**

The seeds of flax were obtained from NARC, Islamabad for cultivation trials at Peshawar, D.I.Khan and Swabi to Judge their performance, Cultivation trials were conducted in the above mentioned three localities of Khyber Pakhtunkhwa, during the years 2009-10 and 2010-11. The following methods were used for cultivation and for record of the morphological and yield characters.

1. The plot size was 1/40<sup>th</sup> of an acre.
2. The sowing was done on the same date for three years consecutively
3. The seed rate was four Kgs per acre.
4. Four replications at each location were made to neutralize the soil factor for yield.
5. Time taken for germination was recorded when fifty percent seeds have germinated.
6. The crop was sown in line 36 cm apart and later on thinning was done to maintain a distance of 8 cm from plant to plant.
7. Time taken for maturity was recorded when the fruit acquired a brownish yellow color.
8. Yield data per acre was recorded by multiplying the plot yield with 40 and average yield of four replications is given in the accompanying table at respective places.
9. Data on the morphological characters was recorded on two hundred plants selected at random. For randomization the plants from each line were numbered away from the field and later on that number was located in the lines and measurements were recorded.
10. Height of the plants was measured from the ground level to the top of the plant.
11. Number of tillers was recorded by counting their numbers from the main stem.
12. Each and every flowering branch was counted to record the number of flowering branches.
13. The number of fruits per plant was counted when the crop got maturity and there was no further scope of fruit formation.
14. Two hundred pods from each replication were collected at random and number of seeds per pod was counted.
15. To find out whether there is any significant difference in the characters of the crop at above mentioned locations, statistical technique "T" and "F" test was applied.

## RESULTS AND DISCUSSION

Table 1. Mean Values of Morphological characters & Yield of *Linum Usitatisimum* at D.I. Khan, Peshawar and Swabi districts of Khyber Pakhtunkhwa

Characters	D.I.Khan	Peshawar	Swabi
Plant height in cm	64.5	76	77.75
No of tillers	11.25	6	6.5
No of flowers	145.5	94.25	102
No of fruits	544.75	388.25	496
No of seeds	7.25	8	7.75
Days of maturity	200.75	201	205
Yield of Seeds per acre in pounds	895.25	716.25	866.25

It is obvious from the data presented in the above table that cultivation of *Linum usitatissimum* in D.I.Khan shows higher yield than cultivation of *Linum* in Peshawar and Swabi and other morphological characters such as average No. of flowers per plant in D.I.Khan i.e. 145.5 is higher than Peshawar and Swabi similarly average no. of fruits per plant and average no. of tillers per plant in D.I.Khan are maximum in numbers comparatively. As regards days of maturity there is significant difference in D.I.Khan and Swabi i.e., 201 days and 205 respectively.

Table 2. Statistical analysis of results of all the characters at different habitat conditions of Khyber Pakhtunkhwa

Characters Location	Plant height in cm	No of tillers	No of flowers	No of fruits	No of seeds	Days of maturity	Yield per acre
D.I.Khan	HS	SG	HS	HS	NS	NS	HS
Peshawar	SG	NS	SS	SS	SG	NS	NS
swabi	NS	SS	NS	NS	NS	SS	NS

HS-\*\*\* highly significant

SG- \*\*significant

SS- \*slightly significant

NS- non significant

From the results of statistical analysis and co- relating the different characters presented in table # 2 it has observed that cultivation of *Linum usitatissimum* in D.I.Khan is Highly Significant among other habitats particularly in yield, no. of tillers, no. of flowers and no. of fruits.

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