

Scientific Correspondence

Flax: The fibre of linen

Flax (*Linum usitatissimum*) is one of the oldest and an important fibre crop of the world. It belongs to the genus *Linum* in the family *Linaceae* and has been under cultivation from pre-historic times. It is native to the region extending from the eastern Mediterranean to India. 'Linen' obtained from flax is one of the world's best raw materials for textile purposes. It is non-lignified, soft, flexible, lustrous, shining, pale yellow fibre and possesses high water absorbency quality (Chaudhary *et. al.* 2015) Furthermore, it is the second stronger fibre after ramie. Flax fibre has low elasticity and is resistant to high temperature, moisture and mildew. It contains 80-90% cellulose and is valued for strength and durability as it is stronger than cotton, rayon or wool. The best grades are used for linen fabrics such as damasks, lace and sheeting.

At present, India spends more than 1000 crores of rupees annually for import of flax fibre from China, Canada, Belgium, Holland and France to meet indigenous demand particularly to defense sector. There is an urgent need to increase production and productivity of flax (as fiber and seed) in India to meet the needs of industry and to save valuable foreign exchange. However, at present there is hardly any acreage under flax as fibre in India (Chaudharu *et.al.* 2015). Only single variety for fiber namely, JRF-2 (Tiara) is released in the year 2015 by Sunnhemp Research Station (ICAR-CRIJAF), Pratapgarh, Uttar Pradesh, India. Flax is very much profitable crop and has its uses in manufacture of fabrics, paper industry, construction and elsewhere.

It is believed that the center of origin of cultivated flax is the Middle East,

although secondary diversity centers were identified in the Mediterranean basin, Ethiopia, Central Asia, and India (Vavilov, 1926 and Zohary *et. al.* 2000). Flax is originated from Mediterranean region. It is commonly known as Alsi (Hindi), Tisi (Bengali), Avise Jinjalu (Telugu), Jawas (Marathi), Ali Vidai (Tamil), Agasi (Kannada), Pesi (Oriya) and Cheruchana Vithu (Malayalam).

In the world, flax growing countries are USSR, Belgium, Holland, China, Japan, Egypt, Australia, new Zealand, Kenya, Uganda, Ireland, Neatherland, England, Sweden, Argentina, Eastern Europe, Poland, Rumania, Greece, Germany, Italy, France, Spain, Portugal, USA, Canada, Uruguay, Asia Minor, Afganistan, and small pocket of India. India is forth producer of flax seed after Canada and China. In India, flax is grown all over country (Excepting Kerala) (Gupta *et. al.* 2006).

Flax is primarily a *rabi* season crop. Last week of October to first week of November is ideal time for sowing of flax in India, before the ambient temperature becomes too low and to affect germination of seeds. Delay in sowing reduces fibre yield and fibre quality. The crop requires well drained sandy loam or loamy soil for high grade fibre production and 120-125 days crop period is good for retting and drying. High yielding flax varieties are being developed by the Sunnhemp Research Station (CRIJAF), Pratapgarh, Uttar Pradesh. India's first genetically improved flax fibre variety 'Tiara' has been released in 2015. JRF-1, JRF-3, JRF-4, FT-895, FT-896 and FT-897 are some other improved strains for the selection of right variety and

getting quality seed are very much essential to obtain high yield.

Flax requires 40kg/ha seed for line sowing and 60kg/ha for broadcasting method. Seeds are sown close together in line to maintain 2-3 parallel rows. The closeness leads to intra-row competition among the plants and as well as prevents damage due to wind as the plants are slender. The number of plants per unit area affects the branching, stem thickness and plant height.

Flax competes rather poorly with weeds and common weeds associated with flax are hirankhuri (*Convolvulus arvensis*), *Cornopus didymus*, *Avena fatua*, *Plantago lanceolata*, *Poa annua* and *Vicia febaand*. Crop should be free from weeds at least up to 35 days after sowing. Two hand weeding, first at 21-25 days and second at 40-45 days after sowing will result in better crop. At this time seedlings are thinned out to maintain plant to plant distance of 1 to 2 cm. Application of Isoproturon 75 WP@1.0kg/ha as post emergence weedicid at 35 days after sowing also advocated for better weed control.

Better crop can be raised from the land rich in organic matter, manured with farm yard manure or cakes @ of 5tonn/ha. Application of phosphatic fertilizers prevents lodging tendency. Application of 60 kg N, 40 kg P and 40 kg K per ha was found best for increasing plant height and high fibre yield. Half dose of nitrogen and full dose of Phosphorous and Potash may be applied as basal dose while the remaining nitrogen may be applied about 35 days after sowing with first irrigation to obtain highest plant height and stalk yield.

Flax crop can be grown both under rainfed and irrigated conditions. However,

production is higher under irrigated conditions as compared to the rainfed conditions. The first irrigation at 35 days after sowing and second at 65 days stage enhances the production of good quality fibre.



The fibre crop matures in around 120-125 days and is harvested before maturation of capsules. The optimum stage for harvesting is the time when $2/3^{\text{rd}}$ of the plant portion of the crop turns yellow and $2/3^{\text{rd}}$ leaves have fallen. The fibre degrades once the plant gets brown colour. Harvesting is done by pulling out the plants from the ground. Plants are tied in small bundles of 15-20cm diameter for retting. Early harvesting may result in tender and fine fibre with low yield, while late harvesting may result in more yield but relatively poor quality of fibre.

After harvesting retting is traditionally carried out by placing the bundles in water pond and keeping them dipped properly through heavy weight so that bundles can absorb the moisture. Bundles are kept side by side horizontally and immersed in water 20-25cm deep with bamboo or stoned or wooden logs. The retting process is completed within three days (72 hours). *Clostroridium* bacteria associated with the soil of stem help in early retting of

bundles. After three days the bundles are washed thoroughly with fresh water. After washing, these bundles are kept on ground for sun drying.



Flax fibre is extracted from the bast or skin of stem of the flax plant. The upper tender portions of retted plants are cut so those capsules are removed from plants. After that flax fibre is ready for scutching, which is a process in which the fibres get separated from stem. It may be done manually, where the small bundle of dried stalk are beaten by hand mallat (mungri), which leads to splitting of wooden part of the stalk and fibre can be separate easily. It also can be done by mechanical method, where the flax



stalks go through the scutching machine developed by CRIJAF (ICAR), Barrackpore for extraction of flax fibre.

The machine is indigenously designed on the principle of passing a handful flax stalk through fluted rollers to break the woody core into straw and separate the fibre in a short time. The fibre is then worked through a comb for separating long fibres from short ones. The separated fibre strands are then rolled into bundles.

Flax fibre is soft, lustrous and flexible. It is stronger than cotton fibre but less elastic. Coarser grades are used for the manufacturing of twine and rope. Flax fiber is also a raw material for the high-quality paper industry for printing currency notes and also for rolling paper for cigarettes and tea bags. Flax fibre is used making lawns, cambrics, drills, canvas and Buckrams. It is used in linen stitching, making twins and nets for fishing, ropes, carpets backing, sails, wrapping cloth and house furnishings. It is a good raw material for tissue papers, fire fighting hose pipes, knapsacks and water bags.

In ancient times flax fibre was used for wrapping mummies. Owing to its good length, flax fibre is suitable for strong yarns such as used for sewing threads and cloth. Flax fibre which is fairly strong is extremely porous and absorbs moisture rapidly such that it makes excellent towels, dry clothes and water holding articles. The great strength, fineness, durability, better resistance to environmental fluctuations are some of the characteristics of flax fibre that make it indispensable during war period. It is also used for high quality paper used in currency notes and bond papers etc. The flax cultivation has good prospects and farmers are to be encouraged to grow the same.

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***Babita Chaudhary*^{1*}, *M. K. Tripathi*², *S. K. Pandey*³ and *Bandana*¹**

¹ICAR-Central Potato Research Institute Campus, Modipuram, Meerut – 250 10, U.P., India

²Sunnhemp Research Station (ICAR - CRIJAF), Pratapgarh, U.P., India

³ICAR-Central Research Institute for Jute and Allied Fibres, Barrackpore, W.B., India

*E-mail: babchaudhary4@gmail.com

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