

Linseed: A lesser known crop, yet the most viable alternative crop in the eastern Himalayas

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Lack of expansion of both edible and non-edible oilseed crops to non-conventional areas like the North-Eastern Hills (NEH) region has been a matter of great concern in the recent past; and many steps have been taken to expedite oilseeds popularization programmes. Linseed, although a lesser-known oilseed crop requires less management inputs with comparatively more economic benefits as well as nutritional values. With the prevailing climatic situations and the available natural resources of the region, this crop could be one of the most viable alternative options to fit into different cropping systems especially in rice fallows during winter (rabi) season. Sensitization on the health benefits of flaxseed, its processing techniques, value addition, marketing, scope for entrepreneurship with the aim to enhance income are some of the areas to be reiterated upon.

Keywords: Arunachal Pradesh, Cropping system, Income, Linseed, Oilseed production

THE state of Arunachal Pradesh is blessed with fertile soil, ample land, water resources and diverse agro-ecosystems which favour cultivation of variety of crops and flaxseed (linseed) is one such crop. Linseed (*Linum usitatissimum* L.) crop is being grown either for oil or fiber (linen) purposes depending on the varieties selected. Since linseed oil is prone to oxidation, hence it is mostly used as an ideal drying oil with many industrial uses. Linseed crop also provides high protein feed stock after oil extraction along with the straw as animal feed, fibers and shives as by-products. It contains about 40–50% oil, which is mostly made up of beneficial polyunsaturated fatty acids. For centuries, flaxseed has been used as a natural medicine and is a potential future functional ingredient with a wide variety of clinical benefits. It is reported to be one of the richest sources of lignin (800 times more than any other plant seed) which provides protection against certain forms of cancer owing to estrogenic and anti-estrogenic activity in

the body. Flaxseed is considered as functional food owing to the presence of three main bioactive components-alpha-linolenic acid, lignans and dietary fiber. Many studies have reported that flaxseed has hypoglycemic and hypolipemic properties, causing foods to have a lower glycemic index. Linseed is known to have high concentration in health promoting omega-3 fatty acids, dietary fibers and antioxidants, as well as being low in carbohydrates, making it an anti-diabetic food. Therefore, incorporating flaxseed into various food products causes positive changes in diabetics' biochemical profiles, thereby improving their metabolic profile.

Food products supplemented with flaxseed are becoming increasingly trendy due to their high levels of unsaturated fatty acids, protein, phytonutrients and soluble fibre. It can be used as roasted and ground seeds, and its oil can be used in a variety of food formulations as vegetable oils, stable emulsions, and micro-encapsulated powder. Many

nutritious food recipes prepared from flaxseed have attracted the health-conscious groups of the modern society. Efforts are being made to develop the edible grade linseed oil suitable for direct consumption or blending with other edible oils. With development of value-added products and edible linseed oil might greatly improve the economic viability of its cultivation.

Linseed cultivation in Arunachal Pradesh

Though, North-Eastern Region of India is predominantly a horticultural hub, yet to some areas, cereal crops like rice and maize have always been traditionally grown. However, there are few pockets where farmers have recently started introducing non-conventional crops like pulses and oilseeds to diversify their cropping systems. Linseed is quite new to most farmers in the eastern Himalayan region. The crop is suitable for winter (rabi) season with optimum sowing time from October–November. Linseed is susceptible to water stress at the initial growth stage,

Table 1. Suitable linseed varieties for Eastern Himalayas, Arunachal Pradesh

Variety	Days to maturity (days)	Plant height (cm)	Seed yield (q/ha)	Gross return (₹)	Net return (₹)	B:C ratio
Priyam	153	59.40	13.77	1,72,597.30	1,00,161.33	2.38
T-397	151	79.53	13.15	1,62,468.00	90,032.00	2.24
RLC-153	151	69.47	13.05	1,64,913.30	92,477.33	2.28



Priyam



T-397

Field overview of linseed varieties at ICAR research farm, Gori, Basar, Arunachal Pradesh



Harvesting of linseed in the month of April



Seed setting affected upon late sowing
owing to co-incidence of pre-monsoon
showers during flowering

development stage and the later stages of the crop could be maintained rainfed. The crop is suitable to be sown during October–November following the standard agronomical practices with application of 5–10 tonnes/ha FYM maintaining a spacing at 30 cm × 10 cm. Selection of the suitable varieties for getting quality seeds is essential. Priyam (13.77 q/ha), T-397 (13.15 q/ha) and RLC-153 (13.05 q/ha) were found to be the most promising ones under the prevailing climatic conditions of Arunachal Pradesh (Table 1). Among the varieties, Priyam was found to give comparatively better net returns (₹1,00,161.3) and B:C ratio (2.38) under Arunachal Pradesh conditions. These varieties can further be tested or distributed to farmers for wider expansion in the region.

Scope for expansion in the region

In the recent years, the Government of India, under the National Mission on Oilseed and Palm oil (NMOOP) has taken due importance and emphasis for the expansion of oilseed crops to non-conventional areas like the North-eastern states. This is due to the ongoing pressure to narrow down the demand-supply gap of edible oil. Several oilseed crops like mustard and toria, soybean, groundnut, sesame, sunflower etc have been tested for their adaptability in the region to see the opportunity of their wider expansion. Among them

rapeseed and mustard, soybean and sesame are the widely cultivated oilseed crops in the region; although some are conventionally cultivated, and not for oil extraction.

Linseed crop with its versatility and climatic adaptability in the region, offers ample scope for its expansion in different ecosystems, especially the rice fallows or in maize-based cropping systems. Further, this crop can be easily cultivated under conserved soil moisture and limited soil nutrient conditions with lesser management practices. Horizontal expansion of the crop to larger plains, foothills and in the fertile river valleys of Arunachal Pradesh, viz. Lohit, Namsai, East Siang, Lower Dibang Valley, Changlang areas etc can be of great scope in the future. Double cropping with toria and buckwheat has been successful and extensively seen in most low-lying paddy growing areas in the districts of Namsai, Lohit, East Siang and Lower Dibang valley. Likewise, the same can be popularized with linseed as a substitute crop for achieving more remuneration to the farmers. As per the observation in Basar, Arunachal Pradesh, a mid-hill situation, revealed that there is ample scope for its successful cultivation although the crop duration was slightly longer than in the warmer regions which could be due to the extended period of cool season. Since, linseed is easy to grow and adaptable to any soil conditions, therefore incorporation in different cropping systems as intercrop or subsequent crop during winter (*rabi*) season could be a viable opportunity in enhancing cropping intensity and income generation of the state.

Potential utilization and opportunities for revenue generation

Linseed has been widely utilized in many forms and has an inclusive variety of applications with huge industrial uses. Its applications have been extensively seen in furniture sector where it has long been used as oil paint for wood finishes and preservative owing to its drying properties. It has been used in textile and paper industry, paints

and varnishes, anti-rust agent for metals, conditioner and cleaner in leather processing, medicinal sector, cosmetic industry etc. Linseed cake is a nutritional feed supplement for livestock and in some reports, flaxseed is being incorporated in the feed of animals to improve the nutritional quality of meat.

Flaxseed as a functional food has a vast array of medical benefits and nutraceutical values. Food products supplemented by flaxseed are gaining popularity owing to its high content of polyunsaturated fatty acids, protein, soluble fibre and phytochemicals. Nutritionists considered flaxseed as a versatile ingredient in various food preparations. It can be used as whole or milled in batters, dough and varieties of baked products. It has also been used as a substitute of egg in bakery items as vegetarian choice. Ground flaxseed after roasting is used as energy bar, flaxseed oil is used in ice cream where it acts as foam stabilizer, enhances meltdown time and provides soft creamy texture. With these wide array of applications, the crop has a huge potential to be popularized in the region by attracting young entrepreneurs and start-ups to come up with diverse valuable products. This can cater the demand locally and pave way for global markets as organic marketable flaxseed products eventually enhancing farmers' income and create employment generation in the region as a whole.

Constraints and future prospects

Success of most oilseed crops depends on many factors and linseed itself is very new to the region in

general and to the state of Arunachal Pradesh in particular where identification of specific varieties of linseed suitable should be carried out. Other constraints include soil acidity, water scarcity during post monsoon period, short time lag period after harvest of paddy in case of rice-based cropping systems, lack of irrigation facilities, etc. It was also observed that the extended crop duration of 150–155 days matches the onset of pre-kharif monsoon which ruins the matured standing crop by deteriorating the seeds, which in turn lowers the crop yield as well as its quality. Many farmers in the state of Arunachal Pradesh are not aware about the economic and health benefits of the crop, and also its processing techniques, value-addition and marketing. These reasons could possibly add towards more reluctance for its cultivation in the region.

Production technology specifically organic production techniques, varietal trials, utilization and opportunities of the crop, its scope for expansion not ignoring the probable constraints are the issues to be accentuated. There is a need for identifying short-duration linseed varieties with adjustment in sowing time to mitigate the production drop that is caused due to co-incidence of pre-kharif monsoon showers. There is ample scope with export potential to cater the demand of organic flex in the foreign markets as most of the North-eastern states have already been declared organic states. Therefore, standardization of organically cultivated linseed becomes an important technological intervention to be highlighted upon where farmers could fetch higher

dividends from organic linseed cultivation. Setting up of processing units for oil and fibre extraction and value addition of flaxseed has to be emphasized and targeted. Sensitization and popularization programmes need to be intensified on the importance of this crop in their cropping systems, its economic returns as well as its nutritional benefits.

SUMMARY

In the recent past, the Government of India has taken due importance and emphasis for expansion of oil seed crops to non-conventional areas like the North-eastern states. Owing to the favourable climatic conditions, the region offers ample scope for introducing new crops like linseed. The crop is at its infancy stage in the region as well as in Arunachal Pradesh. Farmers have very less knowledge about the wide range of its applications, its health benefits, cultivation practices, processing, value addition and lastly its economic value. With the versatility of this crop, there is viability for its extensive cultivation in the region with the goal of crop diversification and enhancing revenue generation. Hence, standardization of its cultivation practices specifically organic production, selection of appropriate varieties, sensitization and dissemination of processing technologies and value addition are some of the areas to be emphasized upon to achieve its wide acceptance in the region in near future.

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**Plant trees,
Conserve water,
Protect environment.**

