



Cultivation and Post-Harvest Technology of Milk Thistle (*Silybum marianum*)

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Milk thistle (*Silybum marianum* [L.] Gaertn.) is a medicinal plant cultivated in Parts of UP, Rajasthan, Punjab, Haryana, Tamilnadu, Gujarat and Madhya Pradesh. It is an important medicinal plant used by man from ancient times. Milk Thistle is an herbal supplement that detoxifies and protects vital liver functions and positive effects on the liver and gallbladder. The seeds contain the highest concentrations of the active compound, silymarin. Silymarin is an antioxidant that reduces free radical production and oxidative damage. It may also inhibit the binding of toxins to the liver. In animals, silymarin reduces liver injury caused by acetaminophen and has been shown to have positive effects on alcoholic liver disease, hepatitis and toxin-induced liver problems. Milk thistle has been used for over 2,000 years as a natural treatment for liver disorders. This plant is a spiny nature so can be very easily grown where cattle or other grazing animals are a problem.

Introduction

Milk Thistle is an erect annual or biennial growing up to 115-125 cm tall. The stem is pale-green, simple or slightly branching, the leaves are large, mottled with white, pinnatifid into ovate, triangular, sinuate-toothed spiny lobes. The head are globular, 6-10 cm broad and concave at the base. The outer scales of the involucre are oblong, broadening into an ovate, prickly, cellate margin appendage which tapers abruptly into a long spine; the inner scales are lanceolate and entire. The flower are hermaphrodite and fertile, purple or white, the tube is slender the limb is dilated below and five-fold (Picture 1). Different plant parts of Milk thistle have been used from the last 2000 years in the preparations of various traditional medicines. It has been used for the treatment of diseases like liver cirrhosis, jaundice, hepatitis and liver poisoning. The flowering heads are good for diabetics. The other medicinal uses of *Silybum* are anti-cancer, anti-depressant, anti-oxidant, cardio protective, demulcent, tonic, hepato-protective, hepato-regenerative, immuno-stimulatory and as a neuroprotective



Picture 1: Flower of Milk Thistle

Soil and Climate

It can be grown on a variety soil, but thrives best in well-drained sandy loam to clay loam soils containing a moderate amount of organic matter. Any soil which is saline, alkaline or water-logged is unsuitable for its cultivation. A range of 20^o c to 25^o c of maximum temperature accompanied with fairly good winter rainfall appears to be conducive to better vegetative growth of the plant. Milk thistles prefer sunny or lightly shaded areas.

Land Preparation

It being a shallow rooted crop does not require deep tillage. The preparation of land is usually not as fine as for other cultivated crops. One or two ploughing is necessary. 10 tonnes/ha of well decomposed farm yard manure is applied before ploughing the field for getting a good growth and applied irrigation for sowing of seeds.

Varieties

Only two improved varieties developed by CSIR-Central Institute of Medicinal and Aromatic Plants Lucknow Viz.,

CIM-Liv: This variety was developed by CIMAP in 2005. It was developed through half-sib progeny selections. This variety is having more number of capitulum with high seed yield of 9 q/ha and Silymarin content 2.8 %.

CIM-Sil 9: This variety was developed by CIMAP in 2013. It was developed through population improvement. It is dwarf in height, seed yield is 10-12 q/ha and Silymarin content is 8%.

Cultivation

Planting time and seed sowing: The crop is raised by using the seed obtained from the previous season's crop. It is sown during September-October in the plains and March-April in hilly areas. The plant should be raised by sowing the seed proved more helpful for efficient cultural operation. 2-3 seeds are placed in loosened soil at the desired inter and intra row spacing and later covered with soil. One and a half to two kg seeds would be sufficient to stock one hectare of land. After the seed is germinated thinning is done, one healthy seedling is kept and rest are removed and utilized elsewhere to fill the gaps, though sowing in situ proved to be best. Transplanting method can also be used if the land to be stocked is not vacant at the time of sowing of seed. The sowing of the seeds should be started from November and can be extended up to January. Under cultivated conditions flowering commences in the second or third week of February and continues till the end of March. Thus it is advisable to sow the seed in early November, so that plant gets sufficient time for attaining optimum vegetative growth and seed yield.

Spacing: Recommended spacing of 60 cm x 30 cm is ideal for better growth, optimum yield and also conducive cultural operations. Minimum plant to plant distance should be not less than 35 cm. it can also be sown at 60 cm x 60 cm spacing using a seed-drill.

Irrigation: First light irrigation is followed after one week of seed germination. Minimum 10 irrigations would be required during the active growing period of the crop. Irrigation at the time of flowering is essential.

Manures and fertilizer: The crop responds well to the application of manure and fertilizers. FYM at the rate of about 10-12 t/ha should be added at the time of land preparation. In addition, a dose of 120 kg N, 100 kg P₂O₅ and 75 KG K₂O/ha, is recommended for obtaining a good yield. Nitrogen is applied at the rate of 60 Kg/ha in the form of urea in two splits, first dose being applied three weeks after germination followed by second dose one month before flowering, i.e., mid-January or first week of February and whole dose of P and K are applied at the time of planting in row by placement method .

Weeding: Milk thistle is often called a weed itself, and is a very good competitor. Hoeing and/or hand weeding in the early stages is the only requirement. One or two weeding when the plants are young will help to avoid competition from weeds.

Diseases and pest: Milk thistle is not bothered by many pests and no diseases have been noted. However there is a report of the pest *Tanyameu spoliatus* which can be controlled by a spray of 0.03% Methyl Parathion. Among the diseases root-wilt caused by the *Rhizoctonia species* has been observed under Karnataka condition which can be controlled by drenching the soil in fungicides like Captan or Brassicol (0.1%).

Post Harvesting Technology

Harvesting: Milk thistle is a 110 to 120 days crop. Flowering is initiated in the third week of February and goes on till the plant withers in May. The thistle heads grow into full size within 30- 40 days. The harvesting of thistle head is to be done when about 50 per cent of these have grown in full size indicated by withered petals. Delay in harvesting may cause seeds shedding resulting in heavy loss. Usually two harvestings are made, first in the second week of April followed by another in May. If harvested at the right time, on an average, about 1 t/ha of seeds may be obtained.

Drying: The material kept in open sun for about 5 to 7 days dries completely. The dried material which consists of ruptured heads, dry sticks and leaves is beaten with long sticks to separate seeds from the heads. During the beating, the dry material should be kept covered with gunnies or any other cloth so as to arrest the spread of pappins which create great nuisance if allowed to float in air. The seed and extraneous material are separated through sifting and winnowing. A further drying seed for a day or two is recommended before the material is finally stored.

Processing: The fluffy pappus must be removed from the "seed" (achenes). The seed is usually dried, powdered and made into a tincture using ethyl alcohol. Since silymarin is nearly insoluble in water, aqueous extracts or teas are ineffective for liver treatment. It is best to use 95% alcohol to extract the seed. Most of the silymarin is concentrated in the protein layer of the seed husk (pericarp). The tincture should be bright yellow, indicating the presence of the resinous fraction which contains the silymarin.

Chemical Composition

Silymarin, Silyhermin, Neosilyhermin A and B, Quercetin, Kaempferol, Dihydrokaempferol, Luteolin, Triterpene acetate, Fumaric acid and Apigenin.

Conclusion

Milk thistle has high medicinal value in the world and is also the number one recommended natural herb for liver health. The achenes, *i.e.* fruits of the plant, are commonly used as a medicinal drug; they are the raw material for isolation of different substances with liver-protection activity. In fact, in Europe, Milk thistle is a prescribed medication and also extracts of milk thistle is prescribed to treat mushroom poisoning, alcoholic cirrhosis, chronic hepatitis and acute viral hepatitis and cultivation of milk thistle also gave more economic returns to the farmers.