

A Grower's Guide

Milk Thistle

Silybum marianum

Milk thistle is a spiny, white-veined plant with sharp, spiny flowers and a purple center. This thistle looks different from the common thistles that are considered weeds in Kansas. It is quite attractive in the flower garden and the blooms attract butterflies. It is not found in the wild in Kansas. The most feared thistle in Kansas, the musk thistle (*Carduus nutans*) and another common thistle, the bull thistle (*Cirsium vulgare*), are not closely related to the milk thistle. Milk thistle is one of the top-selling herbs worldwide. Used clinically in Europe for many years, it has only recently become popular in the United States. The seed is used as supportive treatment in Germany for many forms of chronic inflammatory liver disorders that vary from hepatitis to severe Amanita mushroom poisoning.



Family: Asteraceae/Composite

Life cycle: Annual or biennial

Native: Mediterranean/Europe

Height: 2 to 6 feet

Sun: Full sun

Soil: Any soil, does well in rocky and dry soil.

Water: Low water requirement

Flowering: Flowers are spiny with purple center. Blooms in mid-summer if planted the fall before, and late summer if spring planted. (June-September)

Seed: No treatment is needed, and germination rates are very good. Seed can be planted directly into the field in fall or very early spring, or started inside and transplanted in late spring. Transplants are difficult to handle because of the spines. Transplants are probably not worth the trouble as a cash crop, but would work for a garden. Reseeds itself easily, but hasn't become weedy in our

plots, even after several generations of volunteer plants.

Spacing: Plant 12 to 15 inches apart.

Harvesting: Seed should be harvested when it is brown for maximum medicinal quality. Using scissors, cut off seed head and place into a basket, then remove seed from pods and hairs. Screen out debris. Can also be mechanically harvested with a wheat combine, but one would want to clean out the combine very well or have a designated machine for milk thistle harvest.

Parts used: Fresh or dried seeds

Used as: Tincture, medicinal food, powder, infusion (tea) and capsules.

Food uses: Stalks can be boiled as a vegetable, young leaves used in salads and the root is edible. Roasted seed can be used as a coffee substitute.

Medicinal benefits: Although there are some interesting flavonoids and steroids in the leaves of the plant, the main active

ingredient in this plant, silymarin, is found only in the seed case. Silymarin blocks toxins from entering liver cell membranes, to detoxify liver cells, and even to promote regeneration of liver cells through increased ribosomal protein synthesis. Clinical studies have not always shown improvement in patients with severe liver damage, but a study of patients with subacute liver disease showed positive results. Approved in Europe for treatment of upset stomach and liver and gallbladder ailments. Used for toxic liver damage, adjunctive treatment in chronic inflammatory liver disease and hepatic cirrhosis. Unproven uses include as an antidote to death-cap mushroom poisoning.

Market potential: Very high. This is becoming a very popular herb in the treatment of hepatitis and other liver ailments and is one of the top selling herbs in the world. However, prices for the seed may not justify growing the crop and cleaning the seed, with a price range of \$3.20 to

\$26.50 per pound (lb). Most milk thistle seed is imported from Europe and South America.

Summary of field trial data: The milk thistle appeared to be healthy in our field trials, but we didn't grow it under optimal conditions for high yield. The ideal timing is to direct seed it in the fall or very early spring (February or March in Kansas) so it will flower in June and set seed in July. As a winter annual/biennial, the timing is similar to wheat, but it doesn't have a temperature requirement to bloom as wheat does. Our plants were greenhouse grown and transplanted in May, so they only had a month or two in the field before flowering and seed set. Our data at this point consists of top and root dry weight, and we are working on getting an estimate of

seed weight as a ratio of the total top dry weight. For now, we don't have accurate yield data for the seed for this plant under Kansas conditions.

Estimates from the literature range from ¼ pound of seed per plant, when hand harvested, which would result in about 4,000 pounds of seed from a crop density of 21,780 and a survival rate of 75 percent. Another literature estimate was closer to 2,000 lbs/A of dry weight seed for machine harvesting. The seed heads don't mature at all the same time, so hand-harvested yields will be higher than machine-harvested, which would be harvested all at once. With a yield of 2,000 lbs/A (similar to 33-bushel wheat), a grower would probably not make money at the low-end price of \$1.60/lb (half of lowest price in

Appendix B), but could possibly make money if the price were closer to \$13.25 (half of the high-end price). Other questions would have to be answered, such as whether February or March is the right planting window for growers to get the seed in the ground and the proper equipment to harvest the seed. From our observations, this plant self-seeds, but doesn't seem to become weedy or spread from the immediate vicinity of seed drop. However, in some places this plant has become weedy, be careful where it is seeded and clean harvesting equipment thoroughly before moving to other crops.

K-State Field Trial Data 2000-2002 *Silybum marianum*

				Average	Comments
Age of plants in years	1	2	3		
Number of test sites¹	4	0	0		Annual crop.
Survival rate (%)	75.6	—	—	—	
Vigor rating²	3.6	—	—	—	
Height (cm)	57.5	—	—	—	
Dry weight herb (g/plant)	144.7	—	—	—	
Dry weight root (g/plant)	32.0	—	—	—	
Maturity rating³	4.7	—	—	—	
Insect damage rating⁴	0.9	—	—	—	
Disease rating⁵	0.7	—	—	—	
Estimated planting density (number of plants/A)	21,780	—	—	—	Assume 1- by 2-ft. spacing.
Plant density⁶	16,466	—	—	—	
kg/A dry weight (g/plant x plant number) – seeds		—	—	—	
Estimated marketable yield (dry weight lbs/A) – seeds	2,000	—	—	—	
Yield x ½ of low price¹	\$3,200	—	—	—	
Yield x ½ of high price¹	\$26,500	—	—	—	

¹ See "How Data Were Collected," on page 3.

² Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

³ Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

⁴ Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

⁵ Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

⁶ Calculated as starting plant density x survival rate.

How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at www.oznet.ksu.edu/ksherbs. Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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