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GROWING SAFFLOWER in NEBRASKA

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What Is Safflower?

Safflower is an annual plant grown primarily for oil contained in the seeds. Most varieties have yellow or orange flowers, spines on the flower heads and leaves like a thistle plant. The crop has been known since ancient times in the middle east and Northern Africa where it is grown as the source of a dye and an edible oil. Tests with safflower have been conducted in Nebraska since 1930. Improved varieties with high oil content were first developed by the Nebraska Agricultural Experiment Station.

Where Is Safflower Grown?

The Nebraska Panhandle is the most important safflower producing area in the state. Kimball, Cheyenne and Deuel Counties lead the area in safflower acreage. Smaller acreages are grown in several counties in southwest Nebraska. Humid weather in other parts of Nebraska favors safflower diseases which limit both seed quality and yield. For proper seed set and high oil content dry atmospheric conditions are needed from flowering until the crop is harvested.

In Nebraska the crop is commonly grown in rotations with wheat on non-irrigated land. Where water is available a pre-plant irrigation to fill the soil profile with moisture will help stabilize production without adding disease hazards likely to result from full season irrigation.

What Varieties Are Grown?

N-10, U. S. 10 and Gila (pronounced heela) are recommended varieties. All produce similar yields and oil content under Nebraska conditions. N-10, developed at the Nebraska Agricultural Experiment Station, was until recently the most widely grown variety in the area. It is susceptible to rust and root rot but these diseases have been relatively unimportant in non-irrigated areas of the west. Gila, an Arizona release,

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and U. S. Department of Agriculture Cooperating
E. F. Frolik, Dean E. W. Janike, Director

and U. S. 10 have a degree of root rot resistance. Commercial varieties also are available.

What Yields Are Expected?

Yields of safflower depend on the use of good production practices, varieties, and seasonal variations in growing conditions. In years of little disease and adequate moisture, yields will be similar whether the crop is grown on stubble or summerfallowed land. On stubble land you may expect yields from 500-1,000 pounds per acre and on summerfallow from 500-1,500 pounds per acre.

How Does the Income From Safflower Compare With That From Other Replacement Crops for Wheat?

The average acre income from safflower is comparable with that from other replacement crops that can be grown in the area. During a 6-year period at the Box Butte Experiment Station a rotation of wheat-safflower-fallow produced an average yearly income per acre equal to that from a wheat-fallow rotation. Comparative returns from safflower, spring small grains, sorghum, corn or other crops vary from farm to farm and are influenced by seasonal variations in weather, price relationships and other factors.

What Is the Length of Growing Season?

Length of growing season depends on date of seeding. April plantings will mature in late August or early September (about 140 days). May plantings will mature in mid- to late September (about 120-130 days). June plantings will mature in late September or early October if freezing weather does not occur. Among current varieties there is little difference in length of growing season required.

What Is Safflower Used For Commercially?

Oil is the principal commercial product obtained from safflower seed. It is used primarily in the food and paint and varnish industries. The meal remaining after oil extraction is used as a protein supplement in livestock feed. In experimental feeding trials, safflower meal was equal in feed value to other oilseed meals when comparisons were made on the basis of equal amounts of protein.

Is Safflower "Hard On the Ground"?

Safflower appears to have fertility requirements similar to those of wheat or barley and in terms of nutrient usage is no harder on the ground than these two crops.

1. Soil moisture supply: Safflower has a tap root that will penetrate seven to eight feet in permeable soil if moisture is available to that depth. Like sorghum and other later maturing crops, safflower continues growth until fall and usually leaves little soil moisture in the field. Hence, the outcome of the next crop depends to a large extent on the amount of moisture accumulated in the soil before that crop is planted. A spring planted crop is likely to show moisture stress if it follows another crop that matured late in the previous year. Therefore, it usually is best to follow a late maturing crop such as safflower with a year of fallow or with a crop that is planted late in the spring.

2. Available soil nitrates: Under certain conditions the yield of wheat on safflower-fallow may be poorer than that on wheat-fallow. An analysis of the problem indicates that it may be one of crop management rather than a direct result of planting safflower in the rotation.

Safflower leaves less crop residue than wheat and the safflower residues decompose rapidly during the fallow season. Tests have shown more nitrate nitrogen in safflower-fallow than in wheat-fallow at wheat planting time in the fall.

Safflower-fallow has usually been planted first to assure adequate ground cover for the winter months. The higher level of available nitrogen and earlier planting produces more top growth of newly planted wheat.

In seasons which favor abundant fall wheat growth, such as 1962, these conditions lead to drier surface soil, less plant vigor through the winter months and may encourage greater damage by root rot infections (the major cause of reduced wheat yields in 1963).

To offset these conditions, delay wheat planting on safflower-fallow a few days -- perhaps a week. This will help conserve soil moisture, control amount of top growth, maintain plant vigor through the winter months, and discourage root rot infections. Under normal conditions this procedure should give enough top growth for soil protection. With adequate moisture and in the absence of diseases the yields of wheat on summer-fallowed safflower ground may be a little better than those on comparable fallowed wheat land because of the extra nitrate supply.

How Is Safflower Marketed?

The crop is commonly grown under a marketing contract with an oilseed processing company. At least one company contracts for safflower production in western Nebraska each year -- providing a dependable outlet for the crop. Most production contracts specify a minimum price. Safflower prices will be influenced by the market demand for safflower oil and by the prices of competitive vegetable oils.

What Are Some Important Considerations In Growing Safflower?

Soil Type: Safflower is not a weed and will not do well on marginal cropland. It grows best on deep, (36 inches or more of top soil) well-drained sandy loam to silt loam soils. Land suitable for wheat and barley will usually produce the best yields of safflower.

Seedbed Preparation and Residue Management

Moderate to light wheat stubble: If stubble cover is "light to moderate," a sweep machine or rod weeder with semi-chisels can be used for the first one or two operations. The operations should be at a depth of three to four inches in early April. One or two additional operations with a plain rod weeder before planting will firm the seedbed and destroy newly sprouted weeds.

Heavy wheat stubble: Where stubble cover is heavy (2,000 to 3,000 pounds per acre) a oneway, tandem disk or chisel machine should be used for the first operations. The first tillage should be performed about April 1 at a depth of about four inches. A second chiselling, disking, or subtilling operation can be performed in mid-April. The field may then be rod weeded once or twice before the crop is planted.

Excessively heavy wheat stubble: If stubble cover is excessively heavy -- more than 3,000 pounds per acre -- it may be desirable to chop the residue or remove part of it for straw. Stubble choppers and beaters are available to break up the heavy stubble so the ground can be worked without undue difficulty. Stubble can be cut with a mower or combine and broken up with a disk. Stubble should be chopped sometime in March, if possible, so tillage can start early in April. Tillage operations similar to those outlined for heavy stubble cover can be followed after the stubble has been chopped.

Grain sorghum, corn or millet stubble: Land that was in grain sorghum, corn or millet usually requires one less tillage operation to provide a suitable seedbed for safflower than does small grain stubble. One shallow operation on such land with a subtiller, oneway, or chisel in mid-April, followed by tillage with a plain rod weeder just before planting, should suffice. Unless the soil moisture supply has been built

up by winter moisture it usually is not advisable to follow sorghum or millet with safflower, oats or barley.

Moldboard plowing: It is desirable to leave as much old crop residue as possible at the surface of the soil on fields that are to be planted to safflower. The old crop residue will supplement the safflower stubble in helping control wind erosion. Good weed control can be accomplished by moldboard plowing although it buries the old crop residue and is a more costly operation than subtilling, onewaying or chiselling.

If the moldboard plow is used, plowing should be done in mid-April. Firming the soil with a treader, rotary hoe in reverse, or harrowing should follow immediately to conserve moisture. Plowing and one of the firming operations can often be accomplished in a single trip over the field. One additional tillage with a plain rod weeder just before planting is usually sufficient.

Local field and weather conditions will determine the kind and date of operation. Recommendations are given only as a guide; however, burning stubble to reduce residues and facilitate tillage is an undesirable practice because it leaves the soil more subject to erosion.

Final pre-plant operations: Seedbed preparation is similar to that used for wheat and barley. Final seedbed preparation should take place just before planting. A good practice is to rodweed immediately before seeding to firm the seedbed and control early weed growth. A good seedbed should have moist soil within two inches of the surface.

Fertilization: Where fertilization will help wheat or barley, it will help safflower. Fertilization rates, dates of applications, kinds of fertilizer, and safflower response are problems requiring more investigation. A soil test should be made and used as a guide to applying fertilizer.

Drills: Safflower can be planted with any of the drills used to seed small grains. Proper use is more important than type of drill. In the southern part of the Panhandle semi-deep furrow disk drills or deep-furrow (hoe) drills are more commonly used. Surface disk drills are more common in the central and northern Panhandle area.

Date of seeding: Planting dates are determined by local conditions. In most areas the period from May 1 to May 20 is best. April seedings are often satisfactory but weeds in early seedings are usually more troublesome than when the crop is planted in May. Early seeded safflower is a poor competitor with weeds because of slow seedling growth. Safflower seed requires a soil temperature of at least 40° F. to germinate.

Plantings after May 20 and especially those made in June run a risk of frost damage before the crop matures. Late plantings usually produce a lower yield and oil content than those made at the optimum time.

Rate of seeding: A uniform stand of three to five plants per square foot gives the best yield. This corresponds to 20-30 pounds of seed per acre. Less than three plants per square foot increases the weed problem and more than six frequently results in overcrowding. When planting safflower with a regular grain drill, a wheat setting of 1/2 bushel per acre will plant about 22 pounds of safflower. A wheat setting of 40 pounds per acre will deliver about 25 pounds of safflower.

The size of seed or the germination may vary from one seed lot to another. It is important that the drill be adjusted for each seed lot to insure the proper planting rate.

Depth of planting: For best results safflower should be planted in moist soil and covered with no more than one to two inches of soil. The bottom of the seed furrow should be not more than four inches below the soil surface. The amount of soil cover

over the seed will vary with the depth of planting, design of the seed furrow opener and speed of travel. Press wheels are essential. Moist soil must be pressed firmly around the seed for prompt germination and good seedling vigor.

Weed Control: The best method of weed control is timely rotary hoeing or harrowing. For most effective weed control use a good rotary hoe and pull at speeds of 8 to 10 miles per hour. The first rotary hoeing or harrowing should occur before safflower and weeds can be seen. In early May plantings, best results are obtained by rotary hoeing 2-3 days before the safflower will emerge. Successive crops of weeds may be taken out until safflower reaches a height of 5-6 inches. At this height, damage to safflower stands occurs. To date there is no recommended chemical to control weeds in safflower.

Diseases: The principal diseases of safflower are leaf rust, alternaria leaf spot, and root rot. The severity of the diseases in a particular year is determined by the organisms which are present and the growing conditions during that season.

Treating safflower seed with one of the fungicides used for treating small grains helps to insure uniform stands of vigorous plants by killing fungi on the seeds and protecting the germinating seeds from soil borne organisms. Safflower should be rotated with other crops to avoid possible build-up of disease organisms that could result from continuous crops of safflower.

Harvesting: Safflower harvest does not require any special equipment. Only a few adjustments on the combine are necessary to do a good job. A cylinder speed of 500 to 700 rpm's will properly thresh the crop and cause the least cracking of seed. Reel speeds should be set a little slower than the forward motion of the machine to avoid shattering heads with the reel. Safflower will mature 120-150 days after planting. Most of the leaves and stems will be brown and dry and heads will thresh easily when rubbed between the hands. Safflower seed should have a moisture content of eight percent or less for safe storage.

Separating Weed Seeds from Safflower: Weed seeds are considered dockage in the marketing of safflower. They can be removed during harvest by using a "Scour-Kleen" or similarly effective attachment on the combine. A more economical but less effective method is to attach appropriately sized slotted screens to elevators and augers. Screen sizes should range from 1/16 to 3/36 x 1/2 inch. Many weed seeds can be removed by passing safflower seed over 1/4 inch hardware cloth (hail screen) as it is moved from combine to truck. Prompt removal of green weed seeds is necessary to prevent safflower from absorbing moisture from the damp weed seeds.

What Are the Essentials of Safflower Production?

1. Have a firm seedbed.
2. Rodweed the ground immediately before planting.
3. Plant safflower early, preferably before May 20th.
4. Plant shallow and be sure seed is pressed firmly into moist soil.
5. Do not cover seed with more than two inches of soil.
6. Plant 20-30 pounds of high quality seed per acre on dryland.
7. Rotary hoe or harrow the first time before weeds and safflower can be seen.
8. For subsequent crops of weeds, rotary hoe as needed until safflower reaches a height of six inches.
9. Use proper combine adjustments for efficient harvesting.
10. Harvest as soon after maturity as possible.

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