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Growing Safflower in Nebraska

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Safflower (*Carthamus tinctorius* L.) is a broadleaf, annual oilseed crop. Safflower production was promoted in the Nebraska Panhandle during the 1960s and production increased to several thousand acres before almost completely disappearing by 1970. The closing of the processing facility in Sidney, Nebraska was a major reason safflower fell out of favor. However, it also was reported to decrease subsequent wheat yields, increase erosion potential, and suffer severe losses from diseases, weeds, and insects.

The market for safflower oils has increased due to its high content of poly-unsaturated fatty acids, valued for their role in coronary health. Safflower oil is also used in paints and varnishes because of its non-yellowing characteristic. The high protein byproduct of oil extraction (called foots) is used for livestock feed, and whole seeds are used by the birdseed industry.

Varieties developed during the past 10 years are resistant to *Alternaria* leaf spot (*Alternaria carthami*), bacterial blight (*Pseudomonas syringae*), and *Sclerotinia* white mold (*Sclerotinia sclerotiorum*). This greatly improved stability of safflower yield. Herbicides were tested and labeled for appropriate use in weed control during this time.

The 1990 Farm Bill established non-recourse marketing loan programs for minor alternative oilseeds, including safflower, sunflower, flaxseed, canola, and rapeseed. Oilseeds produced on triple base acres will be eligible for loan. In addition to planting oilseeds on triple base acres, producers may substitute oilseeds on up to 10 percent of their payment acres or oilseeds can be grown on 0-92 acres. These changes in the farm bill will encourage many Panhandle farmers to consider oilseed crops. Of the potential oilseed crops, sunflowers have been the most successful, but they require row-crop equipment. Canola is frequently listed as a potential crop for wheat producing areas because it can be handled with wheat equipment, however, safflower also uses the same equipment. With current varieties safflower is much more consistent in production in the Nebraska Panhandle. The nearest known source of safflower seed for the Nebraska Panhandle is Centennial Grain in New Ramer, CO. Safflower contracts are also available through Centennial Grain.

The development of an expanded safflower market, disease resistant safflower varieties, effective labeled herbicides, changes in the Farm Program, and ability to produce safflower with wheat equipment, lead us to expect an increased acreage of safflower in the Nebraska Panhandle.

Rotations

Safflower has a taproot that can penetrate 8 to 10 feet. This extensive root system allows safflower to perform well when planted in rotation following winter wheat. The deep-rooted full-season nature of safflower often results in significant soil water depletion.

In the lower rainfall areas of western Nebraska it is necessary to summer fallow fields after safflower before planting wheat.

Safflower leaves very little crop residue and consequently leaves the land susceptible to wind and water erosion if fallowed. The potential for soil loss can be reduced significantly by growing safflower in strips with winter wheat and/or stubble fallow.

If the winter annual grasses, such as downy brome or jointed goatgrass, are a problem in a field, safflower in the rotation provides additional control opportunities. Control may be provided by additional tillage and/or the use of herbicides not available for use in a wheat/fallow, wheat/millet/fallow or continuous wheat rotation (see Pest Control:Weeds below).

Safflower is susceptible to the disease Sclerotinia white mold and therefore should not be grown the year following safflower or in close rotation with other susceptible crops such as dry beans, sunflower, canola or rapeseed.

Soil Fertility

Nitrogen is often the most limiting nutrient when safflower is grown on non-fallow land. In Montana, the addition of 30 pounds of N/acre doubled safflower yields following small grains.

Soil should be tested for nitrogen to a depth of four feet because of the deep root system of safflower. This crop will root deeper than winter wheat and use nutrients that may be unavailable to winter wheat. Total available nitrogen in the top four feet of soil need not exceed 120 lbs/acre. Drill row applications should never exceed 10 pounds of actual nitrogen/acre or seedling injury may occur. Urea should never be applied with the seed.

Medium to high levels of phosphorus are needed for high yields and early maturity. Soils testing very low or low in phosphorus should have 20-30 pounds of P_2O_5 applied with the seed.

Varieties

The largest acreage of safflower in Nebraska is planted to the white hulled variety "Finch." Finch was selected as a birdseed type with improved disease resistance compared to "S-208." "S-541" is the most common oil seed type grown in the area, but new releases with improved disease resistance and similar oil content are now available, including "Girard" and "Centennial." "Montola 2,000," a high oleic acid variety is currently being tested in Nebraska. Most safflower contracts specify the variety to be grown.

Planting Dates, Rates & Row Widths

Safflower grows best when planted on deep, fertile, well-drained soils with high water holding capacity and Spring soil moisture of 20 to 24 inches. Planting dates for safflower in western Nebraska are from about April 20 to May 10. Safflower should not be planted before the soil temperature reaches 40° F. As a seedling, safflower can tolerate temperatures as low as 20° F. Safflower usually takes 8 to 15 days to emerge. Early planting results in larger plants more tolerant of insects and diseases. Late planting generally results in smaller plants and lower seed and oil yields.

Soil crusting can be a problem in stand establishment. Planting depths of 1-1.5 inches are recommended. Safflower does not have a vigorous seedling and should never be planted deeper than two inches. A moist, firm seedbed will increase the chances of an adequate stand. Recommended seeding rates are from 20 to 25 pounds of pure live seed per acre.

Safflower is usually planted with small-grain drills in row spacings up to 14 inches. It can also be planted in 30-inch rows and cultivated. Safflower seed is about the same size as barley seed and has a test weight of 42 pounds per bushel. Drill settings for safflower are often about the same as for barley. The following rule can help calibrate your drill before planting: a 20 pound per acre seeding rate planted in 12, 10, 8 and 6-inch rows would require 6, 5, 4, and 3 seeds per linear foot of row, respectively.

Harvesting

Safflower is ready to harvest when most of the leaves have turned brown and the flower bracts show only a green tint. Stems are dry but not brittle and seeds should rub free of the least mature heads. The seed should have a moisture content of 8 percent or less for safe storage.

Safflower is harvested with a small-grain combine. To prevent cracking of the seed, the combine cylinder should not exceed a peripheral speed of 3,000 feet per minute. This will be about 500 rpm for a 22-inch cylinder. The suggested concave clearance is 5/8-inch at the front and 1/2-inch at the back. Shaker speeds greater than those used for small grains are required to keep the machine from clogging.

Shattering is not usually a problem, but safflower should be harvested when it is mature to minimize sprouting in the heads if a fall rain occurs. Bird damage to mature standing fields has not been a problem.

Pest Control

Weeds.

Weeds can cause yield loss and harvesting difficulties. Safflower seedlings grow slowly and compete poorly with weeds for the first 3-4 weeks. The following herbicides are currently labelled for use in safflower: Dual, Eptam, Treflan and Tri-4. Eptam, Treflan and Tri-4 all require soil incorporation. Dual may be preplant incorporated or applied preemergence.

If safflower is planted in wide rows, a rotary hoe may be used at speeds of 8-10 mph to kill weeds between the rows. A harrow may be used to control weeds that emerge before the safflower plants. Some damage to the safflower seedlings may occur if the soil is ridged and seedlings are buried too deep.

Disease.

Diseases may be a problem in safflower, especially in years of above normal rainfall with extended

periods of high humidity. Alternaria leaf spot, a major disease of safflower, causes development of large brown, somewhat irregular spots on the leaves and flower bracts of the plants. The resulting loss of photosynthetic tissue reduces yield. Losses may be minimized by planting disease-free and properly treated seed. Some safflower varieties are more tolerant to the disease than others.

Bacterial blight has symptoms very similar to Alternaria leaf spot and is controlled in a similar manner. Rust infects seedling hypocotyls and causes swelling and bending. Later, infection of cotyledons, leaves and flower bracts results in chestnut-brown pustules that turn black toward the end of the growing season.

Other diseases that may cause a problem in safflower include: Sclerotinia white mold, Botrytis head rot, Phytophthora root rot, Verticillium wilt and Fusarium wilt. Planting disease-free seed, treating the seed with appropriate fungicides and crop rotation (see Rotations above) can be used to control these diseases.

Insects.

Safflower is relatively free from insect damage. Even when attacked by insect pests, safflower is often able to compensate for the damage and yield is not affected unless stands are drastically reduced. Wireworms, army cutworms, thrips and lygus bugs are the most common insect pests found in safflower. Less common insects include seed corn maggots, grasshoppers, alfalfa loopers, leafhoppers, sunflower moths, clover stem borers and armyworms.

Bees are attracted to safflower during flowering. Their presence improves seed set and the adverse effects of any chemical insecticides should be considered before application.

Marketing

Most safflower in Nebraska is grown for birdseed. The average contract price during the past two years has been 7-9.5 cents per pound. Safflower failing to meet birdseed standards enters the oilseed crushing market.

A contract is not essential for safflower production, but is highly advisable in most situations. Like other alternative crops, a greater portion of total effort must be devoted to marketing to be successful.

File NF36 under FIELD CROPS

F-1, Miscellaneous Crops

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