



Safflower — A Potential Crop For Northern Idaho

Safflower (*Carthamus tinctoris* L.), an oil seed crop currently grown in Arizona, California, Montana and North Dakota, was first evaluated by the Idaho Agricultural Experiment Station from 1940 to 1954 and found to be adapted to the dryland areas of northern Idaho and the irrigated valleys of southern Idaho. Trials in 1976 and 1977 indicate that new safflower varieties are well adapted to northern Idaho and could probably be raised commercially, if suitable markets can be developed. This report will provide growers with information on production, uses and marketing of safflower. Production information other than variety adaptation was obtained from research conducted in eastern Montana and North Dakota.

Planting

Safflower should be seeded in the early spring as soon as a firm seedbed can be prepared. Most safflower varieties adapted to this area can tolerate frost to 20°F as seedlings. Early seeding improves soil moisture use and allows the crop to mature before fall frosts. Safflower can be seeded with most standard grain drills. In North Dakota, yields on dryland (12 to 16 inches of annual precipitation) are highest when safflower is seeded at a rate of 20 to 30 pounds per acre in drill rows 6 or 7 inches apart. This seeding rate places 4 to 5 seeds in each foot of drill row. Seed should be planted into moist soil at a depth of 1½ to 2 inches.

Weed Control

Safflower in the prostrate, rosette stage is susceptible to weed competition during the first 3 weeks after emergence. As temperatures rise, safflower plants will elongate rapidly and produce several branches. This increases its ability to compete with weeds. Controlling annual weeds during this early period is essential.

Trifluralin (Treflan) has been tested extensively in North Dakota and Montana and has been used successfully in our test plots. This selective herbicide is registered on safflower and should be applied at rates of 0.5 to 1 pound of active ingredient and incorporated into the top 2 inches of the soil before planting. Trifluralin provides control of Russian thistle, downy brome, pigweed, purslane and lambsquarter. Mustard species, sunflower and wild oats are not controlled

by this chemical. Barley and wheat should not be grown for 12 months after the application of Trifluralin.

Barban (Carbyne) is registered for wild oat control in safflower. Apply Barban post-emergence at 4 to 6 ounces of active ingredient per acre when the wild oat plants are between the first and second leaf stage and not later than the 8-leaf stage of the safflower plant.

Other herbicides are registered for use on this crop but have not been evaluated in Idaho at this time.

GROWERS SHOULD CHECK LOCAL AND STATE REGULATIONS AND CAREFULLY FOLLOW LABEL DIRECTIONS BEFORE USING ANY AGRICULTURAL CHEMICAL.

Soil Fertility

Safflower requires approximately the same nitrogen as that applied to spring barley. Research in Montana has shown applications of 30 to 60 pounds of nitrogen per acre significantly increase seed yield. In soils low in available phosphorus, 20 to 30 pounds of P₂O₅ should increase seed yields and seed oil content. No information is now available on the response of this crop to sulfur or other soil nutrients.

Insects and Diseases

Under humid conditions, safflower is susceptible to many diseases. However, the dry summers characteristic of northern Idaho are not conducive to disease development. In our trials, serious losses to diseases have been observed only at the Bonners Ferry test sites where leaf rust (*Puccinia carthami* Cda.) was severe in both 1976 and 1977 (Table 1). Due to the severity of this disease, safflower probably should not be grown in Boundary County.

Safflower does not have any serious insect pests. Lygus bugs (*Lygus* spp.) are reported to cause damage to flowers and developing seed heads if severe infestations occur. Losses to this insect have not occurred in our trials.

Crop Rotations

The relatively late maturity of this crop and potential herbicide residue would make safflower better adapted if followed by a spring-seeded crop such as peas. The stubble will provide good erosion control and will make an excellent

Table 1. Performance of 'S 208' safflower in northern Idaho replicated trials, 1976 and 1977.

Location	Year	Performance			Precipitation	
		Seed yield (lb./acre)	Seed oil ¹ (%)	Test weight (lb./acre)	Total (Aug.-Aug.)	Growing season (May-Aug.)
Moscow	1977	3482	43.4	42.3	15.2	7.4
Grangeville	1976	1984	36.9		25.2	8.2
Grangeville	1977	1952	40.8	37.6	16.6	9.2
Bonnars Ferry	1976	645	19.3		23.6	6.3
Bonnars Ferry	1977	613	35.5	30.1	10.3	4.8
Coeur d'Alene	1977	2208	39.4	33.4	13.5 (20.5) ²	6.9 (7.0)

¹ Determined by the nuclear magnetic resonance method at the Eastern Montana Agricultural Research Center, Sidney, Montana.

² A total of 7 inches of moisture was applied to the test site by sprinkler irrigations on April 8, June 1, July 1 and August 1.

Table 2. Performance of 14 varieties of safflower at Moscow, 1977.¹

Variety	Seed yield ² (lb./acre)	Test weight (lb./bu)	Seed oil ³ (%)
VF STP-1	3686 a ²	44.0	38.8
Gila (Montana)	3504 ab	43.6	40.4
S208	3374 abc	42.3	42.7
Carmex	3196 abcd	42.3	42.4
Gila (California)	3193 abcd	43.3	39.9
Hull-2	3148 abcd	41.7	44.7
74B-233	3065 abcd	42.3	36.7
U.S.-10	3022 bcd	43.9	37.9
Ute	2984 bcd	43.7	40.1
Hull-1	2908 bcd	42.9	43.2
Leed	2877 bcd	43.1	42.7
Hull-3	2798 cd	42.1	45.6
Hull-4	2659 d	41.7	44.9

¹ Total precipitation from Aug. 1976 to Aug. 1977 was 15.2 inches.

² Means within a column not followed by the same letter differ at the 0.05 level by Duncan's new multiple range test.

³ Determined by the nuclear magnetic resonance method at the Eastern Montana Agricultural Research Center, Sidney, Montana.

snow trap. Safflower is extremely tolerant to drought conditions. This plant can extract soil moisture to a depth of 12 feet in loam-type soils and can probably be adapted to sites too dry for most existing spring crops.

Harvesting

Harvest safflower with a small grain combine when the moisture content of the seed is 8% or less. Plants are mature when they appear dry and the bracts around the head are brown. Set cylinder speeds between 400 and 500 rpm with concave clearance of one-half inch with wind settings similar to barley. If green weeds are present the crop can be swathed before harvest. Care should be taken to minimize shattering losses during harvest, to remove green weed seeds before storage and to prevent the combine radiator from being clogged with chaff from the seed heads. The plants in our 1976 and 1977 trials have matured in early September.

Seed Yield

In North Dakota and Montana, safflower seed yields range from 1,100 to 1,600 pounds per acre. The varieties tested at Moscow from 1940 to 1954 averaged 1,893 pounds per acre. The best adapted varieties averaged 2,602 pounds per acre. Seed yields of one variety, S-208, grown in replicated trials at several locations in northern Idaho

during 1976 and 1977, ranged from 613 to 3,482 pounds per acre (Table 1). Safflower yields were good at Moscow, Grangeville and Coeur d'Alene. Seed oil content of safflower at these locations ranged from 36.9 to 43.4 percent. At Bonnars Ferry the seed yield and oil content of safflower have been low, possibly because cool temperatures during the growing season delayed maturity and because of foliar disease damage. Test weights have averaged 36 pounds per bushel.

In 1977, 13 varieties of safflower were tested in replicated plots at Moscow. Trifluralin (0.6 lb.) active ingredient per acre and 68 pounds of nitrogen per acre were applied to the test area before planting on April 28. The plants were harvested September 13. Seed yields of the varieties averaged 3,109 pounds per acre (Table 2). The most productive entry, VF STP-1, had a seed yield of 3,686 pounds per acre. The high seed yield, test weight and percent seed oil content of many of the varieties indicated that there are several high-yielding varieties adapted to our production area.

Uses and Marketing

Most safflower is currently grown and sold under contract to processing plants which extract the oil. Safflower oil is a high-quality, edible oil and about 80% of the domestically consumed crop is used in margarine and salad oil. Safflower has not been used extensively as a cooking oil because solid particles form in the oil at high temperatures. These particles stick to metal surfaces and impart a flavor in the food. The remaining 20% of the domestic safflower oil crop is used in commercial products such as printing ink, paint and caulking compounds.

Safflower meal, a by-product of oil extraction, is used as a feed for dairy, feedlot cattle and poultry. The meal contains 20% protein, 31% fiber and 1% fat by weight. It has a bitter flavor and is usually mixed as less than 10% of the daily ration.

From 1973 to 1975, approximately 19,300 metric tons of safflower oil were exported from the United States. Much of our oil seed exports are shipped as whole, unprocessed seed to processing plants in Europe and the Orient. Under present marketing conditions, safflower grown in northern Idaho would have to be shipped to oil processing plants in eastern Montana or exported as whole seeds to foreign markets.

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