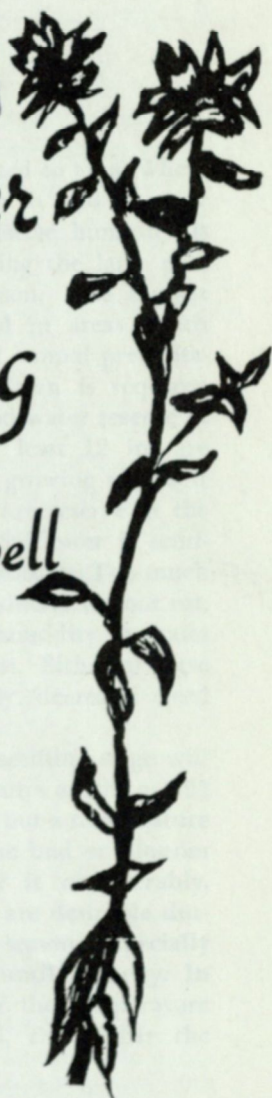


# Growing Safflower in Wyoming

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# GROWING SAFFLOWER IN WYOMING

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Safflower (*Carthamus tinctorius* L.) is an oilseed crop adapted to the western part of the Northern Great Plains, where there is a growing season of at least 120 days. The oil is used in manufacturing quick-drying paints, varnishes, and enamels, since it is non-yellowing. The oil, which is high in linoleic acid, an essential fatty acid in the human diet (1), is used also for cooking, salad dressings, oleomargarine, and other edibles.

## Description

Safflower, an annual, usually grows from 1½ to 3 ft. tall with few to many branches. It belongs to the thistle family (Compositae), and the commercially grown varieties in the United States vary from moderately spiny to fully spiny. Each plant usually produces 1 to 5 thistle-type flowers which vary in color from light yellow to deep orange. Each flower head generally produces 15 to 50 seeds.

Seed from the commercial varieties contain 32 to 40 percent oil. Some experimental lines being developed have considerably higher oil content in the seed.

## Adaptation

Safflower is adapted to areas where the growing season is 120 days or longer and the relative humidity is low, especially during the later part of the growing season. The highest yields are produced in areas which have 20 to 26 in. of annual precipitation. Less precipitation is required if the soil has a good water reserve at planting time. At least 12 in. are needed during the growing season if there is little moisture reserve in the soil at that time. Safflower is sensitive to excessive moisture. Too much soil moisture is conducive to root rot, and high relative humidity increases the incidence of rust. Either of these conditions seriously decreases seed yield.

Safflower in the seedling stage will withstand temperatures as low as 19° F. without damage, but a temperature of 32° F. during the bud or blossom stage will damage it considerably. High temperatures are desirable during the growing season, especially from the bud stage until maturity. In general, the higher the temperature during this period, the higher the

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yield of seed—if moisture is available to the plants.

### **Is Safflower Hard on the Land?**

The fertility requirements of safflower are similar to those of wheat and barley. However, safflower has a long taproot, which grows to a depth of 7 or 8 ft., and moisture may be depleted to this depth. If precipitation is sufficient to build up the soil-moisture reserve between safflower harvest and the planting of the following crop, production should be as high after safflower as after either barley or wheat. If soil moisture is not replenished, the following crop may suffer from lack of moisture.

### **Market**

At present almost all safflower seed is produced under contract with a processing plant. There is now no predictable open market, and it is likely to be difficult to market any seed not grown under contract. If one expects to grow safflower, he should investigate the availability of a marketing contract. The current price of safflower seed is approximately \$70 per ton plus a variable marketing bonus.

### **Yields Expected**

The yield of safflower seed depends upon the amount of moisture available during the growing season. Non-irrigated safflower grown under Wyoming conditions can be expected to

yield from 500 to 1,500 lb. of seed per acre, Tables 1, 2, 3 and 4. Production of safflower seed under irrigation in Wyoming is questionable because of the incidence of root rot and leaf rust.

### **Soil**

Safflower will not produce well on marginal land. It produces best on a deep, well-drained loam to silt-loam soil. In general, any soil which is suitable for production of wheat or barley is suitable for safflower.

### **Seedbed Preparation**

Safflower is generally planted on land which has been summer fallowed the previous year. Plant it on a well-prepared seedbed as you would small grains. The seedbed should be free of weeds and volunteer crop plants. It may be necessary to till the seedbed with a rodweeder or duckfoot cultivator just before planting. Conserve the topsoil moisture, since there should be enough moisture in the top 3 in. to allow rapid germination.

### **Planting**

A grain drill is generally used to plant safflower seed. The seed feeds through the drill at a faster rate than barley. If the drill is set to plant 20 lb. of barley per acre, it will plant approximately 30 lb. of safflower. Plant safflower on dryland at the rate of 20 to 30 lb. per acre. This rate will produce from 3 to 5 plants per square foot, which is the recommended stand.

The seed should be planted between April 15 and May 15. Planting about May 1 is preferred as this will allow weed seed to germinate and be killed by tillage before planting. The seed should be planted 1 to 2 in. deep, or deeper, in moist soil; however, it should not be planted deeper than 3 or 4 in.

Safflower seed requires a soil temperature of at least 40° F. to germinate. At this temperature the plants will emerge in 8 to 15 days. If the soil temperature is 60° F., the plants will emerge in 4 to 8 days.

### Weed Control

Weeds may crowd out safflower during its slow, early growth. If it rains soon after planting, weeds may come up before the safflower. In solid stands, shallow harrowing can destroy most small weeds before the safflower emerges. Do not harrow after complete emergence until the plants are about 3 in. high. Use a harrow or rotary hoe until the plants are about 6 in. high. If safflower is planted in rows, cultivate it in the same manner as you would other row crops.

### Diseases

Leaf rust and root rot are the most important safflower diseases. The amount of damage they cause depends largely upon weather conditions, cul-

tural practices, and variety of safflower grown.

Root rot is most severe on surface-irrigated land; it seldom affects dryland plantings. U.S. 10 and Gila varieties have some resistance.

Rust is seldom a problem on dryland, since high humidity from atmospheric conditions or irrigation is necessary for rust to develop sufficiently to cause yield loss.

### Harvesting

Safflower may be harvested by direct combining since it does not lodge at maturity and the seeds do not shatter easily. It is ready for harvest when the plant has thoroughly dried. To test for maturity, squeeze several of the most recently developed heads. If the seeds separate easily, it can be combined.

Safflower cannot be threshed as fast as barley or wheat. The cylinder speed should be reduced to 500-800 r.p.m. to prevent cracking the seed. The seed may be shattered if the reel speed is too fast or if the reel hits the ripe seedheads directly. Reel speed should be equalized with the ground speed.

### Results of Safflower Testing in Wyoming<sup>2</sup>

Varieties and selections of safflower were tested for seed and oil yield on the dryland substations at Archer, Gillette, and Sheridan from 1958 through

<sup>2</sup>The work reported herein was conducted under a project of the Plant Science Division in cooperation with the A.R.S., U.S.D.A., and the Agricultural Substations. Much credit is due Thomas L. Birch, former superintendent, and Alvin F. Gale, who transferred from Sheridan to Archer; Leland R. Landers, Gillette; and L. R. Richardson, Sheridan, each of whom supervised the plots at his station.



1964. These tests were conducted in cooperation with the U.S.D.A. as part of Safflower Regional Variety Tests.

Test entries were varieties and unnamed lines. They were grown in 4-row plots 25 ft. long and replicated 4 times. All seed yields are reported in pounds per acre, and the oil is reported as percent oil content of the seed. Oil content was determined by the Agricultural Research Service, U.S.D.A., at Logan, Utah. The seed and oil yields for 1964 and the average yields for the 7-year test period are reported in Tables 1, 2, and 3. No average yields are reported for varieties grown only 1 year. The number

of years that each variety was tested is shown in the fourth column of Tables 1, 2, and 3.

Since most of the varieties were not grown all 7 years during the test period, the average yields were computed in relation to the yield of Gila. These computed averages enable the reader to compare the yields of varieties grown over a different period of time.

The average yields of seed and the percent oil of Gila for the years tested at the three stations are reported in Table 4.

The averages were computed by the following formula:

$$\frac{\text{Yield of variety for each year grown}}{\text{Yield of Gila for the same years}} = \% \text{ yield of Gila}$$

$$\text{and: } \% \text{ yield of Gila} \times \text{average yield of Gila} = \text{Computed average yield of the variety}$$

For example: N4051 was grown at Archer in 1960-63.

$$\begin{array}{l} \text{So: Yield of N4051 for 1960, 1961, 1962, 1963} \\ \text{Yield of Gila for 1960, 1961, 1962, 1963} \end{array} \times \begin{array}{l} \text{average yield} \\ \text{of Gila} \end{array} = \text{average yield of N4051.}$$

Table 1. Yield data of safflower varieties and selections grown at Archer, Wyo. 1958-1964.

Selection or variety	Yield 1964 lb/A	Percent oil 1964	Years grown	Means for period grown <sup>1</sup>	
				Yield lb/A	Percent oil
Gila	395	35.0	6	668	36.3
N-10			5	705	34.7
U.S. 10	298	34.5	5	639	34.7
N-4051			4	711	29.4
A-5731			4	545	35.6
A-0104	266	36.8	3	659	36.8
N-6			3	564	30.6
U-5	392	34.4	2	832	36.0
U-15	421	34.6	2	826	35.8
Pacific 1			2	677	34.3
12417	294	43.3	1		
River Road	248	41.2	1		
A-1049	192	39.6	1		

<sup>1</sup> Means computed from percent of Gila

Table 2. Yield data of safflower varieties and selections grown at Gillette, Wyo. 1958-1964.

Selection or variety	Yield 1964 lb/A	Percent oil 1964	Years grown	Means for period grown <sup>1</sup>	
				Yield lb/A	Percent oil
Gila	680	36.1	7	766	36.0
N-10			6	753	35.2
U.S. 10	782	36.9	5	785	35.5
A-5731			4	785	37.2
N-4051			4	719	29.9
N-6			3	816	33.1
U-15	874	36.0	2	935	35.5
U-5	834	36.7	2	891	36.3
A-0104	714	37.9	2	793	37.6
Pacific 1			2	732	35.6
12417	570	46.3	1		
River Road	470	41.5	1		
A-1049	434	42.1	1		

<sup>1</sup> Means computed from percent of Gila



Table 3. Yield data of safflower varieties and selections grown at Sheridan, Wyo. 1958-1964.

Selection or variety	Yield 1964 lb/A	Percent oil 1964	Years grown	Means for period grown <sup>1</sup>	
				Yield lb/A	Percent oil
Gila	1394	39.6	6	867	36.3
N-10			6	781	33.0
U.S. 10	1459	38.0	5	826	34.8
A-5731			4	740	34.5
N-4051			4	636	28.9
N-6			3	703	31.8
U-5	1281	36.6	2	812	32.9
A-0104	1316	39.5	2	794	35.8
U-15	1271	36.8	2	784	34.3
Pacific 1			2	735	34.2
A-1049	1455	43.9	1		
12417	1085	48.2	1		
River Road	903	44.2	1		

<sup>1</sup> Means computed from percent of Gila

Table 4. Average yield in pounds per acre and oil percentage of Gila by years at three dryland locations.

Year	Archer		STATION Gillette		Sheridan	
	Seed yield	Percent oil	Seed yield	Percent oil	Seed yield	Percent oil
1958	756	38.6	1518	35.2	1205	35.8
1959	926	37.6	741	33.4	1065	37.4
1960			638	37.0		
1961	1103	37.5	494	36.9	150	31.3
1962	378	34.9	756	34.9	989	34.6
1963	533	36.1	532	38.7	513	37.7
1964	395	35.0	680	36.1	1394	39.6
Average	682	36.6	767	36.0	886	36.1



## References

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2. Growing Safflower—an Oilseed Crop. 1961. Farmers Bulletin 2133. U.S. Dept. of Agri.
3. Leininger, L. N. Growing Safflower in Utah. 1964. Ext. Leaflet 107. Utah State Univ.
4. Powell, Laverne M. 1959. Safflower Variety Adaptation Trials in Wyoming. Wyo. Agr. Exp. Sta. Mimeo Cir. 113.
5. Riedl, W. A. 1955. Safflower in Wyoming. Wyo. Agr. Exp. Sta. Bul. 332.







Many other Wyoming publications are available from your local county agricultural agents or by writing Bulletin Room, College of Agriculture, University of Wyoming, Box 3354, University Station, Laramie, Wyoming 82071. Some crop publications include:

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| XMC 190R | Recommended Winter Grain Varieties for Wyoming. 1965   |
| XMC 192  | Recommended Spring Wheat Varieties for Wyoming. 1964   |
| XMC 194R | Recommended Spring Barley Varieties. 1965              |
| XMC 197  | Recommended Spring Oat Varieties for Wyoming. 1964     |
| XMC 198R | Hybrid Corn Performance Trials in Wyoming. 1965        |
| XMC 199  | Potato Research in Wyoming—1963. 1964                  |
| XMC 204  | Survey of Small Grain Varieties Grown in Wyoming. 1964 |
| SCD 5    | Seed Certification Directory.                          |

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