

# Proper Seeding Rate for Safflower

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Safflower (*Carthamus tinctorius*) is an annual oilseed crop adapted to North Dakota. It has been grown in North Dakota in experimental plots since 1928 and has been grown commercially since 1957. Annual acreage increased to a peak of 130,000 acres in 1962. Commercial acreage declined sharply after 1962 and fluctuated from 2,000 to 20,000 acres from 1965 to 1976 because of weed and disease problems and/or unsatisfactory economic return.<sup>1</sup> Contracted acreage in 1977, however, will exceed 50,000 acres because of the decline in prices of cereal grains and the economic competitiveness of safflower. Disease problems still exist but can be minimized. Herbicides now control most of the problem weeds.

Recommendations for seeding rates in the past have been based on establishing a stand of safflower that would maximize crop competition with weeds (2). Safflower seedling growth is slow for up to 21 days while the crop is in the "rosette" stage. Weed competition, therefore, is critical during this time. With increased acceptance of herbicide use for weed control in safflower, the need to evaluate lower seeding rates became apparent to minimize seed costs.

## Procedure

The trial was initiated in 1974. Two varieties of safflower were planted on summerfallow at five planting rates on plots 20 feet long, with 12-inch row spacing and in four replications. All planting rates were adjusted for germination and purity. Varieties were selected on basis of leaf spot disease tolerance. *Alternaria* leaf spot caused by *Alternar-*

<sup>1</sup>Jerry Knick, Plant Manager, Continental Grain Co., Culbertson, Montana, personal communication.

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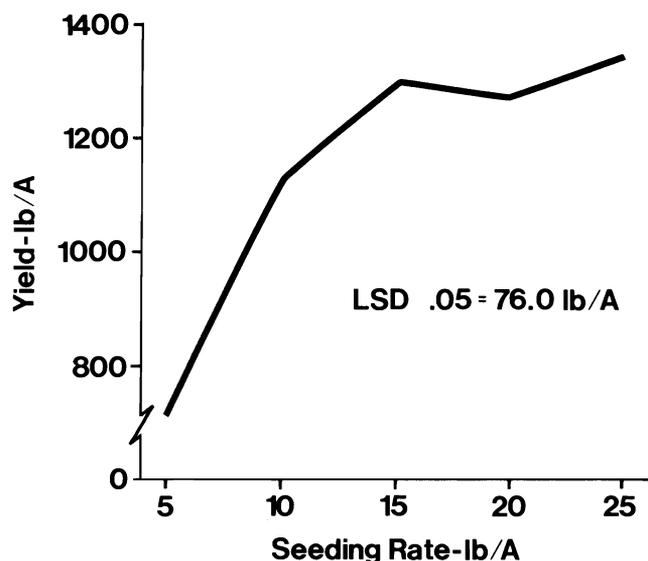


Figure 1. Average seed yield of safflower as influenced by five seeding rates, 1974-76.

*ia carthami* can be a very destructive disease in safflower (1). US-10 is very susceptible to the leaf spotting disease, while 87-14-6, an experimental line developed at Sidney, Montana, and S208 have some tolerance to the disease. The herbicide, Treflan<sup>2</sup>, was applied to the plot area each year at the rate of 3/4 pound per acre. Excellent weed control was obtained. Fertilizer was applied to eliminate nutrient variables. Soil type was a Williams Loam. Data collected include yield, test weight, per cent oil content of the seed, plant height and 50 per cent bloom date.

<sup>2</sup>Trifluralin (a,a,a-trifluoro-2, 6-dinitro-N, N-dipropyl-P-toluidene). Trade name used in this article is for the purpose of providing specific information and mention of a trade name does not constitute a guarantee or warranty of the product.

Table 1. Seed yields of two varieties of safflower as influenced by five seeding rates.

Variety	Seeding rate lb/A	Yield lb/A			
		1974	1975	1976	Average
US-10	5	499	863	811	724
	10	924	1138	1295	1119
	15	884	1666	1347	1299
	20	1029	1478	1300	1269
	25	1122	1479	1346	1316
	LSD 5%	202	198	172	107
87-14-6 <sup>1</sup>	5	500	873	797	723
	10	879	1399	1194	1157
	15	981	1513	1428 <sup>o</sup>	1307
	20	977	1551	1346	1291
	25	1054	1668	1428	1383
	LSD 5%	202	198	172	107

<sup>1</sup>S208 in 1976

## Results and Discussion

Theoretically, lower seeding rates would allow more air movement within the crop, thus minimizing damage due to *Alternaria* leaf spot disease. Since little or no *Alternaria* leaf spotting disease occurred during the three years of the study, there was no opportunity to evaluate that theory. Seed yields obtained from two varieties planted at five planting rates are recorded in Table 1. The two varieties responded similarly to seeding rates. Yields, averaged over varieties and years, show that the 15 pounds per acre (pure, live seed) planting rate will maximize yields (Figure 1). The performance of and recommendations for safflower grown in 6 to 12-inch rows is similar (1, 2, 3).

Other agronomic data are reported in Tables 2 and 3. Maturity is hastened when seeding rate is increased, but seeding rate has no effect on plant height (Table 2). Since the maturity and plant height of the varieties responded similarly to seeding rates, only variety averages are listed.

**Table 2. Average date to 50% bloom and plant height as influenced by five seeding rates averaged over varieties for 1974-76.**

Seeding rate lb/A	Date in July to 50% bloom	Plant height cm.
5	22.8	57.2
10	21.8	57.5
15	21.2	57.1
20	20.2	57.6
25	20.0	57.6

Highest test weights were obtained most consistently when safflower was planted at 15 to 25 pounds per acre (Table 3). Oil content of the seed of a particular variety apparently depends somewhat on test weight. In general, oil content of the

seed in a variety decreases as its test weight decreases. Area commercial processors have used test weight to indicate oil content of safflower, regardless of variety. This assumed that the higher the test weight, the higher the oil content of the seed. However, this relationship only exists if comparisons are made within one variety, and may not be valid if comparisons are made between varieties. For example, the 1975 average test weight of US-10 was 41.9 pounds per bushel, with a seed oil content of 38.8 per cent, while the 1975 average test weight of 87-14-6 was 44.5 pounds per bushel with a seed oil content of only 31.9 per cent.

Seeding 15 pounds per acre of a safflower variety will generally maximize test weight and oil content of the seed, though there are years when weather conditions apparently permit maximum expression of these two characters at lower seeding rates.

## Summary

Seeding 15 pounds per acre of pure live seed will maximize yields and test weight of safflower seeded in "solid" seedings (6- to 12-inch row spacing). Plant height generally is not affected by seeding rate. Oil content of the seed generally is highest when safflower is planted at 15 to 20 pounds per acre.

## References

1. Bergman, J. W., G. P. Hartman, and A. L. Black. 1975. **Safflower Production Guidelines**. Montana Ag. Exp. Sta. Capsule Information Series Number 8.
2. Hoag, B. K., E. W. French, G. N. Geiszler and A. A. Schneiter. 1969. **Safflower in North Dakota**. Bulletin 477, North Dakota Agricultural Experiment Station.
3. Knowles, Paul F., and Milton Miller. 1965. **Safflower**. California Agricultural Experiment Station and Extension Service, Circular 532.

**Table 3. Test weight and oil content of two safflower varieties as influenced by five planting rates.**

Variety	Seeding rate lb/A	Test weight - lb/bus.				Oil content of seed			
		1974	1975	1976	Avg.	1974	1975	1976	Avg.
US-10	5	42.7	40.2	44.3	42.4	37.9	37.2	39.1	38.1
	10	43.5	41.9	44.0	43.1	39.2	38.0	40.1	39.1
	15	43.9	42.4	43.9	43.4	38.5	38.0	39.7	38.7
	20	43.0	42.6	43.7	43.1	39.1	40.3	40.1	39.8
	25	43.7	42.6	43.5	43.2	39.4	40.4	40.1	40.0
	Avg.	43.4	41.9	43.9		38.8	38.8	39.8	
87-14-6 <sup>1</sup>	5	43.4	43.5	43.5	43.4		31.5	43.2	37.4
	10	43.6	43.4	43.4	43.4		31.3	43.0	37.2
	15	45.1	43.2	43.2	43.8		32.6	42.5	37.6
	20	45.5	43.2	43.2	43.9		32.6	42.9	37.8
	25	44.9	43.0	43.0	43.6		32.4	42.8	37.6
	Avg.	44.5	43.3	43.3			31.9	42.9	

<sup>1</sup>S208 in 1976