

PROJECT TITLE: Dryland Evaluation of Standard and Specialty Oil Safflower Varieties.

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OBJECTIVES:

Safflower serves as an excellent crop component in many areas of northern Montana in flexible dryland rotations with small cereal grains. A significant portion of the north central cropping area has climatic conditions suitable for production of standard oil safflower; and certain smaller, yet significant areas further have specific climatic conditions required for production of specialty safflower lines of the high-oleic oil type. It is the objective of this study to evaluate existing commercial entries along with promising experimental lines being developed at Sidney to determine varietal appropriateness, and subsequent release and recommendation information specific to environmental conditions in northern areas. The MAPS program is utilized to refine the definition of areas appropriate for the production of quality safflower.

RESULTS:

All entries in the 1998 safflower variety trial performed slightly below normal when compared with long-term safflower performance at Havre. Although planting date (May 6 = 2 days and 9 days before last 1998 freeze and long-term average last freeze, respectively), was delayed beyond that desired due to inadequate seedbed moisture; seedling development and early vegetative growth was abnormally sluggish even after precipitation was received. Stand and biomass development was below that expected under 1998 growing conditions. Flowering date (August 2) was about as late as can be considered comfortable at Havre in terms of achieving an adequate stage of maturity before first frost.

July mean temperature was 72.1 degrees F (2.3 degrees higher than normal), and Total Growing Degree Day (GDD) values (base 50) were 110 percent of normal. Mean yields were 94 percent of normal, and percent oil values were significantly below normal for Havre.

Stand percent, flower date, plant height, yield, test weight, and oil data for the 1998 trial are presented in Table 1. Long-term (1989-1998) yield and percent oil summaries on selected entries are presented in Table 2.

SUMMARY:

Single trials are established annually on-station at Havre using standard plot techniques in a randomized complete block design. Entries were planted in 4 or 6-row plots, 20 feet in length on a 12-inch spacing utilizing a 'Rem' self-propelled cone seeder equipped with 'Acra-plant' hoe openers. Plots were trimmed to 16 feet and harvested with a plot combine. Other variables specific to the trials are listed in the data table. Data is summarized for selected

entries having been tested 3 years or more during the reporting period 1989-1998. No data were available for 1992 due to severe hail injury, nor the 1993 crop due to a short, cool, and wet growing season.

FUTURE PLANS:

It is planned that these investigations be continued on an annual basis in on-going support of the Montana safflower breeding and variety development project.

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TABLE 1. DRYLAND FALLOW MONTANA UNIFORM SAFFLOWER VARIETY EVALUATION NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1998.

VAR/SELN DESCRIPTION	STAND %	FLOWER DATE 1/	PLNT HT Inches	YIELD Lbs/Ac	TEST WT Lbs/Bu	OIL % @0%Moist.	OIL % @8%Moist.	Lbs/Ac
GW 9025 97 California	65.63	213.67	22.51	1214.03	43.83	33.80	31.10	377.20
GW 9024 97 California	61.47	213.33	22.51	1152.73	43.97	34.33	31.60	364.67
95B 7181 96 D0L5 #115	92.20	214.67	17.03	1079.63	44.57	37.37	34.37	371.00
95B 7174 96 D0L5 #114	92.73	212.00	21.46	1066.27	44.00	37.17	34.20	363.47
S-518 97 Williston	95.33	213.33	18.64	1044.30	40.97	40.77	37.47	392.53
FINCH ND FSF #95/21W	87.20	214.67	20.14	1033.43	45.80	36.53	33.63	347.67
GW 9023 97 California	64.03	215.00	22.83	1014.67	44.20	32.73	30.13	306.20
96B 6757 97 D014 #125	80.20	213.33	19.42	1001.13	41.93	39.37	36.23	362.20
96B 6158 97 I015 #102	77.07	213.33	18.83	996.93	42.20	43.00	39.57	394.53
96B 6798 97 D0L6 #110	88.80	212.00	19.09	991.80	42.53	40.60	37.37	371.47
96B 6662 97 I012 #120	63.03	212.00	20.14	954.87	40.87	38.60	35.50	339.30
91B 6429 94 D0L1 #218/128	80.20	213.33	20.41	948.87	41.60	38.00	34.97	332.00
96B*7018 97 D0L7 #130	84.63	212.00	18.90	946.23	40.83	38.43	35.37	334.50
MORLIN MT Cert. #971-916	87.77	216.33	19.62	937.27	41.07	37.43	34.43	323.23
95B 2896 97 WL04 #105	95.33	216.00	22.47	920.53	41.00	39.10	35.97	331.23
MONT2000 CA #97A-6911-7081	95.83	212.00	19.36	920.13	41.23	39.37	36.20	333.67
95B 7348 96 D0L5 #310/130	96.90	214.67	18.24	917.50	41.57	39.63	36.50	334.57
GW 9022 97 California	52.60	216.67	20.54	889.30	43.30	31.60	29.07	258.10
96B*7007 97B 7192	96.13	216.00	22.38	886.17	41.23	38.17	35.10	313.37
91B 2166 97 MTDSVT #313/105	89.07	212.00	21.26	876.87	39.97	35.90	33.03	289.10
MONT2001 MT Cert. #971-912	92.97	216.00	19.62	854.20	39.47	39.00	35.90	308.73
95B 3538 97DLi1 #126	88.27	213.33	21.85	835.07	42.73	37.23	34.27	283.73
96B6731W 97 W015 #121	75.27	216.00	19.49	812.53	40.70	39.83	36.63	297.77
CENTENNL MT Cert. #901-1925	96.10	214.67	21.42	806.63	41.93	39.67	36.47	293.90
96B 6333 97 D0L3 #109	80.20	212.00	18.37	804.90	40.37	37.77	34.73	280.33
96B 6999 97 D0L7 #123	87.00	214.67	20.47	788.87	39.50	39.37	36.23	285.47
95B 2898 97 DLi1 #125	88.27	216.67	19.29	778.53	41.40	38.13	35.07	273.47
96B6430W 97B W0L4 #102	56.73	217.00	18.27	776.53	37.90	47.27	43.50	337.47
91B 3842 96 DLi2 #216/113	95.07	213.33	21.13	740.80	39.90	40.17	36.93	273.20
ERLIN MT Cert. #951-900	80.77	212.00	17.45	565.10	40.53	37.63	34.63	196.57

STATISTICAL SUMMARY	STAND %	FLOWER DATE 1/	PLNT HT Inches	YIELD Lbs/Ac	TEST WT Lbs/Bu	OIL % @0%Moist.	OIL % @8%Moist.	Lbs/Ac
EXPERIMENTAL MEANS	82.89	214.07	20.10	918.53	41.70	38.27	35.21	322.35
C.V. 2: (S OF MEAN/MEAN)*100	4.12	.45	4.59	7.40	1.22	2.19	2.19	8.01
LSD (0.05)	9.67	2.70	2.61	192.32	1.44	2.38	2.19	73.12

1/ No. of Days from January 1 (214 = August 2)

CLIMATIC and NURSERY MANAGEMENT DATA (summarization yet pending)

TABLE 2. TEN-YEAR YIELD AND PERCENT OIL SUMMARY ON SELECTED ENTRIES FROM A FALLOW SAFFLOWER VARIETY PERFORMANCE NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1989-1998.

VARIETY OR SELECTION	NO. OF YEARS TESTED	YIELD (POUNDS PER ACRE)							OIL (Percent by Weight) @ 8% MOISTURE								
		1994	1995	1996	1997	1998	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE YIELD	PERCENT OF CHECK YIELD	1994	1995	1996	1997	1998	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE OIL %	PERCENT OF CHECK OIL %
STIRLING	3	1185.1	2240.7	1126.5	-	-	1517.4	1307.2	134.0	35.3	32.5	33.1	-	-	33.6	34.0	84.3
FINCH	8	1072.1	1727.0	1048.8	470.0	1033.4	1144.0	1144.0	117.2	37.2	34.7	34.7	33.3	33.6	35.8	35.8	88.7
SAFFIRE	4	1173.2	-	-	-	-	1072.5	1128.8	115.7	34.7	-	-	-	-	33.2	31.5	78.1
MORLIN	6	813.8	1898.6	942.0	466.6	937.3	1143.8	1094.5	112.2	41.0	37.1	35.1	34.8	34.4	36.6	37.4	92.7
S-208	5	966.8	1795.6	-	-	-	1161.5	1051.7	107.8	40.6	35.2	-	-	-	39.1	37.8	93.6
90B 6011	3	873.8	1763.9	1024.6	-	-	1220.8	1051.7	107.8	41.8	35.6	38.1	-	-	38.5	40.1	99.3
MONT 2000	7	952.1	1997.6	972.1	452.3	920.1	1045.4	1018.0	104.3	43.0	39.0	40.2	36.6	36.2	39.8	40.4	100.1
S-541	6	907.3	1821.7	918.4	-	-	1059.8	980.8	100.5	42.9	40.1	40.6	-	-	42.1	41.1	101.8
CENTENNIAL	8	780.6	1679.5	937.7	673.5	806.6	975.7	975.7	100.0	42.1	38.6	39.0	38.7	36.5	40.4	40.4	100.0
91B 6668	4	888.6	1741.1	870.4	517.4	-	1004.4	962.8	98.7	42.0	37.9	37.3	36.2	-	38.3	39.1	96.8
87B1298	3	-	-	-	-	-	961.7	961.5	98.5	-	-	-	-	-	39.6	37.4	92.6
4/ OKER	4	692.6	-	-	-	-	908.0	955.6	97.9	39.0	-	-	-	-	39.4	37.4	92.6
ERLIN	5	873.2	1784.9	925.0	421.2	565.1	913.9	914.0	93.7	40.6	37.3	35.9	34.5	34.6	36.6	37.9	93.9
GIRARD	5	830.0	1618.0	-	-	-	1006.3	911.2	93.4	40.5	35.9	-	-	-	39.2	37.8	93.7
87B1650	3	-	-	-	-	-	907.3	907.1	93.0	-	-	-	-	-	39.7	37.5	92.9
85B4431	3	-	-	-	-	-	902.1	901.9	92.4	-	-	-	-	-	37.6	35.6	88.1
88B 3006	3	813.8	1628.6	-	-	-	1137.7	900.1	92.2	41.0	37.3	-	-	-	39.7	39.2	97.1
MONT 2001	5	822.9	1533.7	922.7	315.9	854.2	889.9	890.0	91.2	42.3	37.8	38.7	34.4	35.9	37.8	39.2	97.0
S-317	4	975.3	-	956.5	-	-	1021.0	820.7	84.1	41.9	-	38.8	-	-	40.3	39.5	97.8
MT 3697	3	761.8	-	-	-	-	680.9	722.2	74.0	43.1	-	-	-	-	42.9	40.4	100.0
MEAN (ENTRIES LISTED)		904.9	1787.0	967.7	473.8	852.8	-	980.0	-	40.5	36.9	37.4	35.5	35.2	-	38.0	-
5/ Grwg Ssn Ppt. (in.)		6.32	14.12	6.28	7.14	9.25	8.37										
S1 PAW in. to SD at Plt		7.91	7.25	8.88	7.25	6.13	8.03										
Tot Plt Avl Water (in.)		14.23	21.37	15.16	14.39	15.38	16.40										
Soil NO3(lbs) to SD@Plt		250.0	210.0	88.0	248.0	N/A											
SD (Smplng Dpth inches)		48.0	48.0	48.0	48.0	48.0											
Fertilizer App. (# N)		70.0	70.0	70.0	70.0	70.0											
(# P2O5)		40.0	40.0	40.0	40.0	40.0											
(# K2O)		0.0	25.0	25.0	25.0	25.0											

Check variety is Centennial.

1/ Only the five most recent years are shown, but the summary calculations include all the years noted.

In 1991 stands were variable due to soil crusting following a 1.8" cloudburst 10 days after seeding. Affected most were Finch, 85B 3829, Oker, and Saffire.

The 1992 nursery was destroyed by hail in July and frost in August.

The 1993 nursery was destroyed by frost and snow in August.

2/ 10-yr. CA = (x/y) * where x = average yield or oil content of the entry for years tested, y = average yield or oil content of Centennial for the same years, and z = 10-yr. average yield and oil content for the check variety Centennial.

3/ Percent of Centennial yield or oil content for the same data years.

4/ 80B 2793 in 1982, 80B 2793-2 in 1983.

5/ Seeding to 14 days prior to harvest maturity.