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PROJECT TITLE: Safflower Variety Performance Evaluation

PERSONNEL:

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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; particularly in view of the status of oilseeds in the Federal Farm Program. A significant portion of the north central cropping area has climatic conditions suitable for production of safflower. 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 M.A.P.S. program is utilized to refine definition of cropping areas appropriate for the production of quality safflower.

SUMMARY:

Single trials were 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 `Hege 125C' plot combine. Other variables specific to the trials are listed in the data tables.

At Havre, total annual precipitation was 15.05 inches or 127 percent of the average of years since 1916. May through September precipitation was 10.39 inches or 130 percent of the long-term average.

RESULTS:

Yields were generally good. However, severe soil crusting due to a 1.8" thundershower received ten days after planting resulted in poor stands and subsequently lower yields than would have been expected on the basis of overall growing season conditions. Due to stand problems, variability not attributable to cultivar differences, was high for the 1991 trial.

Yield, test weight and oil content data for 1991 are summarized in Table 1. Test weights were generally excellent and oil contents ranged from poor to good depending on variety or selection. Ten-year yield and percent oil summaries on selected entries are presented in Table 2.

`Finch', Montana developed, currently yields very well among released, standard cultivars on a `Ten-year Comparable Average' basis at Havre. `Finch', a white-hulled line, features higher test weight; and serves as a more disease-resistant replacement for `S-208' in the birdseed market. However, the average oil content of `S-208' is nearly three percent higher than that of `Finch'.

`S-317', `S-208' and `S-541' continue to perform very well under dryland conditions in the Havre area as alternaria and/or pseudomonas disease organisms have generally not become factors limiting production. Other named varieties among those yielding slightly less, but within ten percent of the `S-208' check are `Rehbein' and `Centennial.'

At Havre, the oleic line `MT 3697' has performed well (particularly in terms of oil quality), and yield has averaged 82 percent of the linoleic check cultivar. `Montola 2000' yield has thus far surpassed `MT 3697', but it has not yet reached the three years of testing considered a minimum for inclusion in this report summary.

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 SAFFLOWER VARIETY NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1991.

ID	VARIETY OR SEL'N	1/ FLOWER DATE	PLNT HT Inches	YIELD Lbs/Ac	TEST WT Lbs/Bu	OIL DRY BASIS %	OIL @ 8% MOISTURE %
04	FINCH	216.33	26.31	2048.97	45.60	41.00	37.73
15	85B 3829	218.00	25.33	1804.50	42.27	40.22	37.00
08	SAFFIRE	209.67	23.23	1732.53	43.93	35.85	32.97
09	OKER	214.00	27.03	1549.93	42.00	42.92	39.47
10	S-208	218.00	25.85	1483.03	41.90	42.51	39.13
18	89B 6145	214.00	23.88	1391.23	41.00	46.64	42.90
03	S-541	215.33	26.90	1269.10	42.13	45.37	41.70
07	S-317	214.33	27.30	1264.77	41.53	45.01	41.40
01	CENTENNIAL	216.33	27.43	1239.80	41.83	45.60	41.93
11	85B 3910	214.67	26.38	1196.77	40.03	42.35	38.97
14	87B 1650	216.67	28.61	1191.20	39.23	42.12	38.77
12	85B 4431	215.67	27.56	1176.43	42.30	40.57	37.33
17	88B 3217	217.00	27.95	1174.43	40.57	44.04	40.50
13	87B 1298	215.00	28.74	1172.30	40.47	42.03	38.67
05	GIRARD	214.00	28.98	1156.00	42.10	43.18	39.73
02	MONTOLA 2000	213.33	24.48	1139.30	40.03	45.28	41.63
16	88B 3006	216.33	27.03	970.73	41.13	44.34	40.80
06	MT 3697	216.67	26.25	725.70	40.30	45.43	41.77

ID	VARIETY OR SEL'N	1/ FLOWER DATE	PLNT HT Inches	YIELD Lbs/Ac	TEST WT Lbs/Bu	OIL DRY BASIS %	OIL @ 8% MOISTURE %
EXPERIMENTAL MEANS		215.30	26.62	1315.93	41.58	43.03	39.58
C.V. 2: (S OF MEAN/MEAN)*100		.29	2.94	10.38	.86	.83	.84
LSD (0.05)		1.77	2.25	392.56	1.03	1.03	.96

1/ Flowering Date = No. of Days from January 1 (215 = August 3)

Note: Stands were variable due to soil crusting following a 1.8" cloudburst 10 days after planting. Affected most were Finch, 85B 3829, Oker, and Saffire.

CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date: 05/10/91
Harvest Date: 10/08/91
Seeding Depth: 1.25 in.
Soil Series: Joplin-Kevin Cl-Loam
Previous Crop: Fallow
Soil Temp @ Sdg: 66F @ 2in., 58F @ 4in.
Root Penetration Depth: N/A in.
Depth to Moisture at Sdg: 0.00 in.
Probed Moist.Depth @ Sdg: 55.0 in.+
Herbicide: Trifluralin @ .75lbs/ac
Measured Soil Water on 04/02/91: 7.88 in. (sampling depth = 48 in.)
Precipitation 04/02/91 to Seeding: 2.14 in (1.91 in events > .1 in.)
Initial Stored Soil Water at Seeding: 10.02 in. (sampling depth = 48 in.)
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):
Total - all measurable events: 10.27 in.
Total - all events >.1 inches: 9.41 in.
Soil Analysis on 4/02/91: (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):
NO3(lbs/ac)= 204 , P(ppm olsen)= 22 , K(ppm)= 359 , pH= 7.9, O.M.(%) = 1.3
Fertilizer: 70#N,40#P2O5 via 46-0-0+11-52-0 bd'cst & till-incorp pre-plant

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. 1982-1991.

VARIETY OR SELECTION	NO. OF YEARS TESTED 1/	YIELD (POUNDS PER ACRE) 1987	1988	1989	1990	1991 2/	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE YIELD 3/	PERCENT OF S-208 YIELD 4/	OIL (Percent by Weight) @ 8% MOISTURE 1987	1988	1989	1990	1991 2/	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE OIL % 3/	PERCENT OF S-208 OIL % 4/
FINCH	8	1871.6	960.8	819.5	931.9	2049.0	1144.9	1318.9	107.8	41.2	42.1	39.7	35.5	37.7	38.7	38.4	93.7
S-317	5	1940.8	-	-	887.4	1264.8	1264.5	1292.5	105.7	46.4	-	-	39.0	41.4	43.1	43.2	105.4
8283555	4	2152.7	1126.2	477.6	948.3	-	1176.2	1259.5	103.0	44.5	45.5	43.0	41.1	-	43.5	42.3	103.3
S-208	10	1870.9	1135.9	753.4	808.6	1483.0	1223.1	1223.1	100.0	43.6	44.3	42.7	37.8	39.1	41.0	41.0	100.0
SAFFIRE	5	1869.0	840.2	695.5	588.8	1732.5	1165.2	1177.4	96.3	36.5	36.2	34.3	31.0	33.0	34.2	33.7	82.4
S-541	10	1942.3	965.3	603.5	838.5	1269.1	1164.0	1164.0	95.2	46.9	47.7	45.2	41.8	41.7	44.2	44.2	107.9
REHBEIN	4	-	-	-	-	-	1353.0	1156.3	94.5	-	-	-	-	-	35.4	35.9	87.6
CENTENIAL	4	-	966.1	739.3	948.7	1239.8	973.5	1139.1	93.1	-	47.0	44.6	41.6	41.9	43.8	43.8	106.8
82B1277	3	1811.2	287.8	-	957.1	-	1018.7	1096.9	89.7	46.8	45.2	-	37.7	-	43.2	42.2	103.1
87B1650	3	-	-	712.9	817.8	1191.2	907.3	1093.3	89.4	-	-	41.6	38.7	38.8	39.7	40.8	99.5
HARTMAN	6	1584.3	-	-	-	-	1174.9	1071.1	87.6	39.3	-	-	-	-	36.7	36.7	89.7
8584431	4	-	801.1	755.8	774.2	1176.4	876.9	1026.1	83.9	-	43.2	41.1	34.5	37.3	39.0	39.0	95.2
8381954	5	1736.0	521.9	694.6	814.4	-	985.1	1015.2	83.0	44.3	44.3	45.1	39.8	-	43.5	42.0	102.7
MT 3697	7	1895.6	1043.7	555.1	-	725.7	906.3	1009.7	82.5	44.5	45.9	43.9	-	41.8	43.3	42.4	103.5
GIRARD	8	1773.8	549.8	517.3	910.1	1156.0	838.2	965.5	78.9	43.2	44.3	41.0	38.6	39.7	40.6	40.3	98.3
5/ OKER	9	1557.3	115.0	630.0	759.6	1549.9	755.0	782.7	64.0	43.5	44.1	41.8	37.5	39.5	41.1	41.0	100.2
8583918	3	-	209.7	526.8	741.6	-	492.7	670.0	54.8	-	47.7	46.0	43.0	-	45.6	44.9	109.6
MEAN (ENTRIES LISTED)		1833.8	732.6	652.4	844.8	1348.9	-	1086.0	-	43.4	44.4	42.3	38.4	39.3	-	40.7	-
6/ Grwg Ssn Ppt. (in.)		6.01	5.13	10.09	4.92	10.27	7.65										
7/ Sl PAW in. to SD@Plt		11.61	9.76	8.01	7.50	10.02	8.83										
Tot Plt Avl Water (in.)		17.62	14.89	18.10	12.42	20.29	16.48										
Soil NO3(lbs) to SD@Plt		94.0	122.0	174.0	232.0	204.0											
SD (Smpling Dpth inches)		48.0	48.0	48.0	48.0	48.0											
Fertilizer App. (# N)		43.0	39.0	39.0	45.0	70.0											
(# P205)		43.0	32.0	32.0	30.0	40.0											

Check variety is S-208.
1/ Only the five most recent years are shown, but the summary calculations include all the years noted.
2/ Stands were variable due to soil crusting following a 1.8" cloudburst 10 days after planting. Affected most were Finch, 858 3829, Oker, and Saffire.
3/ 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 S-208 for the same years, and z = 10-yr. average yield and oil content for the check variety S-208.
4/ Percent of S-208 yield or oil content for the same data years.
5/ 808 2793 in 1982, 808 2793-2 in 1983.
6/ Seeding to 14 days prior to harvest maturity.
7/ Depth of moist soil (ft.) * 2.00 in. PAW/ft except starting in 1986 where soil PAW values are actual gravimetric measurements.