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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 possess 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 1996 safflower variety trial performed reasonably well in view of the fact that early climatic conditions resulted in sluggish vegatative growth (vegatative biomass was only about two-thirds that noted in better safflower years in the past). Flowering date 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 69.6 degrees F, and Total Growing Degree Day (GDD) values (base 50) were 97 percent of normal, while July-September GDD was 101 percent of the 1951-1996 average for Havre. Mean yields were down about 200 lbs, but mean test weight was excellent at over 40 lbs.

Stand percent, flower date, plant height, yield, and test weight for the 1996 trial are presented in Table 1. Long-term (1987-1996) yield and percent oil summaries on selected entries have not yet been prepared since 1996 oil data is not yet available. Long-term data for the previous ten year period (1986-1995) are presented in Table 2.

`Finch', Montana developed, continues to yield 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 2 percent higher than that of Finch.

In the absence of 1996 oil data, further comment about individual entry performance is likely not appropriate at this time.

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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 table. Data is summarized for selected entries having been tested 3 years or more during the reporting period 1986-1995. 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.

NARC will likely cooperate with a portion of NWARC's current investigations regarding the potential for use of safflower as a livestock forage. It is unlikely that under Havre area dryland conditions growers would plant safflower with intentions of haying it as is being done in western Montana, but the potential for salvaging as forage a crop which is not expected to produce mature seed is gaining interest. Such flexibility may, at least for diversified operators, provide greater incentive to grow safflower for the rotational benefits it offers in a small grain program.

PRELIMINARY SPONSOR/COOPERATOR INFO ONLY! (ADDITIONAL DATA PENDING)

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TABLE 1. DRYLAND FALLOW MONTANA UNIFORM SAFFLOWER VARIETY EVALUATION NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1996.

VAR/SELN DESCRIPTION	STAND %	FLOWER DATE 1/	PLNT HT Inches	YIELD Lbs/Ac	TEST WT Lbs/Bu	OIL % @0%Moist.	OIL % @8%Moist.	OIL Lbs/Ac @8%Moist.
STIRLING 95 MTDSVT #317	95.33	210.67	17.98	1126.53	42.70	.	.	.
91B 1130 94 DLI3 #108	98.70	211.00	21.33	1074.53	40.47			
FINCH 1994 FS 94/20	97.40	214.67	21.92	1048.77	45.20	P	P	P
90B 6011 94 MTDSVT #115	98.70	214.67	21.59	1024.60	39.17			
91B 1126 95 MTDSVT #104	98.43	215.33	22.05	1004.13	42.70	E	E	E
91B 1147 94 DLI3 #110	93.77	214.33	21.00	979.40	39.13			
MONT2000 MT Cert. #911-906	98.20	212.67	16.86	972.10	41.20	N	N	N
91B 6342 94 DOL3 #111	94.83	211.00	16.21	964.53	41.50			
S-317 '95' California	100.00	210.00	21.06	956.47	40.80	D	D	D
MORLIN MT Cert. #921-1631	98.97	214.33	20.34	942.00	39.07			
CENTENNL MT Cert. #901-1925	99.23	214.00	19.42	937.73	41.50	I	I	I
ERLIN MT Cert. #951-900	99.73	210.00	17.98	925.03	38.80			
MONT2001 MT Cert. #941-1780	94.57	215.33	18.37	922.67	40.57	N	N	N
S-541 '95' California	98.43	212.33	20.87	918.37	42.43			
91B 1747 94 DLI1 #117	98.93	215.33	19.42	892.33	41.10	G	G	G
91B 6668 94 MTDSVT #117	96.10	212.33	17.85	870.37	39.60			
HI-PRO 94 DLI4 #126	100.00	211.33	21.06	832.30	38.73			
94B 6194 95 DOL2 #117	92.17	210.67	17.13	754.63	36.87			
EXPERIMENTAL MEANS	97.42	212.78	19.58	952.58	40.64	.	.	.
C.V. 2: (S OF MEAN/MEAN)*100	1.80	.34	4.43	6.31	1.07			
LSD (0.05)	5.04	2.08	2.49	172.75	1.25			

1/ No. of Days from January 1 (213 = July 31)

CLIMATIC and NURSERY MANAGEMENT DATA

Exp #: 96-7702-SA Field: An-3-5 Design: __RCB__ # Ents: 18 # Reps: 3 Plot-Obsrv: 108sqft. Hvst-Obsrv: 64 sqft.
Qtr: ___SWNW___ Section: 33 Twnshp: 32 N Range: 15 E Latitude: 48.48 N Longitude: 109.78 W Elevation: 2689 ft.

Seeding Date: 05/07/96 Sd'g Depth: 1.25 in. Depth to Moisture @ Sd'g: 0.00 in. Moist Soil Depth @ Sd'g: 55.0+ in.
Soil Temp @ Sd'g: 44.0F @ 1 in. 45.0F @ 2 in. 46.0F @ 4 in. Soil Texture: CL Soil Series: _____Kevin CL_____
Cropping System: _X_ Fallow ___ Recrop ___ Full-Till _X_ Reduced-Till ___ No-Till # Tillages: 4 # Chem Apps: 1
Cropping System Details: 1x Chem Flw 9/94, 1x Sweep Till 5/95, 2x Sweeps/Rods 7&9/95, 1x Triple K 5/96 (seed'g prep)
Cropping History: 1 Yr Ago = 1995 = ___Fallow___ 2 Yrs Ago = 1994 = _Fdn Amidon_ 3 Yrs Ago = 1993 = ___Fallow___
Fertilizer: 70#N,40#P2O5,25#K2O/ac via gran. blend brd'cst & till-incorp. 9/95 Herbicide: 'Treflan'@ 1.5 pts/ac PPI
Harvest Date: 10/14/96 Root Penetration Depth: __ in. Comments: __Pre-Plant Soil Analysis was Pre-Fertilization___

Depth	PRE-PLANT SOIL ANAL 09/25/95 Max Depth=48"									04/19/96	POST-HVST SOIL ANAL 10/04/96 (Max Depth=48"								
	in. PAW	pH	% OM	Lb/a NO3	ppm P	ppm K	ppm S	Soil Text	CEC Txt	in. PAW	in. PAW	pH	% OM	Lb/a NO3	ppm P	ppm K	ppm S	Soil Text	CEC Txt
0 -6"	1.01	8.0	1.2	14	20	258	20	CL	21.8	1.16	.70	8.2	1.3	4	26	366	18	CL-	21.8
6-24"	3.22			18			28	CL		4.21	1.05			6			24	CL-	
24-36"	2.62			12				CL		3.24	.73			4				CL-	
36-48"	2.03			44				CL		1.84	.80			56				CL-	
TOTAL:	8.88			88						10.45	3.28			70					

Precipitation & Stored Soil Water Summary: 04/19/95 to Sd'g: 0.80 in. (0.69 in events =>.1 in.) Calc'd Initial Soil Water @ Sd'g: 11.94 in.
Sd'g to 10/04/96: 6.34 in. (5.52 in events =>.1 in.) Meas'd Resid Soil Water 10/04/96: 3.28 in.
Growing Season (05/07/96 to 14 days prior to Harvest Maturity: 6.28 in.) (5.19 in events =>.1 in.)
Post-Grwg Seas (14 days prior to Harvest Maturity to 10/04/96: 0.39 in.) (0.33 in events =>.1 in.)
Adj'd Summary: Init GS H2O Inv + 'Init GS Inv to Hvst' Prec - Hvst Resid H2O - 'PostGS' Prec (Calc'd ET: 14.57 in.)

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. 1986-1995.

VARIETY OR SELECTION	NO. OF YEARS TESTED 1/	YIELD (POUNDS PER ACRE) 1991 2/	1992 3/	1993 3/	1994	1995	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE YIELD 4/	PERCENT OF S-208 YIELD 5/	OIL (Percent by Weight) @ 8% MOISTURE 1991 2/	1992 3/	1993 3/	1994	1995	AVERAGE FOR YEARS TESTED	10-YR. COMPAR. AVERAGE OIL % 4/	PERCENT OF S-208 OIL % 5/
FINCH	8	2049.0	-	-	1072.1	1727.0	1381.8	1379.6	108.4	37.7	-	-	37.2	34.7	38.6	38.6	94.3
MORLIN	3	1804.5	-	-	813.8	1898.6	1505.7	1353.8	106.4	37.0	-	-	41.0	37.1	38.4	40.9	100.1
S-317	5	1264.8	-	-	975.3	-	1345.0	1317.5	103.5	41.4	-	-	41.9	-	43.0	42.9	105.0
82B3555	4	-	-	-	-	-	1176.2	1310.3	103.0	-	-	-	-	-	43.5	42.2	103.3
S-208	8	1483.0	-	-	966.8	1795.6	1272.4	1272.4	100.0	39.1	-	-	40.6	35.2	40.9	40.9	100.0
SAFFIRE	6	1732.5	-	-	1173.2	-	1166.5	1268.9	99.7	33.0	-	-	34.7	-	34.3	33.9	82.9
MONT 2000	4	1139.3	-	-	952.1	1997.6	1243.3	1252.0	98.4	41.6	-	-	43.0	39.0	41.4	44.3	108.4
S-541	8	1269.1	-	-	907.3	1821.7	1211.4	1211.4	95.2	41.7	-	-	42.9	40.1	44.0	44.0	107.6
87B1298	3	1172.3	-	-	-	-	961.7	1205.6	94.7	38.7	-	-	-	-	39.6	40.5	99.2
85B1837	3	-	-	-	-	-	850.6	1203.5	94.6	-	-	-	-	-	40.5	39.8	97.4
CENTENIAL	6	1239.8	-	-	780.6	1679.5	1059.0	1164.4	91.5	41.9	-	-	42.1	38.6	42.6	43.6	106.7
82B1277	3	-	-	-	-	-	1018.4	1140.7	89.6	-	-	-	-	-	43.2	42.1	103.1
87B1650	3	1191.2	-	-	-	-	907.3	1137.2	89.4	38.8	-	-	-	-	39.7	40.7	99.5
85B4431	4	1176.4	-	-	-	-	876.9	1067.5	83.9	37.3	-	-	-	-	39.0	38.9	95.2
83B1954	5	-	-	-	-	-	985.1	1056.1	83.0	-	-	-	-	-	43.5	42.0	102.7
GIRARD	8	1156.0	-	-	830.0	1618.0	1052.0	1052.0	82.7	39.7	-	-	40.5	35.9	40.7	40.7	99.6
88B 3006	3	970.7	-	-	813.8	1628.6	1137.7	1023.0	80.4	40.8	-	-	41.0	37.3	39.7	42.3	103.5
6/ OKER	7	1549.9	-	-	692.6	-	870.7	925.0	72.7	39.5	-	-	39.0	-	41.3	41.7	102.0
MT 3697	4	725.7	-	-	761.8	-	771.6	905.1	71.1	41.8	-	-	43.1	-	43.6	42.8	104.7
85B3918	3	-	-	-	-	-	492.7	697.1	54.8	-	-	-	-	-	45.6	44.8	109.6
MEAN (ENTRIES LISTED)		1328.3	-	-	894.9	1770.8	-	1147.2	-	39.3	-		40.6	37.3	-	41.4	-
7/ Grwg Ssn Ppt. (in.)		10.27	10.19	-	6.32	14.12	8.39										
8/ Sl PAW in. to SD@Plt		10.02	7.59	-	7.91	7.25	8.78										
Tot Plt Avl Water (in.)		20.29	17.78	-	14.23	21.37	17.17										
Soil NO3(lbs) to SD@Plt		204.0	252.0	-	250.0	210.0											
SD (Smplng Dpth inches)		48.0	48.0	-	48.0	48.0											
Fertilizer App. (# N)		70.0	70.0	-	70.0	70.0											
(# P2O5)		40.0	40.0	-	40.0	40.0											
(# K2O)		0.0	0.0	-	0.0	25.0											

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, 85B 3829, Oker, and Saffire.

3/ The 1992 nursery was destroyed by hail in July and frost in August.
The 1993 nursery was destroyed by frost and snow in August.

4/ 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.

5/ Percent of S-208 yield or oil content for the same data years.

6/ 80B 2793 in 1982, 80B 2793-2 in 1983.

7/ Seeding to 14 days prior to harvest maturity.

8/ Depth of moist soil (ft.) * 2.00 in. PAW/ft except starting in 1986 where soil PAW values are actual gravimetric measurements.