2007
Annual Report on Subcontracted Research
to
The Institute for Biobased Products
by
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Activities Summary

Research Conducted Utilizing a Funding Extension of a Grant Received in 2006:

1. Multi-Specie Evaluation of Alternative Oilseed Crops for Adaptation and Production in Northern Montana for Use as Biobased Fuels and Lubricants

   This trial was conducted only at Northern Agricultural Research Center (NARC) in 2007. In previous years, four other Research Centers (CARC, NWARC, SARC, and WTARC) also participated. Entries consisted of four (4) different species and twenty nine (29) cultivars or lines. Specie and varietal adaptation of oilseed crops was evaluated, focusing on seed yield, oil quality and oil quantity, while also measuring an array of plant characteristics including percent stand, plant count, flower date, plant height, percent shatter, seed moisture and test weight. The objective of the trial was to determine which oilseed species or lines would produce the best seed yield and oil production in north central Montana while further determining the oilseed best suited for biobased fuel and lubricant applications.

2. Winter Camelina Seeding Rate Evaluations

   In an effort to determine initial seeding rates and also whether winter camelina has the ability to survive and produce seed, a trial was seeded in the fall of 2006. The trial focused on the effect of winter camelina seeding rate on seed yield, oil quality and oil quantity, while also measuring an array of plant characteristics including percent stand, plant count, flower date, plant height, percent shatter, seed moisture and test weight.

3. Camelina Seeding Date/Method Evaluations

   The trial focused on the effect of seeding date and seeding method on camelina yield, oil quality and oil quantity, while also measuring an array of plant characteristics including percent stand, plant count, flower date, plant height, percent shatter, seed moisture and test weight. The camelina was planted on three seeding dates (March 24, April 17 and April 25), with either two or three seeding methods (double-disk drill, drop seed plus phoenix harrow and/or drop seed only). The objective of this trial was to determine the best combination of seeding date and seeding method for seed and oil production under dryland, minimum input, no-till cropping conditions for biobased fuel and lubricant end-use applications.

4. Safflower Cultivar Evaluations

   This 36-entry trial was conducted at NARC and other selected Research Centers in Montana and North Dakota, focusing on the evaluation of existing and experimental safflower cultivars under traditional management methods to determine seed yield and oil quantity and quality, while also measuring an array of plant characteristics including percent stand, flower date, plant height, percent shatter, seed moisture and test weight.

Summary of Results (field and laboratory):

Agronomic and economic performance data for:

1) Multi-specie evaluation of alternative oilseeds are summarized in Tables 1, 2, 3, 4 and 5.
2) Winter camelina seeding rate are summarized in Table 6.
3) Camelina seeding date/method are summarized in Table 7.
4) Safflower cultivar evaluations are summarized in Tables 8, 9 and 10.

Associated site resource and management data specific to each investigation and/or individual entries within an investigation follow the performance data table for each overall investigation grouping.

1. Multi-Specie Evaluation of Alternative Oilseed Crops

Camelina (11), canola (8), mustard (4) and safflower (6) were evaluated in the 2007 multi-species trial. Five camelina entries planted on March 24 produced the highest seed yields of all entries and species. 'Ligena', 'MT15', 'Galena', 'Blaine Creek' (a new release from Montana State University) and 'Robby' produced between 2274 and 2492 lb/ac (Table 1). Posted county prices for Hill County were averaged for all days reported in 2007 to determine average price per pound for all oilseeds other than camelina. These prices were used in conjunction with seed yield to determine gross return per acre. At an estimated market price of $0.11 per pound, the highest yielding camelina line would have produced a gross return of $299.04 with no other crop related expenses taken into account. Because of the high market prices of mustard coupled with the high yield, the gross return of 'Pacific Gold' was $576.07 per acre. No other entry produced a gross return statistically equal to that of the Pacific Gold mustard. For the fourth year, camelina, a crop new to Montana, demonstrated good agronomic potential for oilseed producers. The gross return for camelina in 2004 was lower than that of sunflower, safflower and flax, but higher than that of canola, crambe, mustard, rapeseed and soybean. Low seed yield and gross return of the camelina in 2004 is attributed to a later than optimum seeding date. In 2005 the four early seeded entries of camelina produced the highest gross return of all the oilseeds in the trial. In 2006, camelina produced the highest seed yields and gross returns of all oil seeds tested. In 2007, eleven entries of camelina produced an average seed yield of over 2200 lb/ac. This is an excellent seed yield average which we attribute mainly to seeding date and seeding method. We have found that seeding camelina prior to April 1 coupled with good seed to soil contact via shallow drilling (less than ¼") followed by packer wheels to firm the seedbed is critical for maximizing seed yield potential.

2. Winter Camelina Seeding Rate Evaluations

Seeding rate (3, 4, 5 and 6 lb/ac) of winter camelina ('WSX-WG1') was tested to determine potential of winterkill and also maximum seed yield and oil production (Table 6). There were no data parameters measured between seeding rates that were statistically significant; meaning there were absolutely no differences between seeding rates. Average seed yield for the winter camelina was 1905 lb/ac with an oil content of 37.6%. This line of winter camelina had tenancy to have pods at all different maturity levels, therefore it was very difficult to harvest. Large early pods shattered in late June while the majority of the pods and plant materials were still very green. Winter camelina does have potential, only if other lines mature more uniformly than the one tested.

3. Camelina Seeding Date/Method

Spring camelina ('MT38') was seeded on three dates (March 27, April 17 and April 25) with either two or three different seeding methods (double-disk drill, drop seed/Phoenix harrow and/or drop seed only). The seeding dates were originally planned for 2-week intervals; however excessive rain early in April delayed the middle seeding date. The seeding methods were chosen to theoretically give the camelina the best chance to thrive. We know that it is essential to get good seed to soil contact while having firm seedbed. Drilling camelina ¼" or less has consistently produced the most uniform stands at NARC. Dropping seed, followed by the Phoenix harrow was chosen as the second most likely method to produce good seed to soil contact. This method could be used by growers who do not have the ability to properly drill seed, but still need a method to increase the seed to soil contact. On April 17, the double-disk drill treatment was seeded, but to seeding process was rained out prior to utilizing the Phoenix harrow on the seed that was dropped on top of the ground. Therefore, the third seeding date included three seeding methods for a more complete comparison. Overall, the very best seeding date and method was double-disk drilling the seed on March 24, producing 1582 lb/ac (Table 7). Not only did seeding date affect seed yield, but for every week that seeding was delayed, 1% of oil production was lost. The camelina from the March 24 seeding date produced 38% oil, while camelina from the April 25 seeding date produced 34% oil; a 4% difference.

4. Safflower Cultivar Evaluation

   Seed yield among the 36 common varieties and experimental lines ranged from 1121 to 1988 lb/ac, and percent oil ranged from 32.1 to 48.5 (Table 8). All data parameters measured between entries were statistically significant for all variables. Ten-year comparable averages for seed yield and oil quantity is presented in Tables 9 and 10. This trial is utilized mainly by Eastern Agricultural Research Center to determine lines adapted to north central Montana and across the state. New lines that are determined to be of benefit to the oilseed industry are eventually released for production.

Publications Generated:

Lamb, Peggy F. and G. R. Carlson. 2007 Rotation crop performance evaluations. This is an annual report of preliminary data to the NARC Advisory Council and the general public. The report is made available in hard copy and via the internet (www.ag.montana.edu/narc).

McVay, Kent A. and P. F. Lamb. Camelina production in Montana. MontGuide MT200701AG.

Graduate Students/Post Doctoral Fellows:

None directly associated with Northern Agricultural Research Center in 2007.

Impact Statement

Cooperatives or Small Businesses Formed or Helped:

This information is of assistance to the "Peaks & Prairies Oilseed Cooperative", "Great Northern Growers", "Allied Bio Energies, LLC", "The Camelina Company" and other individuals or groups interested in producing or utilizing oilseeds. This research attempts to determine which oil producing plant species and/or varieties are best suited to grow and produce quality oil under north central Montana environments. This research also helps interested producers determine the best management practices for crop establishment and growth. The economics of the individual crops may be further evaluated after a sufficient amount of data has been collected.

Public Meetings Related to IBP:

1. NARC Public Field Day – June 26, 2007, Havre, MT
   a. Oilseed Crop Adaptation and Biobased Product Research (three tours, 20 minutes each – **79** farmers, ranchers, media representatives, Extension personnel, scientists, industry and other interested individuals from the Hi-Line area).
2. Montana Grain Growers Association 52nd Annual Convention & Trade Show. December 5, 2007, Great Falls, MT.
   a. Camelina Research Update (approx. **60** farmers, ranchers, media representatives, Extension personnel, scientists, bio-fuel industry and other interested individuals).
3. The Camelina Company Board Meeting – December 11, 2007, Havre, MT
   a. Camelina Production (2 hours – **16** investors, researchers, agronomists, sales personnel and media representatives).
4. NARC Advisory Council – February 5, 2008, Havre, MT
   a. 2007 Oilseed Summary (approx. **28** farmers, ranchers, and Extension personnel).

TABLE 1. ALL SPECIES. Oilseed Multi-specie Evaluation Nursery Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC01-OC)

Species	CULTIVAR or SELECTION	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	4/ OIL Lbs/Ac	5/ RETURN $/ac
Camelina	Blaine Creek (MT01)	86.7	267,410	159.5	32.4	11.7	**2289.2***	5.9	51.8	34.9	770.9	$274.70
Camelina	Celine	90.6	418,660	162.0	36.3	17.5	1947.7	6.0	52.4	34.5	671.9	$233.73
Camelina	Galena	87.8	369,050	160.2	31.0	11.7	**2291.1***	5.9	52.7	34.2	784.0	$274.94
Camelina	Ligena	84.0	215,380	160.3	31.0	5.0	**2492.0****	5.9	51.3	36.6	**911.3***	$299.04
Camelina	MT03	79.2	280,720	157.8	33.3	11.7	2097.8	6.1	53.3	35.6	746.9	$251.74
Camelina	MT12	83.9	325,490	159.0	31.6	17.5	2174.5	6.0	52.8	35.6	773.3	$260.94
Camelina	MT15	84.3	332,750	159.8	32.3	10.8	**2345.4***	5.9	51.7	34.6	812.4	$281.45
Camelina	MT32	83.7	325,490	159.8	32.2	12.5	2112.2	6.1	53.4	34.1	721.2	$253.47
Camelina	MT38	84.0	348,480	157.5	31.7	18.3	2054.0	5.9	53.6	35.3	724.5	$246.48
Camelina	Robby	87.5	387,200	160.0	30.0	15.0	**2273.9***	5.9	53.2	33.7	766.5	$272.87
Camelina	Suneson (MT05)	85.3	324,280	158.3	30.8	11.7	2167.4	5.9	53.5	36.7	795.2	$260.09
Canola	HyClass 410	96.8	248,050	171.0	-	1.7	1376.1	4.3	52.5	41.4	569.1	$210.96
Canola	HyClass 712	96.3	291,610	171.0	-	2.3	1352.5	4.2	51.9	41.9	566.7	$207.34
Canola	HyClass 924	96.8	320,650	167.2	-	1.7	1369.2	4.1	51.3	43.2	591.2	$209.90
Canola	Hyola 357 Magnum	96.4	225,060	165.3	-	1.0	1730.8	4.5	52.5	40.9	707.6	$265.33
Canola	InVigor 5550	95.6	267,410	168.2	-	3.0	1575.1	4.3	52.9	41.9	660.7	$241.47
Canola	IS 3057 RR	98.1	359,370	165.0	-	4.3	1602.6	4.3	52.8	43.8	701.2	$245.67
Canola	IS 7145 RR	95.4	264,990	169.3	-	3.0	1688.8	4.1	52.8	43.5	734.2	$258.89
Canola	Python	95.4	298,870	169.3	-	1.7	1435.9	4.2	50.9	41.5	595.3	$220.12
Mustard	Forge - Oriental	96.3	298,870	167.7	-	1.0	1192.3	5.0	55.7	29.3	349.0	$365.80
Mustard	Pacific Gold	98.4	433,180	163.0	-	2.3	1877.7	5.2	54.0	34.2	641.5	**$576.07****
Mustard	Pennant	97.3	313,390	159.5	-	1.0	1144.7	5.2	57.0	22.4	255.9	$351.20
Mustard	Tilney	97.8	372,680	160.2	-	1.0	1139.8	5.3	57.1	21.2	241.5	$349.69
Safflower	C/W 1221	88.7	168,190	198.7	26.9	0.0	1946.5	9.0	39.8	49.1	**955.5****	$337.53
Safflower	C/W 99OL	89.6	153,670	198.2	30.1	0.0	1606.5	8.7	40.1	45.8	736.2	$278.56
Safflower	Finch	91.7	232,320	199.0	27.3	0.0	1847.9	8.2	44.4	40.6	750.1	$320.42
Safflower	Montola2004	88.9	151,250	196.7	24.0	0.0	1759.4	8.3	42.4	41.2	724.7	$305.08
Safflower	Morlin	94.4	239,580	200.3	25.3	0.0	1683.3	9.0	41.7	44.0	741.2	$291.89
Safflower	NutraSaff	86.8	143,990	199.2	28.3	0.0	1268.9	8.4	38.7	**53.9****	683.9	$220.02
EXPERIMENTAL MEANS		91.0	288,898	170.4	30.3	5.8	1787.7	5.9	50.6	38.1	678.7	281.6
LSD (0.05)		7.3	92403.0	1.0	-	2.4	243.8	0.2	0.4	1.6	126.6	40.1
C.V.: (S / MEAN)*100		7.1	28.0	0.5	-	37.0	11.9	2.9	0.6	2.6	11.3	12.5

1/ No. of Days from January 1 (170 = June 19).
2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for camelina, canola, mustard and safflower.
3/ Oil percentage values are reported on a 92% dry matter basis.
4/ Gross Return does not take into account any input costs associated with the crop.
5/ Price quotes are an average of all posted county prices for Hill County as of 12/31/2007, USDA-FSA, Havre, MT. Camelina price estimate was $0.11 per lb.
** Indicates highest ranking entry within a column.
* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

TABLE 2. CAMELINA. Oilseed Multi-specie Evaluation Nursery Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC01-OC)

Species	CULTIVAR or SELECTION	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac	4/ RETURN $/ac
Camelina	Blaine Creek	86.7	267,410	159.5	32.4	11.7	2289.2	5.9	51.8	34.9	770.9	$274.70
Camelina	Celine	90.6	418,660	162.0	36.3	17.5	1947.7	6.0	52.4	34.5	671.9	$233.73
Camelina	Galena	87.8	369,050	160.2	31.0	11.7	2291.1	5.9	52.7	34.2	784.0	$274.94
Camelina	Ligena	84.0	215,380	160.3	31.0	5.0	**2492.0****	5.9	51.3	**36.6**	**911.3****	**$299.04****
Camelina	MT03	79.2	280,720	157.8	33.3	11.7	2097.8	6.1	53.3	**35.6***	746.9	$251.74
Camelina	MT12	83.9	325,490	159.0	31.6	17.5	2174.5	6.0	52.8	**35.6***	773.3	$260.94
Camelina	MT15	84.3	332,750	159.8	32.3	10.8	**2345.4***	5.9	51.7	34.6	812.4	**$281.45***
Camelina	MT32	83.7	325,490	159.8	32.2	12.5	2112.2	6.1	53.4	34.1	721.2	$253.47
Camelina	MT38	84.0	348,480	157.5	31.7	18.3	2054.0	5.9	53.6	**35.3***	724.5	$246.48
Camelina	Robby	87.5	387,200	160.0	30.0	15.0	2273.9	5.9	53.2	33.7	766.5	$272.87
Camelina	Suneson	85.3	324,280	158.3	30.8	11.7	2167.4	5.9	53.5	**36.7****	795.2	$260.09
EXPERIMENTAL MEANS		85.2	324,280	159.5	32.1	13.0	2204.1	5.9	52.7	35.1	770.7	264.5
LSD (0.05)		ns	109,189	0.9	2.6	3.6	186.3	ns	0.2	1.7	85.9	22.4
C.V.: (S / MEAN)*100		8.5	28.8	0.5	7.0	24.1	7.3	2.9	0.4	2.8	6.3	7.3

1/ No. of Days from January 1 (160 = June 9).

2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for camelina.

3/ Oil percentage values are reported on a 92% dry matter basis.

4/ Gross Return does not take into account any input costs associated with the crop. Price quotes are an average of all posted county prices for Hill County as of 12/31/2007, USDA-FSA, Havre, MT.

** Indicates highest ranking entry within a column.

* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

TABLE 3. CANOLA. Oilseed Multi-specie Evaluation Nursery Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC01-OC)

Species	CULTIVAR or SELECTION	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac	4/ RETURN $/ac
Canola	HyClass 410	96.8	248,050	171.0	-	1.7	1376.1	4.3	52.5	41.4	569.1	$210.96
Canola	HyClass 712	96.3	291,610	171.0	-	2.3	1352.5	4.2	51.9	41.9	566.7	$207.34
Canola	HyClass 924	96.8	320,650	167.2	-	1.7	1369.2	4.1	51.3	**43.2***	591.2	$209.90
Canola	Hyola 357 Magnum	96.4	225,060	165.3	-	1.0	**1730.8****	4.5	52.5	40.9	**707.6***	**$265.33****
Canola	InVigor 5550	95.6	267,410	168.2	-	3.0	1575.1	4.3	52.9	41.9	**660.7***	$241.47
Canola	IS 3057 RR	98.1	359,370	165.0	-	4.3	**1602.6***	4.3	52.8	**43.8****	**701.2***	**$245.67***
Canola	IS 7145 RR	95.4	264,990	169.3	-	3.0	**1688.8***	4.1	52.8	**43.5***	**734.2****	**$258.89***
Canola	Python	95.4	298,870	169.3	-	1.7	1435.9	4.2	50.9	41.5	595.3	$220.12
EXPERIMENTAL MEANS		96.3	284,501	168.3	-	2.3	1516.4	4.2	52.2	42.2	640.8	232.5
LSD (0.05)		ns	71,902	0.9	-	ns	137.9	0.1	0.3	1.4	109.2	21.1
C.V.: (S / MEAN)*100		1.8	21.6	0.5	-	78.0	7.8	2.7	0.4	1.9	10.6	7.8

1/ No. of Days from January 1 (168 = June 17).

2/ Volumetric yields are based on plot weights adjusted to a uniform 8 percent grain moisture for canola.

3/ Oil percentage values are reported on a 92% dry matter basis.

4/ Gross Return does not take into account any input costs associated with the crop. Price quotes are an average of all posted county prices for Hill County as of 12/31/2007, USDA-FSA, Havre, MT.

** Indicates highest ranking entry within a column.

* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

TABLE 4. MUSTARD. Oilseed Multi-specie Evaluation Nursery Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC01-OC)

Species	CULTIVAR or SELECTION	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac	4/ RETURN $/ac
Mustard	Forge - Oriental	96.3	298,870	167.7	-	1.0	1192.3	5.0	55.7	29.3	349.0	$365.80
Mustard	Pacific Gold	98.4	433,180	163.0	-	2.3	**1877.7****	5.2	54.0	**34.2****	**641.5****	**$576.07****
Mustard	Pennant	97.3	313,390	159.5	-	1.0	1144.7	5.2	57.0	22.4	255.9	$351.20
Mustard	Tilney	97.8	372,680	160.2	-	1.0	1139.8	5.3	57.1	21.2	241.5	$349.69
EXPERIMENTAL MEANS		97.5	354,530	162.6	-	1.3	1338.6	5.2	55.9	26.7	372.0	410.7
LSD (0.05)		ns	62,390	0.8	-	ns	133.4	0.1	0.3	1.6	73.9	40.9
C.V.: (S / MEAN)*100		2.0	14.3	0.4	-	77.5	8.1	2.0	0.4	3.0	10.7	8.1

1/ No. of Days from January 1 (163 = June 12).
2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for mustard.
3/ Oil percentage values are reported on a 92% dry matter basis.
4/ Gross Return does not take into account any input costs associated with the crop. Price quotes are an average of all posted county prices for Hill County as of 12/31/2007, USDA-FSA, Havre, MT.
** Indicates highest ranking entry within a column.
* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

TABLE 5. SAFFLOWER. Oilseed Multi-specie Evaluation Nursery Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC01-OC)

Species	CULTIVAR or SELECTION	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac	4/ RETURN $/ac
Safflower	C/W 1221	88.7	168,190	198.7	26.9	0.0	**1946.53****	9.0	39.8	49.1	**955.5**	**337.53****
Safflower	C/W 99OL	89.6	153,670	198.2	30.1	0.0	1606.5	8.7	40.1	45.8	736.2	$278.56
Safflower	Finch	91.7	232,320	199.0	27.3	0.0	**1847.85***	8.2	44.4	40.6	750.1	$320.42
Safflower	Montola2004	88.9	151,250	196.7	24.0	0.0	**1759.38***	8.3	42.4	41.2	724.7	**305.08***
Safflower	Morlin	94.4	239,580	200.3	25.3	0.0	1683.3	9.0	41.7	44.0	741.2	**291.89***
Safflower	NutraSaff	86.8	143,990	199.2	28.3	0.0	1268.9	8.4	38.7	**53.85****	683.9	$220.02
EXPERIMENTAL MEANS		90.0	181,500	197.9	27.0	0.0	1685.4	8.6	41.2	45.8	727.2	292.2
LSD (0.05)		3.93	29,402	0.80	1.8	-	191.9	0.3	0.6	0.5	92.6	33.3
C.V.: (S / MEAN)*100		3.67	13.62	0.34	5.7	-	9.6	2.7	1.1	1.0	10.2	9.6

1/ No. of Days from January 1 (198 = July 17).

2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for safflower.

3/ Oil percentage values are reported on a 92% dry matter basis.

4/ Gross Return does not take into account any input costs associated with the crop. Price quotes are an average of all posted county prices for Hill County as of 12/31/2007, USDA-FSA, Havre, MT.

** Indicates highest ranking entry within a column.

* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

Site Resource & Management Data: (Exp# 07-OC01-OC)							
Field	A-6-3		SaltHaz (MMHOS/cm) 6-24"	-		Dry Surf Soil (in.) @ Plnt'g	*
Quarter	NW		Soil Texture 0-6"	CL-		2" Soil Temp (^{o}F) @ Plnt'g	*
Section	33		Soil Texture 6-24"	CL-		4" Soil Temp (^{o}F) @ Plnt'g	*
Township	32N		Soil Texture 24-36"	CL		Fertilizer Formulation**	Gran.Blend
Range	15E		Soil Texture 36-48"	CL		Fertilizer Placement	Bnd at Plntg
Latitude	N48 29.554'		Ca (ppm)	2005		Fert. Rate (lbs/ac) N	0
Longitude	W109 47.947'		Init Zn (ppm) 0-6"	0.7		Fert. Rate (lbs/ac) P2O5	45
Soil Series	Telstad CLm		Init Mn (ppm) 0-6"	9.7		Fert. Rate (lbs/ac) K2O	0
pH 0-6"	7.5		Init Mg (ppm) 0-6"	0		Herbicide App. Date	4/25
Org.Matter (%) 0-6"	1.5		Init Cu (ppm) 0-6"	1.3		Herbicide (not on cm,m,cn)	Sonolan
Init N (lbs/ac) 0-6"	31		Init Fe (ppm) 0-6"	19.2		Herbicide Rate (/ac)	32 oz
Init N (lbs/ac) 6-24"	120		CEC 0-6"	16.1		Precip (in.) Plnt'g-Harvest	7.69
Init N (lbs/ac) 24-36"	194		Init PAW (in.) 0-6"	0.83		Precip (>.1) Plnt'g-Harvest	6.67
Init N (lbs/ac) 36-48"	164		Init PAW (in.) 6-24"	4.00		Harvest Date	*
Init N (lbs/ac) 0-48"	509		Init PAW (in.) 24-36"	1.98		Rooting Depth (in.)	*
Init P (ppm) Olsen 0-6"	35		Init PAW (in.) 36-48"	2.05		Post PAW (in.) 0-6"	*
Init K (ppm) 0-6"	355		Cropping System	NT-ChmFlw		Post PAW (in.) 6-24"	*
Init S (ppm) 0-24"	122		Planting Date	*		Post PAW (in.) 24-36"	*
Init Na (MEQ/100g) 0-6"	18		Planting Depth (in.)	0.125		Post PAW (in.) 36-48"	*
SaltHaz (MMHOS/cm) 0-6"	0.08		Moist Soil Depth @ Plnt'g	48+		Precip (>.1) Hvst-Post	*

* See individaul crop details.

Camelina			4" Soil Temp (^{o}F) @ Plnt'g	60		Post PAW (in.) 0-6"	0.38
Planting Date	3/24		Precip (in.) Plnt'g-Harvest	8.19		Post PAW (in.) 6-24"	2.18
Planting Depth (in.)	0.125		Precip (>.1) Plnt'g-Harvest	7.51		Post PAW (in.) 24-36"	1.09
Dry Surf Soil (in.) @ Plnt'g	2.0		Harvest Date	7/27		Post PAW (in.) 36-48"	1.64
2" Soil Temp (^{o}F) @ Plnt'g	72		Rooting Depth (in.)	38		Precip (>.1) Hvst-Post	0

Safflower**			4" Soil Temp (^{o}F) @ Plnt'g	66		Post PAW (in.) 0-6"	0.67
Planting Date	4/24		Precip (in.) Plnt'g-Harvest	7.69		Post PAW (in.) 6-24"	2.49
Planting Depth (in.)	1.25		Precip (>.1) Plnt'g-Harvest	6.67		Post PAW (in.) 24-36"	-
Dry Surf Soil (in.) @ Plnt'g	0.25		Harvest Date	10/8		Post PAW (in.) 36-48"	-
2" Soil Temp (^{o}F) @ Plnt'g	70		Rooting Depth (in.)	-		Precip (>.1) Hvst-Post	0

Canola			4" Soil Temp (^{o}F) @ Plnt'g	66		Post PAW (in.) 0-6"	0.44
Planting Date	4/24		Precip (in.) Plnt'g-Harvest	5.41		Post PAW (in.) 6-24"	2.26
Planting Depth (in.)	1.25		Precip (>.1) Plnt'g-Harvest	4.82		Post PAW (in.) 24-36"	1.61
Dry Surf Soil (in.) @ Plnt'g	0.25		Harvest Date	8/8		Post PAW (in.) 36-48"	1.25
2" Soil Temp (^{o}F) @ Plnt'g	70		Rooting Depth (in.)	24"		Precip (>.1) Hvst-Post	0

Mustard			4" Soil Temp (^{o}F) @ Plnt'g	66		Post PAW (in.) 0-6"	0.38
Planting Date	4/24		Precip (in.) Plnt'g-Harvest	5.41		Post PAW (in.) 6-24"	2.01
Planting Depth (in.)	1.25		Precip (>.1) Plnt'g-Harvest	4.82		Post PAW (in.) 24-36"	1.36
Dry Surf Soil (in.) @ Plnt'g	0.25		Harvest Date	8/8		Post PAW (in.) 36-48"	-
2" Soil Temp (^{o}F) @ Plnt'g	70		Rooting Depth (in.)	24"		Precip (>.1) Hvst-Post	0

TABLE 6. WINTER CAMELINA. Winter Camelina Seeding Rate Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC06-OC)

Species	CULTIVAR or SELECTION	SEED RATE Lb/Ac	STAND %	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac
Camelina	'WSX-WG1'	3 lb/ac	92	400,510	130.0	31.4	9.2	1801.9	8.8	53.3	37.7	755.7
Camelina	'WSX-WG1'	4 lb/ac	93	398,695	130.2	31.8	10.0	1901.2	8.9	53.3	37.8	741.0
Camelina	'WSX-WG1'	5 lb/ac	94	467,665	130.0	32.3	12.5	1981.1	7.8	53.7	37.6	775.8
Camelina	'WSX-WG1'	6 lb/ac	93	485,210	129.8	30.4	12.5	1934.3	8.3	53.5	37.5	731.3
EXPERIMENTAL MEANS			93	438,020	130.0	31.5	11.0	1904.6	8.4	53.5	37.6	751.0
LSD (0.05)			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
C.V.: (S / MEAN)*100			3.9	19.2	0.7	6.9	50.5	7.0	22.8	1.3	1.3	6.0

1/ No. of Days from January 1 (130 = May 10).
2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for camelina.
3/ Oil percentage values are reported on a 92% dry matter basis.

Site Resource & Management Data: (Exp# 07-OC06-OC)									
Field	A-6-4	Init P (ppm) Olsen 0-6"	15	Init Fe (ppm) 0-6"	9.8	Fert. Rate (lbs/ac) N	na
Quarter	NW	Init K (ppm) 0-6"	298	CEC 0-6"	27	Fert. Rate (lbs/ac) P2O5	na
Section	33	Init S (ppm) 0-24"	106	Init PAW (in.) 0-6"	1.19	Fert. Rate (lbs/ac) K2O	na
Township	32N	Init Na (MEQ/100g) 0-6"	15	Init PAW (in.) 6-24"	3.78	Herbicide App. Date	none
Range	15E	SaltHaz (MMHOS/cm) 0-6"	0.07	Init PAW (in.) 24-36"	1.93	Herbicide (not on cm,m,cn)	na
Latitude	N48 29.461'	SaltHaz (MMHOS/cm) 6-24"	-	Init PAW (in.) 36-48"	2.07	Herbicide Rate (/ac)	na
Longitude	W109 47.946'	Soil Texture 0-6"	CL	Cropping System	NT-ChmFlw	Precip (in.) Plnt'g-Harvest	9.79
Soil Series	Hillon CLm	Soil Texture 6-24"	CL	Planting Date	10/5	Precip (>.1) Plnt'g-Harvest	7.79
pH 0-6"	8.3	Soil Texture 24-36"	CL	Planting Depth (in.)	0.125	Harvest Date	7/11
Org.Matter (%) 0-6"	1.5	Soil Texture 36-48"	CL	Moist Soil Depth @ Plnt'g	48+	Rooting Depth (in.)	28
Init N (lbs/ac) 0-6"	23	Ca (ppm)	4546	Dry Surf Soil (in.) @ Plnt'g	2.0	Post PAW (in.) 0-6"	0.48
Init N (lbs/ac) 6-24"	84	Init Zn (ppm) 0-6"	0.4	2" Soil Temp (^{o}F) @ Plnt'g	74	Post PAW (in.) 6-24"	1.93
Init N (lbs/ac) 24-36"	144	Init Mn (ppm) 0-6"	3.96	4" Soil Temp (^{o}F) @ Plnt'g	65	Post PAW (in.) 24-36"	1.58
Init N (lbs/ac) 36-48"	72	Init Mg (ppm) 0-6"	0	Fertilizer Formulation	none	Post PAW (in.) 36-48"	1.94
Init N (lbs/ac) 0-48"	323	Init Cu (ppm) 0-6"	1.49	Fertilizer Placement	na	Precip (>.1) Hvst-Post	0.42

TABLE 7. CAMELINA. Camelina Seeding Date/Type Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2007.
(Exp# 07-OC09-OC)

SEEDING DATE	SEEDING TYPE	PLANT COUNT	1/ FLOWER DATE	PLNT HT Inches	SHATTER %	2/ YIELD Lb/Ac	MOISTURE %	TEST WT Lbs/Bu	3/ OIL %	3/ OIL Lbs/Ac	MATURITY DATE
March 24	Double-Disk Drill	283,140	159.0	31.6	21.7	**1581.6****	6.0	53.6	**38.2****	**604.0****	**197.7****
March 24	Drop Seed/Phoenix Harrow	210,540	159.0	30.6	23.3	1090.1	6.1	53.4	**38.1***	415.6	198.7
April 17	Double-Disk Drill	72,600	164.3	31.2	21.7	1279.9	6.2	53.3	37.0	473.7	200.3
April 17	Drop Seed	62,920	164.3	31.0	21.7	1260.6	6.2	53.2	36.4	458.6	201.0
April 25	Double-Disk Drill	128,260	172.0	31.6	15.0	1261.6	6.2	52.8	34.1	429.3	204.0
April 25	Drop Seed	256,520	173.0	26.8	15.0	1045.8	6.6	52.6	34.0	355.4	205.0
April 25	Drop Seed/Phoenix Harrow	198,440	173.0	28.7	16.7	1192.2	6.2	52.4	33.9	404.1	204.3
EXPERIMENTAL MEANS		173,203	166.4	30.2	19.3	1244.6	6.2	53.0	36.0	448.7	201.6
LSD (0.05)		ns	1.5	2.5	4.3	208.1	ns	0.3	0.8	74.0	0.7
C.V.: (S / MEAN)*100		72.3	0.5	4.7	12.4	9.4	3.8	0.3	1.2	9.3	0.2

1/ No. of Days from January 1 (166 = June 15).
2/ Yields are based on plot weights adjusted to a uniform 8 percent grain moisture for camelina.
3/ Oil percentage values are reported on a 92% dry matter basis.
** Indicates highest ranking entry within a column.
* Indicates entries ranking equal to the highest ranking enty within a column based on Fisher's protected LSD (p=0.05).

Site Resource & Management Data: (Exp# 07-OC09-OC)							
Field	A-6-4		SaltHaz (MMHOS/cm) 6-24"	-		Dry Surf Soil (in.) @ Plnt'g	2.0
Quarter	NW		Soil Texture 0-6"	CL		2" Soil Temp (^{o}F) @ Plnt'g	72
Section	33		Soil Texture 6-24"	CL		4" Soil Temp (^{o}F) @ Plnt'g	60
Township	32N		Soil Texture 24-36"	CL		Fertilizer Formulation\	none
Range	15E		Soil Texture 36-48"	CL		Fertilizer Placement	na
Latitude	N 48 29.528'		Ca (ppm)	4546		Fert. Rate (lbs/ac) N	na
Longitude	W109 47.946'		Init Zn (ppm) 0-6"	0.4		Fert. Rate (lbs/ac) P2O5	na
Soil Series	Telstad CLm		Init Mn (ppm) 0-6"	3.96		Fert. Rate (lbs/ac) K2O	na
pH 0-6"	8.3		Init Mg (ppm) 0-6"	0		Herbicide App. Date	none
Org.Matter (%) 0-6"	1.5		Init Cu (ppm) 0-6"	1.49		Herbicide (not on cm,m,cn)	na
Init N (lbs/ac) 0-6"	23		Init Fe (ppm) 0-6"	9.8		Herbicide Rate (/ac)	na
Init N (lbs/ac) 6-24"	84		CEC 0-6"	27		Precip (in.) Plnt'g-Harvest	7.76
Init N (lbs/ac) 24-36"	144		Init PAW (in.) 0-6"	1.19		Precip (>.1) Plnt'g-Harvest	7.09
Init N (lbs/ac) 36-48"	72		Init PAW (in.) 6-24"	3.78		Harvest Date	7/27
Init N (lbs/ac) 0-48"	323		Init PAW (in.) 24-36"	1.93		Rooting Depth (in.)	34
Init P (ppm) Olsen 0-6"	15		Init PAW (in.) 36-48"	2.07		Post PAW (in.) 0-6"	0.42
Init K (ppm) 0-6"	298		Cropping System	NT-ChmFlw		Post PAW (in.) 6-24"	1.74
Init S (ppm) 0-24"	106		Planting Date	3/24		Post PAW (in.) 24-36"	1.94
Init Na (MEQ/100g) 0-6"	15		Planting Depth (in.)	0.125		Post PAW (in.) 36-48"	3.03
SaltHaz (MMHOS/cm) 0-6"	0.07		Moist Soil Depth @ Plnt'g	48+		Precip (>.1) Hvst-Post	0.00

TABLE 8. Montana Safflower Cultivar Evaluation Nursery Grown On-Station Under No-Till Dryland Fallow Conditions at Northern Agricultural Research Center. Havre, Montana. 2007. (Exp# 07-7702-SA)

ENTRY	CULTIVAR or SELECTION	STAND %	1/ FLWR DATE	PLNT HT Inches	YIELD Lbs/Ac	MOIST %	TEST WT Lbs/Bu	OIL % 0%Mois.	OIL % 8%Mois.	OIL Lbs/Ac 8%Mois.
HYBRID 9049	HYBRID 9049	87.3	196.3	25.7	1988.3	8.2	43.9	34.9	32.1	638.5
03B 5011	03B 5011	94.2	198.3	23.2	1768.2	8.4	42.6	39.6	36.5	644.4
03B 1149	03B 1149	94.9	199.3	26.1	1731.6	8.6	42.5	42.7	39.3	681.0
HYBRID 1601	HYBRID 1601	93.3	196.7	24.5	1694.8	8.2	41.5	39.3	36.1	612.3
MT 2004	MONTOLA 2004	93.0	196.0	22.9	1669.3	8.3	42.3	39.0	35.8	598.1
03B 4765	03B 4765	94.7	198.7	24.9	1642.0	8.6	40.7	41.6	38.2	628.2
02B 8350	02B 8350	92.6	200.7	24.0	1595.4	8.8	41.4	37.3	34.3	547.2
MON-DAK	MON-DAK	96.3	199.0	23.5	1583.5	8.1	41.1	39.8	36.7	580.2
WILL95FI	FINCH	94.4	199.3	24.0	1583.2	8.2	43.9	39.6	36.5	578.0
WILL	MONTOLA 2000	94.9	198.3	22.8	1540.0	8.2	40.5	42.0	38.6	595.1
02B 8670	02B 8670	91.5	199.0	26.5	1536.5	8.1	42.0	38.6	35.5	544.8
02B 6655	02B 6655	95.1	198.7	25.1	1529.7	8.2	37.7	45.8	42.1	644.2
01B 9104	01B 9104	91.7	199.3	25.6	1524.7	8.3	41.5	37.9	34.9	533.6
WILL	CENTENNIAL	94.0	199.3	24.5	1521.9	8.1	42.1	47.7	43.9	668.4
02B 8628	02B 8628	93.1	199.7	24.4	1513.8	8.4	42.8	39.8	36.7	554.8
01B 2159	01B 2159	93.1	200.0	24.4	1494.0	8.6	42.0	39.0	35.9	535.4
02B 8599	02B 8599	92.1	200.0	24.2	1491.4	8.4	43.2	39.1	35.9	535.8
02B 8632	02B 8632	92.8	199.7	25.6	1463.4	8.4	41.4	37.8	34.8	507.1
05B 3056	05B 3056	95.1	196.7	25.2	1451.0	8.1	42.2	40.3	37.0	538.1
97B 1286	97B 1286	96.5	198.3	24.9	1449.4	8.5	40.2	43.0	39.6	573.6
04B 6301	04B 6301	93.8	199.3	25.2	1411.0	8.6	37.2	44.3	40.8	576.8
02B 6081	02B 6081	92.4	199.0	25.2	1403.0	8.2	41.9	41.0	37.7	529.1
02B 7619	02B 7619	93.5	201.0	23.0	1400.7	8.7	42.2	39.6	36.4	509.6
05B 3232	05B 3232	92.4	196.0	23.0	1391.3	8.5	37.4	46.3	42.6	593.5
CARDINAL	CARDINAL	93.3	200.3	27.5	1384.3	8.6	44.4	39.3	36.1	500.7
01B 7113	01B 7113	95.6	198.7	24.4	1354.7	8.5	36.3	44.7	41.1	558.6
03B 5085	03B 5085	92.6	199.0	24.8	1335.7	7.5	38.7	44.8	41.2	551.0
05B 3284	05B 3284	94.9	199.0	24.4	1323.3	8.6	39.8	45.4	41.8	553.8
03B 6184	03B 6184	94.2	200.7	23.8	1312.9	8.4	41.5	39.1	36.0	472.7
MORLIN	MORLIN	96.1	201.0	24.2	1311.1	9.2	41.5	42.7	39.3	516.5
MT 2003	MONTOLA 2003	96.0	199.0	23.1	1301.2	8.5	41.4	40.1	36.8	479.7
05B 3190	05B 3190	93.3	200.7	25.7	1253.3	8.2	36.8	46.3	42.6	534.8
91B3842	NUTRA SAFF	93.3	199.0	26.0	1210.3	8.0	38.5	52.7	48.5	587.6
04B 6508	04B 6508	95.6	196.0	24.6	1196.7	8.1	37.4	46.6	42.9	513.3
02B 6381	02B 6381	94.4	198.0	23.7	1186.1	8.1	37.5	47.1	43.3	513.4
03B 6521	03B 6521	96.0	196.0	25.2	1121.6	7.9	36.8	45.0	41.4	465.1
EXPERIMENTAL MEANS		93.8	198.8	24.6	1463.0	8.4	40.7	41.9	38.6	561.0
LSD (0.05)		3.8	0.9	2.5	292.2	0.5	1.1	1.4	1.3	119.8
C.V.2: (S of MEAN / MEAN)*100		1.5	0.2	3.7	7.1	1.9	0.9	1.2	1.2	7.6

1/ No. of Days from January 1 (199 = July 18).

Site Resource & Management Data: (Exp# 07-7702-SA)							
Field	An-4-5		SaltHaz(MMHOS/cm) 6-24	-		Dry Surf Soil (in.) @ Plnt'g	1
Quarter	NW		S (ppm) 0-24	60		2" Soil Temp (^{o}F) @ Plnt'g	51
Section	33		Zn (ppm) 0-6	0.6		4" Soil Temp (^{o}F) @ Plnt'g	50
Township	32N		Fe (ppm) 0-6	8.4		Fertilizer Formulation	Gran Blend
Range	15E		Mn (ppm) 0-6	4.3		Fertilizer Placement	Bnd at Plntg
Latitude	N48 29.399'		Cu (ppm) 0-6	1.2		Fert. Rate (lbs/ac) N	0
Longitude	W109 47.872'		CEC 0-6	23.3		Fert. Rate (lbs/ac) P2O5	45
Soil Series	Kevin Cl-Lm		Soil Texture 0-6	CL		Fert. Rate (lbs/ac) K2O	0
pH 0-6	8.0		Soil Texture 6-24	CL		Herbicide App. Date	4/25
Org.Matter (%) 0-6	1.7		Soil Texture 24-36	CL		Herbicide Product	Sonolan PPI
N (lbs/ac) 0-6	27		Soil Texture 36-48	CL		Herbicide Rate (/ac)	32
N (lbs/ac) 6-24	69		Init PAW (in.) 0-6"	1.1		Precip (in.) Plnt'g-Harvest	7.68
N (lbs/ac) 24-36	16		Init PAW (in.) 6-24"	4.3		Precip (>.1) Plnt'g-Harvest	6.67
N (lbs/ac) 36-48	42		Init PAW (in.) 24-36"	3.7		Harvest Date	10/8
N (lbs/ac) 0-48	154		Init PAW (in.) 36-48"	2.8		Rooting Depth (in.)	-
P (ppm) Olsen 0-6	29		Init PAW (in.) 0-48"	11.8		Post PAW (in.) 0-6"	0.88
K (ppm) 0-6	318		Cropping System	CT-MechFlw		Post PAW (in.) 6-24"	1.42
Ca (ppm)	3895		Previous Crop	Barley		Post PAW (in.) 24-36"	-
Mg (ppm) 0-6	355		Planting Date	4/26		Post PAW (in.) 36-48"	-
Na (ppm) 0-6	13		Planting Depth (in.)	1		Post PAW (in.) 0-48"	2.30
SaltHaz (MMHOS/cm) 0-6	0.28		Moist Soil Depth @ Plnt'g	48+		Precip (>.1) Hvst-Post	0

TABLE 9. **Nine-Year Yield Summary on Selected Entries from Dryland Safflower Nursery. Northern Agricultural Research Center. Havre, Montana. 1998-2007. (Exp# 7702-SA)**

VARIETY or SELECTION		No. of YEARS TESTED	YIELD (Lbs Per Acre) 1998	1999	2000	2001 1/	2002	2003	2004	2005	2006	2007	AVE. for YEARS TESTED	% of CHECK YIELD 2/	**9-YR COMP. AVE. YIELD 3/**
HYBRID 9049	HYBRID 9049	3								1509.9	1433.7	1988.3	1644.0	124.5	**1465.9**
95B7181	99MTDSVT 228/107	6	1079.6	1245.5	1902.9		1541.5	676.7	1046.5				1248.8	113.0	**1329.6**
95B7446	99MTDSVT 218/108	7		1366.8	1496.5		1950.3	692.8	1229.7	1222.9	1000.4		1279.9	108.4	**1275.9**
00B8208	01DOL4 4126	4					1754.2	595.8	1343.8	1085.6			1194.8	105.0	**1236.5**
97B1744	99DLI2 319/107	6			1941.9		1785.7	451.7	1298.9	1150.4	833.9		1243.8	103.2	**1214.8**
Will 95FI	FINCH	9	1033.4	1267.5	1516.3		1383.7	564.1	1276.5	1214.2	1082.4	1583.2	1213.5	103.1	**1213.5**
WILL	MONTOLA 2004	6					1617.1	448.8	1257.3	1392.6	1158.3	1669.3	1257.2	102.9	**1211.5**
011-2180	MORLIN	9	937.3	1342.4	1313.2		1839.9	495.0	1359.6	1194.4	1013.9	1311.1	1200.8	102.0	**1200.8**
991-122-6503	MONTOLA 2001	6	854.2	1060.0	1571.6		1605.3	516.6	1074.0				1113.6	100.7	**1185.7**
95B3538	99MTDSVT 104	8	835.1	1160.7	1588.2		1832.6	480.4	1113.7	1215.6	886.4		1139.1	100.4	**1182.4**
WILL	CENTENNIAL	9	806.6	1034.6	1423.6		1744.7	493.5	1130.6	1181.1	1257.3	1521.9	1177.1	100.0	**1177.1**
97B1286	99MTDSVT 311/120	7		1347.7	1036.8		1791.8	447.3	1326.0	1261.8	962.8		1167.7	98.9	**1164.1**
02B 8599	02B 8599	4							1040.4	1453.4	997.8	1491.4	1245.7	97.9	**1152.1**
WILL	MONTOLA 2000	9	920.1	1152.1	1163.5		1787.3	479.2	1113.7	1160.5	1018.2	1540.0	1148.3	97.6	**1148.3**
00B7627	01DOL4 4115	4					1562.6	497.2	1265.8	1089.5			1103.8	97.0	**1142.3**
WILL	S-541	5					1848.6	413.9	1202.1	1061.7	1068.3		1118.9	96.3	**1134.0**
02B 6081	02B 6081	4							1175.4	1344.9	968.1	1403.0	1222.9	96.1	**1131.0**
02B 8628	02B 8628	3								1274.5	1013.3	1513.8	1267.2	96.0	**1129.9**
00B6878	01DOL3 3110	4					1666.2	413.4	1210.1	1038.1			1081.9	95.1	**1119.6**
91B2166	99DLI1 212/106	3	876.9				1552.8		1059.8				1163.1	94.8	**1115.6**
01B 9104	01B 9104	3								1150.6	1027.0	1524.7	1234.1	93.5	**1100.4**
Will WOMA2003	MONTOLA 2003	9	917.5	1311.4	758.9		1715.2	468.2	1110.2	1226.1	882.8	1301.2	1076.8	91.5	**1076.8**
01B 7113	01B 7113	3								1227.9	982.3	1354.7	1188.3	90.0	**1059.6**
02B 6655	02B 6655	3								1155.0	826.6	1529.7	1170.4	88.7	**1043.6**
02B 6381	02B 6381	3							1088.9		891.8	1186.1	1055.6	81.0	**953.4**
91B3842	NUTRASAF	9	740.8	879.4	833.1		1585.8	211.2	1048.9	1036.2	823.9	1210.3	930.0	79.0	**930.0**
99MTDSVT 224/130	ERLIN	8	565.1	882.3	759.0		1262.5	360.4	1376.7	828.3	817.4		856.5	75.5	**889.0**
MEANS (For Entries Listed)			869.7	1170.9	1331.2		1675.1	483.7	1188.6	1194.6	997.5	1475.2			**1147.5**
April-July Precip. (in.)			8.78	8.57	6.01		8.87	8.06	8.64	7.37	5.71	7.43	7.72		
Total Annual Precip. (in.)			12.17	14.30	10.27		13.29	12.51	14.43	11.90	10.29	12.42	12.40		
Soil NO3 (lbs.) to SD at Planting			n/a	n/a	n/a		n/a	78	214	708	157	154	262		
SD (Sampling Depth in Inches)			48	Pndg	Pndg		48	48	48	48	48	48	48		
Fertilizer Applied	(# N)		70	70	70		70	70	70	50	0	0	52		
	(# P2O5)		40	40	40		40	40	40	20	40	40	38		
	(# K2O)		25	25	25		25	25	25	10	0	0	18		

Long-term check variety is Centennial.

1/ The 2001 nursery was destroyed in October due to extreme stand variablity caused by severe drought conditions prior to planting and throughout the growing season.

2/ 9-Yr Comparable Average = (x/y) * z where x = average yield or oil of a given entry for years tested, y = average yield or oil for Centennial for the same years, and z =9-Yr average yield or oil for the check variety Centennial.

3/ Percent of Centennial yield or oil for the same data years as those in which a given entry was tested.

TABLE 10. **Eight-Year Percent Oil Summary on Selected Entries from Dryland Safflower Nursery. Northern Agricultural Research Center. Havre, Montana. 1998-2007. (Exp# 7702-SA)**

VARIETY or SELECTION		No. of YEARS TESTED	Oil (%) @ 8% Seed Moisture										AVE. for YEARS TESTED	% of CHECK OIL 2/	**8-YR COMP. AVE. OIL 3/**
			1998	1999 1/	2000	2001 1/	2002	2003	2004	2005	2006	2007			
91B3842	NUTRASAF	8	36.9		41.6		39.4	46.2	44.9	43.8	43.2	48.5	43.0	108.2	**43.0**
WILL	S-541	5					37.0	41.2	40.5	39.5	39.7		39.6	100.6	**40.0**
WILL	CENTENNIAL	8	36.5		41.3		37.2	40.1	40.1	39.5	39.9	43.9	39.8	100.0	**39.8**
01B 7113	01B 7113	3								40.6	38.4	41.1	40.0	97.5	**38.8**
02B 6381	02B 6381	3							42.2		35.1	43.3	40.2	97.3	**38.7**
02B 6655	02B 6655	3								39.9	37.8	42.1	40.0	97.3	**38.7**
99MTDSVT 224/130	ERLIN	7	34.6		39.7		34.7	36.4	37.7	37.3	36.2		36.6	93.5	**37.2**
97B1286	99MTDSVT 311/120	5			39.5		34.7	36.0	37.6	36.5	37.0		36.9	92.9	**37.0**
00B6878	01DOL3 3110	4					33.5	39.7	35.6	36.5			36.3	92.7	**36.9**
WILL	MONTOLA 2000	8	36.2		37.5		32.7	38.7	37.3	37.9	35.7	38.6	36.8	92.5	**36.8**
011-2180	MORLIN	8	34.4		38.9		33.8	37.3	37.1	36.4	36.9	39.3	36.8	92.3	**36.8**
WILL	MONTOLA 2001	4	35.9		35.7		33.1	39.1	35.5				35.9	91.9	**36.6**
91B2166	99DLI1 212/106	3	33.0				34.3		37.1				34.8	91.8	**36.5**
00B7627	01DOL4 4115	4					33.6	39.3	35.5	35.2			35.9	91.5	**36.4**
Will WOMA2003	MONTOLA 2003	8	36.5		36.7		32.4	37.8	34.9	36.2	34.8	36.8	35.8	89.9	**35.8**
95B7181	99MTDSVT 228/107	4	34.4		34.7		32.4	37.9	34.2				34.7	88.9	**35.4**
02B 6081	02B 6081	4							35.7	36.6	35.0	37.7	36.3	88.8	**35.4**
Will 95FI	FINCH	8	33.6		37.5		32.4	34.5	34.5	35.0	35.5	36.5	34.9	87.8	**34.9**
95B7446	99MTDSVT 218/108	5			35.5		31.7	37.8	34.8	34.8	33.9		34.7	87.6	**34.9**
95B3538	99MTDSVT 104	7	34.3		36.5		32.7	35.2	34.8	33.8	32.2		34.2	87.3	**34.7**
WILL	MONTOLA 2004	6					32.0	37.2	35.5	35.5	33.9	35.8	35.0	87.2	**34.7**
02B 8628	02B 8628	3								34.7	34.5	36.7	35.3	85.9	**34.2**
00B8208	01DOL4 4126	4					30.6	36.4	33.6	33.6			33.6	85.6	**34.1**
97B1744	99DLI2 319/107	5			36.3		32.3	34.6	34.9	33.8	31.8		33.9	85.6	**34.1**
02B 8599	02B 8599	4							33.6	34.2	32.6	35.9	34.1	83.4	**33.2**
01B 9104	01B 9104	3								33.8	33.3	34.9	34.0	82.7	**32.9**
HYBRID 9049	HYBRID 9049	3								31.9	31.0	32.1	31.7	77.1	**30.7**
MEANS (For Entries Listed)			35.1		37.8		33.7	38.1	36.7	36.4	35.6	38.9			**36.2**
April-July Precip. (in.)			8.78	8.57	6.01		8.87	8.06	8.64	7.37	5.71	7.43	7.72		
Total Annual Precip. (in.)			12.17	14.30	10.27		13.29	12.51	14.43	11.90	10.29	12.42	12.40		
Soil NO3 (lbs.) to SD at Planting			n/a	n/a	n/a		n/a	78	214	708	157	154	262		
SD (Sampling Depth in Inches)			48	Pndg	Pndg		48	48	48	48	48	48	48		
Fertilizer Applied	(# N)		70	70	70		70	70	7	50	0	0	45		
	(# P2O5)		40	40	40		40	40	40	20	40	45	38		
	(# K2O)		25	25	25		25	25	25	10	0	0	18		

Long-term check variety is Centennial.

1/ The 1999 oil results not reported. The 2001 nursery was destroyed in October due to extreme stand variablity caused by severe drought conditions prior to planting and throughout the growing season.

2/ 10-Yr Comparable Average = (x/y) * z where x = average yield or oil of a given entry for years tested, y = average yield or oil for Centennial for the same years, and z = 10-Yr average yield or oil for the check variety Centennial.

3/ Percent of Centennial yield or oil for the same data years as those in which a given entry was tested.