

PROPOSED SAFFLOWER CULTIVAR FOR CONSIDERATION AT THE 2004 VARIETY RELEASE AND RECOMMENDATION MEETING

*Submitted by
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- I. Consider for safflower variety release under Plant Variety Protection with the Title V Provision by the Montana Agricultural Experiment Station: 91B3842
- II. Propose naming 91B3842 as 'NutraSaff'
- III. Consider for addition to the Montana Dryland and Irrigated Safflower Recommended List as a specialty linoleic, high oil, high protein variety as a whole seed nutritional feed supplement for beef cattle, dairy cattle, sheep, poultry, fish, and for other supplementary feedstuff uses.

Safflower

'91B3842'

'91B3842' is a high linoleic, high oil, high protein safflower cultivar intended for use as a specialty feedstock nutritional supplement. Its release for production in Montana and other northern Great Plains states will provide a specialty whole seed safflower product for livestock nutrition and value-added meat qualities.

The flower color of 91B3842 is yellow in the bud and bloom stage and orange in the wilt stage. 91B3842 plants are spiny with spines on the tip and along margins of the leaves and involucre bracts. 91B3842 is similar in linoleic fatty acid content to Centennial safflower but has a higher seed oil content, higher meal protein content and reduced hull content.

Protein and Oil Comparisons of 91B3842 Safflower to Centennial and Finch Safflower

| Variety | Year | % Meal ¹ Protein | % Seed ² Oil |
|------------|------------|--------------------------------|----------------------------|
| 91B3842 | 2003-MDSVT | 34.0 | 47.1 |
| Finch | 2003-MDSVT | 22.3 | 36.4 |
| Centennial | 2003-MDSVT | 23.7 | 40.5 |
| ----- | | | |
| LSD (.05) | | 3.90 | 5.13 |
| CV SE/Mean | | 3.7 | 3.2 |

| Variety | Year | % Meal ¹ Protein | % Seed ² Oil |
|------------|------------|--------------------------------|----------------------------|
| 91B3842 | 2003-MISVT | 32.8 | 52.0 |
| Finch | 2003-MISVT | 24.9 | 37.7 |
| Centennial | 2003-MISVT | 27.4 | 39.2 |
| ----- | | | |
| LSD (.05) | | 4.83 | 2.78 |
| CV SE/Mean | | 4.3 | 1.7 |

Protein and Oil Content of 91B3842 Breeders Seed (2002-2003)

| Location | Year | % Meal ¹ Protein | % Seed ² Oil |
|----------|----------------|--------------------------------|----------------------------|
| Sidney | 2002-Irrigated | 39.3 | 48.4 |
| Sidney | 2003-Irrigated | 35.9 | 51.1 |
| Huntley | 2003-Dryland | 38.6 | 49.6 |

¹⁾ By C/N analysis (Leco)

²⁾ By Soxhlet extraction determination

Origin and Breeding History of 91B3842

91B3842 was derived from a single F₁₁ plant selection from a 1981 multi-cross involving Biggs, PI 195895, Cargill 1653, Sidney Selection 87-42-3, and S-541 x a multi-cross involving Sidney Selection, AC-1, Sidney Selection 88-74-2, N-10, Mexican dwarf-2, ol35-1, PCM-1, and Arizona Pigmentless.

Recurrent selection for high seed oil, high meal protein, reduced hull content, and linoleic fatty acid composition was practiced in the breeding of 91B3842. Individual plant selections were made during the F₂, F₃, F₄, F₅, F₆, F₇, and F₈ generations.

91B3842 Safflower Descriptors

| | | |
|--|---|---|
| Leaf Shape | - | Lanceolate |
| Leaf Margin | - | Entire |
| Leaf Spines | - | Intermediate Spineless |
| Leaf Hairiness | - | Non-Hairy |
| Branch Angle | - | Intermediate 20° to 60° |
| Branch Location | - | Predominantly on the Upper Third of the Plant |
| Spine Length on Outer Involucral Bract (OIB) | - | 2.8 mm |
| Spine Location on OIB | - | Tip and Few Basal |
| Number of Spines on OIB | - | Intermediate |
| OIB Attitude | - | Open |
| Diameter of Primary Head | - | 31 mm (average) |

2003 Dryland Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 80 | 19.7 | 60 | 39.2 | 45.2 | 1655 | 749 |
| S-541 | 90 | 20.7 | 65 | 42.5 | 42.0 | 1821 | 765 |
| Centennial | 77 | 21.0 | 69 | 42.3 | 42.4 | 1683 | 714 |
| Morlin | 82 | 21.3 | 60 | 41.7 | 38.8 | 1437 | 558 |
| Finch | 90 | 20.7 | 69 | 44.8 | 36.7 | 1721 | 631 |
| Erlin | 85 | 18.7 | 59 | 40.2 | 38.1 | 1521 | 580 |
| LSD (0.05) | 8.334 | 0.9754 | 8.748 | 0.6227 | 0.8964 | 195 | 74.2 |
| CV (S/mean) | 6.203 | 0.2977 | 8.77 | 0.906 | 1.444 | 7.307 | 7.315 |

Date Seeded: April 24, 2003

Date Harvested: September 9, 2003

2003 Irrigated Valley Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 85 | 26.3 | 70 | 39.7 | 48.3 | 2868 | 1388 |
| S-541 | 92 | 27.0 | 70 | 39.5 | 42.1 | 2723 | 1149 |
| Centennial | 87 | 26.7 | 70 | 38.5 | 41.9 | 2515 | 1057 |
| Morlin | 93 | 27.7 | 69 | 41.2 | 40.8 | 2880 | 1177 |
| Finch | 93 | 25.3 | 71 | 45.0 | 38.0 | 3083 | 1173 |
| Erlin | 93 | 24.7 | 63 | 37.8 | 38.7 | 2485 | 967 |
| LSD (0.05) | 5.475 | 0.9172 | 5.872 | 1.537 | 1.108 | 291.6 | 128 |
| CV (S/mean) | 3.816 | 2.217 | 5.397 | 2.354 | 1.71 | 6.033 | 6.667 |

Date Seeded: May 15, 2003

Date Harvested: September 19, 2003

2003 Recrop Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 78 | 19.0 | 61 | 38.3 | 45.2 | 994 | 449 |
| S-541 | 85 | 21.0 | 60 | 41.7 | 41.0 | 1144 | 471 |
| Centennial | 83 | 21.0 | 59 | 41.3 | 41.6 | 1157 | 482 |
| Morlin | 88 | 21.0 | 53 | 41.3 | 37.9 | 987 | 375 |
| Finch | 88 | 20.0 | 60 | 44.2 | 36.1 | 1266 | 458 |
| Erlin | 83 | 17.3 | 53 | 40.2 | 38.1 | 1199 | 457 |
| LSD (0.05) | 8.496 | 1.448 | 5.667 | 0.6987 | 1.318 | 185.1 | 79.22 |
| CV (S/mean) | 6.331 | 0.4446 | 5.95 | 1.028 | 2.124 | 9.998 | 11.29 |

Date Seeded: April 24, 2003

Date Harvested: September 9, 2003

2003 Dryland Safflower
Williston, North Dakota

| Variety | Flower Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 82.0 | 49 | 38.5 | 45.0 | 1525 |
| S-541 | 83.3 | 51 | 42.0 | 40.9 | 1787 |
| Centennial | 83.7 | 50 | 41.1 | 41.3 | 1920 |
| Morlin | 83.3 | 44 | 41.1 | 38.7 | 1564 |
| Finch | 82.0 | 50 | 45.3 | 36.5 | 1820 |
| Erlin | 81.0 | 43 | 38.9 | 37.7 | 1551 |
| LSD (0.05) | 1.0 | 6.1 | .7 | N/A | 257.3 |
| CV (S/mean) | .7 | 8.1 | 1.1 | N/A | 9.1 |

Date Seeded: April 29, 2003

Date Harvested: September 1, 2003

2003 Dryland Safflower
Havre, Montana

| Variety | Stand Percent | Flower Date* | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|--------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 86 | 204.6 | 13.9 | 39.3 | 46.2 | 211 | 98 |
| S-541 | 91 | 206.3 | 13.5 | 41.5 | 41.2 | 414 | 170 |
| Centennial | 93 | 205.0 | 12.6 | 40.5 | 40.1 | 494 | 198 |
| Morlin | 97 | 204.3 | 11.9 | 40.3 | 37.3 | 495 | 185 |
| Finch | 94 | 204.7 | 11.8 | 42.0 | 34.5 | 564 | 195 |
| Erlin | 92 | 205 | 12.2 | 39.0 | 36.4 | 360 | 132 |
| LSD (0.05) | 7.69 | .77 | 1.96 | 1.11 | .79 | 128.2 | N/A |
| CV (S/mean) | 5.17 | .23 | 9.40 | 1.68 | 1.27 | 15.36 | N/A |

* Julian Flower Date (July 24 = 205)

2003 Dryland Safflower
Moccasin, Montana

| Variety | Height (in) | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|---------------------|-------------|
| 91B3482 | 20.0 | 43.4 | 252 |
| S-541 | 17.5 | 39.3 | 161 |
| Centennial | 19.0 | 39.6 | 189 |
| Morlin | 15.0 | 33.5 | 157 |
| Finch | 17.0 | 31.5 | 230 |
| Erlin | 20.0 | 34.8 | 226 |
| LSD (0.05) | 2.58 | 1.17 | 65.19 |
| CV (S/mean) | 6.89 | 2.01 | 17.93 |

2003 Dryland Safflower
Huntley, Montana

| Variety | Flower Date* | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|--------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 204.0 | 21.2 | 35.3 | 42.0 | 249 |
| S-541 | 204.0 | 21.6 | 35.2 | 39.1 | 237 |
| Centennial | 205.0 | 20.3 | 34.9 | 37.7 | 216 |
| Morlin | 201.7 | 18.7 | 37.4 | 34.1 | 241 |
| Finch | 203.7 | 18.0 | 36.8 | 29.9 | 255 |
| Erlin | 204.3 | 19.8 | 36.4 | 32.9 | 275 |
| LSD (0.05) | .9 | 1.8 | 2.0 | .8 | 85.8 |
| CV (S/mean) | .3 | 5.5 | 3.4 | 1.4 | 18.2 |

*Julian Flower Date (July 23=204)

2003 Irrigated Safflower
Huntley, Montana

| Variety | Flower Date* | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|--------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 203.7 | 23.9 | 39.2 | 47.7 | 2091 |
| S-541 | 205.3 | 25.8 | 40.6 | 43.6 | 2290 |
| Centennial | 204.0 | 22.3 | 40.8 | 42.8 | 1008 |
| Morlin | 204.0 | 20.1 | 41.4 | 40.0 | 665 |
| Finch | 205.0 | 24.3 | 45.6 | 38.1 | 2692 |
| Erlin | 202.0 | 21.5 | 41.3 | 40.8 | 2048 |
| LSD (0.05) | 1.9 | 3.5 | .9 | 1.6 | 548.1 |
| CV (S/mean) | .6 | 9.4 | 1.3 | 2.4 | 16.9 |

*Julian Flower Date (July 23=204)

2002 Dryland Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 83 | 25.0 | 51 | 38.3 | 44.3 | 1111 | 493 |
| S-541 | 95 | 25.3 | 56 | 38.5 | 42.3 | 1055 | 446 |
| Centennial | 80 | 26.7 | 53 | 37.3 | 42.2 | 1050 | 445 |
| Morlin | 78 | 25.7 | 48 | 39.5 | 39.7 | 979 | 388 |
| Finch | 37 | 26.3 | 47 | 42.8 | 37.7 | 727 | 274 |
| Erlin | 83 | 23.3 | 43 | 36.8 | 39.6 | 767 | 305 |
| LSD (0.05) | 9.65 | 0.9921 | 5.909 | 1.142 | 0.5498 | 197 | 77.76 |
| CV (S/mean) | 7.26 | 0.2965 | 7.809 | 1.75 | 0.8535 | 9.765 | 9.776 |

Date Seeded: May 18, 2002

Date Harvested: September 12, 2002

2002 Irrigated Valley Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 90 | 22.3 | 61 | 37.8 | 40.1 | 1812 | 731 |
| S-541 | 88 | 23.7 | 60 | 37.2 | 38.5 | 1511 | 584 |
| Centennial | 82 | 23.3 | 61 | 34.8 | 38.0 | 1345 | 513 |
| Morlin | 85 | 24.7 | 53 | 38.5 | 35.3 | 1806 | 638 |
| Finch | 77 | 22.7 | 60 | 41.3 | 34.7 | 1699 | 589 |
| Erlin | 90 | 21.3 | 50 | 37.2 | 35.5 | 1535 | 554 |
| LSD (0.05) | 7.117 | 1.004 | 7.641 | 1.58 | 1.063 | 334.8 | 133.8 |
| CV (S/mean) | 5.048 | 0.3029 | 7.891 | 2.498 | 1.761 | 9.922 | 10.7 |

Date Seeded: May 14, 2002

Date Harvested: October 9, 2002

2002 Recrop Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 78 | 21.8 | 51 | 39.8 | 40.4 | 858 | 348 |
| S-541 | 78 | 23.0 | 50 | 42.3 | 39.1 | 1136 | 444 |
| Centennial | 66 | 23.5 | 50 | 42.1 | 39.7 | 1100 | 438 |
| Morlin | 75 | 24.0 | 47 | 40.8 | 35.8 | 1053 | 377 |
| Finch | 50 | 22.3 | 43 | 46.4 | 33.9 | 800 | 273 |
| Erlin | 55 | 21.3 | 43 | 42.0 | 36.8 | 643 | 239 |
| LSD (0.05) | 12.89 | 1.636 | 6.370 | 0.7673 | 0.7776 | 262.5 | 102.4 |
| CV (S/mean) | 12.95 | 0.5741 | 9.723 | 1.293 | 1.512 | 18.47 | 19.75 |

Date Seeded: May 2, 2002

Date Harvested: September 12, 2002

2002 Dryland Safflower
Williston, North Dakota

| Variety | Flower Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 77.0 | 39 | 39.2 | 43.9 | 1078 |
| S-541 | 77.7 | 43 | 38.8 | 40.7 | 1236 |
| Centennial | 77.7 | 39 | 37.9 | 41.7 | 1046 |
| Morlin | 76.0 | 31 | 39.9 | 38.1 | 952 |
| Finch | 75.3 | 38 | 44.3 | 36.3 | 994 |
| Erlin | 72.3 | 34 | 38.3 | 36.9 | 789 |
| LSD (0.05) | 1.3 | 6.0 | .9 | .6 | 232.3 |
| CV (S/mean) | 1.1 | 9.6 | 1.3 | 1.0 | 12.5 |

Date Seeded: May 4, 2002

Date Harvested: September 13, 2002

2002 Dryland Safflower
Havre, Montana

| Variety | Stand Percent | Flower Date | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|-------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 60 | 213.7 | 19.63 | 39.5 | 42.8 | 1586 | 679 |
| S-541 | 64 | 213.7 | 20.79 | 41.5 | 40.3 | 1849 | 744 |
| Centennial | 46 | 218.0 | 19.24 | 40.3 | 40.5 | 1745 | 705 |
| Morlin | 55 | 218.0 | 18.39 | 38.9 | 36.7 | 1840 | 676 |
| Finch | 42 | 215.3 | 19.00 | 15.1 | 35.2 | 1384 | 487 |
| Erlin | 41 | 211.7 | 15.76 | 41.5 | 37.7 | 1262 | 476 |
| LSD (0.05) | 12.09 | 2.04 | 2.25 | 10.21 | .85 | 277.70 | N/A |
| CV (S/mean) | 14.14 | .58 | 7.91 | 15.68 | 1.44 | 10.24 | N/A |

2002 Dryland Safflower
Moccasin, Montana

| Variety | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 20.3 | 33.3 | 29.4 | 488 |
| S-541 | 20.5 | 32.9 | 28.6 | 538 |
| Centennial | 21.6 | 31.7 | 26.1 | 555 |
| Morlin | 20.3 | 31.0 | 22.1 | 692 |
| Finch | 20.9 | 34.7 | 24.6 | 497 |
| Erlin | 20.1 | 36.0 | 26.1 | 592 |
| LSD (0.05) | 2.40 | N/A | N/A | 191.9 |
| CV (S/mean) | 7.27 | N/A | N/A | 19.65 |

2002 Dryland Safflower
Huntley, Montana

| Variety | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 21.3 | 37.5 | 37.9 | 143 |
| S-541 | 23.1 | 32.7 | 35.5 | 150 |
| Centennial | 21.3 | 36.6 | 35.5 | 164 |
| Morlin | 20.3 | 36.5 | 32.2 | 144 |
| Finch | 21.5 | 38.7 | 30.8 | 185 |
| Erlin | 20.8 | 38.6 | 33.4 | 146 |
| LSD (0.05) | N/A | N/A | N/A | 81.4 |
| CV (S/mean) | N/A | N/A | N/A | 29.0 |

2001 Dryland Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|---------------------------|---------------|------------|-------------|------------------------------------|---------------------|-------------|-----------------|
| 91B3482 | 92 | 25.7 | 77 | 35.5 | 40.1 | 669 | 269 |
| S-541 | 88 | 27.0 | 75 | 35.4 | 38.9 | 657 | 256 |
| Centennial | 82 | 27.3 | 76 | 33.2 | 37.5 | 329 | 124 |
| Morlin | 78 | 28.3 | 71 | 36.0 | 33.0 | 251 | 83 |
| Finch | 83 | 26.7 | 77 | 36.1 | 31.3 | 588 | 185 |
| Erlin | 85 | 23.7 | 69 | 31.3 | 27.0 | 206 | 56 |
| LSD (0.05) | 14.57 | 1.528 | 9.970 | 1.335 | 1.345 | 200.6 | 80.82 |
| CV (S/mean) | 10.50 | 1.217 | 8.401 | 2.306 | 2.265 | 18.96 | 20.75 |
| Date Seeded: May 10, 2001 | | | | Date Harvested: September 10, 2001 | | | |

2001 Irrigated Valley Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|---------------------------|---------------|------------|-------------|------------------------------------|---------------------|-------------|-----------------|
| 91B3482 | 90 | 21.3 | 74 | 32.7 | 38.4 | 863 | 331 |
| S-541 | 90 | 22.7 | 86 | 31.1 | 34.1 | 565 | 192 |
| Centennial | 82 | 23.3 | 83 | 30.4 | 33.6 | 293 | 98 |
| Morlin | 88 | 23.3 | 72 | 33.3 | 30.8 | 590 | 182 |
| Finch | 92 | 22.3 | 82 | 34.6 | 30.4 | 873 | 265 |
| Erlin | 83 | 20.0 | 69 | 30.8 | 28.8 | 465 | 134 |
| LSD (0.05) | 7.166 | 1.157 | 9.451 | 1.107 | 1.513 | 250.6 | 91.94 |
| CV (S/mean) | 5.030 | .9656 | 7.438 | 2.058 | 2.704 | 17.89 | 19.08 |
| Date Seeded: May 15, 2001 | | | | Date Harvested: September 10, 2001 | | | |

2001 Recrop Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|---------------------------|---------------|------------|-------------|------------------------------------|---------------------|-------------|-----------------|
| 91B3482 | 88 | 24.0 | 57 | 37.6 | 37.6 | 626 | 236 |
| S-541 | 88 | 25.7 | 56 | 37.3 | 36.0 | 750 | 270 |
| Centennial | 77 | 27.3 | 54 | 36.9 | 35.1 | 367 | 129 |
| Morlin | 87 | 26.0 | 49 | 38.3 | 31.6 | 359 | 114 |
| Finch | 78 | 24.3 | 52 | 38.1 | 30.0 | 521 | 156 |
| Erlin | 83 | 23.3 | 46 | 31.4 | 26.8 | 209 | 56 |
| LSD (0.05) | 6.551 | 1.265 | 6.196 | 1.809 | .8035 | 146 | 53.28 |
| CV (S/mean) | 4.928 | 1.020 | 7.264 | 2.967 | 1.457 | 14.52 | 15.59 |
| Date Seeded: May 10, 2001 | | | | Date Harvested: September 10, 2001 | | | |

2001 Dryland Safflower
Williston, North Dakota

| Variety | Flower Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 79 | 65 | 37.8 | 42.2 | 1332 |
| S-541 | 81 | 64 | 38.0 | 39.2 | 1469 |
| Centennial | 81 | 58 | 37.0 | 38.7 | 1075 |
| Morlin | 80.3 | 53 | 38.2 | 35.8 | 1095 |
| Finch | 79 | 61 | 40.8 | 31.7 | 1404 |
| Erlin | 77 | 63 | 34.9 | 32.3 | 855 |
| LSD (0.05) | 1.1 | 9.5 | .9 | .9 | 169.9 |
| CV (S/mean) | .9 | 10.0 | 1.4 | 1.6 | 7.9 |

Date Seeded: May 3, 2001

Date Harvested: September 5, 2003

2001 Dryland Safflower
Moccasin, Montana

| Variety | Stand Percent | Height (in) | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|-------------|---------------------|-------------|-----------------|
| 91B3482 | 83 | 26 | 42.4 | 344 | 146 |
| S-541 | 73 | 24 | 42.4 | 305 | 129 |
| Centennial | 75 | 25 | 43.9 | 437 | 193 |
| Morlin | 67 | 25 | 35.8 | 538 | 193 |
| Finch | 73 | 24 | 36.5 | 657 | 245 |
| Erlin | 73 | 28 | 40.0 | 531 | 213 |
| LSD (0.05) | 16.34 | 3.74 | 2.909 | 290.1 | 124.5 |
| CV (S/mean) | 14.4 | 8.94 | 4.637 | 42.53 | 46.95 |

Date Seeded: April 26, 2001

Date Harvested: September 22, 2001

2001 Dryland Safflower
Huntley, Montana

| Variety | Flower Date* | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|--------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 188.3 | 21.7 | 36.6 | 41.2 | 587 |
| S-541 | 187.0 | 22.6 | 40.0 | 41.0 | 711 |
| Centennial | 189.3 | 19.3 | 39.8 | 40.7 | 714 |
| Morlin | 191.0 | 19.0 | 38.9 | 35.5 | 593 |
| Finch | 187.3 | 19.8 | 44.3 | 34.4 | 839 |
| Erlin | 186.0 | 18.9 | 39.7 | 36.0 | 660 |
| LSD (0.05) | 1.6 | 2.0 | 1.1 | 1.1 | 145.6 |
| CV (S/mean) | .5 | 6.4 | 1.8 | 1.8 | 12.2 |

*Julian Flower Date (July 5=186)

2000 Dryland Safflower – 4 row
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 88 | 20.7 | 56 | 39 | 44.4 | 1958 | 868 |
| Centennial | 80 | 23.7 | 55 | 40.3 | 42.8 | 1578 | 675 |
| Morlin | 93 | 22.7 | 54 | 40.5 | 40.2 | 1725 | 693 |
| Finch | 90 | 20.0 | 57 | 44.5 | 37.1 | 2145 | 795 |
| Erlin | 85 | 17.7 | 53 | 38.5 | 38.4 | 1486 | 571 |
| LSD (0.05) | 6.339 | 1.451 | 9.759 | .6073 | 1.322 | 191.5 | 79.4 |
| CV (S/mean) | 4.552 | 1.034 | 10.73 | .9140 | 2.164 | 6.478 | 7.172 |

Date Seeded: April 27, 2000 Date Harvested: September 8, 2000

2000 Valley Safflower – 3 row
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 81 | 70.3 | 88 | 34.9 | 41.0 | 1272 | 522 |
| Centennial | 83 | 82.7 | 65 | 34.9 | 37.1 | 846 | 313 |
| Morlin | 84 | 83.7 | 74 | 34.9 | 33.0 | 1150 | 377 |
| Finch | 80 | 80.0 | 72 | 39.2 | 34.1 | 1724 | 588 |
| Erlin | 77 | 77.0 | 63 | 33.4 | 33.3 | 1142 | 380 |
| LSD (0.05) | 1.332 | 8.551 | 7.109 | 2.040 | 2.679 | 390.3 | 140.7 |
| CV (S/mean) | 1.004 | 7.498 | 4.934 | 3.618 | 5.018 | 15.78 | 17.43 |

Date Seeded: May 2, 2000 Date Harvested: September 7, 2000

2000 Valley Safflower – 4 row
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 90 | 19.3 | 68 | 34.7 | 40.6 | 1527 | 621 |
| Centennial | 75 | 22.7 | 66 | 33.4 | 36.3 | 691 | 251 |
| Morlin | 77 | 22.3 | 74 | 33.8 | 33.3 | 1374 | 458 |
| Finch | 87 | 19.7 | 71 | 37.8 | 33.6 | 1742 | 586 |
| Erlin | 82 | 17.0 | 64 | 32.7 | 32.1 | 1124 | 363 |
| LSD (0.05) | 6.984 | 1.222 | 5.880 | 1.845 | 1.624 | 335.1 | 119.5 |
| CV (S/mean) | 5.021 | .9289 | 5.067 | 3.380 | 3.089 | 12.66 | 14.02 |

Date Seeded: May 2, 2000 Date Harvested: September 8, 2000

2000 Recrop Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 93 | 14.3 | 43 | 39.2 | 43.4 | 819 | 356 |
| Centennial | 90 | 14.7 | 46 | 41.2 | 42.1 | 1032 | 440 |
| Morlin | 92 | 14.7 | 35 | 39.9 | 37.8 | 654 | 247 |
| Finch | 81 | 24.7 | 39 | 45.1 | 36.9 | 678 | 251 |
| Erlin | 79 | 24.7 | 36 | 39.8 | 37.5 | 671 | 252 |
| LSD (0.05) | 1.59 | 5.54 | 8.09 | .779 | 1.25 | 428.6 | 172.3 |
| CV (S/mean) | 1.19 | 3.78 | 12.59 | 1.16 | 2.11 | 32.37 | 35.57 |

Date Seeded: April 25, 2000

Date Harvested: September 8, 2000

2000 Dryland Safflower
Williston, North Dakota

| Variety | Flower Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 81.0 | 54 | 38.2 | 40.4 | 1459 |
| Centennial | 83.7 | 53 | 39.6 | 38.3 | 1355 |
| Morlin | 82.3 | 50 | 40.5 | 36.4 | 1340 |
| Finch | 79.3 | 47 | 42.6 | 32.6 | 1719 |
| Erlin | 78.0 | 39 | 37.5 | 33.7 | 1130 |
| LSD (0.05) | 1.3 | 6.5 | .9 | 1.3 | 216.9 |
| CV (S/mean) | 1.0 | 8.6 | 1.3 | 2.2 | 9.0 |

Date Seeded: May 1, 2000

Date Harvested: September 13, 2000

2000 Dryland Safflower
Havre, Montana

| Variety | Stand Percent | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|---------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 50 | 21.2 | 41.7 | 45.2 | 421 |
| Centennial | 60 | 21.0 | 43.8 | 44.9 | 846 |
| Morlin | 53 | 21.1 | 43.0 | 42.2 | 686 |
| Finch | 76 | 22.1 | 46.2 | 40.8 | 1144 |
| Erlin | 49 | 19.3 | 42.4 | 43.1 | 367 |
| LSD (0.05) | 14.9 | 2.8 | 1.0 | 1.4 | 261.8 |
| CV (S/mean) | 9.0 | 4.8 | 0.8 | 1.3 | 11.1 |

2000 Dryland Safflower
Huntley, Montana

| Variety | Flower Date* | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|--------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 197.7 | 27.0 | 39.5 | 38.4 | 1036 |
| Centennial | 199.0 | 28.1 | 41.2 | 38.4 | 1619 |
| Morlin | 198.3 | 26.6 | 41.3 | 35.0 | 1687 |
| Finch | 198.7 | 26.9 | 45.4 | 34.9 | 2144 |
| Erlin | 194.7 | 25.1 | 39.9 | 34.6 | 1712 |
| LSD (0.05) | 1.6 | 2.0 | 1.1 | 1.4 | 577.2 |
| CV (S/mean) | .5 | 4.6 | 1.6 | 2.3 | 18.9 |

*Julian Flower Date (July 18=199)

2000-2003 Average Dryland Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 85.8 | 22.8 | 61 | 38.0 | 43.5 | 1348 | 595 |
| Centennial | 79.8 | 24.7 | 63 | 38.3 | 41.2 | 1160 | 490 |
| Morlin | 82.8 | 24.5 | 58 | 39.4 | 37.9 | 1098 | 431 |
| Finch | 75.0 | 23.4 | 62 | 42.1 | 35.7 | 1295 | 471 |
| Erlin | 84.5 | 20.9 | 56 | 36.7 | 35.8 | 995 | 378 |
| LSD (0.05) | 9.723 | 1.2 | 8.596 | 0.926 | 1.028 | 196.025 | 78.045 |
| CV (S/mean) | 7.128 | 0.7 | 8.927 | 1.469 | 1.682 | 10.627 | 11.253 |

2000-2003 Average Irrigated Valley Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 88.8 | 22.3 | 68 | 36.2 | 41.9 | 1768 | 768 |
| Centennial | 81.5 | 24.0 | 70 | 34.3 | 37.5 | 1211 | 480 |
| Morlin | 85.8 | 24.5 | 67 | 36.7 | 35.1 | 1663 | 614 |
| Finch | 87.3 | 22.5 | 71 | 39.7 | 34.2 | 1849 | 653 |
| Erlin | 87.0 | 20.8 | 62 | 34.6 | 33.8 | 1402 | 505 |
| LSD (0.05) | 6.685 | 1.1 | 7.211 | 1.517 | 1.327 | 303.025 | 118.31 |
| CV (S/mean) | 4.729 | 1.1 | 6.448 | 2.572 | 2.316 | 11.626 | 12.617 |

2000-2003 Average Recrop Safflower
Sidney, Montana

| Variety | Stand Percent | Bloom Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A | Oil Yield Lbs/A |
|-------------|---------------|------------|-------------|----------------|---------------------|-------------|-----------------|
| 91B3482 | 84.3 | 19.8 | 53 | 38.7 | 41.7 | 824 | 347 |
| Centennial | 79.0 | 21.6 | 52 | 40.4 | 39.6 | 914 | 372 |
| Morlin | 85.5 | 21.4 | 46 | 40.1 | 35.8 | 763 | 278 |
| Finch | 74.3 | 22.8 | 48.5 | 43.5 | 34.2 | 816 | 285 |
| Erlin | 75.0 | 21.7 | 44.5 | 38.4 | 34.8 | 681 | 251 |
| LSD (0.05) | 7.382 | 2.5 | 6.581 | 1.014 | 1.037 | 255.55 | 101.8 |
| CV (S/mean) | 6.349 | 1.5 | 8.882 | 1.61 | 1.80 | 18.8395 | 20.55 |

2000-2003 Average Dryland Safflower
Williston, North Dakota

| Variety | Flower Date | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 79.7 | 52 | 38.4 | 42.9 | 1349 |
| Centennial | 81.5 | 50 | 38.9 | 40.0 | 1349 |
| Morlin | 80.5 | 45 | 39.9 | 37.3 | 1238 |
| Finch | 78.9 | 49 | 43.3 | 34.3 | 1484 |
| Erlin | 77.1 | 45 | 37.4 | 35.2 | 1081 |
| LSD (0.05) | 1.18 | 7.03 | 0.85 | N/A | 219.10 |
| CV (S/mean) | 0.93 | 9.08 | 1.28 | N/A | 9.63 |

2000-2003* Average Dryland Safflower
Havre, Montana

| Variety | Stand Percent | Height (in) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|---------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 65 | 18.2 | 40.2 | 44.7 | 739 |
| Centennial | 66 | 17.6 | 41.5 | 41.8 | 1028 |
| Morlin | 68 | 17.1 | 40.7 | 38.7 | 1007 |
| Finch | 71 | 17.6 | 34.4 | 36.8 | 1031 |
| Erlin | 61 | 15.8 | 41.0 | 39.1 | 663 |
| LSD (0.05) | 11.56 | 2.3 | 4.1 | 1.0 | 222.57 |
| CV (S/mean) | 9.44 | 7.4 | 6.1 | 1.3 | 12.23 |

*No data for 2001 because of drought conditions

2001-2003* Average Dryland Safflower
Moccasin, Montana

| Variety | Height (cm) | Oil Content Percent | Yield Lbs/A |
|-------------|-------------|---------------------|-------------|
| 91B3482 | 22.1 | 38.4 | 361 |
| Centennial | 21.9 | 36.5 | 394 |
| Morlin | 20.1 | 30.5 | 462 |
| Finch | 20.6 | 30.9 | 461 |
| Erlin | 22.7 | 33.6 | 450 |
| LSD (0.05) | 2.9 | N/A | 182.4 |
| CV (S/mean) | 7.7 | N/A | 26.7 |

*No data for 2000 because plots got hailed out

2000-2003 Average Dryland Safflower
Huntley, Montana

| Variety | Flower Date* | Height (cm) | Test Wt Lbs/bu | Oil Content Percent | Yield Lbs/A |
|-------------|--------------|-------------|----------------|---------------------|-------------|
| 91B3482 | 196.7 | 22.8 | 37.2 | 39.9 | 503.8 |
| Centennial | 197.8 | 22.3 | 38.1 | 38.1 | 678.3 |
| Morlin | 197.0 | 21.2 | 38.5 | 34.2 | 666.3 |
| Finch | 196.6 | 21.6 | 41.3 | 32.5 | 855.8 |
| Erlin | 195.0 | 21.2 | 38.7 | 34.2 | 698.3 |
| LSD (0.05) | N/A | N/A | N/A | N/A | 222.5 |
| CV (S/mean) | N/A | N/A | N/A | N/A | 19.6 |

*No flower dates for 2002

**91B3842 (2002-2003) Breeders Seed
Fatty Acid Composition**

| SAMPLE NAME | C16:0 2.6 | C18:0 4.5 | C18:1 4.7 | C18:2 11.2 | C20:0 | C22:0 | C24:0 | % SAT |
|--------------------|----------------------|----------------------|----------------------|-----------------------|--------------|--------------|--------------|--------------|
| 2003 Huntley | 7.1 | 2.2 | 11.3 | 77.2 | 0.3 | 0.3 | 0.1 | 10.0 |
| 2003 Sidney | 6.9 | 2.2 | 10.0 | 79.1 | 0.3 | 0.2 | 0.1 | 9.8 |
| 2002 Sidney | 6.7 | 1.9 | 9.6 | 79.3 | 0.3 | 0.2 | 0.1 | 9.3 |
| Average | 6.9 | 2.1 | 10.3 | 78.5 | 0.3 | 0.2 | 0.1 | 9.7 |