

# *Agricultural Experiment Station*

College of Agricultural Sciences

Department of Soil & Crop Sciences

Extension

## **Making Better Decisions**



**2017 Colorado  
Sunflower  
Variety  
Performance  
Trials**

Crops  
Testing



For the fastest access to up-to-date variety information and results visit us at:  
[www.csucrops.com](http://www.csucrops.com)

Research conducted by Colorado State University Crops Testing Program  
Department of Soil and Crop Sciences  
Colorado State University Extension  
Colorado Agricultural Experiment Station

#### Disclaimer

**\*\*Mention of a trademark or proprietary product does not constitute endorsement by the Colorado Agricultural Experiment Station.\*\***

Colorado State University is an equal opportunity/affirmative action institution and complies with all Federal and Colorado State laws, regulations, and executive orders regarding affirmative action requirements in all programs. The Office of Equal Opportunity is located in 101 Student Services. In order to assist Colorado State University in meeting its affirmative action responsibilities, ethnic minorities, women, and other protected class members are encouraged to apply and to so identify themselves.

## Table of Contents

|                                                                                                  |    |
|--------------------------------------------------------------------------------------------------|----|
| Authors.....                                                                                     | 4  |
| Acknowledgments.....                                                                             | 4  |
| Summary of the 2017 Colorado Sunflower Hybrid Performance Trials.....                            | 5  |
| 2017 Dryland Oil Sunflower Hybrid Variety Performance Trial at Arapahoe.....                     | 7  |
| 2017 Limited-Irrigation Oil Sunflower Hybrid Variety Performance Trial at Burlington .....       | 8  |
| 2017 Limited-Irrigation Confection Sunflower Hybrid Variety Performance Trial at Burlington..... | 9  |
| 2017 Dryland Oil Sunflower Hybrid Variety Performance Trial at Julesburg.....                    | 10 |
| 2017 Dryland Confection Sunflower Hybrid Variety Performance Trial at Julesburg.....             | 11 |
| 2017 Irrigated Oil Sunflower Hybrid Variety Performance Trial at Prospect Valley.....            | 12 |
| 2017 Irrigated Confection Sunflower Hybrid Variety Performance Trial at Prospect Valley.....     | 13 |
| Advances in Sunflower Breeding and Production.....                                               | 14 |

## Authors

Dr. Jerry Johnson - Professor and Extension Specialist - Crop Production, CSU Department of Soil and Crop Sciences, Phone: 970-491-1454, Cell: 970-690-9259, E-mail: jerry.johnson@colostate.edu.

Sally Jones - Research Agronomist - Crops Testing, CSU Department of Soil and Crop Sciences, Phone: 970-491-1914, E-mail: sally.jones@colostate.edu.

Ed Asfeld - Research Associate - Crops Testing, CSU Department of Soil and Crop Sciences, 40335 CR GG, Akron, CO 80720, Phone: 970-554-0980, E-mail: ed.asfeld@colostate.edu.

Ron Meyer - Extension Agronomist - Golden Plains Area, CSU Extension, 817 15th St., Burlington, CO 80807, Phone: 719-346-5571 ext. 302, E-mail: rf.meyer@colostate.edu.

## Acknowledgments

The authors wish to express their gratitude to the collaborating Colorado farmers who voluntarily and generously contributed the use of their land, equipment, and time to facilitate the 2017 sunflower hybrid performance trials: Josh Lechman at Julesburg, Gabe Mitchek at Arapahoe, Gerhard Heintges at Burlington, and David Ruppel at Prospect Valley. We thank DOW AgroSciences for doing the sunflower seed oil content analysis and Red River Commodities, Inc. for doing the confection sunflower seed-sizing analyses.

# Summary of the 2017 Colorado Sunflower Hybrid Performance Trials

Jerry Johnson, Sally Jones, Ed Asfeld, and Ron Meyer

Colorado State University conducts hybrid oil and confection sunflower performance trials to provide unbiased and reliable information to Colorado sunflower producers so they can select the best hybrids for their farms. Hybrid selection is a cornerstone of all crop production systems. Variable climatic conditions, innovations from plant breeding and biotechnology, acquisitions and mergers of seed companies, and rapid development of new hybrids means sunflower performance information is more important than ever to Colorado sunflower producers. The sunflower hybrid performance trial is made possible by funding received from company entry fees, the Colorado Sunflower Administrative Committee, and Colorado State University. CSU Crops Testing is a public service for Colorado producers powered primarily by entry fees by the seed companies. Please join us in thanking the sunflower seed companies that entered the 2017 trials and encourage local company representatives to participate in 2018.

Colorado sunflower producers harvested over 90 million pounds in 2017, according to the USDA National Ag. Statistics Service.

Advances in weed control with a broader range of herbicides such as imidazolinone, Express, Clearfield,

and Clearfield Plus have benefited sunflower producers. A new herbicide labeled for sunflowers, called Zidua, also has added broadleaf control benefits.

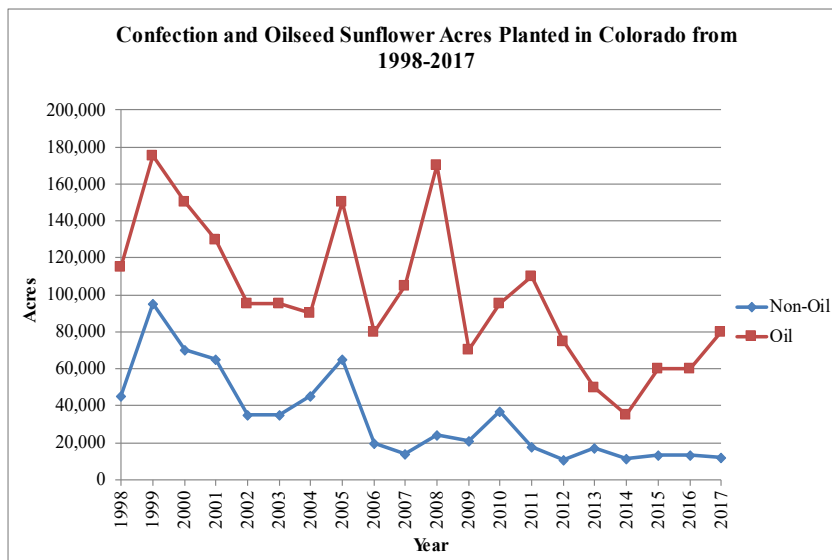


Figure 1 shows the variability of acreage for both oil and confection sunflowers in Colorado – especially for oil type sunflowers.

Acreage planted to oil type sunflowers has ranged from 35,000 (2014) planted acres up to 175,000 acres in 1999. The planted acres of confection sunflowers have generally decreased since 1999 and held steady since 2006. The variability of sunflower acreage could be due to several factors, including sunflower

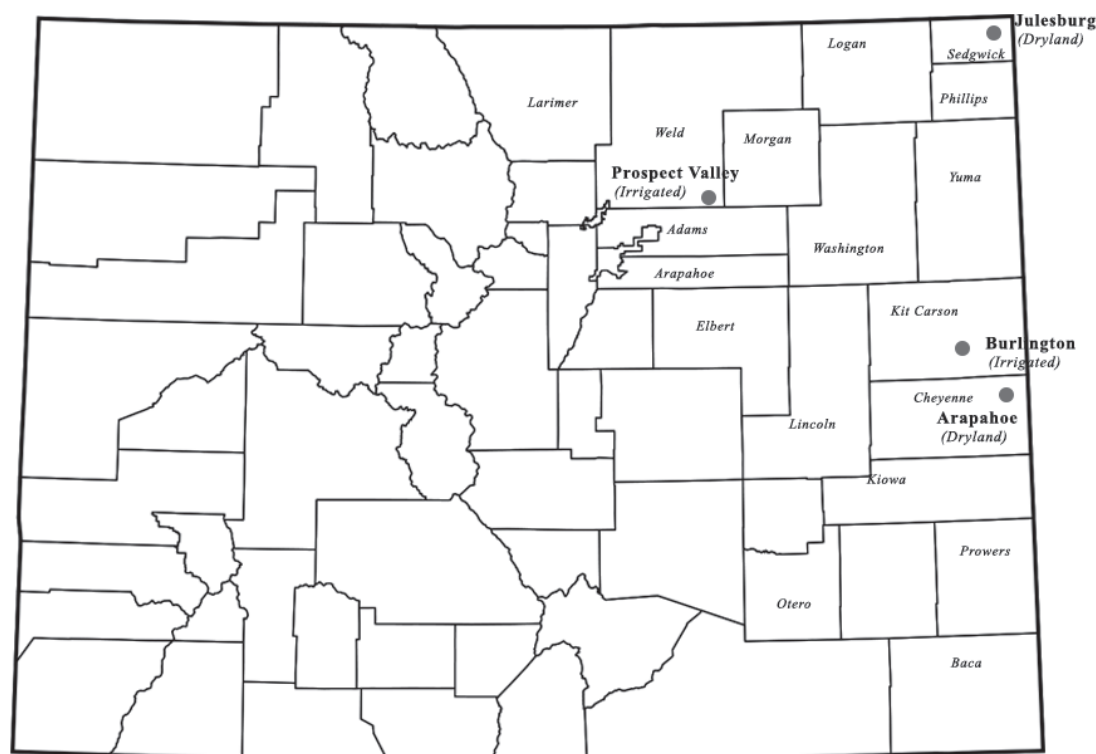
Table 1. Confection and oilseed sunflower acres planted in Colorado from 1998-2017.

commodity prices, the availability of contracts, soil water at the time of planting, crop insurance requirements, and adoption of cropping rotations that do not include sunflower. Dryland sunflowers may have fallen out of favor in recent years due to the increasing popularity of dryland corn and grain sorghum. On the other hand, herbicide tolerant sunflowers and new oil traits could lead to an increase of sunflower acreage in coming years. Food processors and consumers are demanding healthier oils, and sunflower oil meets this demand with the introduction of High Oleic type hybrids. High Oleic oil pressed from sunflower is more stable when used in cooking and has exceptional health benefits not found in other oils.

Colorado State University evaluated commercial and experimental oil and confection sunflower hybrids in eastern Colorado at one fully irrigated, one limited-irrigation, and two dryland locations in 2017. The limited irrigation trial was at Burlington and the fully irrigated trial was at Prospect Valley. The two dryland trials were located at Julesburg and Cheyenne Wells.

Results tables for the dryland and irrigated trials are presented on the following pages. Thirty-eight hybrids with diverse origins and maturities were tested in the irrigated and dryland trials. Plot sizes were approximately 150 ft<sup>2</sup> at Burlington and Prospect Valley (irrigated), and 300 ft<sup>2</sup> in the dryland trials at Julesburg and Cheyenne Wells. All plots were replicated four times at each trial location. Seed yield for all trial varieties are reported in the tables. Yield and oil content (for oil trials) are adjusted to 10% seed moisture content.

**Colorado Sunflower Trial Locations in 2017**



## 2017 Dryland Oil Sunflower Hybrid Variety Performance Trial at Arapahoe

| Brand                        | Hybrid     | Technology            |                     | Yield <sup>c</sup> | Moisture   | Test Weight | Plant Height | Population   | Oil Content |
|------------------------------|------------|-----------------------|---------------------|--------------------|------------|-------------|--------------|--------------|-------------|
|                              |            | Oil Type <sup>a</sup> | Traits <sup>b</sup> |                    |            |             |              |              |             |
|                              |            |                       |                     | lb/ac              | percent    | lb/bu       | in           | plants/ac    | percent     |
| Croplan                      | 568 CL HO  | HO                    | Clearfield, DM      | 2707               | 7.3        | 26.5        | 43           | 8,404        | 36.7        |
| Croplan                      | 7919 CL HO | HO                    | Clearfield, DM      | 2549               | 7.9        | 25.1        | 41           | 7,557        | 35.3        |
| Nuseed                       | N4HM521    | HO                    | Clearfield, DM      | 2527               | 7.7        | 25.3        | 49           | 8,073        | 38.2        |
| Croplan                      | 549 CL     | NS                    | Clearfield, DM      | 2427               | 6.4        | 26.5        | 61           | 8,661        | 34.4        |
| Nuseed                       | Hornet     | HO                    | Clearfield, DM      | 2371               | 6.9        | 25.6        | 47           | 8,571        | 35.6        |
| Croplan                      | 545 CL     | NS                    | Clearfield, DM      | 2236               | 7.6        | 25.6        | 46           | 9,243        | 37.6        |
| Croplan                      | 3732       | NS                    | N/A                 | 2186               | 6.2        | 26.6        | 48           | 10,261       | 38.6        |
| Croplan                      | 458 E HO   | HO                    | ExpressSun, DM      | 2135               | 7.2        | 23.2        | 50           | 9,090        | 34.9        |
| Nuseed                       | Camaro II  | NS                    | Clearfield, DM      | 2134               | 5.9        | 27.2        | 46           | 11,348       | 36.8        |
| Croplan                      | 432 E      | NS                    | ExpressSun, DM      | 2100               | 6.3        | 25.3        | 44           | 10,174       | 33.3        |
| Croplan                      | 455 E HO   | HO                    | ExpressSun, DM      | 2010               | 6.6        | 26.0        | 48           | 9,197        | 35.9        |
| Nuseed                       | N4HM354    | NS                    | Clearfield, DM      | 1916               | 5.9        | 25.8        | 43           | 9,814        | 37.0        |
| Croplan                      | 450 E HO   | HO                    | ExpressSun, DM      | 1912               | 6.4        | 25.7        | 45           | 8,517        | 36.8        |
| Croplan                      | 7717 CL HO | HO                    | Clearfield, DM      | 1843               | 6.2        | 26.7        | 40           | 9,749        | 34.6        |
| Nuseed                       | Cobalt II  | HO                    | Clearfield, DM      | 1692               | 6.4        | 25.8        | 41           | 8,696        | 35.0        |
| Croplan                      | 3845 HO    | HO                    | N/A                 | 1666               | 6.4        | 26.3        | 43           | 6,556        | 39.7        |
| <b>Average</b>               |            |                       |                     | <b>2151</b>        | <b>6.7</b> | <b>25.8</b> | <b>46</b>    | <b>8,994</b> | <b>36.3</b> |
| <sup>d</sup> LSD (P<0.30)    |            |                       |                     | 159                |            |             |              |              |             |
| <sup>d</sup> LSD (P<0.05)    |            |                       |                     | 306                |            |             |              |              |             |
| Coefficient of Variation (%) |            |                       |                     | 11.6               |            |             |              |              |             |

<sup>a</sup>Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

<sup>b</sup>Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

<sup>c</sup>Yield and oil content were corrected to 10% moisture.

<sup>d</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

### Site Information

Collaborator: Gabe Mitchek

Planting Date: June 15, 2017

Harvest Date: October 26, 2017

Fertilizer: N at 37, P at 24, S at 11, and Zn at 0.6 lb/ac

Herbicide: Pre-plant: Glyphosate at 48 oz/ac and 2,4-D at 24 oz/ac, Prowl at 1 qt/ac, 0.40 oz/ac of Spartan, and gramoxone at 44 oz/ac for burndown; In-season: Select at 10 oz/ac

Insecticide: Mustang Maxx

Soil Type: Keith-Richfield silt loam

*This table may be reproduced only in its entirety.*

## 2017 Limited-Irrigation Oil Sunflower Hybrid Variety Performance Trial at Burlington

| Brand                        | Hybrid     | Oil               |                                | Yield <sup>c</sup> | Moisture   | Test        |           | Plant         |         | Oil         |
|------------------------------|------------|-------------------|--------------------------------|--------------------|------------|-------------|-----------|---------------|---------|-------------|
|                              |            | Type <sup>a</sup> | Technology Traits <sup>b</sup> |                    |            | Weight      | Height    | Population    | Content |             |
|                              |            |                   |                                | lb/ac              | percent    | lb/bu       | in        | plants/ac     |         | percent     |
| Dyna-Gro                     | XH72N54CP  | HO                | Clearfield Plus                | 4119               | 6.8        | 33.7        | 49        | 17,642        |         | 41.6        |
| Dyna-Gro                     | XH71N44CL  | NS                | Clearfield                     | 3591               | 6.8        | 31.5        | 70        | 18,803        |         | 38.8        |
| Croplan                      | 568 CL HO  | HO                | Clearfield, DM                 | 3404               | 6.8        | 30.8        | 64        | 15,173        |         | 40.0        |
| Nuseed                       | N4HM505    | HO                | Clearfield, DM                 | 3399               | 7.1        | 30.3        | 60        | 16,553        |         | 38.4        |
| Dyna-Gro                     | XH71H27CL  | HO                | Clearfield                     | 3364               | 6.7        | 30.8        | 73        | 15,827        |         | 39.5        |
| Croplan                      | 545 CL     | NS                | Clearfield, DM                 | 3359               | 7.5        | 31.7        | 64        | 15,246        |         | 37.8        |
| Croplan                      | 7919 CL HO | HO                | Clearfield, DM                 | 3303               | 7.0        | 29.7        | 64        | 14,566        |         | 39.9        |
| Dyna-Gro                     | XH72H61CL  | HO                | Clearfield                     | 3178               | 6.1        | 30.6        | 54        | 17,714        |         | 39.9        |
| Nuseed                       | Camaro II  | NS                | Clearfield, DM                 | 3128               | 6.2        | 31.7        | 68        | 17,642        |         | 37.7        |
| Nuseed                       | N4HM521    | HO                | Clearfield, DM                 | 3109               | 6.9        | 29.8        | 68        | 15,173        |         | 40.2        |
| Croplan                      | 3732       | NS                | N/A                            | 3025               | 6.8        | 30.9        | 62        | 16,625        |         | 40.1        |
| Dyna-Gro                     | XH72H38CL  | HO                | Clearfield                     | 2996               | 6.5        | 30.3        | 66        | 12,995        |         | 37.9        |
| Nuseed                       | N4HM354    | NS                | Clearfield, DM                 | 2977               | 6.1        | 31.2        | 60        | 16,988        |         | 39.7        |
| Nuseed                       | Hornet     | HO                | Clearfield, DM                 | 2959               | 7.1        | 30.7        | 64        | 14,507        |         | 39.2        |
| Dyna-Gro                     | XH72H12CP  | HO                | Clearfield Plus                | 2947               | 6.2        | 31.2        | 77        | 15,827        |         | 39.6        |
| Croplan                      | 549 CL     | NS                | Clearfield, DM                 | 2945               | 6.2        | 31.1        | 75        | 14,375        |         | 38.7        |
| Dyna-Gro                     | XH72H47CL  | HO                | Clearfield                     | 2908               | 6.8        | 30.2        | 65        | 16,553        |         | 39.9        |
| Croplan                      | 432 E      | NS                | ExpressSun, DM                 | 2871               | 6.2        | 30.7        | 73        | 17,569        |         | 37.3        |
| Dyna-Gro                     | HX71N33CL  | NS                | Clearfield                     | 2830               | 6.4        | 31.3        | 58        | 17,027        |         | 39.4        |
| Croplan                      | 3845 HO    | HO                | N/A                            | 2707               | 6.7        | 30.9        | 62        | 11,367        |         | 40.9        |
| Croplan                      | 450 E HO   | HO                | ExpressSun, DM                 | 2591               | 6.8        | 30.5        | 73        | 13,620        |         | 37.0        |
| Dyna-Gro                     | XH71H11CL  | HO                | Clearfield                     | 2565               | 6.3        | 31.0        | 62        | 17,569        |         | 38.3        |
| Croplan                      | 458 E HO   | HO                | ExpressSun, DM                 | 2469               | 7.2        | 29.3        | 71        | 13,671        |         | 36.8        |
| Dyna-Gro                     | XH73H14CL  | HO                | Clearfield                     | 2466               | 6.5        | 30.6        | 62        | 17,424        |         | 37.9        |
| Croplan                      | 455 E HO   | HO                | ExpressSun, DM                 | 2406               | 6.7        | 31.0        | 68        | 15,173        |         | 38.6        |
| Dyna-Gro                     | XH73H32CL  | HO                | Clearfield                     | 2362               | 7.1        | 30.4        | 64        | 14,157        |         | 39.4        |
| Croplan                      | 7717 CL HO | HO                | Clearfield, DM                 | 2303               | 6.0        | 30.8        | 56        | 16,553        |         | 38.5        |
| Dyna-Gro                     | XH72H22HCL | HO                | Clearfield                     | 2201               | 6.4        | 32.0        | 62        | 12,357        |         | 37.6        |
| Nuseed                       | Cobalt II  | HO                | Clearfield, DM                 | 2184               | 7.0        | 30.9        | 66        | 17,061        |         | 38.3        |
| <b>Average</b>               |            |                   |                                | <b>2919</b>        | <b>6.6</b> | <b>30.9</b> | <b>65</b> | <b>15,716</b> |         | <b>38.9</b> |
| <sup>d</sup> LSD (P<0.30)    |            |                   |                                | 240                |            |             |           |               |         |             |
| <sup>d</sup> LSD (P<0.05)    |            |                   |                                | 458                |            |             |           |               |         |             |
| Coefficient of Variation (%) |            |                   |                                | 11.5               |            |             |           |               |         |             |

<sup>a</sup>Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

<sup>b</sup>Technology trait designations: Clearfield and Clearfield Plus=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

<sup>c</sup>Yield and oil content were corrected to 10% moisture.

<sup>d</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

### Site Information

Collaborator: Gerhard Heintges  
 Planting Date: June 12, 2017  
 Harvest Date: October 30, 2017  
 Fertilizer: N at 120, P at 35, and S at 10 lb/ac  
 Herbicide: Dual Magnum and Spartan  
 Insecticide: Lorsban and Warrior to control moths  
 Irrigation: Center-pivot  
 Soil Type: Richfield silty clay loam

*This table may be reproduced only in its entirety.*

## 2017 Limited-Irrigation Confection Sunflower Hybrid Variety Performance Trial at Burlington

| Brand                        | Hybrid       | Technology<br>Traits <sup>a</sup> | Yield <sup>b</sup><br>lb/ac | Moisture<br>percent | Test<br>Weight<br>lb/bu | Plant<br>Height<br>in | Population<br>plants/ac | Seed Retained Over Screen |               |               |               |
|------------------------------|--------------|-----------------------------------|-----------------------------|---------------------|-------------------------|-----------------------|-------------------------|---------------------------|---------------|---------------|---------------|
|                              |              |                                   |                             |                     |                         |                       |                         | Over<br>24/64             | Over<br>22/64 | Over<br>20/64 | Over<br>16/64 |
| Nuseed                       | 4334         | Clearfield                        | 3618                        | 10.4                | 18.9                    | 77                    | 13,145                  | 48.0                      | 82.8          | 94.9          | 99.3          |
| Red River Commodities, Inc.  | RRC 2215     | N/A                               | 3561                        | 9.2                 | 21.3                    | 73                    | 12,995                  | 24.7                      | 63.0          | 90.9          | 98.8          |
| Red River Commodities, Inc.  | RRC Exp 17-1 | N/A                               | 3497                        | 9.4                 | 21.8                    | 71                    | 14,375                  | 15.3                      | 53.8          | 85.0          | 98.8          |
| Nuseed                       | 5009         | N/A                               | 3236                        | 9.8                 | 20.9                    | 66                    | 11,061                  | 21.7                      | 51.6          | 84.9          | 98.8          |
| Valia Genetics               | Valia 41     | N/A                               | 3159                        | 9.6                 | 20.6                    | 63                    | 11,323                  | 26.5                      | 58.5          | 87.3          | 98.1          |
| Red River Commodities, Inc.  | RRC 2215 CL  | Clearfield                        | 2978                        | 10.1                | 20.6                    | 66                    | 9,078                   | 38.5                      | 74.7          | 92.1          | 99.3          |
| Red River Commodities, Inc.  | RRC 8015     | N/A                               | 2937                        | 9.4                 | 17.8                    | 61                    | 13,820                  | -                         | -             | -             | -             |
| Red River Commodities, Inc.  | RRC 8025     | N/A                               | 2505                        | 9.2                 | 18.8                    | 60                    | 12,705                  | 31.4                      | 62.8          | 86.7          | 98.7          |
| Nuseed                       | Panther DMR  | DM                                | 2447                        | 8.6                 | 21.6                    | 64                    | 10,761                  | 32.6                      | 63.7          | 85.8          | 99.4          |
| <b>Average</b>               |              |                                   | <b>3104</b>                 | <b>9.5</b>          | <b>20.2</b>             | <b>67</b>             | <b>12,140</b>           | <b>29.8</b>               | <b>63.9</b>   | <b>88.5</b>   | <b>98.9</b>   |
| <sup>c</sup> LSD (P<0.30)    |              |                                   | 149                         |                     |                         |                       |                         |                           |               |               |               |
| <sup>c</sup> LSD (P<0.05)    |              |                                   | 291                         |                     |                         |                       |                         |                           |               |               |               |
| Coefficient of Variation (%) |              |                                   | 14.6                        |                     |                         |                       |                         |                           |               |               |               |

<sup>a</sup>Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology traits.

<sup>b</sup>Yields were corrected to 10% moisture.

<sup>c</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

### Site Information

Collaborator: Gerhard Heintges  
 Planting Date: June 12, 2017  
 Harvest Date: October 31, 2017  
 Fertilizer: N at 120, P at 35, and S at 10 lb/ac  
 Herbicide: Dual Magnum and Spartan  
 Insecticide: Lorsban and Warrior to control moths  
 Irrigation: Center-pivot  
 Soil Type: Richfield silty clay loam

*This table may be reproduced only in its entirety.*

## 2017 Dryland Oil Sunflower Hybrid Variety Performance Trial at Julesburg

| Brand                        | Hybrid     | Oil Type <sup>a</sup> | Technology<br>Traits <sup>b</sup> | Yield <sup>c</sup><br>lb/ac | Moisture<br>percent | Test<br>Weight<br>lb/bu | Plant<br>Height<br>in | Population<br>plants/ac | Oil<br>Content <sup>c</sup><br>percent |
|------------------------------|------------|-----------------------|-----------------------------------|-----------------------------|---------------------|-------------------------|-----------------------|-------------------------|----------------------------------------|
| Croplan                      | 7919 CL HO | HO                    | Clearfield, DM                    | 2466                        | 8.9                 | 25.1                    | 59                    | 10,388                  | 37.7                                   |
| Nuseed                       | N4HM521    | HO                    | Clearfield, DM                    | 2342                        | 8.5                 | 23.8                    | 61                    | 9,868                   | 36.5                                   |
| Nuseed                       | Hornet     | HO                    | Clearfield, DM                    | 2332                        | 7.7                 | 26.1                    | 61                    | 11,967                  | 38.1                                   |
| Croplan                      | 3732       | NS                    | N/A                               | 2326                        | 7.8                 | 26.7                    | 55                    | 9,928                   | 38.8                                   |
| Croplan                      | 549 CL     | NS                    | Clearfield, DM                    | 2229                        | 7.1                 | 27.1                    | 67                    | 12,560                  | 36.9                                   |
| Croplan                      | 455 E HO   | HO                    | ExpressSun, DM                    | 2222                        | 7.9                 | 26.5                    | 58                    | 11,869                  | 37.9                                   |
| Croplan                      | 545 CL     | NS                    | Clearfield, DM                    | 2118                        | 7.9                 | 26.4                    | 56                    | 13,581                  | 37.1                                   |
| Croplan                      | 568 CL HO  | HO                    | Clearfield, DM                    | 2095                        | 8.5                 | 25.9                    | 57                    | 9,029                   | 37.1                                   |
| Croplan                      | 7717 CL HO | HO                    | Clearfield, DM                    | 1959                        | 7.1                 | 26.8                    | 60                    | 12,816                  | 37.5                                   |
| Croplan                      | 432 E      | NS                    | ExpressSun, DM                    | 1955                        | 7.3                 | 26.0                    | 54                    | 12,091                  | 35.3                                   |
| Nuseed                       | N4HM354    | NS                    | Clearfield, DM                    | 1952                        | 7.2                 | 26.5                    | 53                    | 14,233                  | 36.5                                   |
| Nuseed                       | Cobalt II  | HO                    | Clearfield, DM                    | 1898                        | 7.5                 | 26.6                    | 57                    | 12,793                  | 37.4                                   |
| Nuseed                       | Camaro II  | NS                    | Clearfield, DM                    | 1827                        | 7.6                 | 27.1                    | 61                    | 11,388                  | 35.8                                   |
| Croplan                      | 458 E HO   | HO                    | ExpressSun, DM                    | 1823                        | 7.9                 | 23.5                    | 59                    | 10,113                  | 34.6                                   |
| Croplan                      | 3845 HO    | HO                    | N/A                               | 1761                        | 7.6                 | 26.2                    | 48                    | 7,752                   | 37.7                                   |
| Croplan                      | 450 E HO   | HO                    | ExpressSun, DM                    | 1628                        | 7.9                 | 26.3                    | 57                    | 9,822                   | 34.5                                   |
| <b>Average</b>               |            |                       |                                   | <b>2058</b>                 | <b>7.8</b>          | <b>26.0</b>             | <b>58</b>             | <b>11,262</b>           | <b>36.8</b>                            |
| <sup>d</sup> LSD (P<0.30)    |            |                       |                                   | 196                         |                     |                         |                       |                         |                                        |
| <sup>d</sup> LSD (P<0.05)    |            |                       |                                   | 376                         |                     |                         |                       |                         |                                        |
| Coefficient of Variation (%) |            |                       |                                   | 13.0                        |                     |                         |                       |                         |                                        |

<sup>a</sup>Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

<sup>b</sup>Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

<sup>c</sup>Yield and oil content were corrected to 10% moisture.

<sup>d</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

### **Site Information**

Collaborator: Josh Lechman  
 Planting Date: June 8, 2017  
 Harvest Date: November 2, 2017  
 Fertilizer: N at 40 lb/ac and P at 34 lb/ac at planting  
 Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl H2O at 1.8 pt/ac  
 Soil Type: Richfield loam

*This table may be reproduced only in its entirety.*

## 2017 Dryland Confection Sunflower Hybrid Variety Performance Trial at Julesburg

| Brand          | Hybrid      | Technology<br>Traits <sup>a</sup> | Yield <sup>b</sup><br>lb/ac | Moisture<br>percent | Test<br>Weight<br>lb/bu | Plant<br>Height<br>in | Population<br>plants/ac | Seed Retained Over Screen |               |               |               |
|----------------|-------------|-----------------------------------|-----------------------------|---------------------|-------------------------|-----------------------|-------------------------|---------------------------|---------------|---------------|---------------|
|                |             |                                   |                             |                     |                         |                       |                         | Over<br>24/64             | Over<br>22/64 | Over<br>20/64 | Over<br>16/64 |
| Nuseed         | 5009        | N/A                               | 2111                        | 14.1                | 17.8                    | 58                    | 8,088                   | 74.2                      | 90.5          | 96.7          | 98.9          |
| Nuseed         | 4334        | Clearfield                        | 2087                        | 13.5                | 16.8                    | 59                    | 8,455                   | 87.6                      | 95.0          | 97.6          | 99.3          |
| Nuseed         | Panther DMR | DM                                | 1959                        | 11.1                | 17.8                    | 56                    | 8,971                   | 72.3                      | 90.3          | 97.8          | 99.7          |
| <b>Average</b> |             |                                   | <b>2052</b>                 | <b>12.9</b>         | <b>17.5</b>             | <b>58</b>             | <b>8,505</b>            | <b>78.0</b>               | <b>91.9</b>   | <b>97.4</b>   | <b>99.3</b>   |

<sup>c</sup>LSD (P<0.30)

NS

<sup>a</sup>Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology traits.

<sup>b</sup>Yield corrected to 10% moisture.

<sup>c</sup>NS=Yields were not significantly different from each other.

### Site Information

Collaborator: Josh Lechman  
 Planting Date: June 8, 2017  
 Harvest Date: November 2, 2017  
 Fertilizer: N at 40 lb/ac and P at 34 lb/ac at planting  
 Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl H20 at 1.8 pt/ac  
 Soil Type: Richfield loam

*This table may be reproduced only in its entirety.*

## 2017 Irrigated Oil Sunflower Hybrid Variety Performance Trial at Prospect Valley

| Brand                        | Hybrid     | Oil Type <sup>a</sup> | Technology          | Yield <sup>c</sup> | Moisture   | Test        | Plant     | Population    | Oil                  |
|------------------------------|------------|-----------------------|---------------------|--------------------|------------|-------------|-----------|---------------|----------------------|
|                              |            |                       | Traits <sup>b</sup> |                    |            | Weight      | Height    |               | Content <sup>c</sup> |
|                              |            |                       |                     | lb/ac              | percent    | lb/bu       | in        | plants/ac     | percent              |
| Dyna-Gro                     | XH72H47CL  | HO                    | Clearfield          | 4211               | 6.7        | 32.5        | 63        | 19,907        | 40.7                 |
| Croplan                      | 568 CL HO  | HO                    | Clearfield, DM      | 4138               | 7.0        | 31.9        | 60        | 18,605        | 41.2                 |
| Nuseed                       | N4HM521    | HO                    | Clearfield, DM      | 4022               | 7.3        | 30.4        | 60        | 18,123        | 38.7                 |
| Nuseed                       | N4HM505    | HO                    | Clearfield, DM      | 3976               | 7.1        | 32.4        | 63        | 22,732        | 39.1                 |
| Dyna-Gro                     | XH72N54CP  | HO                    | Clearfield Plus     | 3869               | 6.9        | 35.2        | 66        | 21,936        | 42.0                 |
| Croplan                      | 455 E HO   | HO                    | ExpressSun, DM      | 3856               | 6.8        | 33.0        | 63        | 21,658        | 39.2                 |
| Dyna-Gro                     | XH71H27CL  | HO                    | Clearfield          | 3802               | 6.7        | 32.3        | 69        | 21,805        | 39.9                 |
| Croplan                      | 549 CL     | NS                    | Clearfield, DM      | 3744               | 6.4        | 32.8        | 71        | 19,387        | 38.1                 |
| Nuseed                       | Hornet     | HO                    | Clearfield, DM      | 3712               | 6.7        | 32.5        | 64        | 19,605        | 39.6                 |
| Croplan                      | 7919 CL HO | HO                    | Clearfield, DM      | 3547               | 7.1        | 30.7        | 59        | 18,965        | 39.8                 |
| Croplan                      | 545 CL     | NS                    | Clearfield, DM      | 3539               | 6.9        | 32.6        | 57        | 18,456        | 38.4                 |
| Croplan                      | 450 E HO   | HO                    | ExpressSun, DM      | 3499               | 6.9        | 32.3        | 64        | 17,583        | 37.6                 |
| Croplan                      | 3845 HO    | HO                    | N/A                 | 3422               | 6.5        | 32.4        | 57        | 15,580        | 40.4                 |
| Nuseed                       | Camaro II  | NS                    | Clearfield, DM      | 3388               | 6.5        | 33.4        | 63        | 21,898        | 38.6                 |
| Croplan                      | 3732       | NS                    | N/A                 | 3350               | 6.6        | 32.8        | 56        | 19,529        | 40.5                 |
| Dyna-Gro                     | XH71N44CL  | NS                    | Clearfield          | 3335               | 7.0        | 32.7        | 58        | 22,911        | 39.2                 |
| Croplan                      | 432 E      | NS                    | ExpressSun, DM      | 3328               | 6.7        | 32.3        | 58        | 22,261        | 36.5                 |
| Dyna-Gro                     | XH72H38CL  | HO                    | Clearfield          | 3287               | 6.6        | 31.8        | 57        | 17,501        | 38.7                 |
| Dyna-Gro                     | XH72H12CP  | HO                    | Clearfield Plus     | 3205               | 6.4        | 32.7        | 65        | 20,391        | 39.7                 |
| Croplan                      | 458 E HO   | HO                    | ExpressSun, DM      | 3180               | 6.7        | 31.2        | 57        | 19,050        | 38.7                 |
| Croplan                      | 7717 CL HO | HO                    | Clearfield, DM      | 3172               | 6.5        | 31.9        | 58        | 19,273        | 37.4                 |
| Nuseed                       | N4HM354    | NS                    | Clearfield, DM      | 3167               | 6.4        | 33.0        | 61        | 21,872        | 39.6                 |
| Dyna-Gro                     | XH72H22HCL | HO                    | Clearfield          | 2819               | 6.6        | 32.9        | 52        | 19,084        | 37.5                 |
| Dyna-Gro                     | XH72H61CL  | HO                    | Clearfield          | 2735               | 6.5        | 31.4        | 65        | 19,179        | 38.3                 |
| Dyna-Gro                     | HX71N33CL  | NS                    | Clearfield          | 2688               | 6.4        | 33.4        | 58        | 22,619        | 39.9                 |
| Nuseed                       | Cobalt II  | HO                    | Clearfield, DM      | 2485               | 6.7        | 32.9        | 57        | 20,055        | 39.3                 |
| Dyna-Gro                     | XH73H14CL  | HO                    | Clearfield          | 2450               | 6.7        | 32.3        | 52        | 21,161        | 38.6                 |
| Dyna-Gro                     | XH73H32CL  | HO                    | Clearfield          | 2401               | 6.7        | 32.7        | 66        | 17,707        | 39.3                 |
| Dyna-Gro                     | XH71H11CL  | HO                    | Clearfield          | 2166               | 6.6        | 32.6        | 58        | 22,035        | 39.2                 |
| <b>Average</b>               |            |                       |                     | <b>3327</b>        | <b>6.7</b> | <b>32.4</b> | <b>61</b> | <b>20,030</b> | <b>39.2</b>          |
| <sup>d</sup> LSD (P<0.30)    |            |                       |                     | 256                |            |             |           |               |                      |
| <sup>d</sup> LSD (P<0.05)    |            |                       |                     | 488                |            |             |           |               |                      |
| Coefficient of Variation (%) |            |                       |                     | 10.5               |            |             |           |               |                      |

<sup>a</sup>Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

<sup>b</sup>Technology trait designations: Clearfield and Clearfield Plus=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

<sup>c</sup>Yield and oil content were corrected to 10% moisture.

<sup>d</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

### Site Information

Collaborator: David Ruppel  
 Planting Date: June 5, 2017  
 Harvest Date: November 3, 2017  
 Fertilizer: Poultry manure at 4.5 ton/ac  
 Herbicide: Sonalan at 3 pt/ac  
 Insecticide: Warrior at 1.92 oz/ac and Lorsban at 0.67 pt/ac  
 Irrigation: Furrow irrigation  
 Soil Type: Weld loam

*This table may be reproduced only in its entirety.*

## 2017 Irrigated Confection Sunflower Hybrid Variety Performance Trial at Prospect Valley

| Brand                        | Hybrid       | Technology<br>Traits <sup>a</sup> | Yield <sup>b</sup> | Moisture    | Test<br>Weight | Plant<br>Height | Population    | Seed Retained Over Screen |               |               |               |
|------------------------------|--------------|-----------------------------------|--------------------|-------------|----------------|-----------------|---------------|---------------------------|---------------|---------------|---------------|
|                              |              |                                   |                    |             |                |                 |               | Over<br>24/64             | Over<br>22/64 | Over<br>20/64 | Over<br>16/64 |
|                              |              |                                   | lb/ac              | percent     | lb/bu          | in              | plants/ac     | percent                   |               |               |               |
| Red River Commodities, Inc.  | RRC Exp 17-1 | N/A                               | 3909               | 10.9        | 23.2           | 63              | 15,367        | 16.3                      | 60.7          | 92.0          | 98.4          |
| Red River Commodities, Inc.  | RRC 8015     | N/A                               | 3871               | 10.4        | 20.5           | 57              | 14,314        | 28.3                      | 64.7          | 89.3          | 99.0          |
| Red River Commodities, Inc.  | RRC 8025     | N/A                               | 3820               | 10.8        | 19.9           | 56              | 14,552        | 20.6                      | 53.3          | 82.1          | 98.3          |
| Nuseed                       | 4334         | Clearfield                        | 3770               | 12.1        | 19.5           | 66              | 12,088        | 58.0                      | 84.1          | 94.3          | 98.7          |
| Nuseed                       | 5009         | N/A                               | 3549               | 11.7        | 22.2           | 58              | 13,271        | 17.4                      | 57.0          | 84.4          | 97.9          |
| Red River Commodities, Inc.  | RRC 2215 CL  | Clearfield                        | 3476               | 11.9        | 21.3           | 59              | 11,644        | 42.6                      | 81.7          | 95.3          | 98.9          |
| Red River Commodities, Inc.  | RRC 2215     | N/A                               | 3260               | 9.8         | 23.6           | 61              | 14,615        | 11.9                      | 52.4          | 86.6          | 97.2          |
| Nuseed                       | Panther DMR  | DM                                | 3049               | 9.4         | 23.3           | 60              | 13,624        | 23.2                      | 52.7          | 79.8          | 97.5          |
| <b>Average</b>               |              |                                   | <b>3588</b>        | <b>10.9</b> | <b>21.7</b>    | <b>60</b>       | <b>13,684</b> | <b>27.3</b>               | <b>63.3</b>   | <b>88.0</b>   | <b>98.2</b>   |
| <sup>c</sup> LSD (P<0.30)    |              |                                   | 283                |             |                |                 |               |                           |               |               |               |
| <sup>c</sup> LSD (P<0.05)    |              |                                   | 552                |             |                |                 |               |                           |               |               |               |
| Coefficient of Variation (%) |              |                                   | 10.8               |             |                |                 |               |                           |               |               |               |

<sup>a</sup>Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology traits.

<sup>b</sup>Yield corrected to 10% moisture.

<sup>c</sup>If the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) the difference is significant.

### Site Information

Collaborator: David Ruppel  
 Planting Date: June 5, 2017  
 Harvest Date: November 3, 2017  
 Fertilizer: Poultry manure at 4.5 ton/ac  
 Herbicide: Sonalan at 3 pt/ac  
 Insecticide: Warrior at 1.92 oz/ac and Lorsban at 0.67 pt/ac  
 Irrigation: Furrow irrigation  
 Soil Type: Weld loam

*This table may be reproduced only in its entirety.*

# **Advances in Sunflower Breeding and Production**

RF Meyer

Plant scientists have been employing science to improve crops for centuries. Evidence from early cave dwellers suggest they selected seeds from plants that had the best tall stalks and seeds. A great breakthrough occurred in 1866 when Agronomist/Monk Gregor Mendel crossed pea plants and became known as the “Father of Genetics”. As knowledge improved, science improved. Plant scientists (agronomists by today’s title) have advanced varieties and traits, one gene at a time.

Today, plant breeders work with a number of non-transgenic methods to transfer desirable traits from one plant to the next generation of plants. Sunflower is a crop that is not GMO or transgenic, which means that more traditional plant breeding techniques are employed. In an effort to use new technologies more efficiently with non-transgenic crops, plant breeders have discovered better and faster methods for transferring desirable plant traits to the next generation. DNA Marker-Assisted Selection (MAS) is one technology that is currently being employed. DNA markers have been found that allow a plant breeder to more efficiently select specific traits to advance to the next generation. While markers may or may not be the DNA that controls the desired trait, they act as a “flag” that point to the specific gene that plant breeders want transferred. This technology has been used since the early 2000s.

One particularly powerful form of DNA marker technology is Single Nucleotide Polymorphism or SNP (pronounced snip). This plant breeding technology allows less expensive and high-throughput DNA sequencing methods to identify and locate genes controlling important traits. SNPs located close to a particular gene act as a marker for that gene. Once the marker is identified, plant breeders know which genes to focus on and select for transfer.

Two other plant breeding methods that are currently garnering increased attention are Genomic Selection and High Throughput Phenotyping. Genomic Selection allows the breeder to use SNPs to increase the accuracy and efficiency of trait selection, with the key goal of shortening the breeding cycle time and quickly increase the rate of genetic gain. High throughput phenotyping uses remote sensing and other technologies to rapidly and inexpensively evaluate breeding germplasm for drought tolerance, heat tolerance, plant biomass, pest tolerance, and other important production characteristics.

Further, another new plant genetic transfer technique is called Clustered Regularly Interspaced Short Palindromic Repeats or CRISPR. The CRISPR breeding method involves proteins used to change the sequence and potentially “deactivate” certain undesirable genes. For instance, CRISPR technology could disable a plant’s gene that allows disease or insect susceptibility, thus making the plant resistant to specific pests, without using transgenic methods. This technology could make plants more insect or disease resistant by turning off the bad genes and enabling the good genes to thrive, without inserting foreign genes into the plant. This could also eliminate or reduce future pesticide applications to control pests. Sunflower breeders are incorporating all these techniques to deliver the best traits possible.

As a result of improved crop production techniques, breeders are now able to reduce the time required to release a new and improved sunflower variety equipped with targeted pest tolerant traits from ten years to approximately three years, in some cases. Even without transgenic technology, sunflower enjoys herbicide resistance traits found in the wild and crossed into new hybrids, giving producers another tool. A new herbicide was tested this year for broadleaf control with excellent results. Zidua, applied with

both pre- and post-emergence treatments performed well. New advances are also finding sunflower genes that are insect resistant, which could eliminate insecticide applications.

It is no accident that record crop yields are happening yearly. At a trial site near Prospect Valley, one new sunflower variety yielded 4998 pounds per acre. Clearly, 5000 pound per acre sunflower yields are reachable. While CSU does not breed new varieties, the on-farm testing team continues to explore new techniques to increase yields. To be sure, agricultural scientists are currently employing the best technology available and the return on investment is showing up with quicker variety release times, enhanced pest resistance, and higher yields using similar inputs.

Sources:

Colorado Wheat Farmer, Glenda Mostek.

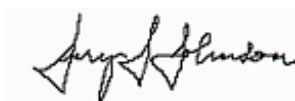
Maine Organic Farmer & Gardener- Spring 2011, John Koster.

Scott Haley, Colorado State University Wheat Breeder.

# Colorado State University



Department of Soil and Crop Sciences  
1170 Campus Delivery  
Fort Collins, Colorado 80523-1170



Jerry Johnson, Extension Specialist Crop Production

Find us on Twitter: [@csucrops](https://twitter.com/csucrops)