

Technical Report TR 14-10

Agricultural Experiment Station

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**2014 Colorado Sunflower
Variety Performance Trials**

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Authors

Dr. Jerry Johnson - Associate Professor and Extension Specialist - Crop Production, Colorado State University, Department of Soil and Crop Sciences, Phone: 970-491-1454, E-mail: jerry.johnson@colostate.edu.

Jim Hain - Research Associate - Crops Testing Program, Colorado State University, Department of Soil and Crop Sciences, 40335 CR GG, Akron, CO 80720, Phone: 970-554-0980.

Sally Sauer - Research Associate - Crops Testing Program, Colorado State University, Department of Soil and Crop Sciences, Phone: 970-491-1914, E-mail: sally.sauer@colostate.edu.

Ron Meyer – Extension Agronomist – Golden Plains Area, Colorado State University, 817 15th St., Burlington, CO 80807, Phone: 970-346-5571 ext. 302, E-mail: rf.meyer@colostate.edu.

Kierra Jewell - Administrative Assistant III, Colorado State University, Department of Soil and Crop Sciences, Phone: 970-491-6201, E-mail: kierra.jewell@colostate.edu.

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Summary of the 2014 Colorado Sunflower Hybrid Performance Trials

Jerry Johnson 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. Variable climatic conditions, innovations from plant breeding and biotechnology, acquisitions and mergers of seed companies, and rapid development of new hybrid lines means crop performance information is increasingly important 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.

Colorado sunflower producers are expected to harvest 52 million pounds of seed in 2014, which is 112% of last year's total from 30% fewer acres than last season according to the USDA National Ag. Statistics Service. Above average rainfall and new hybrids contributed to the increase. Advances in weed control with a broader range of herbicides such as imidazolinone, Express, Clearfield, and Clearfield Plus have benefited our sunflower producers. The 2014 sunflower growing season was cooler and wetter than in 2013. The cooler weather affected the dry down rate and delayed and extended harvest activities. Harvest began 3 weeks later than normal. Yields of both oil and confection types were 500 pounds per acre higher than 2013 yields. Oil content and confection seed size were also better than observed in 2013.

Figure 1 shows that the acreage of both oil and confection sunflowers in Colorado has been highly variable (especially the oil type) over the past 20 years. The oil type has ranged from 45,000 planted acres in 1996 up to 175,000 acres in 1999, and only 35,000 acres planted in 2014. The planted acres of confection sunflowers have generally decreased since 1999. The variability of sunflower acreage could be due to several factors, including sunflower 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, especially with the new drought tolerant hybrids coming onto the market. On the other hand, herbicide tolerant sunflowers and new oil traits could lead to an increase of sunflower acreage in coming years.

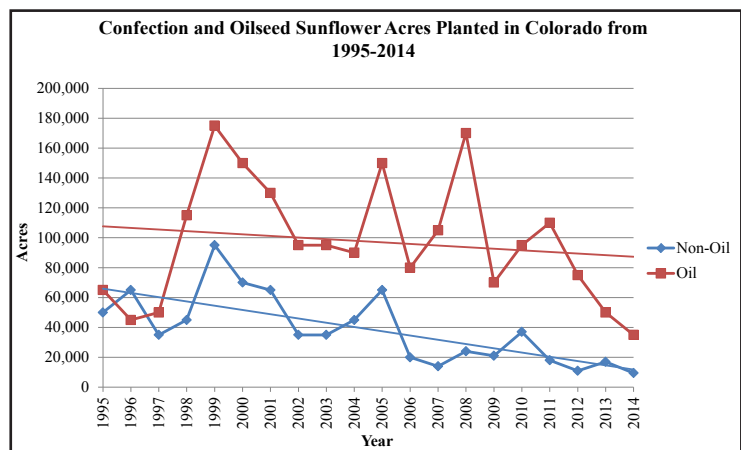
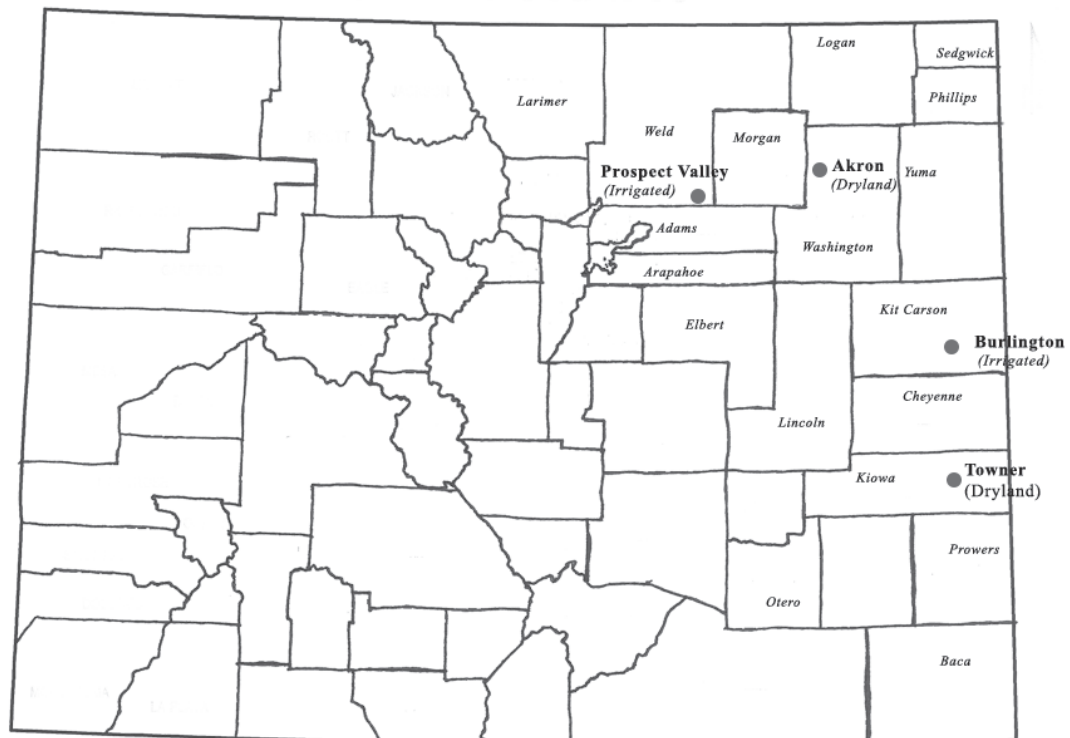


Figure 1: Confection and Oilseed Sunflower Acres Planted in Colorado from 1995-2014

Colorado State University evaluated commercial and experimental oil and confection sunflower hybrids in eastern Colorado at two limited irrigation and two dryland locations in 2014. The irrigated trial locations were Burlington and Prospect Valley. The two dryland trials were located at Towner (southeast) and Akron (northeast). We lost one trial this year (Prospect Valley confections) due to a hailstorm that defoliated plants by 80%. While the confection trial was lost, the top two oilseed hybrids in the trial at Prospect Valley still yielded more than 2000 pounds per acre. Even with the hail damage,

oil types from this trial averaged 1800 pounds per acre, indicating good adaptability to our conditions. Results tables for the trials are presented in the following pages. Thirty-seven hybrids with diverse origins and maturities were tested across different irrigated and dryland trial locations. Plot sizes were approximately 150 ft² at Burlington and Akron, and 300 ft² at Prospect Valley and Towner. Seed yields for all trial varieties are reported in the tables. Yields and oil content (for oil trials) are adjusted to 10% seed moisture content.

Colorado Sunflower Trial Locations in 2014



2014 Limited-Irrigation Oil Sunflower Hybrid Performance Trial at Burlington

| Brand | Hybrid | Herbicide | | 2014 Yield ^c lb/ac | 2-Year Avg. Yield | Moisture percent | Test Weight lb/bu | Plant Height in | Population plants/ac | Lodging percent | Oil Content percent |
|----------------------|---------------|-----------------------|-------------------------------|----------------------------------|-------------------|---------------------|----------------------|--------------------|-------------------------|--------------------|------------------------|
| | | Oil Type ^a | Technology Trait ^b | | | | | | | | |
| Croplan | 14-572 | HO | Clearfield | 3226 | - | 6.9 | 30.6 | 77 | 16,655 | 5.0 | 37.7 |
| Croplan | 559 CL | NS | Clearfield | 3066 | 2546 | 6.9 | 30.4 | 73 | 22,554 | 9.0 | 39.5 |
| Croplan | 545 CL | NS | Clearfield | 3017 | - | 7.3 | 31.7 | 78 | 21,216 | 2.8 | 39.5 |
| Mycogen | 8H449CLDM | HO | Clearfield | 3015 | 2516 | 6.5 | 31.8 | 67 | 22,004 | 7.6 | 41.3 |
| Nuseed Americas Inc. | Hornet | HO | Clearfield | 2970 | 2513 | 6.8 | 29.9 | 79 | 22,458 | 5.2 | 39.9 |
| Croplan | 432 E | NS | ExpressSun | 2910 | 2162 | 7.1 | 29.8 | 65 | 21,714 | 7.6 | 37.0 |
| Croplan | 13-652 CL | HO | Clearfield | 2894 | 2710 | 7.2 | 29.3 | 66 | 19,914 | 10.6 | 39.3 |
| Nuseed Americas Inc. | Camato II | NS | Clearfield | 2863 | 2275 | 6.5 | 32.2 | 68 | 22,324 | 4.4 | 39.1 |
| Mycogen | 8H859CL | HO | Clearfield | 2857 | - | 7.3 | 30.0 | 74 | 22,845 | 7.2 | 39.7 |
| Syngenta | 3732 NS | NS | N/A | 2831 | - | 6.6 | 30.1 | 61 | 20,690 | 9.5 | 39.7 |
| Syngenta | 3845 HO | HO | N/A | 2715 | 2500 | 6.4 | 30.1 | 63 | 20,988 | 11.4 | 41.1 |
| Mycogen | 8N668S | NS | N/A | 2427 | 2310 | 7.6 | 29.2 | 56 | 19,281 | 10.1 | 40.6 |
| Nuseed Americas Inc. | Falcon | NS | ExpressSun | 2392 | 2099 | 8.4 | 30.3 | 62 | 19,638 | 5.7 | 39.1 |
| Syngenta | 7717 HO/CL/DM | HO | Clearfield | 2185 | - | 6.3 | 29.9 | 67 | 20,956 | 6.4 | 38.8 |
| Croplan | 13-08 E | HO | ExpressSun | 2118 | 1953 | 7.1 | 30.4 | 53 | 20,535 | 13.2 | 39.5 |
| Mycogen | 8H570CL | HO | Clearfield | 1467 | - | 6.7 | 30.7 | 51 | 22,942 | 12.0 | 38.8 |
| Average | | | | 2685 | 2358 | 7.0 | 30.4 | 66 | 21,045 | 8.0 | 39.4 |

^dLSD (P<0.30)
365

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bHerbicide technology trait designations: Clearfield=Clearfield; ExpressSun=Express herbicide; N/A=No herbicide traits.

^cYields were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is statistically significant.

Plot size: 5' x 30'

Site Information

Collaborator: Gerhard Heintges
 Planting Date: 6/16/2014
 Harvest Date: 10/22/2014
 Fertilizer: Nitrogen at 100 lb/ac and phosphorus at 40 lb/ac
 Insecticide: Warrior applied at 1.92 oz/ac during bloom stage
 Irrigation: Pre-plant: 3 inches applied
 Post-emergence: 2 inches applied
 Soil Type: Silt-loam

2014 Limited-Irrigation Oil Sunflower Hybrid Performance Trial at Prospect Valley

| Brand | Hybrid | Oil Type ^a | Herbicide Technology Trait ^b | Yield ^c lb/ac | Test | | Population plants/ac | Lodging percent | Oil Content percent |
|---------------------------|---------------|-----------------------|---|-----------------------------|---------------------|-----------------------|-------------------------|--------------------|---------------------------|
| | | | | | Moisture percent | Plant Height in | | | |
| Mycogen | 8H449CLDM | HO | Clearfield | 2152 | 5.5 | 66 | 23,499 | 0.6 | 39.2 |
| NuSeed Americas Inc. | Hornet | HO | Clearfield | 2006 | 5.2 | 74 | 26,852 | 3.5 | 38.0 |
| NuSeed Americas Inc. | Camaro II | NS | Clearfield | 1979 | 5.1 | 71 | 28,050 | 0.9 | 38.4 |
| Mycogen | 8H570CL | HO | Clearfield | 1857 | 5.3 | 51 | 25,772 | 2.0 | 37.9 |
| Mycogen | 8N668S | NS | N/A | 1823 | 7.0 | 50 | 23,358 | 1.4 | 41.2 |
| Mycogen | 8H859CL | HO | Clearfield | 1800 | 6.0 | 69 | 25,350 | 1.3 | 39.9 |
| NuSeed Americas Inc. | Falcon | NS | ExpressSun | 1695 | 5.7 | 59 | 22,033 | 1.2 | 39.4 |
| Syngenta | 3732 NS | NS | N/A | 1690 | 5.3 | 61 | 26,420 | 0.8 | 35.9 |
| Syngenta | 7717 HO/CL/DM | HO | Clearfield | 1652 | 5.1 | 60 | 25,910 | 0.3 | 35.2 |
| Syngenta | 3845 HO | HO | N/a | 1572 | 5.2 | 56 | 23,279 | 0.6 | 37.4 |
| Average | | | | 1822 | 5.6 | 62 | 25,052 | 1.3 | 38.2 |
| ^d LSD (P<0.30) | | | | 123 | | | | | |

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bHerbicide technology trait designations: Clearfield=Clearfield; ExpressSun=Express herbicide; N/A=No herbicide traits.

^cYields were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is statistically significant.

Plot size: 10' x 30'

Site Information

Collaborator: David Ruppel
 Planting Date: 6/6/2014
 Harvest Date: 10/20/2014
 Fertilizer: Poultry manure applied at 4 tons/ac
 Herbicide: Sonalan
 Insecticide: Warrior and Lorsban

2014 Dryland Oil Sunflower Hybrid Performance Trial at Akron

| Brand | Hybrid | Oil | | Yield ^c lb/ac | Moisture percent | Test Weight lb/bu | Plant | | Lodging percent | Oil Content percent |
|---------------------------|---------------|-------------------|--|-----------------------------|---------------------|-------------------------|--------------|-------------------------|--------------------|---------------------------|
| | | Type ^a | Herbicide Technology Trait ^b | | | | Height in | Population plants/ac | | |
| Syngenta | 3845 HO | HO | N/A | 2239 | 5.9 | 31.0 | 49 | 7,192 | 9.5 | 39.9 |
| Mycogen | 8H570CL | HO | Clearfield | 2214 | 5.6 | 28.5 | 39 | 9,616 | 5.0 | 40.3 |
| Croplan | 13-652 CL | HO | Clearfield | 2184 | 5.6 | 28.1 | 48 | 7,676 | 7.6 | 38.1 |
| Mycogen | 8N668S | NS | N/A | 2116 | 6.8 | 29.9 | 43 | 9,371 | 15.7 | 38.8 |
| Croplan | 545 CL | NS | Clearfield | 1960 | 6.9 | 28.3 | 55 | 7,877 | 16.7 | 38.1 |
| Mycogen | 8H449CLDM | HO | Clearfield | 1860 | 6.5 | 30.8 | 51 | 9,701 | 12.9 | 40.7 |
| Syngenta | 3732 NS | NS | N/A | 1749 | 5.7 | 28.4 | 48 | 8,543 | 22.9 | 39.2 |
| Mycogen | 8H859CL | HO | Clearfield | 1742 | 7.3 | 28.2 | 57 | 8,650 | 12.4 | 38.3 |
| Syngenta | 7717 HO/CL/DM | HO | Clearfield | 1624 | 5.8 | 29.9 | 53 | 8,515 | 12.1 | 36.4 |
| Croplan | 432 E | NS | ExpressSun | 1590 | 5.9 | 28.4 | 50 | 8,591 | 22.0 | 36.2 |
| Croplan | 14-572 | HO | Clearfield | 1511 | 6.4 | 27.0 | 59 | 5,703 | 25.9 | 37.1 |
| Croplan | 559 CL | NS | Clearfield | 1398 | 5.6 | 29.2 | 60 | 9,002 | 31.2 | 38.6 |
| Average | | | | 1849 | 6.1 | 29.0 | 51 | 8,370 | 16.2 | 38.5 |
| ^d LSD (P<0.30) | | | | 264 | | | | | | |

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bHerbicide technology trait designations: Clearfield=Tolerant to Beyond herbicide; ExpressSun=Tolerant to Express herbicide; N/A=No herbicide traits.

^cYields were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is statistically significant.

Plot size: 5' x 30'

Site Information

Collaborator: Central Great Plains Research Center

Planting Date: 6/12/2014

Harvest Date: 10/24/2014

Herbicide: Roundup, Aim, and Spartan applied with hooded sprayer

2014 Dryland Confection Sunflower Hybrid Performance Trial at Akron

| Brand | Hybrid | Herbicide Technology Trait ^b | Yield ^c lb/ac | Moisture percent | Test Weight lb/bu | Plant Height in | Population plants/ac | Lodging percent | Seed Retained Over Screen | | | |
|-----------------------|---------|--|-----------------------------|---------------------|-------------------------|-----------------------|-------------------------|--------------------|---------------------------|-------------|---------------|---------------|
| | | | | | | | | | 24/64 | 22/64 | Over 20/64 | Over 16/64 |
| Red River Commodities | 2215 | N/A | 2048 | 8.6 | 20.7 | 60 | 6,100 | 14.5 | 6.2 | 37.0 | 72.0 | 99.0 |
| Red River Commodities | 8015 | N/A | 1964 | 8.7 | 17.5 | 57 | 5,520 | 26.0 | 18.0 | 46.8 | 75.8 | 99.2 |
| Red River Commodities | 2217 CP | Clearfield Plus | 1929 | 9.8 | 18.7 | 56 | 6,623 | 11.1 | 11.4 | 34.6 | 59.4 | 99.0 |
| Red River Commodities | 2215 CL | Clearfield | 1839 | 9.0 | 19.4 | 63 | 5,104 | 10.6 | 11.0 | 43.0 | 72.2 | 99.0 |
| Average | | | 1945 | 9.0 | 19.1 | 59 | 5,837 | 15.6 | 11.7 | 40.4 | 69.9 | 99.1 |

^dLSD (P<0.30)

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bHerbicide technology trait designations: Clearfield=Tolerant to Beyond herbicide; ExpressSun=Tolerant to Express herbicide; N/A=No herbicide traits.

^cYields were corrected to 10% moisture.

^dNS=the yield results were not significantly different from each other.

Plot size: 5' x 30'

Site Information

Collaborator: Central Great Plains Research Center

Planting Date: 6/12/2014

Harvest Date: 10/24/2014

Herbicide: Roundup, Aim, and Spartan applied with hooded sprayer

2014 Dryland Oil Sunflower Hybrid Performance Trial at Towner

| Brand | Hybrid | Oil | | Yield ^c | Moisture | Test | Plant | | Oil | | | |
|----------------|---------------|-------------------|------------|--------------------|------------|-------------|-------------------------------|--------------|-------------|-------------|-------|---------|
| | | Type ^a | Herbicide | | | | Technology Trait ^b | lb/ac | | percent | lb/bu | Height |
| | | | | | | | | in | plants/ac | percent | | percent |
| Mycogen | 8H859CL | HO | Clearfield | 467 | 6.1 | 25.2 | 48 | 6,788 | 19.3 | 33.8 | | |
| Mycogen | 8N668S | NS | N/A | 452 | 5.9 | 25.5 | 38 | 5,917 | 35.9 | 33.6 | | |
| Syngenta | 3732 NS | NS | N/A | 445 | 6.0 | 25.6 | 41 | 6,873 | 28.4 | 32.3 | | |
| Croplan | 432 E | NS | ExpressSun | 420 | 6.0 | 24.1 | 44 | 7,659 | 21.8 | 32.1 | | |
| Mycogen | 8H449CLDM | HO | Clearfield | 381 | 5.9 | 25.1 | 45 | 7,696 | 21.8 | 33.6 | | |
| Croplan | 545 CL | NS | Clearfield | 370 | 5.9 | 24.9 | 48 | 7,115 | 45.5 | 32.7 | | |
| Croplan | 13-652 CL | HO | Clearfield | 360 | 5.9 | 25.2 | 46 | 9,874 | 13.7 | 33.2 | | |
| Syngenta | 7717 HO/CL/DM | HO | Clearfield | 351 | 5.9 | 24.9 | 46 | 6,824 | 31.3 | 33.2 | | |
| Mycogen | 8H570CL | HO | Clearfield | 340 | 5.8 | 25.5 | 32 | 8,373 | 19.9 | 33.8 | | |
| Syngenta | 3845 HO | HO | N/A | 326 | 5.9 | 24.5 | 37 | 9,438 | 12.5 | 32.9 | | |
| Croplan | 14-572 | HO | Clearfield | 321 | 5.9 | 24.4 | 50 | 7,841 | 14.9 | 33.1 | | |
| Croplan | 559 CL | NS | Clearfield | 280 | 5.9 | 24.7 | 48 | 10,261 | 20.2 | 33.8 | | |
| Average | | | | 376 | 5.9 | 25.0 | 43 | 7,888 | 23.8 | 33.2 | | |

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bHerbicide technology trait designations: Clearfield=Clearfield; ExpressSun=Express herbicide; N/A=No herbicide traits.

^cYields were corrected to 10% moisture.

Yield trial data could not be interpreted due to the high degree of field variability. The yield results should not be used by farmers for selecting superior hybrids for planting.

Plot size: 10' x 30'

Site Information

Collaborator: Sean Harkness

Planting Date: 6/17/2014

Harvest Date: 10/21/2014

Comments: Hot and dry conditions were experienced during the flowering and grain fill stages, which resulted in lower yields.

Fertilizer: Preplant: Nitrogen at 4.5 lb/ac, phosphorus at 11 lb/ac, potassium at 2.5 lb/ac, sulfur at 2.5 lb/ac, and zinc at 0.5 lb/ac

Herbicide: Prowl H20 at 32 oz/ac, Spartan Charge at 1.5 oz/ac on 6/6/14. RoundUp RT 3 at 40 oz/ac, Class Act at 32 oz/ac, and

Spartan Charge at 1 oz/ac on 6/18/14.

Insecticide: Mustang Maxx at 4 oz/ac and Whirlwind at 6 oz/ac on 8/15/14.

2014 Dryland Confection Sunflower Hybrid Performance Trial at Towner

| Brand | Hybrid | Herbicide Technology Trait ^a | Yield ^b lb/ac | Moisture percent | Test Weight lb/bu | Plant Height in | Population plants/ac | Lodging percent | Seed Retained Over Screen | | | |
|-----------------------|---------|--|-----------------------------|---------------------|----------------------|--------------------|-------------------------|--------------------|---------------------------|-------------|-------------|-------------|
| | | | | | | | | | Over 24/64 | Over 22/64 | Over 20/64 | |
| Red River Commodities | 2217 CP | Clearfield Plus | 435 | 9.6 | 13.8 | 48 | 8,785 | 9.4 | 35.4 | 60.2 | 80.6 | 98.8 |
| Red River Commodities | 2215 CL | Clearfield | 407 | 8.0 | 13.5 | 55 | 8,639 | 16.1 | 12.2 | 39.6 | 69.8 | 99.4 |
| Red River Commodities | 2215 | N/A | 348 | 7.8 | 11.2 | 54 | 9,438 | 14.5 | 23.0 | 51.0 | 77.0 | 98.6 |
| Red River Commodities | 8015 | N/A | 252 | 8.3 | 13.4 | 45 | 5,590 | 16.0 | 22.6 | 50.8 | 75.6 | 98.0 |
| Average | | | 360 | 8.4 | 13.0 | 50 | 8,113 | 14.0 | 23.3 | 50.4 | 75.8 | 98.7 |

^aHerbicide technology trait designations: Clearfield= Tolerant to Beyond herbicide; Clearfield Plus= Tolerant to Beyond herbicide; N/A= No herbicide traits.

^bYields were corrected to 10% moisture.

Yield trial data could not be interpreted due to the high degree of field variability. The yield results should not be used by farmers for selecting superior hybrids for planting.

Plot size: 10' x 30'

Site Information

Collaborator: Sean Harkness

Planting Date: 6/17/2014

Harvest Date: 10/21/2014

Comments: Hot and dry conditions were experienced during the flowering and grain fill stages, which resulted in lower yields.

Fertilizer: Preplant: Nitrogen at 4.5 lb/ac, phosphorus at 11 lb/ac, potassium at 2.5 lb/ac, sulfur at 2.5 lb/ac, and zinc at 0.5 lb/ac

Nitrogen applied at 102 lb/ac on 6/6/14, and slow-release nitrogen applied at 5 lb/ac on 8/5/14.

Prowl H20 at 32 oz/ac, Spartan Charge at 1.5 oz/ac on 6/6/14. RoundUp RT 3 at 40 oz/ac, Class Act at 32 oz/ac, and

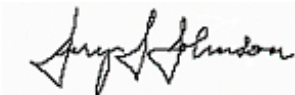
Spartan Charge at 1 oz/ac on 6/18/14.

Insecticide: Mustang Maxx at 4 oz/ac and Whirlwind at 6 oz/ac on 8/15/14.

Colorado State University



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



Jerry Johnson, Extension Specialist Crop Production