Technical Report TR 16-10

Agricultural Experiment Station

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Making Better Decisions

2016 Colorado Sunflower Variety Performance Trials

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Summary of the 2016 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 hybrid lines means sunflower hybrid 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 2016 trials.

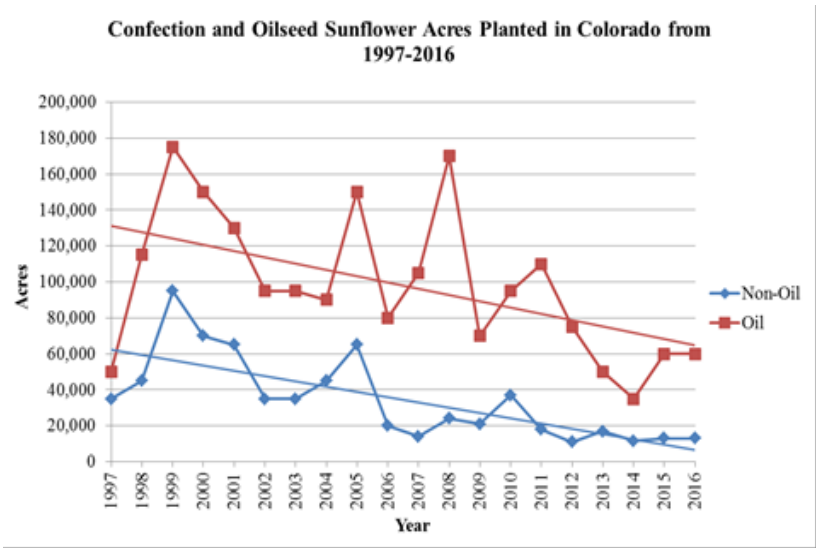


Table 1. Confection and oilseed sunflower acres planted in Colorado from 1997-2016.

Colorado sunflower producers harvested over 95 million pounds in 2016, according to the USDA National Ag. Statistics Service. Above-average rainfall and new hybrids contributed to high production in 2016 compared to 2015. Advances in weed control with a broader range of herbicides such as imidazolinone, Express, Clearfield, and Clearfield Plus have also benefited sunflower producers.

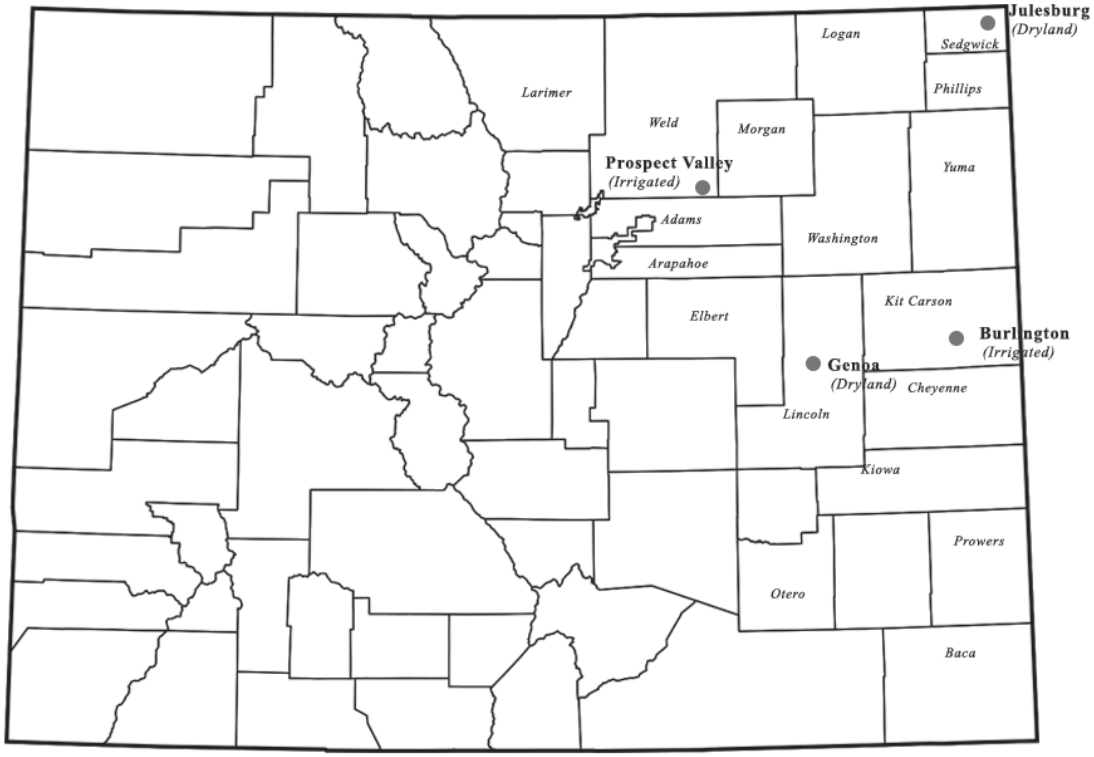
Figure 1 shows the variability of acreage for both oil and confection sunflowers in Colorado. This is especially true for oil type sunflowers in the past 20 years. Acreage planted to oil type sunflowers has ranged from 35,000 (2014) planted acres up to 175,000 acres in 1999. The planted acres of confection sunflowers have generally decreased since 1999 and held steady since 2006. The variability of sunflower acreage could be due to several factors, including sunflower 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. Food processors 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 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 2016. 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 Genoa (northeast Colorado).

Results tables for the dryland and irrigated trials are presented on the following pages. Twenty-eight hybrids with diverse origins and maturities were tested in the irrigated and dryland trials. Plot sizes were approximately 150 ft^2 at Burlington and Prospect Valley (irrigated), and 310 ft^2 in the dryland trials at Julesburg and Genoa. 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 2016



2016 Limited-Irrigation Oil Sunflower Hybrid Performance Trial at Burlington

Brand	Hybrid	Oil Type[a]	Technology Traits[b]	2016 Yield[c]	2-Year Avg. Yield[c]	Moisture	Test Weight	Plant Height	Population	Lodging	Oil Content[c]
				lb/ac	lb/ac	percent	lb/bu	in	plants/ac	percent	percent
Mycogen Seeds	8H456CL	HO	Clearfield, DM	3721	2837	7.0	24.8	70	19,146	1.0	43.8
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	3542	2814	6.6	28.7	67	19,228	1.1	44.5
Croplan	455 E HO	HO	ExpressSun, DM	3340	-	6.9	26.8	68	17,217	16.0	41.2
Croplan	545 CL	NS	Clearfield, DM	3328	2835	7.5	26.4	74	17,294	0.0	40.2
Croplan	553 CL HO	HO	Clearfield, DM	3270	2570	7.1	28.2	72	16,687	1.9	40.7
Syngenta	SY7919	HO	Clearfield, DM	3256	-	7.1	27.9	62	17,943	1.5	43.6
Nuseed	Sierra	HO	N/A	3184	-	8.4	26.5	67	20,023	0.0	39.8
Nuseed	Hornet	HO	Clearfield, DM	3034	2415	6.6	28.5	65	17,940	10.1	41.4
Croplan	549 CL HO	HO	Clearfield, DM	2942	2385	6.5	28.6	74	18,542	1.6	40.1
Croplan	432 E	NS	ExpressSun, DM	2760	2222	6.8	25.9	62	17,139	0.0	38.5
Syngenta	3732 NS	NS	N/A	2508	1981	6.3	27.7	61	20,257	1.7	42.7
Croplan	458 E HO	HO	ExpressSun, DM	2356	1569	7.2	26.3	67	18,637	0.8	40.6
Nuseed	N4HM354	HO	Clearfield, DM	2240	-	6.4	28.4	64	17,022	0.0	41.8
Syngenta	SY7717	HO	Clearfield, DM	2051	1473	6.4	27.6	59	19,542	0.0	41.6
Nuseed	Daytona	HO	Clearfield	1879	-	7.0	28.2	61	17,892	1.5	40.7
Nuseed	Cobalt II	HO	Clearfield, DM	1791	-	6.4	27.4	59	21,123	0.0	41.5
Average				**2825**	**2310**	**6.9**	**27.4**	**66**	**18,477**	**2.3**	**41.4**
[d]LSD (P<0.30)				299							
[d]LSD (P<0.05)				574							
Coefficient of Variation (%)				14.3							

[a]Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

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

[c]Yield and oil content were corrected to 10% moisture.

[d]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.

Plot size: 5' x 30'

Site Information

Collaborator: Gerhard Heintges
Planting Date: June 4, 2016
Harvest Date: October 14, 2016
Fertilizer: N at 120 lb/ac and P at 40 lb/ac
Herbicide: Spartan 4F at 3 oz/ac and Dual II Magnum at 1.2 pt/ac applied on June 8.
Insecticide: Lorsban at 1 pt/ac and Lambda at 3.8 oz/ac
Irrigation: Center-pivot; pre-watered 3 inches before planting and applied 2 inches during growing season
Soil Type: Kuma-Keith silt loam

2016 Limited-Irrigation Confection Sunflower Hybrid Performance Trial at Burlington

Brand	Hybrid	Technology Traits[a]	2016 Yield[b]	3-Year Avg. Yield[b]	Moisture	Test Weight	Plant Height	Population	Seed Retained Over Screen Over 24/64	Over 22/64	Over 20/64	Over 16/64
			lb/ac	lb/ac	percent	lb/bu	in	plants/ac		percent		
Red River Commodities, Inc.	RRC 2215 CL	Clearfield	3031	3088	8.3	20.5	80	16,005	18.8	52.4	82.2	98.4
Nuseed	N6LM448	Clearfield	2958	-	9.2	18.5	68	12,935	43.2	64.2	84.4	98.2
Nuseed	6946 DMR	DM	2898	-	7.2	22.7	66	14,969	12.6	37.0	71.4	95.8
Red River Commodities, Inc.	RRC 8015	N/A	2846	2829	8.1	17.9	70	15,849	16.6	49.2	85.8	98.8
Red River Commodities, Inc.	RRC 2215	N/A	2810	2838	7.7	21.6	77	15,527	9.8	38.0	74.2	96.8
Red River Commodities, Inc.	RRC 8042	N/A	2798	-	9.4	19.4	67	13,971	20.0	45.6	75.8	96.6
Red River Commodities, Inc.	RRC 2217 CP	Clearfield Plus	2681	2664	8.4	18.7	72	12,478	37.0	67.2	90.6	98.6
Nuseed	Panther DMR	DM	2015	-	7.8	18.2	62	12,822	23.2	46.8	75.4	95.0
Red River Commodities, Inc.	RRC 2205	N/A	2011	-	8.1	19.3	66	14,934	25.4	56.8	78.0	96.8
Average			**2672**	**2855**	**8.2**	**19.6**	**70**	**14,388**	**23.0**	**50.8**	**79.8**	**97.2**
[c]LSD (P<0.30)			297									
[c]LSD (P<0.05)			577									
Coefficient of Variation (%)			14.8									

[a]Technology trait designations: Clearfield=tolerant to Beyond herbicide; Clearfield Plus=tolerant to Beyond herbicide; N/A=no technology traits.

[b]Yields were corrected to 10% moisture.

[c]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.

Plot size: 5' x 30'

Site Information

Collaborator:	Gerhard Heintges
Planting Date:	June 4, 2016
Harvest Date:	October 14, 2016
Fertilizer:	N at 120 lb/ac and P at 40 lb/ac
Herbicide:	Spartan 4F at 3 oz/ac and Dual II Magnum at 1.2 pt/ac applied on June 8.
Insecticide:	Lorsban at 1 pt/ac and Lambda at 3.8 oz/ac
Irrigation:	Center-pivot; pre-watered 3 inches before planting and applied 2 inches during growing season
Soil Type:	Kuma-Keith silt loam

2016 Irrigated Oil Sunflower Hybrid Performance Trial at Prospect Valley

Brand	Hybrid	Oil Type[a]	Technology Traits[b]	2016 Yield[c]	Moisture	Test Weight	Plant Height	Population	Lodging	Oil Content[c]
				lb/ac	percent	lb/bu	in	plants/ac	percent	percent
Pioneer	P63HE90	HO	ExpressSun	3993	8.0	27.8	59	14,907	3.8	39.2
Nuseed	Sierra	HO	N/A	3993	16.4	20.5	55	16,768	3.2	37.9
Mycogen Seeds	8H456CL	HO	Clearfield, DM	3957	12.9	26.9	56	14,779	7.1	40.0
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	3896	11.4	27.9	60	15,338	1.2	40.5
Nuseed	Hornet	HO	Clearfield, DM	3643	7.4	26.0	49	14,465	1.1	39.5
Pioneer	P64ME01	NS	ExpressSun	3588	11.6	23.3	54	14,802	0.0	35.6
Croplan	545 CL	NS	Clearfield, DM	3446	13.1	24.6	56	11,582	1.1	36.8
Croplan	455 E HO	HO	ExpressSun, DM	3388	12.4	24.2	55	11,038	0.0	35.6
Syngenta	3732 NS	NS	N/A	3254	7.9	25.3	49	13,990	0.7	40.3
Croplan	553 CL HO	HO	Clearfield, DM	3066	9.8	25.2	54	11,501	0.0	37.0
Croplan	458 E HO	HO	ExpressSun, DM	2947	8.6	26.1	59	13,564	0.5	39.8
Syngenta	SY7919	HO	Clearfield, DM	2652	10.6	25.9	45	10,726	1.2	39.3
Pioneer	P63HE60	HO	ExpressSun	2619	7.6	25.4	57	15,911	0.0	39.4
Nuseed	Daytona	HO	Clearfield	2452	8.4	25.4	46	16,261	1.6	38.0
Croplan	432 E	NS	ExpressSun, DM	2128	7.1	24.7	54	10,364	2.3	36.2
Croplan	549 CL HO	HO	Clearfield, DM	2108	10.9	24.1	60	8,610	5.0	34.5
Nuseed	N4HM354	HO	Clearfield, DM	2064	9.3	25.4	47	16,258	1.1	39.7
Nuseed	Cobalt II	HO	Clearfield, DM	1937	7.4	23.6	45	17,511	0.5	37.2
Syngenta	SY7717	HO	Clearfield, DM	1887	8.5	24.8	47	14,569	1.3	37.9
Average				**3001**	**9.9**	**25.1**	**53**	**13,839**	**1.7**	**38.1**
[d]LSD (P<0.30)				422						
[d]LSD (P<0.05)				807						
Coefficient of Variation (%)				19.0						

[a]Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

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

[c]Yield and oil content were corrected to 10% moisture.

[d]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.

Plot size: 5' x 30'

Site Information

Collaborator: David Rupple
Planting Date: June 3, 2016
Harvest Date: October 17, 2016
Fertilizer: Poultry manure at 4 t/ac
Herbicide: Sonalan at 3 pt/ac,
Insecticide: Warrior II at 1.3 oz/ac and Lorsban at 0.75 pt/ac applied August 2.
Irrigation: Furrow-irrigation three times during the growing season
Soil Type: Colby loam

2016 Irrigated Confection Sunflower Hybrid Performance Trial at Prospect Valley

Brand	Hybrid	Technology Traits[a]	2016 Yield[b]	2-Year Avg. Yield[b]	Moisture	Test Weight	Plant Height	Population	Lodging	Seed Retained Over Screen Over 24/64	Over 22/64	Over 20/64	Over 16/64
			lb/ac	lb/ac	percent	lb/bu	in	plants/ac	percent		percent		
Red River Commodities, Inc.	RRC 8042	N/A	3262	-	17.1	16.6	37	8,466	2.4	61.4	86.6	95.8	97.4
Red River Commodities, Inc.	RRC 2215 CL	Clearfield	3066	3424	15.5	20.0	53	9,169	11.0	68.0	88.8	94.8	97.4
Red River Commodities, Inc.	RRC 2215	N/A	2477	2849	12.7	20.5	51	10,917	6.5	50.2	80.0	94.2	97.8
Red River Commodities, Inc.	RRC 8015	N/A	2266	2685	14.8	17.9	39	9,099	4.8	64.2	85.4	94.4	98.2
Nuseed	6946 DMR	DM	2201	-	12.0	19.6	44	7,801	27.3	63.8	85.2	94.6	99.0
Nuseed	N6LM448	Clearfield	2025	-	12.8	19.3	48	6,683	6.1	58.4	80.2	92.6	97.6
Nuseed	Panther DMR	DM	1950	-	9.4	20.1	48	12,296	9.5	32.0	60.6	84.0	97.8
Red River Commodities, Inc.	RRC 2205	N/A	1943	-	12.9	18.3	50	10,504	6.7	63.4	82.6	90.8	97.0
Red River Commodities, Inc.	RRC 2217 CP	Clearfield Plus	1705	2641	13.9	19.4	42	7,274	2.7	64.6	84.8	92.6	98.4
Average			**2322**	**2900**	**13.4**	**19.1**	**46**	**9,134**	**8.5**	**58.4**	**81.6**	**92.6**	**97.8**
[c]LSD (P<0.30)			419										

[a]Technology trait designations: Clearfield=tolerant to Beyond herbicide; Clearfield Plus=tolerant to Beyond herbicide; N/A=no technology traits.

[b]Yields were corrected to 10% moisture.

[c]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.

Plot size: 5' x 30'

Site Information

Collaborator:	David Rupple
Planting Date:	June 3, 2016
Harvest Date:	October 17, 2016
Fertilizer:	Poultry manure at 4 t/ac
Herbicide:	Sonalan at 3 pt/ac,
Insecticide:	Warrior II at 1.3 oz/ac and Lorsban at 0.75 pt/ac applied August 2.
Irrigation:	Furrow-irrigation three times during the growing season
Soil Type:	Colby loam

2016 Dryland Oil Sunflower Hybrid Performance Trial at Julesburg

Brand	Hybrid	Oil Type[a]	Technology Traits[b]	2016 Yield[c]	Moisture	Test Weight	Plant Height	Population	Lodging	Oil Content[c]
				lb/ac	percent	lb/bu	in	plants/ac	percent	percent
Mycogen Seeds	8H456CL	HO	Clearfield, DM	2021	7.5	28.4	59	12,107	20.8	40.4
Nuseed	Hornet	HO	Clearfield, DM	1935	6.6	29.2	54	12,452	33.5	-
Croplan	553 CL HO	HO	Clearfield, DM	1778	7.2	30.4	55	13,351	45.7	39.1
Pioneer	P64ME01	NS	ExpressSun	1774	8.8	29.2	57	12,379	20.6	36.9
Syngenta	3732 NS	NS	N/A	1765	6.7	30.7	51	12,150	29.7	38.2
Syngenta	SY7919	HO	Clearfield, DM	1754	7.9	28.6	50	8,695	24.8	37.1
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	1709	7.4	29.4	55	11,991	24.3	39.7
Nuseed	Sierra	HO	N/A	1659	9.0	27.6	57	12,449	28.1	36.3
Croplan	545 CL	NS	Clearfield, DM	1522	6.8	29.6	56	11,129	35.0	38.2
Croplan	455 E HO	HO	ExpressSun, DM	1490	7.7	29.7	53	11,206	40.2	38.9
Pioneer	P63HE90	HO	ExpressSun	1461	8.4	29.2	55	7,850	49.5	36.6
Croplan	549 CL HO	HO	Clearfield, DM	1424	7.1	29.6	54	14,236	37.6	36.7
Pioneer	P63HE60	HO	ExpressSun	1386	7.0	30.0	52	13,052	37.9	38.3
Croplan	458 E HO	HO	ExpressSun, DM	1358	7.3	28.7	50	12,162	21.6	37.9
Nuseed	Daytona	HO	Clearfield	1343	6.8	28.5	52	12,534	36.8	38.0
Nuseed	N4HM354	HO	Clearfield, DM	1322	6.5	30.4	54	13,881	34.3	38.2
Croplan	432 E	NS	ExpressSun, DM	1235	6.7	29.4	48	11,166	30.7	35.5
Syngenta	SY7717	HO	Clearfield, DM	1168	8.0	28.4	50	8,178	29.3	34.9
Nuseed	Cobalt II	HO	Clearfield, DM	1093	6.5	29.4	47	14,081	30.1	36.6
Average				**1537**	**7.4**	**29.3**	**53**	**11,845**	**32.1**	**37.6**
[d]LSD (P<0.30)				187						
[d]LSD (P<0.05)				358						
Coefficient of Variation (%)				16.5						

[a]Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

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

[c]Yield and oil content were corrected to 10% moisture.

[d]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.

Plot size: 10' x 31'

Site Information

Collaborator: Josh Leachman
Planting Date: June 8, 2016
Harvest Date: October 20, 2016
Fertilizer: N at 39 lb/ac and P at 9 lb/ac at planting
Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl at 1.8 pt/ac
Soil Type: Richfield loam
Trial Comments: Trial was hailed in late-June. Sunflower plants recovered despite serious damage.

2016 Dryland Confection Sunflower Hybrid Performance Trial at Julesburg

Brand	Hybrid	Technology Traits[a]	2016 Yield[b]	Moisture	Test Weight	Plant Height	Population	Lodging	Seed Retained Over Screen			
									Over 24/64	Over 22/64	Over 20/64	Over 16/64
			lb/ac	percent	lb/bu	in	plants/ac	percent	percent			
Nuseed	N6LM448	Clearfield	2124	17.3	18.1	53	5,154	21.7	15.4	35.2	71.8	94.2
Nuseed	Panther DMR	DM	1768	9.5	22.9	46	5,842	28.0	59.4	77.0	86.6	94.2
Nuseed	6946 DMR	DM	1737	10.0	22.7	49	5,078	32.2	21.0	40.8	71.6	95.2
Average			**1876**	**12.2**	**21.2**	**49**	**5,358**	**27.3**	**31.9**	**51.0**	**76.7**	**94.5**
[c]LSD (P<0.30)			NS									

[a]Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance.

[b]Yield corrected to 10% moisture.

[c]NS=Yields were not significantly different from each other.

Plot size: 10' x 31'

Site Information

Collaborator: Josh Leachman
Planting Date: June 8, 2016
Harvest Date: October 20, 2016
Fertilizer: N at 39 lb/ac and P at 9 lb/ac at planting
Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl at 1.8 pt/ac
Soil Type: Richfield loam
Trial Comments: Trial was hailed in late-June. Sunflower plants recovered despite serious damage.

2016 Dryland Oil Sunflower Hybrid Performance Trial at Genoa

Brand	Hybrid	Oil Type[a]	Technology Traits[b]	Yield[c]	Moisture	Test Weight	Plant Height	Population	Oil Content[c]
				lb/ac	percent	lb/bu	in	plants/ac	percent
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	2059	5.3	32.0	50	10,091	44.6
Syngenta	3732 NS	NS	N/A	1924	5.2	29.9	44	11,035	41.5
Mycogen Seeds	8H456CL	HO	Clearfield, DM	1824	5.1	28.2	52	11,398	44.5
Syngenta	SY7919	HO	Clearfield, DM	1704	5.8	29.3	52	6,582	41.0
Syngenta	SY7717	HO	Clearfield, DM	1153	5.2	29.3	52	10,019	41.0
Average				**1733**	**5.3**	**29.7**	**50**	**9,825**	**42.5**
[d]LSD (P<0.30)				231					

[a]Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

[b]Technology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology

[c]Yield and oil content were corrected to 10% moisture.

[d]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.

Plot size: 10' x 31'

Site Information

Collaborator:	Rob Boyd
Planting Date:	June 8, 2016
Harvest Date:	November 1, 2016
Fertilizer:	N at 50 lb/ac
Herbicide:	Roundup at 36 oz/ac and Spartan Charge at 4 oz/ac
Soil Type:	Fort Collins-Platner loams

Effects of Additional Inputs on Sunflower Production

Ron F. Meyer

Sunflower production inputs were studied on irrigated fields during both the 2015 and 2016 growing seasons. Six treatments were imposed on confection sunflowers at Prospect Valley, Colorado. The six treatments are as follows: 1) check-plot fertilized according to recommendations from a soil test, 2) an insecticide applied during early vegetative stages, 3) a fungicide applied pre-bloom, 4) a micro-nutrient mix, 5) additional N-P-K (in addition to what was called for by the soil test), and 6) a treatment that included all the above. Treatments were not replicated within a year however the same experiment was conducted in the two years.

Flood irrigation was used on the trial. Both growing seasons during 2015 and 2016 were exceptional for sunflower production at the site. The check treatment received only farmer applied fertility based on soil sample analysis. The insecticide (treatment 2) used in 2015 was Counter, applied 6/23/15, while in 2016 Force was applied on 7/11/16. In addition, the producer also applied insecticide applications to the entire field during bloom stage. For treatment 3, Headline Amp was the fungicide applied, pre-bloom, on 7/23 both seasons. The micronutrient mix (treatment 4) consisted of the following actual nutrients applied per acre: 13 lb/ac nitrogen, 27 lb/ac phosphorous, 7 lb/ac potassium, 7 lb/ac sulfur, 1 lb/ac manganese, 1.5 lb/ac iron, 0.06 lb/ac boron, and 1.75 lb/ac of zinc. For treatment 5, actual additional nitrogen, phosphorous, and potassium treatments applied were 50 lb/ac nitrogen, 30 lb/ac phosphorous, and 15 lb/ac potassium. Finally, treatment 6 consisted of all the above treatments.

2015 Growing Season

Treatment	Harvest moisture	Test Weight	Grain Yield
	percent	lb/bu	lb/ac
Fungicide	10.0	19.9	4036
NPK	10.0	21.2	4009
All Inputs	13.5	19.0	3878
Check	10.1	22.1	3877
Insecticide	16.2	16.3	3593
Micronutrient Mix	17.7	20.6	2963

Yield results indicate that additional N-P-K increased yields over the check even when soil tests indicated additional fertility may not be needed. When additional N-P-K was added yield increased 132 and 308 pounds per acre in 2015 and 2016, respectively. Micronutrients failed to increase yields in either year. Decreases of 914 and 231 pounds per acre were observed in 2015 and 2016, respectively, when micronutrients were applied. Similar lack of response has been observed in the past by the author when micronutrients have been studied in sunflower.

Insecticide applications early in the growing seasons were an attempt to control stalk boring insects primarily Dectes and sunflower stem weevil. However, in both years, early insecticide treatments did not increase yield and yields from both years were lower than the check where no early insecticide applications were made.

2016 Growing Season

Treatment	Harvest moisture	Test Weight	Grain Yield
	percent	lb/bu	lb/ac
All Inputs	6.5	19.5	4259
NPK	7.2	18.8	3779
Check	6.8	16.3	3481
Micronutrients	5.9	21.2	3250
Insecticide	9.7	17.2	2930
Fungicide	6.2	20.5	2576

Likewise, fungicide applications failed to increase yield in this study. The seasonal nature of disease infestations is evident in the results, which may help explain the yield increase in 2015 where low levels of some leaf diseases were noted later in the season. Rust was not a yield limiting factor in either year.

When all treatments were combined there was a favorable response in 2016 but less so in 2015. It is felt that the micronutrient mix could have reduced yield when added to this combination in 2015.

Additional trials are planned for the 2017 season. It is hoped that we can separate the beneficial effects on sunflower yield of nitrogen, phosphorus, and potassium.

Colorado State University

Crops Testing

Colorado State University
Extension

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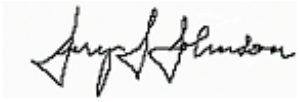
Fort Collins, Colorado 80523-1170



Jerry Johnson, Extension Specialist Crop Production

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