



RESULTS OF AGRONOMIC, CROPPING SYSTEMS AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2015

The Annual Report of the Investigations at and Administration of the
Southern Agricultural Research Center, Huntley, Montana

<u>PROJECT TITLE:</u>	Irrigated Hybrid Grain Corn Performance Trial near Huntley, Montana. (Exp. 151309).
<u>PROJECT LEADERS:</u>	Kenneth D. Kephart, Agronomist, SARC, Huntley Kelli Maxwell, Research Associate, SARC, Huntley
<u>PROJECT PERSONNEL:</u>	Tom A. Fischer, Research Specialist and Farm Foreman, SARC, Huntley Janna Kransky, Research Assistant III, SARC, Huntley
<u>OBJECTIVES:</u>	To provide corn growers in south central Montana with a reliable, unbiased, up-to-date source of information that will permit valid comparisons among improved corn hybrids for irrigated grain production. This information should help corn producers in south central Montana select hybrids best suited to this region of the state.
<u>METHODS:</u>	For 2015, four sponsors submitted 25 corn hybrids for testing under flood irrigated conditions near Huntley, Montana (Table 1). All of the hybrids entered in the 2015 trial appeared to be genetically modified for both insect resistance and herbicide tolerance. The study was planted using a randomized complete block design with four replications. Test plots consisted of a 30-foot, 4-row plot with 30-inch row spacing. Each 30 foot row was planted with 69 seeds, equal to planting 40,075 seeds per acre or about 105 percent of the target population of 38,200 plants per acre. Planting depth was set 1½ inches deep. Plot stands were determined by counting the number of established plants along the two center rows at approximately the 4 to 5 leaf stage of crop development. All rows of each test plot were subsequently trimmed 36 inches. The center two rows of each plot were harvested using an experimental-plot combine. Test weight (pounds per bushel) and percent grain moisture content were obtained for each plot using a Dickey-john GAC 2100 grain analyzer. Grain protein, oil and starch content were estimated by near-infrared reflectance using a Perten DA7200 NIR spectrometer, and adjusted to 100 percent dry matter content. Recorded grain yields were adjusted to 15.5% grain moisture content, and are reported in bushels per acre based on a 56 pound standard bushel weight.
<u>RESULTS and SUMMARY:</u>	<p>Below average precipitation combined with warmer than normal temperatures occurred at Huntley during the preceding fall and winter months, which resulted in dry surface soil moisture conditions prior to planting of spring and summer crops in 2015 (Table 2). The frost-free period for the 2015 growing season at Huntley spanned from May 11th to October 15th, resulting in a 157 day growing season (Table 2), 32 days longer than the normally expected frost-free period at this location. Total accumulated heat units (2,433 °F, GDD_{corn}) for the season were 436 °F warmer, or about 20 percent above the level of heat units normally expected to accumulate during the 125 day interval and nearly 6 percent warmer than normally expected for an average 157 day growing season. June growing conditions were warmer than normal with less than average precipitation as crop irrigation began.</p> <p>Surface soil moisture conditions were marginal for quick emergence, establishment and early growth of corn at planting. Planted on May 4th, 2015, no emergence was evident in the plots prior to last freezing date (May 11th) experienced in 2015. Emergence in all plots continued to be poor until after May 15th and 16th, when 1.1 inches of precipitation was received at the Huntley test</p>

site. Final crop establishment eventually averaged 83 percent with hybrids varying from 72 to 89 percent (Table 3). While differences in crop stand or establishment were detected between the 25 entries, those differences did not correlate with the subsequent differences in harvested grain yield observed between hybrids.

Silking dates in 2015 varied by ten days among the 25 entries (Table 3). Average silking dates were the same for both 2014 and 2015. In comparison the average silking date for 2015 was 15 days later than those observed in 2013 and 9 days earlier than average silking dates observed the past 10 to 12 years at this location. No lodging was evident in 2015. Adjusted corn grain yields averaged 233.2 bushels per acre. Adjusted grain yield among the 25 entries in 2015 varied from 264.4 bushels per acre for the hybrid 'Croplan 3899VT2P/RIB' to 194.5 bushels per acre for the hybrid 'Channel 185-81STXRIB'. Seven other hybrid corn entries produced averaged adjusted grain yields from 240.3 to 262.4 bushels per acre, which were statistically equal to the yield of the highest yielding hybrid tested in 2015.

Table 1. Contact information for seed sources of 25 hybrid corn entries tested at the MSU Southern Agricultural Research Center near Huntley, Montana during 2015.

Brand	Hybrids	Contact
<u>Channel Seed</u>	185-81STXRIB 186-33STXPRIB 187-42VT2PRIB 190-13VT2PRIB 192-09VT3PRIB	Ms. Jaymi Wegner Simplot Grower Solutions/Channel Seed 4804 Danford Drive Billings MT 59106 PH: 406-656-2804 FX: 406-656-2005 EM: Jaymi.Wegner@simplot.com
<u>Croplan by Winfield</u>	2417VT2P/RIB 2845SS/RIB 3055VT2P/RIB 3146SS/RIB 3499VT3P/RIB 3337VT2P/RIB 3899VT2P/RIB 3134SS/RIB	Mr. Curt Droogsma Croplan by Winfield 406 Cherry Hills Road Billings MT 59105 PH: 406-860-1330 EM: cddroogsma@landolakes.com
<u>Golden Harvest</u>	G84J92-3111A G90Y04-3110A G94B95-3110 G95D32-3110	Mr. Marc Vogel North 40 Ag 2150 Road 14 South Ballentine MT 59006 PH: 406-860-2966 EM: mvogel@north40ag.com
<u>Monsanto</u>	DKC 36-28RIB DKC 37-86RIB DKC 38-03RIB DKC 39-07RIB DKC 39-27RIB DKC 42-36RIB DKC 43-10RIB DKC 44-13RIB	Mr. David Heimkes Monsanto Company Emmett ID 83617 PH: 320-444-3186 EM: david.heimkes@monsanto.com

Table 2. Summary of climatic data by months for the 2014-2015 cropping year (September-August) compared to averages for the period of record from 1911 to 2015 at the Southern Agricultural Research Center near Huntley, Montana.

	2014				2015								Year
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
<u>Precipitation (inches)</u>													<u>Total</u>
Current Year (2014-2015)	0.65	0.29	0.55	0.53	0.85	0.13	0.11	1.30	2.66	1.78	0.94	1.26	11.05
Average (1911-2015)	1.31	1.08	0.63	0.60	0.56	0.47	0.79	1.36	2.20	2.33	1.15	0.96	13.44
Difference	-0.66	-0.79	-0.08	-0.07	+0.29	-0.34	-0.68	-0.06	+0.46	-0.55	-0.21	+0.30	-2.39
<u>Mean Temperature (°F)</u>													<u>Average</u>
Current Year (2014-2015)	58.3	50.7	28.8	26.2	26.0	30.6	44.0	46.7	53.8	66.0	71.2	68.7	47.6
Average (1911-2015)	58.1	47.0	33.7	24.0	21.0	25.7	34.2	45.6	55.0	63.4	70.8	68.8	45.6
Difference	+0.2	+3.7	-4.9	+2.2	+5.0	+4.9	+9.8	+1.1	-1.2	+2.6	+0.4	-0.1	+2.0

Last Killing Frost in Spring^{1/} 2015 27 °F on May 11, 2015
Average (1911-2015) May 17

First Killing Frost in the Fall^{1/} 2015 30 °F on Oct 15, 2015
Average (1911-2015) September 19

Frost-free Period 2015 157 days
Average (1911-2015) 125 days

Growing Degree Days (Base 50)^{2/} 2015 2,389 GDD (°F)
Average (1911-2015) 2,018 GDD (°F)

Growing Degree Days (Base Corn)^{2/} 2015 2,433 GDD (°F)
Average (1911-2015) 2,303 GDD (°F)

Maximum Summer Temperature 100 °F on Jul 5 and Aug 15, 2015

Minimum Winter Temperature -23 °F on Jan 9, 2015

1/ 32 °F is considered a killing frost. Average last and first killing frost dates are calculated on a 50% probability of a minimum temperature occurring below the threshold temperature of 32.5 °F based on observations from 1911 to 2015.

2/ Growing degree days calculated from temperatures observed during the frost free period from May 11 through October 15, 2015, and for the same 157 day interval from the period of record of 1911 to 2015.

Table 3. Agronomic performance of 25 commercial corn hybrids grown under irrigated conditions near Huntley, Montana during 2015. Sorted by brand & hybrid. MSU Southern Agricultural Research Center.

Brand & Hybrid	RM	GMO	Grain ^{1/}	Test ^{2/}	Test ^{3/}	Harvest	Grain ^{4/}	Grain ^{4/}	Grain ^{4/}	Crop Establishment		Silking Date	
			Yield	Weight	Weight	Moisture	Protein	Oil	Starch	Stand	Emergence	Julian	Calendar
	- days -	- Y/N -	- bu/a -	- lb/bu -	- lb/bu -	----- % -----			- plants/a -	- % -			
Channel 185-81STXRIB	85	Y	194.5	57.3	60.3	19.1	8.3	2.7	59.4	33,638	83.9	203.0	Jul 22
Channel 186-33STXRIB	86	Y	204.8	55.0	57.8	20.5	8.5	2.8	57.5	31,783	79.3	199.5	Jul 18
Channel 187-42VT2PRIB	87	Y	218.8	54.8	59.2	20.5	7.6	2.8	56.9	30,169	75.3	202.0	Jul 21
Channel 190-13VT2PRIB	90	Y	228.1	54.5	57.0	19.8	7.6	2.7	59.5	34,041	84.9	201.3	Jul 20
Channel 192-09VT3PRIB	92	Y	243.0*	53.7	57.5	22.4	7.2	2.5	58.0	35,574	88.8	207.0	Jul 26
Croplan 2417VT2/RIB	85	Y	218.6	57.0	59.2	17.8	8.0	2.9	60.6	35,009	87.4	200.3	Jul 19
Croplan 2845SS/RIB	89	Y	228.5	56.8	59.0	19.3	7.8	2.7	59.6	35,090	87.6	203.3	Jul 22
Croplan 3055VT2P/RIB	90	Y	221.8	55.6	57.4	20.0	7.5	2.7	58.2	28,798	71.9	202.0	Jul 21
Croplan 3134SS/RIB	91	Y	246.9*	56.0	58.3	19.5	7.9	2.7	58.2	31,299	78.1	201.8	Jul 20
Croplan 3146SS/RIB	91	Y	237.9	55.0	59.0	21.1	7.5	2.7	57.8	33,315	83.1	201.5	Jul 20
Croplan 3337VT2P/RIB	93	Y	262.4*	54.1	56.7	23.1	6.9	2.5	57.6	34,929	87.2	202.8	Jul 21
Croplan 3499VT3P/RIB	94	Y	259.4*	53.6	57.5	23.7	7.1	2.7	56.5	35,332	88.2	204.3	Jul 23
Croplan 3899VT2P/RIB	96	Y	264.4**	51.8	55.6	27.1	6.4	2.6	55.0	35,413	88.4	205.5	Jul 24
Golden Harvest G84J92-3111A	86	Y	237.4	56.9	59.1	18.7	7.9	2.7	60.2	33,880	84.5	198.8	Jul 17
Golden Harvest G90Y04-3110A	90	Y	226.1	54.2	57.4	21.1	7.9	2.5	58.3	31,702	79.1	205.3	Jul 24
Golden Harvest G94B95-3110	94	Y	229.3	53.7	57.8	21.2	8.1	2.5	59.1	29,605	73.9	204.8	Jul 23
Golden Harvest G95D32-3110	95	Y	248.3*	53.5	57.5	23.8	6.9	2.7	55.4	34,525	86.2	203.8	Jul 22
Monsanto DKC36-28RIB	86	Y	224.6	56.3	58.3	19.3	8.3	2.7	59.3	33,799	84.3	200.3	Jul 19
Monsanto DKC37-86RIB	87	Y	231.5	55.6	58.5	19.4	7.4	2.7	59.8	32,186	80.3	200.5	Jul 19
Monsanto DKC38-03RIB	88	Y	247.1*	55.9	58.6	19.9	7.7	2.8	59.3	35,332	88.2	201.3	Jul 20
Monsanto DKC39-07RIB	89	Y	240.3*	53.2	56.4	22.1	7.0	2.5	57.9	34,364	85.7	203.3	Jul 22
Monsanto DKC39-27RIB	89	Y	234.5	54.2	57.7	22.2	7.1	2.7	58.0	34,767	86.8	202.8	Jul 21
Monsanto DKC42-36RIB	92	Y	229.2	58.1	59.7	19.0	7.7	2.9	59.6	34,687	86.6	202.8	Jul 21
Monsanto DKC43-10RIB	93	Y	230.6	53.8	57.4	21.2	7.1	2.7	58.2	33,315	83.1	204.3	Jul 23
Monsanto DKC44-13RIB	94	Y	221.6	52.1	56.5	26.0	6.8	2.7	54.9	32,509	81.1	204.8	Jul 23
Average			233.2	54.9	58.0	21.1	7.5	2.7	58.2	33,402	83.3	202.7	
PLSD (p=0.05)			24.9	2.1	1.1	2.3	0.5	0.1	1.8	4,250	10.6	1.9	
CV%			7.6	2.7	1.2	7.7	4.3	3.9	2.2	9.0	9.0	0.7	

1/ Yields in bushels per acre are based on a 56 pound standard bushel weight for corn and adjusted to 15.5 percent moisture content.

2/ Grain test weight determined on an "as-is" or harvest moisture basis.

3/ Grain test weight determined for grain dried below the threshold of 15.5 percent moisture content.

4/ Grain protein, oil and starch content adjusted to 100 percent dry matter content.

** Indicates highest yielding hybrid within a column.

* Indicates hybrids yielding equal to highest yielding hybrid within a column based on Fisher's protected LSD (p=0.05).

Planted: May 4, 2015

Harvested: October 14, 2015