



## RESULTS OF AGRONOMIC, CROPPING SYSTEMS AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA – 2018

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

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<b><u>PROJECT TITLE:</u></b>	Dryland Hybrid Grain Corn Performance Trial near Huntley, Montana. (Exp. 181308).
<b><u>PROJECT LEADERS:</u></b>	Kenneth D. Kephart, Agronomist, SARC, Huntley Valerie Smith, Research Associate, SARC, Huntley
<b><u>PROJECT PERSONNEL:</u></b>	Tom A. Fischer, Research Specialist and Farm Foreman, SARC, Huntley Janna Rozett, Research Assistant III, SARC, Huntley
<b><u>OBJECTIVES:</u></b>	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.
<b><u>METHODS:</u></b>	For 2018, two private companies submitted 11 corn hybrids representing three brands for testing under dryland conditions near Huntley, Montana (Table 1). All of the hybrids entered in the 2018 trial appeared to be genetically modified for both insect resistance and herbicide tolerance. Relative maturity ratings varied from 76 to 94 days. The study was planted using an alpha-lattice 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 27 seeds, equal to planting 15,682 seeds per acre or about 105 percent of the target population of 14,935 plants per acre. Planting depth was set at 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. Test weight is reported for grain sampled immediately after harvest on an “as-is” moisture basis, and also for grain dried below a threshold value of 15.5 percent moisture content. Grain protein, oil, and starch content were estimated by near-infrared reflectance using a Perten IM9500+ 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.
<b><u>RESULTS and SUMMARY:</u></b>	<p>Conditions were colder than average during March and April of 2018, but rose above average for May, while precipitation was well above average throughout most of the growing season (Table 2). Record winter snowfall and the above average precipitation in the spring led to above average surface soil moisture conditions at planting, facilitating quick emergence, establishment and early growth of the corn. The last freezing date in the spring of 2018 (April 25<sup>th</sup>), occurred before planting on May 3<sup>rd</sup>. Final crop establishment eventually averaged 91 percent with hybrids varying from 84 to 96 percent (Table 3).</p> <p>The frost-free period for the 2018 growing season at Huntley spanned from April 25<sup>th</sup> to September 21<sup>st</sup>, resulting in a 149-day growing season (Table 2). This interval is 24 days longer than the normally expected frost-free period at this location. Total accumulated heat units (2,199 °F, GDD<sub>corn</sub>) for the season were 29 °F cooler than the heat units normally expected to accumulate on average for this 149-day interval, and 1 percent below the level of heat units normally expected to</p>

accumulate during a typical 125-day frost-free growth period. June and July growing conditions were normal with greater than average precipitation during crop irrigation. All hybrids had achieved some level of physiological maturity (*aka*, kernel black layer) by the middle of September when killing frost occurred. Later maturing hybrids all possessed black layer development for kernels at or near the base of the ears but usually lacked black layer for kernels examined at the distal end of the ears. The subsequent drying period was prolonged due to precipitation. Harvested on October 24<sup>th</sup>, harvest grain moisture content averaged 19 percent. Minimal lodging was evident prior to harvest in 2018.

Adjusted corn grain yields averaged 126.2 bushels per acre in 2018 (Table 3). Yields among the 11 entries in 2018 varied from 181.5 bushels per acre for the hybrid 'Innotech IC4286' to 86.0 bushels per acre for the hybrid 'Dekalb DKC 26-40RIB'. One other hybrid corn entry produced averaged grain yield of 169.1 bushels per acre, which was statistically equal to the yield of the highest yielding hybrid tested in 2018. Test weight measured from grain dried below 15.5 percent moisture content averaged 57.3 lb/bu for the 11 entries and varied from 52.9 lb/bu for Innotech IC4286 to 62.3 lb/bu for 'Dekalb DKC 27-54'. Four of the 11 hybrid corn entries possessed a test weight value less than 56 lb/bu at grain moisture levels below 15.5 percent. Grain protein, oil, and starch content averaged 11.6, 3.9, and 69.2 percent, respectively.

Table 1. Contact information for seed sources of 11 hybrid corn entries tested at the MSU Southern Agricultural Research Center near Huntley, Montana during 2018.

Brand	Hybrids	Contact
DeKalb	DKC 26-40RIB DKC 27-54 DKC 29-89RIB DKC 31-07 DKC 32-12RIB DKC 33-78RIB	Mr. David Heimkes Monsanto Company Emmett ID 83617 PH: 320-444-3186 EM: david.heimkes@monsanto.com
<u>Innotech</u>	IC4016 IC4286	Mr. Dan Story Rob-See-Co 707 Golf Course Road Laurel MT 59044
<u>Rob-See-Co</u>	RC3601 RC4343 RC4427	PH: 406-697-6084 EM: dstory@robseeco.com

Table 2. Summary of climatic data by months for the 2017-2018 cropping year (September-August) compared to averages for the period of record from 1911 to 2017 at the Southern Agricultural Research Center near Huntley, Montana.

	2017				2018								Year
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
<u>Precipitation (inches)</u>													<u>Total</u>
Current Year (2017-2018)	2.57	0.37	1.17	1.14	0.58	1.82	0.90	2.70	3.81	3.77	0.87	2.00	21.70
Average (1911-2016)	1.30	1.07	0.64	0.59	0.55	0.45	0.79	1.34	2.18	2.33	1.14	0.94	13.32
Difference	+1.27	-0.70	+0.53	+0.55	+0.03	+1.37	+0.11	+1.36	+1.63	+1.44	-0.27	+1.06	+8.38
<u>Mean Temperature (°F)</u>													<u>Average</u>
Current Year (2016-2017)	58.6	47.0	33.6	23.4	19.6	9.9	29.3	40.7	59.1	63.4	70.2	67.8	43.6
Average (1911-2016)	58.0	46.9	33.6	23.9	20.7	25.7	34.3	45.5	54.9	63.3	70.8	68.8	45.5
Difference	+0.6	+0.1	0.0	-0.5	-1.1	-15.8	-5.0	-4.8	+4.2	+0.1	-0.6	-1.0	-1.9

Last Killing Frost in Spring<sup>1/</sup> 2018 ..... 32°F on April 25  
Average (1911-2017) ..... May 17

First Killing Frost in the Fall<sup>1/</sup> 2018 ..... 30°F on September 21  
Average (1911-2017) ..... September 19

Frost-free Period 2018 .....149 days  
Average (1911-2017) ..... 125 days

Growing Degree Days (Base 50)<sup>2/</sup> 2018 ..... 2,138 GDD (°F)  
Average (1911-2017) ..... 2,009 GDD (°F)

Growing Degree Days (Base Corn)<sup>2/</sup> 2018 ..... 2,199 GDD (°F)  
Average (1911-2017) ..... 2,219 GDD (°F)

Maximum Summer Temperature 100°F on August 11, 12, and 13, 2018

Minimum Winter Temperature -29 °F on February 10 and 20, 2018

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 2017.

2/ Growing degree days calculated from temperatures observed during the frost free period from April 25 through September 17, 2018, and for the same 145-day interval from the period of record of 1911 to 2017.

Table 3. Agronomic performance of 11 commercial corn hybrids grown under dryland conditions near Huntley, Montana during 2018. Sorted by brand & hybrid. MSU Southern Agricultural Research Center.

Brand & Hybrid	RM	Harvest			Test <sup>3/</sup> Weight	Grain <sup>4/</sup> Protein	Grain <sup>4/</sup> Oil	Grain <sup>4/</sup> Starch	Crop Establishment		Silking Date		Tasseling Date		Bird <sup>5/</sup> Damage
		Grain <sup>1/</sup> Yield	Test <sup>2/</sup> Weight	Grain Moisture					Stand	Emergence	Julian	Calendar	Julian	Calendar	
	- days -	- bu/a -	- lb/bu -	- % -	- lb/bu -	----- % -----			- plants/a -	- % -					- % -
Dekalb DKC 26-40RIB	76	86.0	60.0	15.3	60.4	11.8	4.4	68.8	13,940	88.9	194.8	Jul 13	194.5	Jul 13	24.8
Dekalb DKC 27-54	77	100.6	59.7	17.7	62.3	11.6	4.1	69.2	14,745	94.0	195.8	Jul 14	192.6	Jul 11	17.8
Dekalb DKC 29-89RIB	79	90.5	52.8	19.5	54.8	11.7	4.0	69.1	14,660	93.5	198.3	Jul 17	198.6	Jul 17	21.1
Dekalb DKC 31-07	81	101.5	58.7	14.8	59.0	11.3	4.3	69.2	14,700	93.7	198.7	Jul 17	197.9	Jul 16	28.5
Dekalb DKC 32-12RIB	82	96.3	56.9	15.2	56.9	12.0	4.0	68.9	14,112	90.0	198.4	Jul 17	199.2	Jul 18	34.1
Dekalb DKC 33-78RIB	83	119.1	55.0	18.5	57.2	12.0	3.9	68.9	14,986	95.6	198.4	Jul 17	199.0	Jul 18	21.2
Innotech IC4016	90	149.9	52.5	21.7	55.8	10.9	3.5	70.1	13,175	84.0	202.7	Jul 21	204.2	Jul 23	10.0
Innotech IC4286	92	<b>181.5**</b>	49.3	22.4	52.9	10.7	3.5	70.1	14,217	90.7	203.7	Jul 22	204.9	Jul 23	6.0
Rob-See-Co RC3601	86	156.7	55.3	19.3	58.3	11.0	3.9	69.8	14,213	90.6	199.6	Jul 18	201.5	Jul 20	11.1
Rob-See-Co RC4343	93	137.4	50.5	21.9	54.1	12.5	3.6	68.7	14,014	89.4	205.2	Jul 24	205.6	Jul 24	0.6
Rob-See-Co RC4427	94	<b>169.1*</b>	53.6	20.6	57.0	12.0	3.5	69.3	13,916	88.7	202.8	Jul 21	205.0	Jul 24	1.4
Average		126.2	54.9	18.8	57.2	11.6	3.9	69.3	14,243	90.8	199.9	Jul 18	200.3	Jul 19	16.1
Prob > F		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.386	0.386	<0.001		<0.001		<0.001
LSD (P=0.05)		20.8	4.0	2.7	1.4	0.6	0.2	0.5	ns	ns	1.3		1.4		0.8
CV%		11.2	4.6	9.1	3.1	3.5	3.8	0.5	6.6	6.6	0.4		0.4		2.6
Lattice RE%		100.0	115.9	114.8	120.6	101.1	101.3	100.0	100.0	100.0	110.9		130.5		100.0

\*\* Indicates highest yielding hybrid.

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

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" harvest moisture basis.

3/ Grain test weight determined for wet grain (>15.5 %) dried below the threshold of 15.5 percent moisture content.

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

5/ Bird damage visually estimated as the percent feeding damage occurring on at least 50% of the ears.

6/ Adjusted means provided for Lattice RE% values equal to or greater than 100%.

Planted: May 3, 2018

Harvested: October 24, 2018

Fertility: 237.5 lb/a of residual soil NO3-N

Herbicide: AMS (1 lb/a) + Roundup Powermax (32 oz/a) + Prowl 3.3EC (24 oz/a) + Outlook (24 oz/a), pre-emergence

Insecticide: None

Previous Crop: Chemical fallow

Precipitation (planting to harvest): 11.32 inches