



2016 ANNUAL RESEARCH REPORT

**Langdon Research
Extension Center**

NORTH DAKOTA STATE UNIVERSITY

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NDSU NORTH DAKOTA
STATE UNIVERSITY



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Table of Contents

Overview	4
2016 Crop Management - Langdon.....	5
2016 Crop Management - Off-Station.....	6
Weather Observations	7-10
Average Data by Crop and Year across Sites for Durum, Barley and HRSW.....	11-12
Langdon HRSW	13-14
Off-Station HRSW	15-18
HRSW Diseases	19-20
Langdon Durum	21
Off-Station Durum	22
Rye.....	22
HRWW	23
HRWW Diseases.....	24
Corn.....	25
Langdon Barley	26-27
Off-Station Barley	28
Oats.....	29-30
Flax	31
Canola - Conventional.....	32-33
Canola - Roundup Ready	34-35
Carinata	36
Mustard	36
Langdon Dry Bean	37
Off-Station Dry Bean	38
Field Peas	39
Faba Beans	40
Conventional & Liberty Link Soybeans.....	41
Roundup Ready Soybeans.....	42-49
Roundup Ready 2 Xtend Soybeans	50-51
Sunflower	52-54
Crop Production Research.....	55-65
Crop Disease Research.....	66-77
Soil Health & Fertility Research	78-86
Foundation Seed Increase.....	87

The 2016 annual research report is intended to provide producers information to aid in selecting varieties and/or hybrids. Variety information and research reports on crop disease and production can also be found on our website www.ag.ndsu.edu/langdonrec/. Variety trial results from all NDSU Research Extension Centers and the Main Station at Fargo, along with crop extension bulletins, can be accessed on the web at www.ag.ndsu.edu/varietytrials/.

Choosing a variety is one of the most important decisions a producer makes in successful crop production. Characteristics to consider in selecting a variety may include yield potential, disease resistance, protein content, straw strength, plant height, test weight, yield stability across years and locations, quality and economic profitability. A variety's performance may differ from year to year and from location to location within a year due to varying environmental conditions. When selecting a variety to grow, it is best to consider a variety's performance over several years and locations.

The agronomic data presented in this publication are from replicated research plots using experimental designs that enable the use of statistical analysis. The trials are designed so that "real" yield and agronomic differences can be statistically separated from differences that occur by chance. The least significant difference (LSD) values given in the report are used for this purpose. For example, if the LSD 10% is five bushels, then if the difference between any two varieties is greater than five bushels they are said to be significantly different from one another 90 times out of 100 under those growing conditions. If the difference between two varieties is less than five bushels, they are not significantly different from one another. If there is a "NS" for the LSD 10% value it means there was no real difference between any varieties or the trial was too variable to detect a real difference. The CV stands for coefficient of variation and is expressed as a percentage. The CV is a measure of variability in the trial. Large CVs mean that a large amount of variation could not be attributed to differences in the varieties or agronomic characteristic.

The NDSU Langdon Research Extension Center, in addition to its on-station research program, conducted variety research trials at several locations in 2016. Trial locations were at Cavalier, Park River, Pekin, and Cando. These locations are in cooperation with a local farmer, the NDSU Extension Service and the County Crop Improvement Association.

2016 Weather Summary

The 2016 growing season (May-September) was the wettest on record and 2016 will break the yearly precipitation record set in 1954. The record was already broken by the end of September. Precipitation from April-August was 26.66 inches with areas in Northeast North Dakota exceeding that precipitation amount. Fall recharge at Langdon for September through October 2015 was 7.31 inches or 4.04 inches above normal. Precipitation from November 2015 through March 2016 was 4.03 inches or 0.39 inches above normal. Snowfall for 2015-2016 was 29.3 inches, 3.8 inches below normal. Winter temperatures were 8.2° F above normal. Soil moisture was near normal coming into spring allowing for a general planting around late April across the region. Rainfall ranged from 102-176 percent of normal, with an average 145 percent across the region from April-September. Accumulated growing degree days were 151 and 200 above normal for corn and small grains, respectively, across the region. Dry and drought predictions were common during the winter and seed zone moisture was getting very short until the first substantial rains started falling on May 22. With all the moisture, diseases were more of a problem in all crops. Crop yields were generally good except in areas that were affected with excessive saturated soil conditions. Harvest was difficult due to the wet conditions with many low areas having delayed harvest or they were abandoned. Stuck combines were probably at record levels also. Spring planting may present additional challenges with wet soils in the spring of 2017.

2016 Crop Management - Langdon						
Field Trial	Previous Crop	Seeding Rate Unit/Acre	Yield Goal	Planting Date	Harvest Date	Row Spacing
Barley	soybean	1.25 million pls	100 bu	May 2	Aug. 15	6
Carinata	soybean	610,000 pls	2500 lb	May 17	Sept. 14	6
Canola - LL, CL, SU	soybean	610,000 pls	2500 lb	May 17	Aug. 30	6
Canola - RR	soybean	610,000 pls	2500 lb	May 16	Aug. 30	6
Corn	soybean	28,000 thinned	150 bu	May 4	Oct. 24	30
Durum	soybean	1.50 million pls	60 bu	May 2	Aug. 24	6
Dry Bean	wheat	70,000-90,000 pls	2000 lb	May 19	DNH*	30
Faba Bean	wheat	192,000 pls	4000 lbs	May 3	Sept. 20	6
Field Pea	soybean	300,000 pls	60 bu	May 3	Aug. 12	6
Flax	soybean	2.8 million pls	40 bu	May 9	Sept. 2	6
HRSW	soybean	1.50 million pls	60 bu	May 2	Aug. 23	6
HRWW	canola	1.25 million pls	100 bu	Sept. 10, 2015	Aug. 10	6
Industrial Hemp	hrsw	522,000 pls	1100 bu	May 24	DNH*	12
Mustard	soybean	610,000 pls	2500 lb	May 17	Aug. 31	6
Oats	soybean	1.0 million pls	120 bu	April 29	Aug. 18	6
Rye	canola	1.0 million pls	70 bu	Sept. 14, 2015	Aug. 10	6
Soybean - Conventional	wheat	200,000 pls	60 bu	May 19	Oct. 13	6
Soybean - LL	wheat	200,000 pls	60 bu	May 19	Oct. 13	6
Soybean - RR	wheat	200,000 pls	60 bu	May 19	Oct. 3	6
Soybean Xtend	wheat	200,000 pls	60 bu	May 19	Oct. 3	6
Sunflower - Confection	wheat	17,000 thinned	2500 lb	May 18	Oct. 20	30
Sunflower - Oil	wheat	20,000 thinned	2500 lb	May 18	Oct. 20	30
Soil Type - Svea-Barnes loam						

*DNH – Did not harvest – Trial was lost due to waterlogged soil conditions.

Special thanks to our local cooperators and Extension Agents for their efforts in our off-station variety testing.

Jeff and Ryan Miller - Cando
Lindy Berg - Towner County Agent
Dave Hankey - Park River
Brad Brummond - Walsh County Agent
Kent Schluchter - Cavalier
Samantha Lahman - Pembina County Agent
Doug Stein - McVille
Katelyn Hain - Nelson County Agent
Lesley Lubenow - LREC Area Extension Specialist

2016 Crop Management – Off-Station						
Location (County/Field Trial)	Previous Crop	Seeding Rate Unit/Acre	Yield Goal	Planting Date	Harvest Date	Row Spacing
Cavalier (Pembina)						
HRSW	wheat	1.50 million pls	60 bu	May 4	Aug. 22	6
Soybean	wheat	200,000 pls	60 bu	May 25	Sept. 29	6
Dry Bean	wheat	70,000-90,000 pls	2000 lb	May 25	Sept. 29	30
Park River (Walsh)						
HRSW	cover crop	1.50 million pls	65 bu	April 28	Aug. 22	6
Barley	cover crop	1.25 million pls	100 bu	April 28	Aug. 8	6
Soybean	wheat	200,000 pls	60 bu	June 2	Oct. 11	6
Pekin (Nelson)						
HRSW	soybean	1.50 million pls	60 bu	April 28	Aug. 16	6
Soybean	wheat	200,000 pls	60 bu	May 22	Sept. 30	6
Cando (Towner)						
HRSW	soybean	1.50 million pls	60 bu	April 26	Aug. 17	6
Barley	soybean	1.25 million pls	100 bu	April 26	Aug. 8	6
Durum	soybean	1.50 million pls	60 bu	April 26	Aug. 17	6
Location	Soil Type					
Cavalier	Borup silty clay					
Park River	Glyndon silt loam, soybean – Fairdale silt loam					
Pekin	Svea loam					
Cando	Great Benad – Overly silty loam					

pls = pure live seeds

**Record of Climatological Observation
Langdon, ND**

	Precipitation		Dep. from		Temperature		Dep. from
	Normal*	2016	Normal		Normal*	2016	Normal
April	1.24	1.99	+0.75	April	38.1	35.9	-2.2
May	2.29	2.62	+0.33	May	51.5	56.5	+5.0
June	3.26	5.17	+1.91	June	60.8	62.6	+1.8
July	2.91	8.24	+5.33	July	66.2	66.3	+0.1
August	2.60	3.31	+0.71	August	64.5	66.0	+1.5
September	2.06	5.33	+3.27	September	54.5	56.7	+2.2
Total	14.36	26.66	+12.3	Total	55.9	57.3	+1.4

*115 year average

Monthly Growing Degree Days and Normals-Langdon

	Wheat Growing Degree Days			Corn Growing Degree Days			Sunflower Growing Degree Days		
	2016	Normal	Deviation	2016	Normal	Deviation	2016	Normal	Deviation
April	238	274	-36	--	--	--	--	--	--
May	739	613	+126	308	219	+89	444	314	+130
June	891	875	+16	393	356	+37	560	519	+41
July	1033	1018	+15	507	499	+8	690	685	+5
August	980	962	+18	470	457	+13	647	642	+5
September	730	671	+59	281	255	+26	413	358	+55
Total	4611	4413	+198	1959	1786	+173	2754	2518	+236

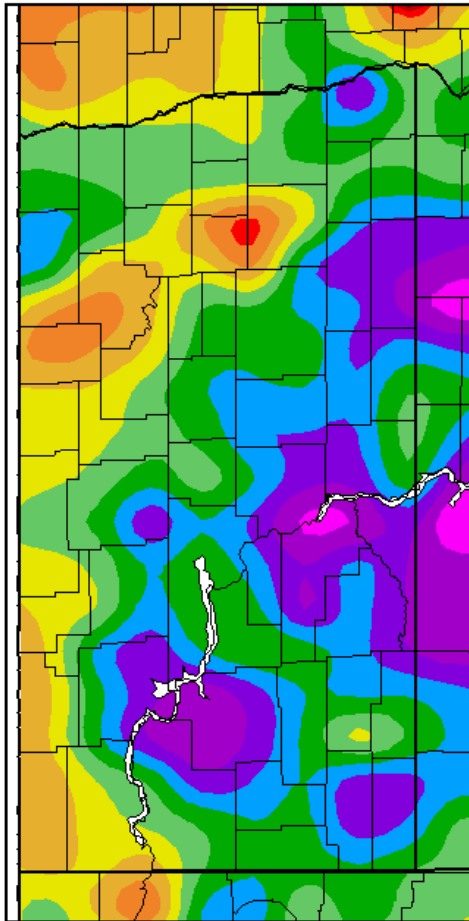
Frost Dates-Langdon and Selected Cities

	Last Spring Frost		First Fall Frost		Frost Free Days	
	32°F	28°F	32°F	28°F	32°F	28°F
Langdon						
Normal	20-May	9-May	19-Sep	29-Sep	122	143
2016	14-May	14-May	6-Oct	8-Oct	145	147
Cavalier						
Normal	16-May	5-May	24-Sep	5-Oct	131	153
2016	14-May	14-May	8-Oct	20-Oct	147	159
Park River						
Normal	8-May	30-Apr	30-Sep	10-Oct	145	163
2016	14-May	14-May	8-Oct	12-Oct	147	151
Pekin						
Normal	18-May	3-May	22-Sep	30-Sep	127	150
2016	15-May	13-Apr	6-Oct	8-Oct	144	178

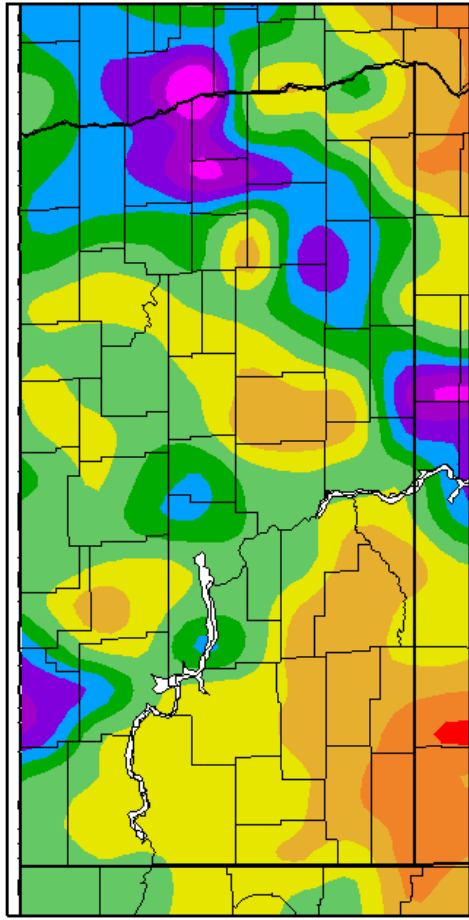
Normals are from the NWS. The 2016 frost dates are from the nearest reporting NDAWN station.

North Dakota 2016 Precipitation (inches) Maps

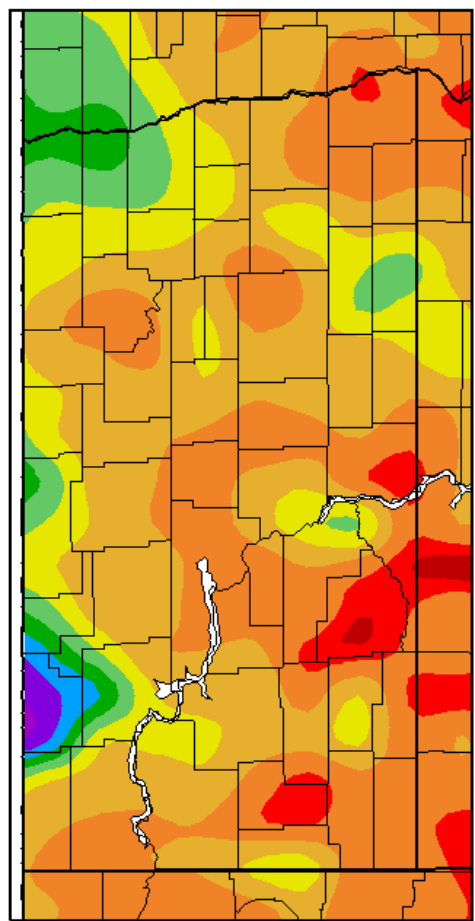
4/1/16 – 4/30/16



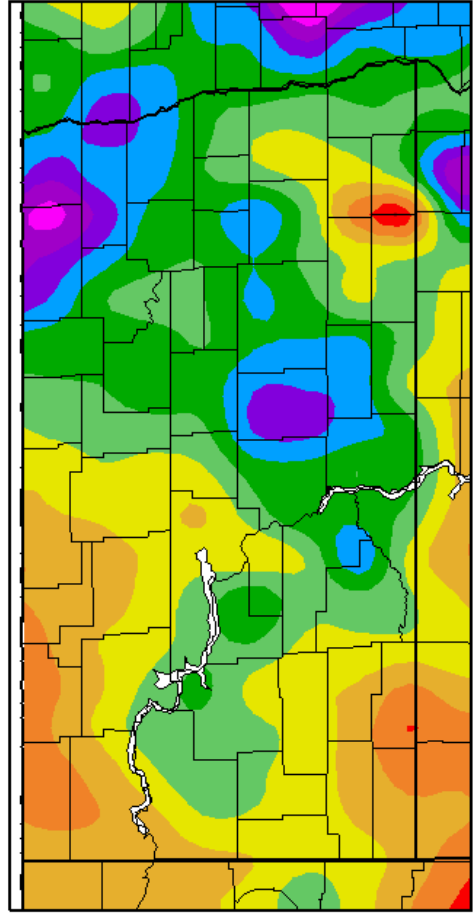
5/1/16 – 5/31/16



6/1/16 – 6/30/16

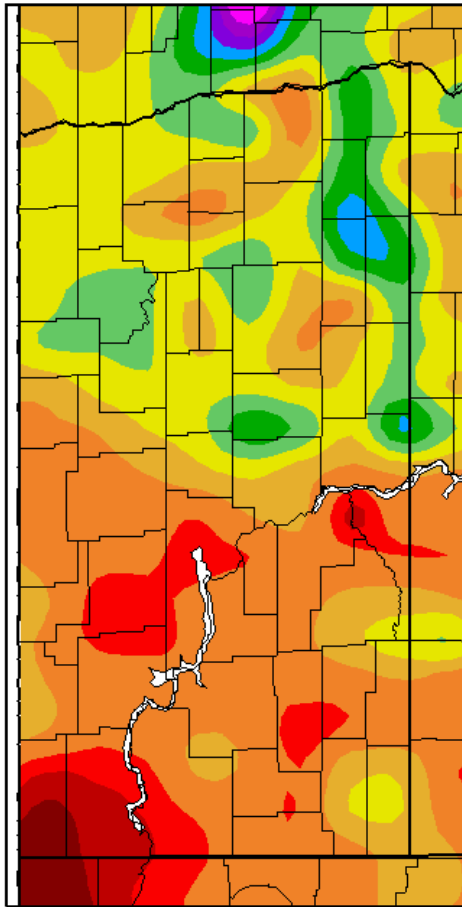


7/1/16 – 7/31/16

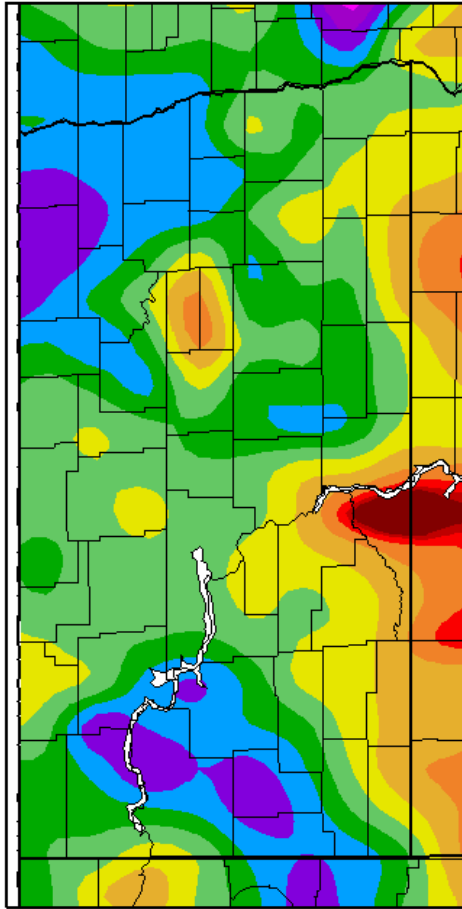


North Dakota 2016 Precipitation (inches) Maps Continued

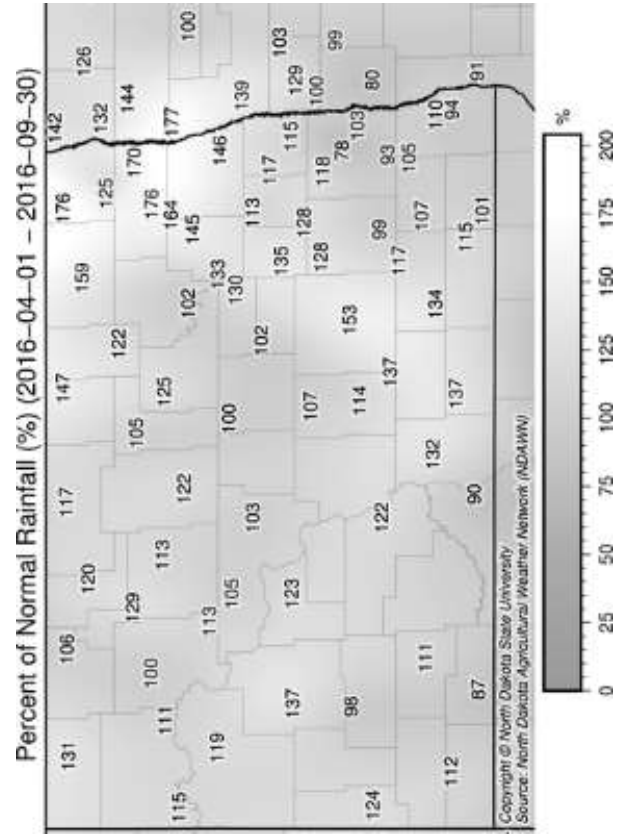
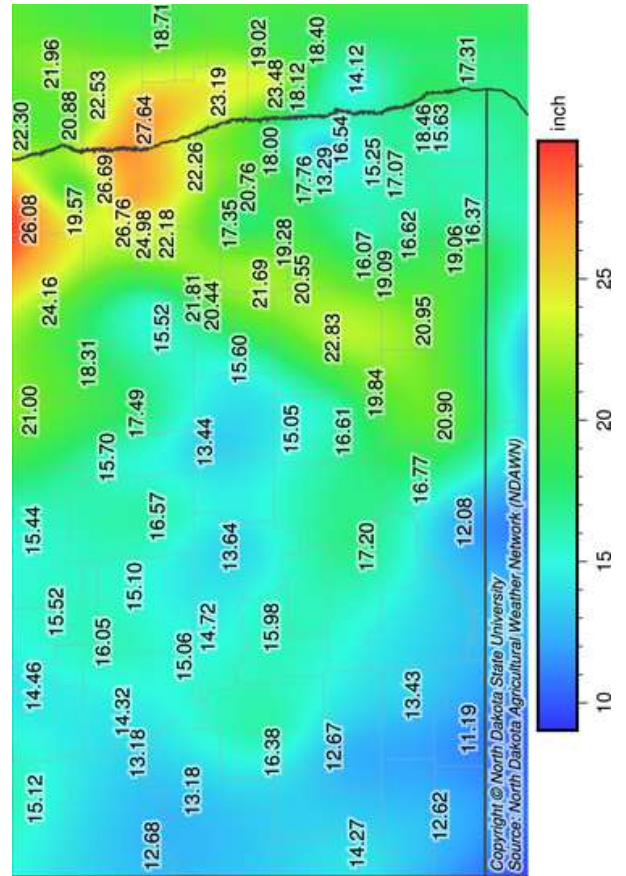
8/1/16 – 8/31/16



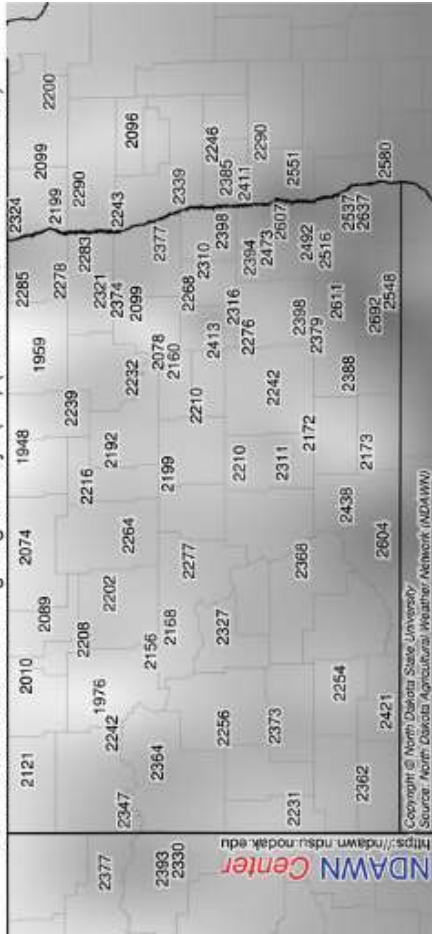
9/1/16 – 9/30/16



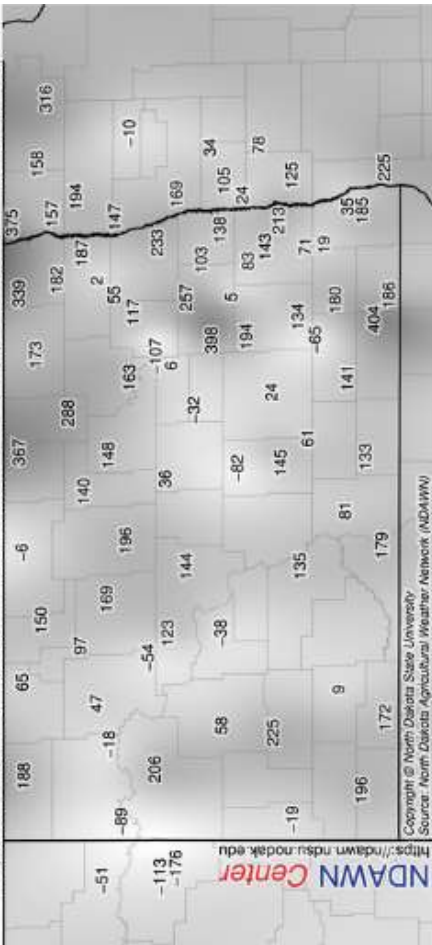
Growing Season 4/1/16 – 9/30/16



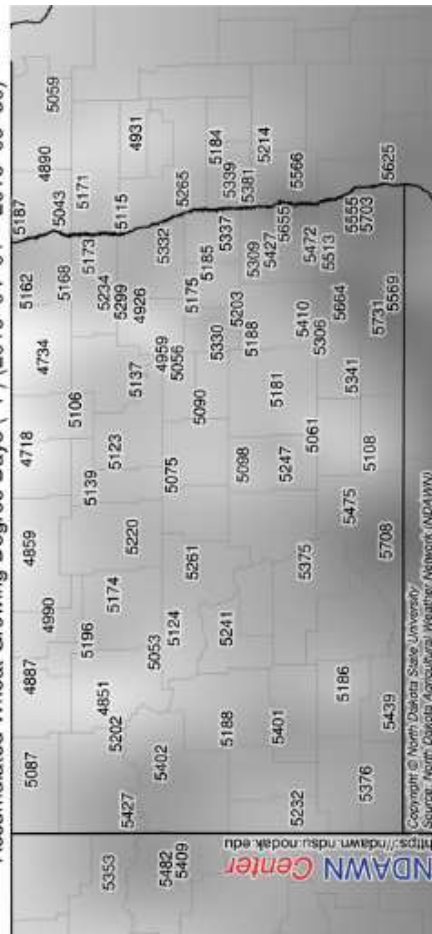
Corn Accumulated Growing Degree Days (°F) (2016-05-01 - 2016-09-30)



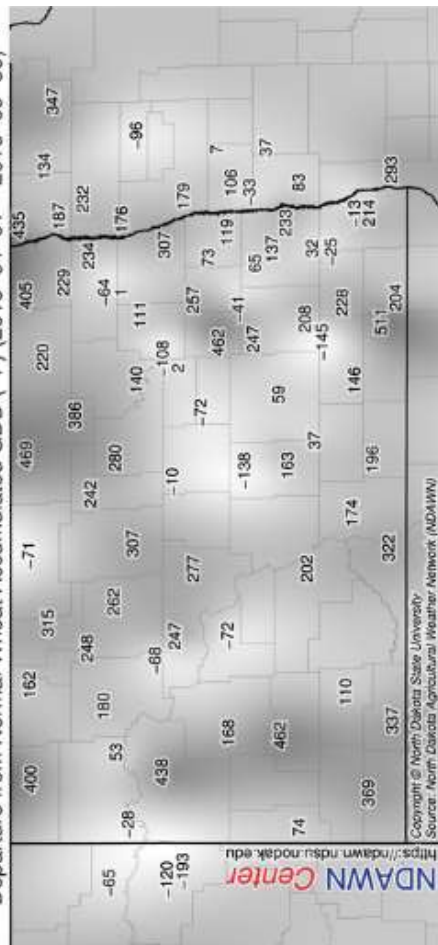
Departure from Normal Corn Accumulated GDD (°F) (2016-05-01 - 2016-09-30)



Accumulated Wheat Growing Degree Days (°F) (2016-04-01 - 2016-09-30)



Departure from Normal Wheat Accumulated GDD (°F) (2016-04-01 - 2016-09-30)



Average Data by Crop and Year Across Sites

Durum	Yield (bu/a)						Test Weight (lbs/bu)						Height (in)						Days to Head											
	3		2		2		3		2		2		3		2		2		3		2		2		3		2		2	
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
Alkabo	69	86	69	61	62	64	58.5	61.3	59.2	60.7	57.6	59.2	38	42	40	36	39	38	64	52	57	64	62	61	64	52	57	64	62	61
Tioga	71	88	67	67	50	61	58.2	60.7	58.5	60.3	54.0	57.6	41	45	43	39	41	41	63	53	58	65	62	62	63	53	58	65	62	62
Divide	67	84	68	70	50	63	58.6	60.0	58.5	60.4	54.9	57.9	40	44	42	38	40	40	64	53	59	65	63	62	64	53	59	65	63	62
Carpio	69	90	67	74	57	66	58.7	61.6	58.4	61.0	57.3	58.9	40	45	41	38	40	40	65	54	59	66	63	63	65	54	59	66	63	63
Joppa	66	94	71	71	58	67	58.5	60.7	58.7	60.6	56.1	58.5	41	42	41	38	39	39	63	52	59	64	63	62	63	52	59	64	63	62
Lebsock	68	79	69	67	--	--	58.8	61.1	59.6	62.2	--	--	38	41	39	37	--	--	62	51	55	63	--	--	62	51	55	63	--	--
Grenora	67	89	--	--	--	--	57.3	60.2	--	--	--	--	37	40	--	--	--	--	63	52	--	--	--	--	63	52	--	--	--	--
DG Max	65	83	--	--	--	--	58.3	60.7	--	--	--	--	39	43	--	--	--	--	63	52	--	--	--	--	63	52	--	--	--	--
Westhope	66	--	--	--	--	--	58.4	--	--	--	--	--	39	--	--	--	--	--	64	--	--	--	--	--	64	--	--	--	--	--

Barley	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Plump (%)						Days to Head					
	3		2		2		3		2		2		3		2		2		3		2		2		3		2		2	
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
Lacey	99	135	123	110	113	115	47.9	50.4	50.0	49.2	47.1	48.8	12.5	12.6	13.1	13.2	13.4	13.2	83	99	95	93	92	93	58	49	63	55	56	56
Tradition	77	138	124	109	104	112	46.1	50.7	49.5	48.4	46.1	48.0	12.9	12.5	12.7	13.0	13.2	13.0	80	99	94	92	89	92	58	49	61	57	56	56
Quest	95	132	123	107	98	109	46.8	48.8	48.1	47.8	45.1	47.0	12.2	12.3	12.9	12.9	12.9	12.9	75	96	92	87	87	89	60	49	63	56	56	56
Innovation	94	130	130	109	111	117	47.0	49.4	49.8	48.5	45.9	48.1	12.7	12.4	13.3	13.2	13.2	13.2	81	98	97	92	90	93	58	48	61	56	55	55
Pinnacle*	--	--	--	114	103	--	--	--	--	49.6	47.1	--	--	--	--	11.8	12.4	--	--	--	--	95	96	--	--	--	63	56	--	--
ND Genesis*	--	--	--	105	90	--	--	--	--	48.1	46.4	--	--	--	--	10.8	11.4	--	--	--	--	94	96	--	--	--	64	58	--	--
Celebration	80	135	125	--	--	--	45.9	49.7	49.2	--	--	--	13.5	13.6	13.6	--	--	--	83	99	94	--	--	--	59	50	--	--	--	--
Stellar-ND	92	132	126	--	--	--	46.7	49.6	48.6	--	--	--	12.2	12.3	12.7	--	--	--	85	99	97	--	--	--	59	49	--	--	--	--

*2-row barley

HRSW Summary, Langdon 2012-2016																
Variety	Days to Head						Height (in)						Lodging (0-9)			
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	15	16	2yr	
Barlow	61	52	53	61	55	56	37	33	37	36	35	36	2.1	3.9	3.0	
Elgin-ND	61	54	53	61	57	57	38	36	39	38	39	39	1.6	2.6	2.1	
Faller	63	55	54	62	57	58	37	35	35	36	38	36	1.6	3.7	2.7	
Glenn	60	52	52	60	53	55	40	34	37	38	37	37	0.4	1.7	1.1	
LCS Breakaway	60	52	53	60	55	56	32	29	33	33	33	33	1.2	1.8	1.5	
Prevail	61	53	54	60	56	57	38	33	36	35	37	36	0.0	1.3	0.7	
Prosper	64	55	53	63	57	58	37	34	36	36	36	36	3.4	4.6	4.0	
Rollag	61	53	53	61	56	57	31	30	33	32	35	33	0.0	1.8	0.9	
SY Soren	62	55	53	61	56	57	31	29	31	32	33	32	0.1	1.9	1.0	
WB Mayville	62	53	51	60	55	55	29	29	33	31	33	32	0.4	0.9	0.7	
Linkert	--	55	54	62	57	58	--	28	29	31	32	31	0.1	0.6	0.4	
MS Stingray	--	58	56	65	64	62	--	33	36	37	38	37	0.1	0.7	0.4	
SY Rowyn	--	52	53	61	55	56	--	30	33	34	34	34	0.1	3.6	1.9	
LCS Iguacu	--	57	55	63	59	59	--	31	35	34	36	35	0.0	1.6	0.8	
Bolles	--	56	55	64	59	59	--	32	35	35	35	35	0.5	2.6	1.6	
HRS 3361	--	56	54	62	58	58	--	32	34	33	35	34	0.2	1.2	0.7	
SY Ingmar	--	--	54	62	58	58	--	--	32	32	34	33	0.4	2.5	1.5	
LCS Nitro	--	--	56	63	59	59	--	--	34	34	34	34	1.0	3.0	2.0	
WB9507	--	--	52	60	55	56	--	--	34	35	34	34	0.9	3.1	2.0	
HRS 3419	--	--	58	64	61	61	--	--	33	35	34	34	0.2	0.4	0.3	
MS Chevelle	--	--	51	60	54	55	--	--	33	34	34	34	0.2	2.8	1.5	
Focus	--	--	50	56	51	52	--	--	36	39	38	38	1.9	3.5	2.7	
Boost	--	--	55	63	59	59	--	--	35	36	35	35	1.1	3.5	2.3	
LCS Pro	--	--	--	61	55	--	--	--	--	38	40	--	0.6	2.4	1.5	
WB9653	--	--	--	62	58	--	--	--	--	32	31	--	0.3	1.8	1.1	
SY Valda	--	--	--	62	57	--	--	--	--	33	35	--	0.3	0.8	0.6	
HRS 3530	--	--	--	64	58	--	--	--	--	39	39	--	0.1	2.1	1.1	
Redstone	--	--	--	66	63	--	--	--	--	35	37	--	0.0	0.4	0.2	
Prestige	--	--	--	59	54	--	--	--	--	35	35	--	0.1	2.7	1.4	
HRS 3504	--	--	--	62	58	--	--	--	--	33	32	--	0.2	0.8	0.5	
LCS Prime	--	--	--	60	55	--	--	--	--	36	35	--	0.6	2.4	1.5	
Shelly	--	--	--	63	59	--	--	--	--	33	34	--	0.6	2.6	1.6	
HRS 3100	--	--	--	--	58	--	--	--	--	--	35	--	--	1.4	--	
HRS 3616	--	--	--	--	57	--	--	--	--	--	34	--	--	2.6	--	
LCS Anchor	--	--	--	--	57	--	--	--	--	--	32	--	--	2.7	--	
TCG-Cornerstone	--	--	--	--	58	--	--	--	--	--	33	--	--	1.3	--	
TCG-Spitfire	--	--	--	--	61	--	--	--	--	--	33	--	--	1.2	--	
TCG-Wildfire	--	--	--	--	58	--	--	--	--	--	37	--	--	2.4	--	
Surpass	--	--	--	--	52	--	--	--	--	--	34	--	--	4.2	--	
Velva	63	56	55	--	58	--	36	33	36	--	37	--	--	2.1	--	
RB07	60	53	52	59	--	--	34	32	35	33	--	--	0.4	--	--	
LCS Albany	65	57	55	63	--	--	32	32	35	33	--	--	0.0	--	--	
Samson	61	55	54	61	--	--	30	29	32	32	--	--	0.2	--	--	
Vantage	67	58	56	68	--	--	35	31	34	34	--	--	0.1	--	--	
Norden	62	56	52	61	--	--	33	31	33	35	--	--	0.0	--	--	
Alpine	62	54	54	62	--	--	35	32	35	36	--	--	0.5	--	--	
LCS Powerplay	62	54	53	62	--	--	34	33	34	34	--	--	1.0	--	--	
Forefront	58	51	52	59	--	--	35	35	39	39	--	--	0.6	--	--	
Advance	58	54	55	62	--	--	40	31	34	35	--	--	1.0	--	--	
HRS 3378	--	55	55	62	--	--	--	31	34	34	--	--	0.3	--	--	
Cardale	--	--	52	61	--	--	--	--	36	35	--	--	1.0	--	--	
LSD 5%	1.5	1.0	1.3	0.7	0.9		1.6	1.8	1.9	1.5	2.2		1.6	1.5		
LSD 10%	1.2	0.8	1.1	0.6	0.8		1.3	1.5	1.6	1.3	1.8		1.3	1.3		

HRSW Summary, Langdon 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
Barlow	72	94	86	74	60	73	60.3	61.7	62.9	62.1	60.0	61.7	12.7	14.2	13.9	14.1	14.8	14.3
Elgin-ND	76	99	90	73	65	76	59.2	61.1	62.3	60.8	59.2	60.8	12.0	14.1	13.7	13.6	14.9	14.1
Faller	85	112	96	74	79	83	59.4	60.7	62.2	60.5	60.8	61.2	11.3	13.4	12.3	12.3	13.6	12.7
Glenn	68	91	76	75	64	72	62.6	63.0	64.0	64.5	63.0	63.8	13.1	14.6	14.4	14.3	14.7	14.5
LCS Breakaway	76	88	77	74	71	74	61.4	62.2	62.9	62.2	61.7	62.3	12.6	14.5	13.7	13.7	14.1	13.8
Prevail	74	89	85	74	66	75	58.8	60.2	61.9	61.7	59.3	61.0	11.5	14.0	13.3	13.0	14.3	13.5
Prosper	84	110	93	71	78	81	59.7	60.3	62.4	60.4	60.9	61.2	11.2	13.2	12.4	12.6	13.8	12.9
Rollag	70	83	85	75	71	77	60.0	61.6	63.0	61.5	61.3	61.9	12.6	14.8	14.1	14.0	14.8	14.3
SY Soren	71	86	85	74	69	76	59.9	61.4	63.2	61.8	60.6	61.9	12.4	14.8	13.4	13.8	14.5	13.9
WB Mayville	70	86	81	66	57	68	59.9	60.3	61.4	60.3	58.9	60.2	12.9	14.5	13.6	13.9	14.7	14.1
Linkert	--	81	82	76	63	74	--	60.8	62.2	61.1	59.7	61.0	--	15.4	13.6	14.5	15.1	14.4
MS Stingray	--	118	93	62	76	77	--	59.9	60.1	56.6	58.8	58.5	--	11.4	10.7	10.9	11.6	11.1
SY Rowyn	--	95	87	78	67	77	--	60.7	62.2	61.8	60.1	61.4	--	14.0	12.9	12.7	14.1	13.2
LCS Iguacu	--	94	91	73	76	80	--	60.2	62.0	61.9	60.7	61.5	--	12.4	11.6	11.3	12.4	11.8
Bolles	--	94	86	73	63	74	--	61.0	61.6	60.9	60.2	60.9	--	15.4	13.8	15.1	15.9	14.9
HRS 3361	--	98	85	66	71	74	--	60.5	61.3	58.6	58.7	59.5	--	13.5	13.5	12.5	13.8	13.3
SY Ingmar	--	--	87	74	70	77	--	--	62.9	61.5	60.9	61.8	--	--	13.7	13.9	15.1	14.2
LCS Nitro	--	--	91	75	78	81	--	--	61.5	60.5	60.0	60.7	--	--	11.8	12.0	13.3	12.4
WB9507	--	--	87	61	77	75	--	--	60.4	57.7	59.2	59.1	--	--	13.1	11.9	13.7	12.9
HRS 3419	--	--	89	83	79	84	--	--	60.0	60.6	59.1	59.9	--	--	12.3	12.5	13.3	12.7
MS Chevelle	--	--	91	80	68	80	--	--	62.1	60.5	58.5	60.4	--	--	12.5	12.5	13.4	12.8
Focus	--	--	73	73	53	66	--	--	62.3	62.4	61.2	62.0	--	--	13.9	13.2	14.3	13.8
Boost	--	--	85	72	61	73	--	--	61.4	60.6	58.5	60.2	--	--	13.1	13.5	15.0	13.9
LCS Pro	--	--	--	76	68	--	--	--	--	62.0	61.1	--	--	--	--	13.5	14.4	--
WB9653	--	--	--	74	76	--	--	--	--	58.1	58.5	--	--	--	--	12.5	13.4	--
SY Valda	--	--	--	79	78	--	--	--	--	60.7	60.5	--	--	--	--	13.0	13.9	--
HRS 3530	--	--	--	77	78	--	--	--	--	60.3	60.8	--	--	--	--	12.8	14.3	--
Redstone	--	--	--	79	76	--	--	--	--	61.2	60.1	--	--	--	--	12.7	13.4	--
Prestige	--	--	--	78	68	--	--	--	--	61.2	59.4	--	--	--	--	12.9	14.5	--
HRS 3504	--	--	--	85	73	--	--	--	--	58.2	58.2	--	--	--	--	12.7	13.4	--
LCS Prime	--	--	--	78	69	--	--	--	--	61.6	60.9	--	--	--	--	11.9	13.5	--
Shelly	--	--	--	80	71	--	--	--	--	62.0	59.7	--	--	--	--	13.0	14.0	--
HRS 3100	--	--	--	--	70	--	--	--	--	--	58.1	--	--	--	--	--	13.7	--
HRS 3616	--	--	--	--	66	--	--	--	--	--	59.4	--	--	--	--	--	15.3	--
LCS Anchor	--	--	--	--	60	--	--	--	--	--	59.3	--	--	--	--	--	14.7	--
TCG-Cornerstone	--	--	--	--	58	--	--	--	--	--	59.5	--	--	--	--	--	14.5	--
TCG-Spitfire	--	--	--	--	58	--	--	--	--	--	59.0	--	--	--	--	--	14.2	--
TCG-Wildfire	--	--	--	--	64	--	--	--	--	--	59.4	--	--	--	--	--	14.2	--
Surpass	--	--	--	--	59	--	--	--	--	--	59.4	--	--	--	--	--	14.2	--
Velva	72	99	93	--	53	--	59.2	60.2	61.2	--	57.7	--	12.1	13.8	12.5	--	14.8	--
RB07	74	96	88	74	--	--	58.8	60.4	62.1	61.5	--	--	12.3	14.5	13.8	13.5	--	--
LCS Albany	79	105	95	68	--	--	58.8	61.4	61.9	60.0	--	--	10.9	12.8	11.7	12.3	--	--
Samson	72	92	86	79	--	--	60.1	59.8	60.9	60.4	--	--	12.6	13.9	12.5	12.5	--	--
Vantage	67	86	81	68	--	--	61.4	62.1	63.5	63.1	--	--	13.0	15.8	14.4	14.7	--	--
Norden	73	90	81	73	--	--	61.3	62.2	63.2	61.7	--	--	12.1	13.9	13.2	13.5	--	--
Alpine	79	99	92	73	--	--	59.0	59.8	61.1	61.0	--	--	11.6	13.8	12.9	13.3	--	--
LCS Powerplay	75	101	88	71	--	--	59.6	61.0	62.4	61.2	--	--	11.5	13.5	13.4	12.9	--	--
Forefront	78	89	74	72	--	--	60.6	60.5	62.1	62.7	--	--	11.4	14.3	13.8	13.6	--	--
Advance	81	97	85	75	--	--	60.1	61.7	62.6	61.9	--	--	12.1	12.9	12.6	12.5	--	--
HRS 3378	--	90	87	72	--	--	--	61.0	62.7	61.7	--	--	--	13.3	12.4	12.4	--	--
Cardale	--	--	84	61	--	--	--	--	61.4	57.2	--	--	--	--	13.8	13.8	--	--
LSD 5%	4.0	5.7	6.6	5.9	8.1		0.5	0.4	0.7	0.8	1.0		0.6	0.4	0.8	0.4	0.6	
LSD 10%	3.3	4.8	5.5	5.0	6.8		0.4	0.3	0.5	0.6	0.8		0.5	0.3	0.7	0.4	0.5	

HRSW Summary, Nelson County 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)		
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	14	16	2yr
Faller	81	95	102	60	71	78	57.3	63.2	60.7	57.6	57.2	58.5	13.5	14.0	14.1	13.0	14.0	13.7	2.2	2.5	2.4
SY Soren	75	85	81	50	72	68	57.3	63.6	60.9	57.4	58.0	58.8	14.2	15.2	14.3	14.1	13.6	14.0	0.2	0.6	0.4
WB Mayville	76	85	86	59	66	70	58.3	62.8	61.0	58.9	57.0	59.0	14.5	15.0	14.4	14.1	14.3	14.3	0.1	0.2	0.2
LCS Breakaway	75	83	94	59	73	75	59.1	63.9	62.7	59.5	58.8	60.3	14.6	15.0	14.8	13.6	14.4	14.3	0.8	0.7	0.8
Elgin-ND	82	91	91	63	64	73	57.1	62.7	60.5	58.7	57.0	58.7	13.9	15.0	14.5	13.6	14.7	14.3	2.1	2.4	2.3
Prosper	77	88	100	59	75	78	57.1	63.2	60.5	58.0	58.0	58.8	13.8	13.7	13.9	13.0	13.9	13.6	2.1	2.2	2.2
Rollag	69	85	85	74	63	74	57.8	63.8	61.7	60.9	57.9	60.2	15.5	15.1	14.8	15.0	15.0	14.9	0.4	0.8	0.6
Linkert	--	77	83	70	66	73	--	62.9	60.6	60.2	56.8	59.2	--	15.6	15.0	15.0	14.3	14.8	0.1	0.1	0.1
SY Rowyn	--	86	93	63	78	78	--	62.4	61.3	58.8	59.2	59.8	--	14.2	13.8	13.1	13.7	13.5	1.7	1.9	1.8
Prevail	--	--	83	70	70	74	--	--	60.5	60.7	57.8	59.7	--	--	14.5	13.2	13.5	13.7	3.0	0.0	1.5
SY Ingmar	--	--	86	62	74	74	--	--	61.5	60.2	59.0	60.2	--	--	14.9	14.2	14.4	14.5	1.6	0.4	1.0
WB9507	--	--	104	56	81	80	--	--	60.0	56.1	56.9	57.7	--	--	14.6	12.8	14.0	13.8	1.2	2.1	1.7
HRS 3361	--	--	86	52	72	70	--	--	60.0	56.4	56.6	57.7	--	--	13.9	12.2	13.3	13.1	0.6	0.0	0.3
HRS 3419	--	--	91	71	71	77	--	--	59.3	57.6	56.3	57.7	--	--	13.4	12.6	14.4	13.5	0.3	0.0	0.2
Bolles	--	--	--	54	64	--	--	--	--	58.1	56.2	--	--	--	--	15.2	15.9	--	--	0.7	--
Focus	--	--	--	70	63	--	--	--	--	61.4	59.5	--	--	--	--	13.0	14.1	--	--	2.7	--
SY Valda	--	--	--	64	79	--	--	--	--	58.1	59.1	--	--	--	--	13.2	14.0	--	--	2.6	--
WB9653	--	--	--	54	73	--	--	--	--	53.5	56.2	--	--	--	--	12.4	13.9	--	--	1.3	--
HRS 3530	--	--	--	63	80	--	--	--	--	58.4	58.6	--	--	--	--	13.2	14.2	--	--	2.3	--
HRS 3504	--	--	--	58	72	--	--	--	--	54.7	56.1	--	--	--	--	12.8	13.9	--	--	0.1	--
Shelly	--	--	--	--	72	--	--	--	--	--	56.6	--	--	--	--	--	14.4	--	--	0.3	--
Boost	--	--	--	--	72	--	--	--	--	--	58.8	--	--	--	--	--	15.0	--	--	1.6	--
Surpass	--	--	--	--	75	--	--	--	--	--	57.8	--	--	--	--	--	14.0	--	--	3.6	--
LCS Prime	--	--	--	--	75	--	--	--	--	--	58.9	--	--	--	--	--	13.1	--	--	1.9	--
LCS Anchor	--	--	--	--	67	--	--	--	--	--	57.5	--	--	--	--	--	14.1	--	--	0.6	--
HRS 3616	--	--	--	--	69	--	--	--	--	--	56.9	--	--	--	--	--	14.7	--	--	0.5	--
HRS 3100	--	--	--	--	73	--	--	--	--	--	56.9	--	--	--	--	--	13.6	--	--	0.2	--
TCG-Cornerstone	--	--	--	--	59	--	--	--	--	--	57.1	--	--	--	--	--	14.2	--	--	0.0	--
Barlow	77	81	88	63	--	--	58.6	63.3	61.4	59.5	--	--	14.3	14.9	14.7	14.0	--	--	0.9	--	--
Samson	75	87	98	61	--	--	57.9	61.9	60.4	56.1	--	--	14.3	14.2	14.0	13.8	--	--	0.0	--	--
Forefront	73	80	81	62	--	--	57.5	63.1	60.9	61.8	--	--	13.8	15.4	14.7	13.4	--	--	3.3	--	--
LCS Powerplay	76	91	87	63	--	--	58.2	63.7	61.6	58.8	--	--	13.6	13.9	14.5	13.1	--	--	3.0	--	--
LCS Ignacu	--	--	95	62	--	--	--	--	61.1	60.2	--	--	--	--	11.4	11.7	--	--	2.1	--	--
LCS Nitro	--	--	99	66	--	--	--	--	59.8	58.1	--	--	--	--	12.4	11.9	--	--	2.5	--	--
Cardale	--	--	--	60	--	--	--	--	--	55.3	--	--	--	--	--	14.4	--	--	--	--	--
RB07	78	81	93	--	--	--	57.5	63.0	60.8	--	--	--	14.1	15.1	14.7	--	--	--	2.5	--	--
Vantage	62	86	78	--	--	--	59.1	63.6	62.2	--	--	--	16.0	15.3	16.6	--	--	--	0.0	--	--
LCS Albany	75	103	84	--	--	--	56.1	63.5	59.8	--	--	--	12.9	12.9	13.6	--	--	--	3.4	--	--
HRS 3378	--	--	87	--	--	--	--	--	60.9	--	--	--	--	--	13.3	--	--	--	2.0	--	--
LSD 5%	6.9	6.5	5.0	4.4	5.7	--	1.0	0.4	0.5	1.1	0.8	--	0.7	0.5	0.4	0.6	0.3	--	1.1	0.9	--
LSD 10%	5.7	5.4	4.2	3.7	4.8	--	0.9	0.4	0.4	0.9	0.6	--	0.5	0.4	0.3	0.5	0.3	--	0.9	0.8	--

HRSW Summary, Pembina County 2013-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)						DON (ppm)	
	13	14	15	16	3yr	13	14	15	16	3yr	13	14	15	16	3yr	13	14	15	16	3yr	15	16	2yr	16	16	16
Faller	100	88	50	61	66	61.4	61.7	56.0	60.1	59.3	13.6	13.8	14.8	13.8	14.1	5.5	2.3	3.9	2.0							
Linkert	80	66	53	56	58	61.7	60.9	56.9	59.3	59.0	14.8	15.5	14.9	14.7	15.0	0.2	0.4	0.3	2.7							
Prosper	99	80	49	57	62	61.4	61.9	55.7	59.3	59.0	13.3	13.7	14.8	13.9	14.1	5.9	2.3	4.1	3.1							
Rollag	85	72	50	58	60	62.3	62.3	57.6	60.4	60.1	14.6	14.9	15.6	14.6	15.0	0.5	1.9	1.2	1.2							
SY Soren	82	66	46	54	55	61.6	61.3	56.8	59.4	59.2	14.1	15.0	15.0	14.8	14.9	2.9	1.7	2.3	1.7							
WB Mayville	83	64	45	43	51	61.7	61.2	54.7	57.0	57.6	14.7	14.2	15.1	14.9	14.7	0.1	0.7	0.4	4.3							
LCS Breakaway	86	63	44	46	51	62.9	62.8	55.5	60.0	59.4	14.6	15.3	15.3	14.7	15.1	5.1	1.9	3.5	2.6							
SY Rowyn	90	66	53	56	58	61.1	61.4	57.5	59.9	59.6	13.3	14.4	14.3	14.2	14.3	4.6	1.7	3.2	1.3							
Elgin-ND	93	75	44	53	57	61.0	61.3	55.0	58.5	58.3	14.2	14.5	15.0	14.6	14.7	4.7	2.8	3.8	2.7							
Prevail	--	79	47	55	60	--	61.2	55.1	58.3	58.2	--	13.8	14.5	13.7	14.0	4.5	1.6	3.1	2.1							
SY Ingmar	--	67	56	55	59	--	62.2	57.9	59.9	60.0	--	15.2	14.8	14.9	15.0	0.0	1.8	0.9	1.8							
WB9507	--	78	45	57	60	--	60.3	52.9	57.7	57.0	--	15.0	14.6	14.2	14.6	5.2	2.5	3.9	1.5							
HRS 3361	--	81	58	64	68	--	60.6	56.7	58.0	58.4	--	14.3	12.8	13.8	13.6	2.1	0.8	1.5	2.6							
HRS 3419	--	87	60	68	72	--	59.6	56.0	58.8	58.1	--	12.2	13.2	13.1	12.8	1.8	0.7	1.3	2.1							
Bolles	--	--	44	48	--	--	--	56.0	57.9	--	--	--	15.9	15.9	--	4.3	2.6	3.5	2.7							
Focus	--	--	50	44	--	--	--	58.3	60.9	--	--	--	14.4	14.2	--	7.9	2.0	5.0	0.9							
SY Valda	--	--	47	59	--	--	--	55.6	59.2	--	--	--	15.0	13.9	--	3.7	2.0	2.9	1.7							
WB9653	--	--	42	62	--	--	--	54.0	57.7	--	--	--	14.6	13.3	--	5.1	2.0	3.6	1.9							
HRS 3530	--	--	62	57	--	--	--	57.8	59.3	--	--	--	14.0	14.4	--	4.7	2.4	3.6	3.3							
HRS 3504	--	--	51	57	--	--	--	55.2	57.9	--	--	--	13.7	13.2	--	2.8	0.5	1.7	2.7							
Shelly	--	--	--	51	--	--	--	--	58.8	--	--	--	--	13.8	--	--	2.1	--	1.4							
Boost	--	--	--	44	--	--	--	--	58.2	--	--	--	--	14.6	--	--	3.7	--	1.9							
Surpass	--	--	--	46	--	--	--	--	59.0	--	--	--	--	14.1	--	--	3.2	--	1.9							
LCS Prime	--	--	--	46	--	--	--	--	59.4	--	--	--	--	13.1	--	--	3.1	--	1.5							
LCS Anchor	--	--	--	45	--	--	--	--	58.9	--	--	--	--	14.7	--	--	1.0	--	2.3							
HRS 3616	--	--	--	50	--	--	--	--	58.0	--	--	--	--	15.5	--	--	2.9	--	1.3							
HRS 3100	--	--	--	61	--	--	--	--	58.6	--	--	--	--	13.7	--	--	0.7	--	1.5							
TCG-Cornerstone	--	--	--	44	--	--	--	--	57.6	--	--	--	--	14.7	--	--	1.2	--	4.4							
Samson	83	72	49	--	--	60.5	60.0	53.8	--	--	13.3	13.8	13.9	--	--	1.2	--	--	--							
Barlow	87	75	43	--	--	62.2	61.4	56.3	--	--	14.2	14.3	15.2	--	--	5.2	--	--	--							
Forefront	81	68	53	--	--	61.3	61.0	57.6	--	--	14.4	15.1	14.6	--	--	5.2	--	--	--							
LCS Powerplay	92	75	38	--	--	61.8	62.3	54.3	--	--	13.4	13.6	15.2	--	--	6.0	--	--	--							
LCS Iguacu	--	75	62	--	--	--	61.8	59.0	--	--	--	11.9	11.9	--	--	0.5	--	--	--							
LCS Nitro	--	77	49	--	--	--	60.0	55.2	--	--	--	12.2	13.5	--	--	4.2	--	--	--							
Cardale	--	--	48	--	--	--	--	55.8	--	--	--	--	15.8	--	--	3.5	--	--	--							
RB07	88	73	--	--	--	61.1	60.7	--	--	--	14.5	14.7	--	--	--	--	--	--	--							
Vantage	79	68	--	--	--	63.3	62.6	--	--	--	14.4	15.3	--	--	--	--	--	--	--							
LCS Albany	95	84	--	--	--	61.4	61.5	--	--	--	12.5	12.1	--	--	--	--	--	--	--							
HRS 3378	--	77	--	--	--	--	61.8	--	--	--	--	13.4	--	--	--	--	--	--	--							
LSD 5%	5.3	8.3	7.2	5.9	--	0.4	0.5	1.5	0.9	--	0.5	0.5	0.8	0.4	--	1.9	1.1	--	--							
LSD 10%	4.4	6.9	6.0	4.9	--	0.3	0.4	1.2	0.7	--	0.4	0.4	0.7	0.3	--	1.6	0.9	--	--							

HRSW Summary, Towner County 2012-2016

Variety	Yield (bu/a)												Test Weight (lbs/bu)												Protein (%)						Lodging (0-9)	
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	15	16	2yr						
Faller	71	85	84	56	88	76	55.8	61.1	58.6	59.6	60.2	59.5	13.0	13.9	14.1	14.1	13.7	14.0	13.3	13.9	14.1	14.1	13.7	14.0	1.3	2.9	2.1					
Prosper	70	79	79	55	83	72	56.1	61.3	58.3	60.4	59.8	59.5	13.7	13.7	14.3	13.9	14.0	14.1	13.0	13.7	14.3	13.9	14.0	14.1	0.6	2.7	1.7					
Rollag	60	68	70	54	73	66	57.1	61.4	59.9	61.3	60.2	60.5	14.4	15.4	15.4	15.0	15.3	15.2	14.4	15.4	15.4	15.0	15.3	15.2	0.0	1.0	0.5					
SY Soren	66	71	67	45	82	65	56.5	61.2	58.8	59.8	60.0	59.5	13.6	15.2	14.5	15.0	14.8	14.8	13.6	15.2	14.5	15.0	14.8	14.8	0.4	2.1	1.3					
WB Mayville	64	68	66	47	69	61	56.1	60.0	58.0	59.5	57.6	58.4	13.9	14.9	14.8	15.2	14.7	14.9	13.9	14.9	14.8	15.2	14.7	14.9	0.1	0.4	0.3					
LCS Breakaway	65	72	72	49	78	66	57.9	62.0	60.4	48.9	61.5	56.9	14.6	15.1	14.9	14.9	14.5	14.8	14.6	15.1	14.9	14.9	14.5	14.8	0.3	1.5	0.9					
Elgin-ND	63	75	71	59	76	69	55.8	60.8	58.0	60.2	60.1	59.4	13.3	14.7	14.9	14.4	14.9	14.7	13.3	14.7	14.9	14.4	14.9	14.7	0.4	2.3	1.4					
Linkert	--	70	64	50	75	63	--	60.1	57.9	59.9	59.4	59.1	--	15.7	15.1	14.9	14.9	15.0	0.0	15.7	15.1	14.9	14.9	15.0	0.0	0.0	0.0					
SY Rowyn	--	73	78	50	81	70	--	61.1	59.2	60.3	60.1	59.9	--	14.2	14.3	14.4	14.3	14.3	1.1	14.2	14.3	14.4	14.3	14.3	1.1	2.2	1.7					
Prevail	--	--	74	55	83	71	--	--	58.5	59.7	59.6	59.3	--	--	14.0	13.6	13.8	13.8	0.5	--	14.0	13.6	13.8	13.8	0.5	1.2	0.9					
SY Ingmar	--	--	74	51	76	67	--	--	59.1	60.9	59.2	59.7	--	--	15.0	15.0	15.3	15.1	0.2	--	15.0	15.0	15.3	15.1	0.2	1.2	0.7					
HRS 3361	--	--	73	50	80	68	--	--	58.1	58.6	57.6	58.1	--	--	13.9	13.7	14.2	13.9	0.4	--	13.9	13.7	14.2	13.9	0.4	0.5	0.5					
HRS 3419	--	--	77	53	93	74	--	--	57.7	58.9	59.8	58.8	--	--	13.7	12.3	13.5	13.2	0.3	--	13.7	12.3	13.5	13.2	0.3	0.3	0.3					
WB9507	--	--	93	54	84	77	--	--	58.5	58.2	58.1	58.3	--	--	14.6	14.2	13.5	14.1	0.6	--	14.6	14.2	13.5	14.1	0.6	2.7	1.7					
Bolles	--	--	--	46	77	--	--	--	--	59.0	59.9	--	--	--	--	16.4	16.0	--	0.7	--	--	16.4	16.0	--	0.7	2.5	1.6					
Focus	--	--	--	58	86	--	--	--	--	61.8	61.5	--	--	--	--	13.8	13.9	--	1.3	--	--	13.8	13.9	--	1.3	1.2	1.3					
SY Valda	--	--	--	56	83	--	--	--	--	60.8	59.7	--	--	--	--	13.9	14.6	--	0.9	--	--	13.9	14.6	--	0.9	1.4	1.2					
WB9653	--	--	--	61	74	--	--	--	--	58.5	56.6	--	--	--	--	13.5	13.9	--	0.5	--	--	13.5	13.9	--	0.5	2.2	1.4					
HRS 3530	--	--	--	57	92	--	--	--	--	60.3	60.5	--	--	--	--	14.8	14.5	--	0.2	--	--	14.8	14.5	--	0.2	2.5	1.4					
HRS 3504	--	--	--	62	75	--	--	--	--	59.3	57.1	--	--	--	--	13.3	13.8	--	0.2	--	--	13.3	13.8	--	0.2	0.6	0.4					
Shelly	--	--	--	--	87	--	--	--	--	--	59.8	--	--	--	--	--	14.1	--	--	--	--	--	14.1	--	--	1.4	--					
Boost	--	--	--	--	68	--	--	--	--	--	59.1	--	--	--	--	--	15.7	--	--	--	--	--	15.7	--	--	4.1	--					
Surpass	--	--	--	--	82	--	--	--	--	60.0	--	--	--	--	--	14.1	--	--	--	--	--	--	14.1	--	--	3.1	--					
LCS Prime	--	--	--	--	80	--	--	--	--	60.3	--	--	--	--	--	13.6	--	--	--	--	--	--	13.6	--	--	3.9	--					
LCS Anchor	--	--	--	--	78	--	--	--	--	59.8	--	--	--	--	--	15.0	--	--	--	--	--	--	15.0	--	--	1.2	--					
HRS 3616	--	--	--	--	77	--	--	--	--	58.8	--	--	--	--	--	15.9	--	--	--	--	--	--	15.9	--	--	3.0	--					
HRS 3100	--	--	--	--	79	--	--	--	--	57.3	--	--	--	--	--	14.1	--	--	--	--	--	--	14.1	--	--	0.8	--					
TCG-Cornerstone	--	--	--	--	62	--	--	--	--	58.5	--	--	--	--	--	14.6	--	--	--	--	--	--	14.6	--	--	0.3	--					
Forefront*	66	58	76	50	--	--	57.3	60.7	59.0	61.0	--	--	12.5	15.0	14.9	14.2	--	--	0.4	--	--	--	--	--	0.4	--	--					
LCS Powerplay	61	81	74	56	--	--	56.4	61.3	59.5	61.3	--	--	13.0	14.0	14.8	14.1	--	--	0.2	--	--	--	--	--	0.2	--	--					
Barlow	64	73	75	47	--	--	57.3	60.8	59.9	60.8	--	--	14.0	14.8	15.1	14.6	--	--	0.9	--	--	--	--	--	0.9	--	--					
Samson	64	77	81	53	--	--	56.0	59.2	57.2	58.4	--	--	13.9	14.3	14.0	13.8	--	--	0.2	--	--	--	--	--	0.2	--	--					
LCS Ignacu	--	--	74	45	--	--	--	58.7	60.4	--	--	--	--	--	11.7	12.7	--	--	0.3	--	--	--	--	--	0.3	--	--					
LCS Nitro	--	--	76	53	--	--	--	57.0	58.9	--	--	--	--	--	12.9	12.7	--	--	0.7	--	--	--	--	--	0.7	--	--					
Cardale	--	--	--	47	--	--	--	--	58.5	--	--	--	--	--	--	15.9	--	--	--	--	--	--	--	--	0.7	--	--					
RB07	71	75	73	--	--	--	56.5	60.3	57.9	--	--	--	13.9	14.9	14.6	--	--	--	--	--	--	--	--	--	--	--	--					
Vantage	50	70	61	--	--	--	57.9	62.7	59.5	--	--	--	15.7	16.5	17.2	--	--	--	--	--	--	--	--	--	--	--	--					
LCS Albany	60	78	67	--	--	--	54.7	61.0	57.7	--	--	--	13.4	13.2	14.3	--	--	--	--	--	--	--	--	--	--	--	--					
HRS 3378	--	--	66	--	--	--	--	--	58.1	--	--	--	--	--	13.3	--	--	--	--	--	--	--	--	--	--	--	--	--				
LSD 5%	4.7	6.1	5.5	6.6	6.9	--	0.9	0.6	0.7	0.8	0.9	--	0.6	0.4	0.3	0.5	0.5	--	NS	1.5	--	--	--	--	NS	1.5	--					
LSD 10%	4.0	5.1	4.6	5.5	5.7	--	0.7	0.5	0.6	0.7	0.8	--	0.5	0.3	0.3	0.4	0.4	--	NS	1.3	--	--	--	--	NS	1.3	--					

*Forefront had some shelling prior to harvest in 2013.

HRSW Summary, Walsh County 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
Faller	82	87	93	62	81	79	61.3	59.9	61.4	57.3	58.9	59.2	11.9	12.3	11.8	15.2	13.0	13.3	0.5	3.1	0.0	6.5	2.2	2.9
Prosper	87	81	96	53	79	76	61.6	59.8	61.5	56.6	59.1	59.1	12.4	12.2	12.1	15.0	13.1	13.4	0.3	4.0	0.3	7.4	1.7	3.1
Rollag	74	80	82	62	74	73	62.0	61.6	62.3	59.3	59.9	60.5	13.9	13.6	13.4	16.5	14.3	14.7	0.0	0.2	0.0	2.1	0.4	0.8
SY Soren	79	82	84	55	76	72	61.2	60.9	61.5	58.1	58.9	59.5	13.9	13.8	13.6	15.9	13.9	14.5	0.0	0.0	0.2	1.1	1.8	1.0
WB Mayville	74	79	77	56	65	66	60.3	59.6	61.4	57.0	57.1	58.5	14.2	13.8	13.3	15.0	14.2	14.2	0.0	0.1	0.0	0.4	0.2	0.2
Elgin-ND	77	80	83	56	77	72	60.3	60.4	61.4	56.4	59.1	59.0	13.2	13.5	12.2	15.5	13.6	13.8	1.5	4.1	0.5	6.5	0.4	2.5
LCS Breakaway	80	80	85	57	75	73	61.7	61.8	62.9	58.0	60.0	60.3	13.7	13.8	13.1	15.6	13.6	14.1	1.0	2.4	0.0	4.3	1.0	1.8
Linkert	--	77	79	65	71	72	--	60.8	61.4	58.7	58.3	59.5	--	13.6	13.9	15.9	14.2	14.7	--	0.0	0.0	0.0	0.0	0.0
SY Rowyn	--	76	85	63	76	74	--	59.6	61.5	58.0	58.3	59.3	--	13.1	12.0	15.4	13.3	13.6	--	3.6	0.3	5.0	2.3	2.5
Prevail	--	--	84	65	79	76	--	60.8	57.5	57.9	58.7	--	--	13.2	14.7	13.3	13.7	--	--	2.7	6.3	2.5	3.8	
SY Ingmar	--	--	81	68	74	74	--	61.9	60.0	59.2	60.4	--	--	13.2	15.4	14.1	14.2	--	--	0.0	0.9	1.2	0.7	
HRS 3361	--	--	85	66	72	74	--	60.6	57.1	57.0	58.2	--	--	12.2	13.8	12.9	13.0	--	--	0.0	2.1	1.3	1.1	
HRS 3419	--	--	93	68	83	81	--	59.9	57.8	58.1	58.6	--	--	11.3	13.2	12.5	12.3	--	--	0.0	0.6	0.0	0.2	
WB9507	--	--	92	59	80	77	--	60.6	54.2	57.1	57.3	--	--	11.7	15.5	12.5	13.2	--	--	0.0	7.1	2.1	3.1	
Bolles	--	--	--	59	69	--	--	57.3	58.3	--	--	--	--	--	16.6	14.9	--	--	--	--	5.7	0.4	--	
Focus	--	--	--	62	69	--	--	59.2	59.8	--	--	--	--	--	15.4	13.2	--	--	--	--	5.8	3.5	--	
SY Valda	--	--	--	66	78	--	--	58.9	58.4	--	--	--	--	--	14.9	13.3	--	--	--	--	3.8	2.0	--	
WB9653	--	--	--	69	70	--	--	57.0	55.7	--	--	--	--	--	14.0	12.7	--	--	--	--	2.3	0.4	--	
HRS 3530	--	--	--	67	80	--	--	58.3	59.8	--	--	--	--	--	15.6	13.5	--	--	--	--	7.2	2.7	--	
HRS 3504	--	--	--	70	69	--	--	57.1	55.6	--	--	--	--	--	14.2	13.2	--	--	--	--	0.0	7.1	2.1	3.1
Shelly	--	--	--	82	--	--	--	--	58.7	--	--	--	--	--	--	13.1	--	--	--	--	--	--	0.3	--
Boost	--	--	--	69	--	--	--	--	58.2	--	--	--	--	--	--	14.2	--	--	--	--	--	--	2.5	--
Surpass	--	--	--	73	--	--	--	--	57.8	--	--	--	--	--	--	13.0	--	--	--	--	--	--	4.6	--
LCS Prime	--	--	--	76	--	--	--	--	59.1	--	--	--	--	--	--	12.6	--	--	--	--	--	--	2.6	--
LCS Anchor	--	--	--	61	--	--	--	--	57.3	--	--	--	--	--	--	14.3	--	--	--	--	--	--	0.8	--
HRS 3616	--	--	--	73	--	--	--	--	57.8	--	--	--	--	--	--	14.8	--	--	--	--	--	--	2.2	--
HRS 3100	--	--	--	71	--	--	--	--	56.4	--	--	--	--	--	--	13.0	--	--	--	--	--	--	0.9	--
TCG-Cornerstone	--	--	--	60	--	--	--	--	57.9	--	--	--	--	--	--	14.2	--	--	--	--	--	--	0.4	--
Samson	72	92	88	72	--	--	60.7	59.8	61.1	56.6	--	--	13.7	13.0	12.0	14.2	--	--	0.0	0.0	0.0	1.7	--	--
Barlow	76	73	81	59	--	--	60.9	60.8	62.2	59.0	--	--	14.0	12.5	13.1	15.6	--	--	1.5	2.2	1.8	5.7	--	--
LCS Powerplay	76	81	91	62	--	--	61.1	60.5	62.0	58.9	--	--	12.6	13.2	12.0	14.6	--	--	0.0	3.6	0.0	5.8	--	--
Forefront	80	75	79	60	--	--	61.8	59.7	61.4	58.5	--	--	12.5	14.1	13.4	15.9	--	--	1.3	6.4	6.2	7.9	--	--
LCS Iguacu	--	--	91	71	--	--	--	61.6	59.6	--	--	--	--	10.9	12.7	--	--	--	--	--	0.1	4.0	--	--
LCS Nitro	--	--	94	65	--	--	--	60.9	56.7	--	--	--	--	10.9	13.8	--	--	--	--	--	0.3	3.7	--	--
Cardale	--	--	--	51	--	--	--	--	55.4	--	--	--	--	--	17.2	--	--	--	--	--	--	6.0	--	--
Vantage	69	80	82	--	--	--	63.3	62.1	63.2	--	--	--	14.6	15.6	14.4	--	--	--	0.0	0.0	0.0	--	--	--
LCS Albany	75	90	89	--	--	--	60.1	60.9	61.0	--	--	--	11.7	12.5	11.0	--	--	--	0.0	0.1	0.0	--	--	--
RB07	78	86	88	--	--	--	60.8	60.0	61.3	--	--	--	13.1	13.4	12.9	--	--	--	0.0	2.6	0.0	--	--	--
HRS 3378	--	--	85	--	--	--	--	62.2	--	--	--	--	--	12.1	--	--	--	--	--	--	0.0	--	--	--
LSD 5%	4.0	6.9	5.0	8.4	5.1	--	0.6	0.5	0.4	1.1	0.8	--	0.7	0.8	0.7	0.6	0.5	--	0.7	2.8	0.8	1.7	1.9	
LSD 10%	3.3	5.8	4.2	7.0	4.3	--	0.5	0.4	0.4	0.9	0.7	--	0.5	0.7	0.6	0.5	0.4	--	0.6	2.3	0.7	1.5	1.5	

HRSW Disease Summary, Langdon 2016

Variety	<u>Fusarium Head Blight</u>			<u>Stripe Rust</u>		DON (ppm)	Yield (bu/a)	Test Weight (lbs/bu)
	% Incidence	% Severity	Index	% Incidence	% Severity			
Glenn	24	21	5	8	0.8	1.4	64.3	63.0
Faller	30	10	3	72	6.0	1.3	79.0	60.8
Barlow	46	14	6	8	2.4	2.7	59.6	60.0
Prosper	48	23	11	46	4.6	2.7	77.8	60.9
Velva	74	12	9	34	3.2	6.5	52.6	57.7
Elgin-ND	50	21	11	6	1.2	2.6	64.7	59.2
Rollag	28	13	4	4	0.2	1.1	71.2	61.3
Linkert	46	10	5	0	0.0	2.5	62.8	59.7
Bolles	56	13	8	6	0.8	2.2	62.6	60.2
Shelly	50	17	9	14	1.2	1.4	71.1	59.7
Prevail	36	25	9	8	0.4	1.5	65.9	59.3
Focus	36	37	13	10	1.2	1.4	53.1	61.2
Boost	36	12	4	6	0.6	1.5	60.5	58.5
Surpass	44	43	19	20	0.4	2.3	58.5	59.4
MS Chevelle	60	25	15	8	0.4	3.3	67.7	58.5
MS Stingray	44	17	8	58	3.4	1.8	75.6	58.8
HRS 3100	26	14	4	18	1.8	2.2	69.5	58.1
HRS 3361	26	10	3	4	0.4	1.1	70.5	58.7
HRS 3419	46	22	10	12	1.0	1.6	78.9	59.1
HRS 3504	44	33	15	8	0.6	1.8	73.2	58.2
HRS 3530	36	10	4	16	0.8	1.4	78.1	60.8
HRS 3616	48	18	9	8	0.4	1.2	65.9	59.4
LCS Breakaway	26	24	6	14	2.0	2.8	70.9	61.7
LCS Iguacu	32	18	6	62	4.6	2.0	75.7	60.7
LCS Nitro	56	21	12	12	1.2	1.5	77.8	60.0
LCS Pro	48	22	11	22	1.6	3.4	67.8	61.1
LCS Prime	18	6	1	28	2.4	1.4	68.7	60.9
LCS Anchor	40	28	11	4	0.2	2.3	59.5	59.3
Prestige	12	6	1	20	1.6	1.6	67.8	59.4
Redstone	26	27	7	12	1.6	3.2	75.9	60.1
SY Soren	40	25	10	4	0.2	0.8	68.9	60.6
SY Rowyn	12	7	1	4	0.6	1.6	67.2	60.1
SY Ingmar	24	16	4	4	1.0	1.0	70.0	60.9
SY Valda	36	15	5	26	2.6	1.1	78.4	60.5
TCG-Cornerstone	84	32	27	4	0.4	2.3	58.3	59.5
TCG-Spitfire	44	16	7	16	0.8	3.0	58.2	59.0
TCG-Wildfire	72	22	16	0	0.0	4.5	64.2	59.4
WB Mayville	70	39	27	2	0.4	4.8	56.9	58.9
WB9507	14	50	7	90	17.0	1.3	76.6	59.2
WB9653	42	39	16	38	3.8	1.9	76.1	58.5
Trial Mean						2.1	66.5	60.2
C.V. %						25.2	8.7	1.1
LSD 5%						1.0	8.1	1.0

HRSW Disease Summary, Off-Station 2016

Variety	Nelson County						Townner County						Walsh County						
	Fusarium Head Blight			Stripe Rust			Fusarium Head Blight			Stripe Rust			Fusarium Head Blight			Stripe Rust			
	% Inc.	% Sev.	Index	Yield (bu/a)	Test Wt. (lbs/bu)	% Inc.	% Sev.	Index	Yield (bu/a)	Test Wt. (lbs/bu)	% Inc.	% Sev.	Index	Yield (bu/a)	Test Wt. (lbs/bu)	% Inc.	% Sev.	Index	Yield (bu/a)	Test Wt. (lbs/bu)
Faller	3	9	0.3	71.1	57.2	20	15	3.2	87.9	60.2	38	23	10.9	22	8.5	81.2	58.9		
Prosper	6	8	0.6	75.3	58.0	25	11	2.7	82.5	59.8	22	18	4.3	24	7.1	78.6	59.1		
Elgin-ND	13	17	2.7	63.6	57.0	38	16	6.7	76.0	60.1	38	17	6.3	10	3.1	77.3	59.1		
Rollag	11	12	1.3	63.1	57.9	46	11	5.4	72.8	60.2	25	27	6.7	11	3.0	74.2	59.9		
Linkert	17	15	2.6	66.2	56.8	40	20	8.2	74.7	59.4	39	25	9.8	14	1.9	71.1	58.3		
Bolles	10	8	0.8	64.1	56.2	30	20	6.3	77.2	59.9	30	20	5.7	5	1.0	69.0	58.3		
Shelly	7	8	0.7	71.5	56.6	22	14	3.1	87.0	59.8	19	19	3.6	10	6.5	82.3	58.7		
Prevail	5	9	0.5	69.7	57.8	26	16	4.3	83.4	59.6	38	17	8.5	11	2.0	78.7	57.9		
Focus	5	7	0.3	62.6	59.5	13	6	0.8	85.6	61.5	23	22	5.4	8	2.1	69.0	59.8		
Boost	5	4	0.3	72.2	58.8	33	14	4.7	68.0	59.1	28	20	5.7	4	0.7	68.9	58.2		
Surpass	15	9	1.3	75.2	57.8	19	11	2.1	81.5	60.0	35	25	8.8	15	2.1	72.9	57.8		
SY Soren	7	5	0.4	72.3	58.0	30	15	4.8	82.0	60.0	39	22	8.6	11	2.0	76.0	58.9		
SY Rowyn	7	4	0.4	77.6	59.2	10	4	0.5	81.2	60.1	32	13	4.6	10	1.6	75.9	58.3		
SY Ingmar	4	3	0.1	73.6	59.0	13	11	6.2	76.2	59.2	25	25	6.2	12	1.7	74.2	59.2		
SY Valda	11	7	0.7	79.4	59.1	33	18	6.2	83.3	59.7	33	27	8.9	16	2.4	77.7	58.4		
WB Mayville	19	14	2.7	66.0	57.0	46	28	12.9	69.3	57.6	65	42	27.7	19	2.9	65.4	57.1		
WB9507	4	4	0.2	81.0	56.9	12	12	1.5	84.4	58.1	27	12	2.9	71	20.3	80.2	57.1		
WB9653	11	6	0.6	72.6	56.2	42	28	12.0	73.5	56.6	32	32	10.2	34	9.8	69.7	55.7		
LCS Breakaway	11	6	0.7	72.7	58.8	37	26	9.6	77.8	61.5	38	32	7.8	41	6.3	75.1	60.0		
LCS Prime	7	8	0.6	75.4	58.9	35	15	6.2	80.0	60.3	25	11	7.8	25	5.3	75.6	59.1		
LCS Anchor	7	3	0.3	67.3	57.5	32	17	6.8	78.0	59.8	25	16	3.8	9	2.5	61.3	57.3		
HRS 3361	9	7	0.7	72.3	56.6	14	14	2.0	80.0	57.6	22	20	4.5	31	7.0	72.2	57.0		
HRS 3419	5	4	0.2	70.6	56.3	11	6	0.7	93.0	59.8	26	13	3.3	31	6.8	82.7	58.1		
HRS 3504	11	16	1.7	71.5	56.1	43	32	13.9	75.3	57.1	56	39	21.8	11	2.0	68.6	55.6		
HRS 3530	16	7	1.2	79.8	58.6	23	13	7.1	91.7	60.5	39	23	9.1	10	1.4	79.9	59.8		
HRS 3616	11	15	1.5	68.5	56.9	30	21	7.1	77.3	58.8	31	12	4.4	5	1.1	73.3	57.8		
HRS 3100	9	6	0.5	72.9	56.9	32	7	2.0	79.2	57.3	42	25	10.4	13	4.3	70.8	56.4		
TCG Cornerstone	21	10	2.0	58.9	57.1	62	41	25.6	61.6	58.5	45	27	13.6	3	0.5	60.0	57.9		
Trial Mean	10	8	0.9	71.0	57.8	29	17	5.8	79.1	59.6	33	22	8.0	17	3.9	73.7	58.4		
C.V. %	35.5	61.4	76.9	52.2	82.7	30.1	48.5	66.7	6.1	1.1	35.7	44.5	64.9	102.3	120.8	4.9	0.9		
LSD 5%	5.6	8.2	1.2	23.9	11.3	17.9	16.5	7.9	6.9	0.9	24.0	19.9	10.6	34.9	9.7	5.1	0.8		

Abbreviations:
 % Inc. = % Incidence
 % Sev. = % Severity
 Test Wt. = Test Weight

Durum Summary, Langdon 2012-2016																																
Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)						Height (in)						Days to Head						DON (ppm)	
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	10	11	15	16	4yr	13	14	15	16	3yr	13	14	15	16	3yr	13	14	15	16	3yr	16
AC Commander	71	95	88	59	45	64	58.0	59.9	60.7	57.7	52.5	57.0	5.0	0.0	1.0	3.8	2.5	34	35	30	35	33	58	57	64	62	61	11.8				
AC Navigator	64	89	84	52	35	57	58.3	60.1	61.3	58.0	52.9	57.4	4.7	0.5	0.8	4.1	2.5	36	35	29	35	33	57	55	63	60	59	9.2				
Alkabo	75	97	85	70	51	69	60.0	61.5	62.2	61.6	56.6	60.1	3.7	0.7	0.5	5.8	2.7	39	40	39	39	39	58	56	64	62	61	6.6				
Ben	74	90	80	72	45	65	60.2	61.3	62.8	61.7	55.3	59.9	3.5	0.4	2.3	6.2	3.1	41	42	40	41	41	57	56	64	62	61	7.7				
Grenora	76	98	86	77	41	68	58.7	60.8	62.1	61.3	54.2	59.2	5.1	1.1	0.8	6.7	3.4	38	38	37	39	38	58	56	63	62	60	9.7				
Lebsock	79	89	79	72	53	68	60.0	61.2	62.6	61.7	57.2	60.5	3.3	0.3	3.8	5.7	3.3	38	39	38	40	39	57	55	63	61	60	7.9				
Maier	73	91	83	74	37	65	59.1	60.4	62.0	61.5	53.7	59.1	5.7	0.2	0.5	5.0	2.9	38	39	37	38	38	57	55	63	62	60	7.0				
Mountrail	77	103	87	80	38	68	59.0	60.3	61.8	60.7	54.4	59.0	5.3	0.1	2.0	7.2	3.7	39	40	39	41	40	58	57	64	63	61	13.3				
Pierce	77	101	82	73	41	66	60.3	61.9	62.3	61.9	56.7	60.3	5.1	0.4	3.0	6.6	3.8	40	41	39	43	41	58	55	63	62	60	7.7				
Strongfield	73	102	85	65	33	61	59.5	61.2	60.6	59.6	53.2	57.8	6.3	0.2	3.8	6.4	4.2	39	39	39	39	39	59	57	64	62	61	10.1				
Tioga	78	96	84	76	37	65	59.4	60.9	61.9	61.5	53.2	58.9	4.4	1.2	0.3	6.4	3.1	41	43	41	41	42	58	56	64	63	61	8.5				
Carpio	79	105	79	85	43	69	60.3	61.9	60.6	61.3	55.6	59.2	5.9	0.0	1.0	7.6	3.6	41	40	39	40	40	59	58	66	63	62	10.8				
Alzada	61	73	80	61	37	59	56.7	59.6	57.7	57.6	51.4	55.6	7.2	0.3	0.0	3.0	2.6	29	33	30	34	32	56	54	61	57	57	9.2				
Joppa	75	102	86	82	43	70	60.0	60.7	61.9	61.3	55.4	59.5	4.7	0.7	0.5	6.9	3.2	37	42	40	40	41	58	57	64	64	62	6.7				
Divide	75	94	84	78	35	65	60.0	60.2	61.4	61.0	53.6	58.7	5.8	0.3	1.8	6.9	3.7	40	41	40	41	41	59	58	64	64	62	6.9				
CDC Verona	70	103	76	70	36	61	59.0	61.2	60.7	59.8	55.5	58.7	4.4	0.4	0.8	5.7	2.8	40	40	37	41	39	60	56	64	64	61	6.7				
Rugby	67	86	74	66	32	57	59.4	60.6	62.1	61.4	54.3	59.3	--	0.3	4.0	7.0	--	44	43	42	42	42	57	57	62	61	60	10.4				
VT Peak	--	97	81	75	55	70	--	61.7	62.6	62.5	58.6	61.2	--	--	0.5	4.3	--	38	40	38	40	39	57	56	64	62	61	6.2				
MS Dart	--	--	85	--	--	--	--	--	61.8	--	--	--	--	--	--	--	--	--	39	--	--	--	--	57	--	--	--	--				
DG Max	69	90	--	--	--	--	59.7	61.0	--	--	--	--	5.1	0.4	--	--	--	39	--	--	--	--	57	--	--	--	--	--				
DG Star	73	--	--	--	--	--	59.0	--	--	--	--	--	2.9	0.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
Dilse	70	--	--	--	--	--	59.4	--	--	--	--	--	5.5	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
LSD 5%	4.6	6.4	4.9	7.6	6.3		0.8	0.5	1.0	0.9	1.2		1.3	1.4	NS	1.3		1.7	1.6	2.7	2.3		1.0	1.1	1.2	0.9		3.4				
LSD 10%	3.8	5.3	4.1	6.4	5.3		0.7	0.4	0.9	0.7	1.0		--	--	2.2	1.1		1.4	1.4	2.3	1.9		0.9	0.9	1.0	0.8		2.8				

Durum Summary, Towner County 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Height (in)						Days to Head						DON (ppm)				
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	13	14	15	16	3yr	13	14	15	16	3yr	13	14	15	16	3yr	16	16
Alkabo	57	74	52	52	73	59	56.9	61.0	56.2	59.8	58.6	58.2	45	40	33	38	37	46	58	64	61	61	46	58	64	61	61	4.6	4.6
Tioga	57	79	50	57	63	57	56.5	60.5	55.1	59.1	54.8	56.3	49	42	37	41	40	47	59	66	61	62	47	59	66	61	62	4.4	4.4
Divide	52	73	51	61	64	58	56.8	59.8	55.6	59.7	56.2	57.2	47	42	36	39	39	47	59	65	62	62	47	59	65	62	62	2.8	2.8
Carpio	56	75	55	62	70	63	57.0	61.2	56.1	60.7	58.9	58.6	48	41	37	39	39	48	60	66	63	63	48	60	66	63	63	3.2	3.2
Joppa	52	85	56	60	73	63	56.7	60.7	55.4	59.9	56.8	57.4	46	40	35	37	37	46	60	64	61	62	46	60	64	61	62	4.0	4.0
Lebscock	51	68	58	61	--	--	57.1	61.0	56.5	62.7	--	--	44	39	35	--	--	45	55	63	--	--	45	55	63	--	--	--	--
Grenora	53	80	--	--	--	--	55.7	59.5	--	--	--	--	41	--	--	--	--	45	--	--	--	--	45	--	--	--	--	--	--
DG Max	53	75	--	--	--	--	56.4	60.4	--	--	--	--	46	--	--	--	--	46	--	--	--	--	46	--	--	--	--	--	--
LSD 5%	NS	6.7	NS	NS	4.7	NS	NS	0.5	NS	NS	1.6	NS	1.2	1.9	2.4	1.6	NS	0.6	1.3	2.3	NS	NS	0.6	1.3	2.3	NS	NS	1.0	1.0
LSD 10%	NS	5.5	NS	NS	3.9	NS	NS	0.4	NS	NS	1.3	NS	1.0	1.5	2.0	1.3	NS	0.5	1.1	1.9	1.1	1.1	0.5	1.1	1.9	1.1	1.1	0.8	0.8

Rye, Langdon 2016

Variety	Julian		Plant		Test	
	Days to Head	Plant Height (in)	Height (in)	Lodging (0-9)	Weight (lbs/bu)	Yield (bu/a)
Aroostock	142	52	52	5.3	52.6	55.6
Dacold	149	54	54	5.5	52.7	76.5
Hancock	145	53	53	4.8	54.3	75.8
Musketeer	145	54	54	5.0	54.0	64.7
ND Dylan	147	53	53	5.0	52.3	84.0
Rymin	147	53	53	4.5	53.5	65.8
Spooner	144	56	56	2.5	54.2	67.4
Mean	145	53	53	4.6	53.2	69.1
C.V. %	0.5	5.4	5.4	16.2	1.6	8.3
LSD 5%	1.1	NS	NS	1.1	1.2	8.5
LSD 10%	0.9	NS	NS	0.9	1.0	7.0

Trial was planted into 10 inch canola stubble.
 Winter survival was 100% for all varieties.

HRWW Summary, Langdon 2013-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Julian Days to Head		Height (in)		Lodging (0-9)		Protein (%)					
	13	14	15	16	3yr		13	14	15	16	3yr		16		16		16		13	14	15	16	3yr	
AC Broadview	91	78	76	87	80		58.2	59.6	58.9	56.8	58.4		158		38		2.7		11.8	12.4	11.3	10.1	11.3	
AC Emerson	79	76	85	86	82		61.9	59.9	62.0	59.3	60.4		159		36		1.0		13.4	12.3	11.8	10.9	11.7	
Accipiter	107	74	73	75	74		60.1	59.8	59.7	56.3	58.6		162		38		0.3		11.5	10.7	11.8	10.5	11.0	
Decade	85	73	84	74	77		60.4	60.9	61.3	54.2	58.8		157		35		2.3		13.8	13.8	12.0	10.6	12.1	
Flourish	103	69	75	90	78		60.4	60.5	59.1	57.4	59.0		156		38		0.7		12.1	12.2	11.9	11.3	11.8	
Ideal	96	68	80	74	74		61.8	60.7	60.9	56.2	59.3		158		37		2.0		12.7	11.1	11.3	10.4	10.9	
Jerry	96	72	76	65	71		59.7	60.2	59.7	56.0	58.6		159		42		2.0		13.0	13.3	12.0	10.7	12.0	
Lyman	99	72	84	81	79		60.8	59.9	61.2	58.1	59.7		154		37		3.7		14.2	13.7	11.6	11.6	12.3	
Moats	100	75	77	83	78		61.3	59.6	59.7	59.8	59.7		158		39		2.3		12.2	12.9	11.7	11.8	12.1	
Overland	92	69	90	88	82		61.4	60.8	61.2	58.1	60.0		155		40		2.0		13.2	13.1	10.9	10.8	11.6	
Peregrine	86	76	78	81	79		60.7	60.3	60.7	58.8	59.9		160		39		3.0		11.6	12.0	11.0	10.8	11.3	
SY Wolf	82	72	84	92	82		60.8	61.1	61.6	58.7	60.5		157		36		2.0		12.7	12.8	11.4	11.3	11.8	
WB Matlock	103	76	70	73	73		61.3	60.6	60.6	57.1	59.4		159		40		1.0		12.2	12.2	12.2	10.9	11.8	
AC Gateway	--	71	79	88	79		--	59.2	61.3	56.5	59.0		159		37		0.7		--	13.5	12.3	11.3	12.4	
CDC Chase	--	--	85	90	--		--	--	61.6	59.9	--		158		40		4.3		--	--	11.2	11.6	--	
Colter	--	--	82	73	--		--	--	57.1	50.9	--		159		38		0.0		--	--	11.4	11.2	--	
Northern	--	--	84	93	--		--	--	59.8	54.0	--		159		37		2.0		--	--	11.7	11.3	--	
Redfield	--	--	79	82	--		--	--	60.5	58.0	--		156		34		1.3		--	--	11.5	11.1	--	
Loma	--	--	--	76	--		--	--	--	52.9	--		160		37		0.0		--	--	--	10.9	--	
Ruth	--	--	--	81	--		--	--	--	56.9	--		154		38		4.7		--	--	--	10.7	--	
SY Monument	--	--	--	98	--		--	--	--	56.5	--		158		35		3.0		--	--	--	11.1	--	
SY Sunrise	--	--	--	100	--		--	--	--	57.3	--		155		33		4.3		--	--	--	11.2	--	
WB4614	--	--	--	88	--		--	--	--	52.6	--		157		33		1.0		--	--	--	11.5	--	
CDC Falcon	101	76	76	--	--		60.8	60.5	58.6	--	--		--		--		--		12.0	11.9	11.7	--	--	
LSD 5%	11.1	5.3	8.1	11.3			1.4	1.1	0.8	1.8			1.4		2.3		1.5		0.6	0.9	0.5	0.5		
LSD 10%	--	--	6.7	9.5			--	--	0.7	1.5			1.2		1.9		1.3		--	--	0.4	0.5		

Planted into 10 inch canola stubble.

Winter survival for all varieties was 100%.

Fungicides were used in 2013-2015 but not in 2016.

HRWW Disease Summary, Langdon 2016

Variety	FHB (Scab)			Stripe Rust		DON (ppm)	Yield (bu/a)	Test Weight (lbs/bu)
	% Incidence	% Severity	Index	% Incidence	% Severity			
AC Broadview	12	24	2.8	76	43	2.0	86.5	56.8
AC Emerson	3	10	0.3	65	7	0.5	85.8	59.3
Accipiter	5	16	1.1	81	50	1.5	75.1	56.3
Decade	11	14	1.6	99	64	1.4	73.5	54.2
Flourish	18	52	9.6	57	7	2.0	89.9	57.4
Ideal	11	24	2.5	99	65	2.1	74.2	56.2
Jerry	7	16	1.2	99	79	1.7	64.7	56.0
Lyman	9	14	1.3	78	38	0.8	80.6	58.1
Moats	10	26	2.2	7	1	0.7	82.7	59.8
Overland	18	18	3.5	78	45	0.6	87.5	58.1
Peregrine	5	13	1.0	13	3	0.9	81.0	58.8
SY Wolf	14	29	3.8	25	7	0.9	92.0	58.7
WB Matlock	4	16	0.7	98	70	1.6	73.3	57.1
AC Gateway	3	8	0.3	91	38	1.8	88.4	56.5
CDC Chase	3	6	0.2	3	1	1.1	89.9	59.9
Colter	17	32	5.4	98	47	3.6	73.3	50.9
Northern	13	15	1.9	81	19	2.9	92.5	54.0
Redfield	21	26	5.7	39	10	2.0	81.6	58.0
Loma	13	20	3.0	100	70	2.2	75.6	52.9
Ruth	11	31	3.4	98	42	1.1	81.2	56.9
SY Monument	14	29	5.0	13	1	2.2	98.3	56.5
SY Sunrise	11	34	4.1	55	5	1.5	99.9	57.3
WB4614	15	38	7.2	67	14	4.5	87.9	52.6
Trial Mean	10	20	2.4	70	36	1.6	80.1	56.8
C.V. %	43.0	67.4	95.6	25.5	47.4	28.2	8.6	1.9
LSD 5%	6.7	21.7	3.8	29.2	27.5	1.0	11.3	1.8

Corn Grain, Langdon 2016

Brand	Hybrid	RM ¹	Days to Harvest		Test	Yield	
			Silk	Moisture (%)	Weight (lbs/bu)	2016	2yr
Integra	2803 VT2PRIB	78	86	24.5	53.8	172.1	146.1
Integra	9302 VT2PRIB	80	86	27.0	53.9	143.7	127.8
Legacy	L-1814 VT2PRO	79	85	30.0	52.1	150.7	134.4
Legacy	L-2213 VT2PRO	80	85	29.2	52.7	158.9	137.8
Legacy	L-2245 VT2PRO	81	88	30.2	52.3	156.5	--
NorthStar	NS 78-510 RR2	78	86	28.8	53.6	167.2	151.1
NorthStar	NS 78-166 VT2P	78	85	31.6	52.7	159.1	--
NorthStar	NS 80-580 VT2P RIB	80	85	29.6	53.2	128.7	--
NorthStar	NS 81-188 VT2P	81	87	31.1	51.9	145.1	--
NuTech/G2 Genetics	5F-775	75	82	25.7	51.4	173.6	150.8
NuTech/G2 Genetics	5F-379	79	85	28.7	50.9	176.4	151.6
NuTech/G2 Genetics	5F-781	81	86	32.1	52.0	146.9	147.9
NuTech	X5G-8001	80	83	26.2	56.1	136.7	--
Pioneer	P7332R	73	83	24.0	53.2	161.1	148.1
Pioneer	P7958AM	79	84	25.9	53.2	158.1	--
Proseed	1280 VT2P	80	87	29.8	52.8	136.2	128.5
Proseed	1480 VT2P	80	87	30.1	52.4	149.9	133.2
Proseed	1378 VT2P	78	86	26.9	53.2	155.8	140.6
Proseed	1382 VT2P	81	87	33.5	51.0	146.9	--
PFS	PFS21N78	78	85	24.8	53.3	172.9	151.1
PFS	PFS71C80	80	86	28.0	54.0	135.6	--
REA	1B730-RIB	73	83	27.4	56.1	133.0	122.2
REA	1B790-RIB	79	87	30.4	52.5	153.9	140.3
Thunder	4578	78	86	25.5	53.0	156.9	143.7
Thunder	EXP 76	76	82	26.5	54.2	169.3	--
Thunder	EXP 80	80	87	27.6	52.8	167.0	--
Wensman	W80761VT2RIB	76	84	29.9	54.6	116.4	124.2
Wensman	W80809VT2RIB	80	87	31.4	52.3	150.7	130.4
Wensman	W80818VT2PRO	81	88	33.0	50.5	158.6	--
Trial Mean			85	28.6	53.0	153.0	
C.V. %			1.5	5.7	1.4	7.7	
LSD 5%			2.2	2.7	1.2	19.4	
LSD 10%			1.8	2.2	1.0	16.2	

¹Relative maturity and hybrid traits as submitted by the company.

Yield reported at 15.5% moisture.

Barley Summary, Langdon 2012-2016																		
Variety	Height (in)						Protein (%)						Days to Head					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
Lacey	37	28	33	37	32	34	12.2	12.5	12.2	13.5	13.9	13.2	61	52	52	61	54	56
Stellar-ND	35	29	33	37	34	35	12.0	12.5	12.3	12.7	13.3	12.8	63	53	52	61	54	56
Tradition	34	29	33	39	34	35	12.2	12.5	12.0	12.8	13.9	12.9	64	52	52	60	55	56
Celebration	34	28	33	37	32	34	13.3	13.6	12.9	14.3	13.9	13.7	65	53	53	61	55	56
Quest	37	31	34	37	33	35	12.2	12.2	12.2	12.8	13.0	12.7	62	54	52	61	55	56
Innovation	37	26	32	36	32	33	12.8	12.4	13.0	13.6	13.5	13.4	61	52	50	60	55	55
Conlon*	35	30	30	37	33	33	12.8	11.7	12.4	12.8	12.7	12.6	57	50	48	56	51	52
Pinnacle*	35	31	33	37	34	35	11.7	11.3	11.5	12.1	12.5	12.0	62	55	53	61	55	56
Rawson*	33	31	32	37	33	34	11.6	10.8	11.7	12.1	12.2	12.0	61	52	50	58	54	54
ND Genesis*	32	32	32	36	30	33	10.7	10.3	11.8	11.0	10.9	11.2	62	56	54	61	57	57
CDC Meredith*	--	--	--	36	31	--	--	--	--	12.9	12.2	--	--	--	--	65	59	--
AAC Synergy*	--	--	--	--	31	--	--	--	--	--	11.9	--	--	--	--	--	58	--
SY Sirish*	--	--	--	--	30	--	--	--	--	--	13.0	--	--	--	--	--	60	--
ABI Balster*	--	--	--	--	31	--	--	--	--	--	12.8	--	--	--	--	--	59	--
ABI Growler*	--	--	--	--	32	--	--	--	--	--	12.4	--	--	--	--	--	60	--
LCS Genie*	--	--	--	--	29	--	--	--	--	--	12.4	--	--	--	--	--	62	--
LCS Odyssey*	--	--	--	--	31	--	--	--	--	--	12.0	--	--	--	--	--	61	--
AC Metcalfe*	31	32	29	37	--	--	12.7	11.7	12.6	13.2	--	--	65	56	54	62	--	--
CDC Copeland*	35	35	32	40	--	--	12.1	11.8	12.2	12.3	--	--	65	59	56	66	--	--
Conrad*	28	29	27	34	--	--	12.0	12.3	12.7	13.3	--	--	65	57	55	64	--	--
LSD 5%	1.7	2.0	1.9	2.1	2.9		0.9	0.6	0.8	0.4	0.9		1.2	1.1	1.3	1.1	1.0	
LSD 10%	1.5	1.7	1.6	1.7	2.4		0.8	0.5	0.7	0.4	0.8		1.0	0.9	1.1	0.9	0.8	

*2-row

Conlon suffered damage from rodents in 2016.

Barley Summary, Langdon 2012-2016																					
Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)			Plump (%)					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	15	16	2yr	12	13	14	15	16	3yr
Lacey	97	164	134	128	116	126	48.5	50.9	52.1	51.1	46.9	50.0	0.9	0.6	0.8	86	98	99	97	91	96
Stellar-ND	94	159	142	129	104	125	48.4	50.0	50.9	49.6	48.8	49.8	0.7	0.0	0.4	88	99	99	97	95	97
Tradition	69	163	133	131	108	124	47.0	50.9	51.9	49.8	46.8	49.5	1.3	1.1	1.2	81	98	98	96	89	94
Celebration	78	165	144	130	111	128	47.0	50.3	51.9	49.6	47.1	49.5	1.0	2.5	1.8	86	98	98	97	92	96
Quest	94	163	130	124	107	120	48.2	49.3	50.3	49.4	45.9	48.5	0.8	0.6	0.7	76	96	96	92	85	91
Innovation	91	160	138	128	113	126	47.4	50.2	51.8	50.2	46.3	49.4	0.7	0.0	0.4	81	98	99	97	91	96
Conlon*	83	138	126	111	76	104	49.3	52.5	52.4	51.9	49.7	51.3	0.9	0.0	0.5	92	99	99	96	96	97
Pinnacle*	91	180	138	132	106	125	49.7	53.1	53.9	51.9	47.9	51.2	0.2	0.9	0.6	91	98	98	97	96	97
Rawson*	83	166	122	124	107	118	47.7	51.8	52.1	49.0	46.8	49.3	3.0	1.2	2.1	95	99	99	97	97	98
ND Genesis*	93	174	128	125	105	119	48.1	51.3	52.6	50.5	47.3	50.1	0.4	3.1	1.8	90	98	98	96	96	97
CDC Meredith*	--	--	--	116	90	--	--	--	--	48.6	44.7	--	4.9	8.0	6.5	--	--	--	92	86	--
AAC Synergy*	--	--	--	--	113	--	--	--	--	--	48.0	--	--	2.9	--	--	--	--	--	94	--
SY Sirish*	--	--	--	--	88	--	--	--	--	--	44.1	--	--	3.5	--	--	--	--	--	85	--
ABI Balster*	--	--	--	--	92	--	--	--	--	--	43.7	--	--	6.6	--	--	--	--	--	84	--
ABI Growler*	--	--	--	--	94	--	--	--	--	--	45.4	--	--	5.4	--	--	--	--	--	84	--
LCS Genie*	--	--	--	--	77	--	--	--	--	--	43.5	--	--	3.2	--	--	--	--	--	83	--
LCS Odyssey*	--	--	--	--	71	--	--	--	--	--	39.9	--	--	5.5	--	--	--	--	--	82	--
AC Metcalfe*	71	154	125	120	--	--	47.6	52.5	53.3	51.4	--	--	2.0	--	--	81	97	97	95	--	--
CDC Copeland*	86	172	127	122	--	--	47.6	49.9	50.9	49.1	--	--	1.8	--	--	84	96	97	91	--	--
Conrad*	77	155	125	120	--	--	47.7	51.2	52.7	50.4	--	--	1.0	--	--	88	97	98	94	--	--
LSD 5%	6.4	10.3	6.7	9.4	9.1		0.8	0.6	0.9	0.9	1.7		1.6	2.4		3.9	0.7	0.9	2.5	5.4	
LSD 10%	5.4	8.6	5.5	7.8	7.6		0.7	0.5	0.7	0.7	1.4		1.3	2.0		3.3	0.6	0.8	2.1	4.5	

*2-row

Conlon suffered damage from rodents in 2016.

Barley Summary, Towner County 2011-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)						Protein (%)						Plump (%)					
	11	12	14	15	16	3yr	11	12	14	15	16	3yr	15	16	2yr	11	12	14	15	16	3yr	11	12	14	15	16	3yr			
Lacey	77	83	117	108	122	116	49.3	46.4	48.7	48.3	46.6	47.9	3.8	4.0	3.9	13.7	14.2	14.8	14.8	13.6	13.8	14.1	95	72	88	90	88	89		
Tradition	81	68	117	104	111	111	49.1	45.5	47.6	48.3	45.0	47.0	2.5	3.5	3.0	13.4	14.4	14.4	14.4	13.6	14.1	14.0	93	76	85	90	81	85		
Quest	81	78	130	104	99	111	46.7	45.3	47.8	47.4	44.2	46.5	3.3	6.0	4.7	13.6	13.6	15.3	13.7	14.1	14.4	80	66	86	87	84	86			
Innovation	--	76	130	105	117	117	--	45.6	48.5	47.8	44.7	47.0	4.0	4.8	4.4	--	14.3	14.8	13.7	13.8	14.1	--	71	92	91	82	88			
Pinnacle*	79	--	--	109	102	--	49.6	--	--	48.4	46.5	--	3.8	4.0	3.9	12.4	--	--	11.9	13.4	--	94	--	--	93	93	--			
ND Genesis*	--	--	--	105	93	--	--	--	--	46.8	46.0	--	3.5	5.0	4.3	--	--	--	10.8	11.9	--	--	--	--	93	94	--			
Celebration	71	73	114	--	--	--	47.8	44.6	47.4	--	--	--	--	--	--	15.1	14.1	15.8	--	--	--	89	77	86	--	--	--			
Stellar-ND	83	75	118	--	--	--	48.3	45.1	48.1	--	--	--	--	--	--	13.5	13.1	14.2	--	--	--	95	78	93	--	--	--			
LSD 5%	5.6	10.0	NS	NS	NS	6.6	0.8	NS	NS	NS	1.2	NS	1.6	NS	0.4	NS	0.8	0.6	0.5	3.7	8.3	4.4	NS	6.0						
LSD 10%	--	7.3	NS	NS	NS	5.4	--	NS	NS	1.0	1.0	NS	1.3	NS	NS	0.6	0.5	0.4	--	6.0	3.6	NS	5.0							

*2-row barley

Barley Summary, Walsh County 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)						Protein (%)						Plump (%)					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	15	16	2yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr			
Lacey	116	106	117	95	101	104	48.9	49.9	49.2	48.2	47.7	48.4	1.5	5.8	3.7	11.1	12.6	12.2	12.4	12.6	12.4	91	99	98	92	98	96			
Tradition	94	113	121	92	93	102	45.8	50.4	49.0	47.0	46.5	47.5	4.3	5.8	5.1	12.0	12.4	11.6	12.5	11.6	11.9	84	99	98	90	98	95			
Quest	111	100	108	93	88	96	46.9	48.3	46.3	46.5	45.2	46.0	3.3	6.0	4.7	10.8	12.3	11.3	12.1	11.7	11.7	84	96	94	83	93	90			
Innovation	113	101	122	94	103	106	47.9	48.6	49.0	47.5	46.6	47.7	2.3	5.8	4.1	11.0	12.4	12.0	12.4	12.2	12.2	90	98	99	89	97	95			
Pinnacle*	--	--	--	100	100	--	--	--	--	48.6	47.0	--	1.8	6.8	4.3	--	--	--	11.3	11.2	--	--	--	--	94	98	--			
ND Genesis*	--	--	--	86	73	--	--	--	--	47.0	45.9	--	3.8	7.3	5.6	--	--	--	10.6	11.3	--	--	--	--	94	98	--			
Celebration	88	105	117	--	--	--	46.0	49.0	48.2	--	--	--	--	--	--	13.1	13.6	12.2	--	--	--	85	99	99	--	--	--			
Stellar-ND	108	104	117	--	--	--	46.5	49.2	46.9	--	--	--	--	--	--	11.4	12.1	11.7	--	--	--	88	99	98	--	--	--			
LSD 5%	6.1	NS	NS	6.8	10.8		1.4	0.6	0.7	1.1	0.8	NS	NS	NS	0.9	0.6	NS	0.5	NS	2.2	0.5	0.8	5.3	1.5						
LSD 10%	5.0	NS	NS	5.6	8.9		0.5	0.5	0.5	0.9	0.7	NS	NS	NS	0.7	0.5	NS	0.4	NS	1.8	0.4	0.7	4.3	1.3						

*Two row barley

Barley trials are conducted in Pembina County in odd numbered years and Walsh County in even numbered years. 2013 and 2015 data is from Pembina County.

Oat Summary, Langdon 2012-2016																	
Variety	Height (in)						Protein (%)						Lodging (0-9)				
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	10	12	15	16	3yr
AC Pinnacle	42	42	44	48	44	45	13.7	14.0	10.6	8.1	7.9	8.9	8.5	2.0	1.5	5.5	3.0
Beach	45	43	47	51	47	48	15.2	16.0	10.4	10.6	9.5	10.2	8.7	0.0	0.4	4.0	1.5
CDC Dancer	44	42	45	48	44	46	13.7	14.5	8.6	8.1	7.9	8.2	8.2	0.0	1.3	5.7	2.3
HiFi	42	42	44	47	43	45	15.3	15.6	9.7	9.5	8.6	9.3	6.3	1.7	2.6	5.5	3.3
Hytest	42	44	45	50	45	47	17.8	18.9	10.3	13.2	11.4	11.6	8.4	3.4	4.7	7.2	5.1
Killdeer	38	37	39	44	40	41	14.4	14.6	11.2	9.3	8.2	9.6	8.8	2.0	2.6	5.5	3.4
Otana	43	44	46	50	42	46	14.8	14.3	16.0	9.7	8.4	11.4	9.0	5.9	4.1	6.7	5.6
Rockford	43	42	44	48	44	45	16.4	16.4	11.4	10.2	9.4	10.3	6.8	0.2	2.0	4.7	2.3
Souris	39	39	40	45	43	43	14.8	15.2	10.1	8.6	8.0	8.9	6.5	0.0	0.9	3.0	1.3
Stallion	43	44	45	48	43	45	16.2	17.4	8.4	12.6	10.1	10.4	8.3	5.9	1.7	8.0	5.2
Furlong	41	42	46	47	45	46	16.0	17.8	10.6	9.9	9.1	9.9	9.0	1.2	0.9	3.2	1.8
CDC Minstrel	39	39	42	45	43	43	12.6	12.9	9.5	7.0	7.3	7.9	8.9	0.4	0.3	3.7	1.5
Newburg	44	45	48	50	47	48	14.9	14.7	9.5	9.1	7.7	8.8	7.5	2.6	3.2	7.5	4.4
Leggett	40	41	41	48	46	45	16.4	16.8	8.7	11.7	10.0	10.1	7.3	0.5	3.0	4.3	2.6
Jury	42	47	49	51	45	48	15.5	15.5	9.2	9.9	8.0	9.0	7.8	4.2	2.3	6.5	4.3
Goliath	--	47	52	52	45	50	--	15.9	12.9	10.9	9.1	11.0	--	--	0.3	5.3	--
Paul*	--	--	46	49	43	46	--	--	8.5	15.1	13.4	12.3	5.4	--	1.0	6.0	--
Deon	--	--	46	48	42	45	--	--	10.2	11.8	8.7	10.2	--	--	0.6	4.3	--
Hayden	--	--	--	--	44	--	--	--	--	--	8.3	--	--	--	--	6.0	--
CS Camden	--	--	--	--	40	--	--	--	--	--	8.9	--	--	--	--	2.5	--
Horsepower	38	36	36	41	--	--	15.2	15.9	10.1	9.3	--	--	--	0.1	0.0	--	--
Morton	45	44	--	--	--	--	16.4	15.5	--	--	--	--	6.0	0.0	--	--	--
Stark*	44	44	--	--	--	--	17.4	19.2	--	--	--	--	6.7	0.3	--	--	--
Shelby 427	40	40	--	--	--	--	16.0	17.9	--	--	--	--	7.1	0.9	--	--	--
Buff*	38	--	--	--	--	--	18.4	--	--	--	--	--	7.8	0.0	--	--	--
LSD 5%	2.1	1.9	2.1	2.2	3.8		0.5	--	--	--	--		1.2	2.6	2.1	2.5	
LSD 10%	1.8	1.6	1.8	1.8	3.2		0.5	--	--	--	--		--	2.2	1.8	2.1	

*Naked-hull variety

Oat Summary, Langdon 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Days to Head					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr
AC Pinnacle	173	235	180	177	151	170	36.5	40.2	38.9	36.9	34.9	36.9	65	58	58	66	63	62
Beach	173	204	138	174	146	153	39.9	40.9	42.3	40.8	37.0	40.0	63	56	55	63	61	60
CDC Dancer	166	229	175	176	132	161	39.7	39.9	38.5	39.4	36.3	38.1	65	56	56	64	61	60
HiFi	170	216	171	159	139	156	39.2	38.7	40.1	37.2	35.8	37.7	64	57	56	64	62	61
Hyttest	140	176	127	139	102	123	41.6	41.3	42.0	41.8	38.5	40.8	62	54	54	63	57	58
Killdeer	169	208	178	161	154	165	37.1	38.1	39.4	37.7	35.9	37.7	63	55	55	62	58	58
Otana	144	188	144	135	100	127	37.5	37.5	39.2	34.8	34.3	36.1	64	56	57	64	62	61
Rockford	166	211	152	149	125	142	40.6	39.5	41.3	38.4	36.8	38.8	64	58	56	64	63	61
Souris	167	202	184	138	136	153	38.7	38.7	40.7	36.6	34.8	37.4	64	57	55	64	61	60
Stallion	154	194	157	160	107	141	38.7	40.8	41.9	41.2	35.9	39.7	62	56	55	64	60	60
Furlong	158	218	186	157	152	165	38.2	38.5	38.8	38.7	37.0	38.2	65	59	58	64	65	62
CDC Minstrel	169	232	178	160	145	161	35.2	37.7	39.5	34.9	33.2	35.9	63	57	55	64	59	59
Newburg	168	228	176	162	139	159	38.2	38.2	40.0	37.8	33.7	37.2	63	56	55	63	60	59
Leggett	154	221	165	190	157	171	38.6	38.8	40.9	39.3	37.1	39.1	65	57	55	64	61	60
Jury	162	225	166	151	128	148	39.7	39.7	41.1	38.7	34.9	38.2	62	56	56	63	60	60
Goliath	--	212	165	171	132	156	--	39.7	43.8	40.4	36.2	40.1	--	57	56	65	63	61
Paul*	--	--	134	127	99	120	--	--	43.9	45.1	44.2	44.4	--	--	58	65	65	63
Deon	--	--	163	186	162	170	--	--	40.5	39.2	35.5	38.4	--	--	57	65	63	62
Hayden	--	--	--	--	134	--	--	--	--	--	38.3	--	--	--	--	--	59	--
CS Camden	--	--	--	--	174	--	--	--	--	--	34.1	--	--	--	--	--	61	--
Horsepower	160	171	160	135	--	--	39.5	39.1	40.6	38.3	--	--	61	53	54	61	--	--
Morton	149	195	--	--	--	--	39.8	39.2	--	--	--	--	63	57	--	--	--	--
Stark*	130	180	--	--	--	--	43.8	42.8	--	--	--	--	66	59	--	--	--	--
Shelby 427	143	189	--	--	--	--	39.7	40.7	--	--	--	--	60	54	--	--	--	--
Buff*	108	--	--	--	--	--	45.4	--	--	--	--	--	60	--	--	--	--	--
LSD 5%	10.1	14.3	15.5	16.9	23.8		0.9	1.3	1.9	1.1	1.5		0.7	1.2	0.9	1.0	1.3	
LSD 10%	8.5	12.0	13.0	14.2	19.9		0.7	1.1	1.6	0.9	1.3		0.6	1.0	0.8	0.9	1.1	

*Naked-hull variety

Flax Summary, Langdon 2012-2016

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)						Height (in)						Days to Flower					
	12	13	14	15	16	3yr	12	13	14	15	16	3yr	10	16	2yr	12	13	14	15	16	3yr	12	13	14	15	16	3yr			
Carter*	37	38	40	36	40	39	52.9	53.4	52.1	53.0	52.1	52.4	0.0	0.5	0.3	25	19	25	26	27	26	58	50	49	46	50	48			
CDC Bethune	32	39	39	38	39	38	52.6	53.8	52.3	51.9	52.2	52.1	0.0	0.5	0.3	25	20	26	30	28	28	58	51	48	48	50	49			
CDC Glas	39	42	43	41	41	41	51.8	52.5	51.2	50.8	50.8	50.9	--	0.2	--	26	21	26	29	26	27	60	51	51	50	51	51			
CDC Sanctuary	32	42	38	41	33	38	52.0	53.3	51.5	50.7	51.0	51.1	--	1.7	--	24	21	25	28	25	26	59	51	52	49	50	50			
CDC Sorrel	33	38	38	40	34	37	51.9	53.0	51.8	52.3	51.2	51.8	1.0	2.0	1.5	25	22	27	31	26	28	57	52	52	48	51	50			
Nekoma	34	38	38	37	38	38	52.7	53.7	52.3	52.6	52.1	52.3	0.2	0.6	0.4	25	20	26	30	27	28	57	50	48	47	49	48			
Omega*	32	39	36	36	33	35	52.8	53.7	52.4	53.1	52.2	52.6	0.0	1.0	0.5	24	20	25	26	24	25	58	51	50	47	51	49			
Pembina	33	38	38	37	38	38	52.6	53.3	52.0	52.8	51.2	52.0	0.3	0.3	0.3	25	21	26	29	27	27	57	50	51	49	50	50			
Prairie Blue	35	34	40	38	40	39	52.2	53.2	51.7	51.7	51.4	51.6	0.7	0.4	0.6	24	19	25	28	25	26	58	51	49	49	50	49			
Prairie Grande	33	31	35	37	42	38	52.0	53.3	51.4	51.0	51.6	51.3	0.7	0.8	0.8	23	18	22	27	25	25	55	51	47	46	49	47			
Prairie Sapphire	36	47	38	38	35	37	51.5	52.7	51.0	51.4	50.8	51.1	--	2.1	--	25	22	26	26	28	27	58	51	51	46	51	49			
Prairie Thunder	37	45	42	37	39	39	53.0	53.9	52.0	51.5	52.2	51.9	0.7	0.4	0.6	26	22	27	30	28	28	59	50	50	49	51	50			
Rahab 94	35	32	40	38	40	39	52.0	53.0	51.5	50.2	51.5	51.1	0.0	0.4	0.2	24	20	24	27	26	26	58	50	48	48	49	48			
Shape	37	45	38	40	44	41	51.8	53.0	51.3	51.4	51.4	51.4	--	0.0	--	25	22	25	27	28	27	58	50	49	45	50	48			
Webster	35	45	39	35	40	38	52.7	54.0	52.1	52.2	52.6	52.3	0.0	0.8	0.4	25	21	27	30	28	28	59	51	50	49	50	50			
York	35	39	38	35	41	38	52.5	53.6	52.0	52.4	51.7	52.0	0.0	0.3	0.2	24	19	25	30	26	27	56	50	48	49	49	49			
Gold ND*	--	--	37	36	38	37	--	--	52.2	52.3	52.1	52.2	--	0.7	--	--	--	27	30	26	28	--	--	50	50	52	51			
CDC Neela	--	--	39	39	37	38	--	--	51.9	51.9	51.4	51.7	--	1.6	--	--	--	25	28	26	26	--	--	52	48	50	50			
CDC Plava	--	--	--	--	31	--	--	--	--	--	51.4	--	--	4.0	--	--	--	--	--	25	--	--	--	--	49	--	--			
CDC Arras	33	40	40	37	--	--	52.5	53.6	51.8	51.9	--	--	0.5	--	--	25	21	26	30	--	--	57	51	49	47	--	--			
Hanley	35	41	37	37	--	--	52.0	53.7	52.0	52.2	--	--	0.5	--	--	26	20	25	30	--	--	57	51	48	48	--	--			
Lightning	35	40	38	35	--	--	52.5	53.6	52.3	52.1	--	--	0.3	--	--	25	20	27	28	--	--	57	51	48	48	--	--			
Linott	33	39	39	35	--	--	52.7	53.5	52.2	51.9	--	--	0.0	--	--	26	21	25	30	--	--	58	51	49	48	--	--			
McGregor	34	37	40	39	--	--	52.5	53.4	51.7	51.8	--	--	0.0	--	--	25	21	25	29	--	--	59	51	49	48	--	--			
Neche	33	40	38	37	--	--	52.5	53.8	52.2	52.5	--	--	0.2	--	--	25	21	27	30	--	--	58	51	48	47	--	--			
LSD 5%	3.3	6.0	NS	3.0	4.0		0.3	0.4	0.4	0.7	0.6		0.8	1.5		1.1	1.8	1.5	1.9	2.4		0.6	1.2	1.5	0.7	1.2				
LSD 10%	2.8	5.0	NS	2.5	3.3		0.2	0.3	0.3	0.6	0.5		--	1.2		1.0	1.5	1.3	1.6	2.0		0.5	1.0	1.3	0.6	1.0				

*Yellow seeded.

Canola - Liberty Link, Clearfield and Sulfonylurea Varieties, Langdon 2015-2016

Company/Brand	Variety	Type ¹	Blackleg Rating ²	Status ³	Clubroot Resistant	Days to First Flower				Days to End Flower				Days to Mature				% Cover ⁴					
						15		16		2yr		15		16		2yr		15		16		2yr	
Bayer CropScience	InVigor L130	H,LL,TR	R	CA	No	43	44	44	44	65	66	66	66	84	90	87	96	94	95				
Bayer CropScience	InVigor L252	H,LL,TR	R	CA	No	44	47	46	46	63	67	65	65	84	95	90	94	76	85				
Bayer CropScience	InVigor L140P	H,LL,TR	R	CA	No	42	44	43	43	61	66	64	64	82	91	87	99	91	95				
Bayer CropScience	InVigor 241C	H,LL,TR	R	CA	Yes	44	44	44	44	65	67	66	66	84	93	89	98	94	96				
Bayer CropScience	InVigor L230	H,LL,TR	R	CA	No	--	43	--	--	--	64	--	--	--	91	--	--	95	--				
Bayer CropScience	InVigor L233P	H,LL,TR	R	CA	No	--	44	--	--	--	65	--	--	--	92	--	--	93	--				
Bayer CropScience	InVigor L157H	H,LL,HO	R	CA	No	--	42	--	--	--	66	--	--	--	91	--	--	93	--				
Bayer CropScience	InVigor 5440	H,LL,TR	R	CA	No	44	--	--	--	65	--	--	--	85	--	--	99	--	--				
Bayer CropScience	InVigor L156 H	H,LL,TR	R	CA	No	43	--	--	--	65	--	--	--	85	--	--	99	--	--				
BrettYoung	BY16-6058	H,CL,TR	R	EXP	No	--	47	--	--	--	67	--	--	--	96	--	--	84	--				
BrettYoung	BY16-6059	H,CL,TR	R	EXP	No	--	45	--	--	--	68	--	--	--	93	--	--	93	--				
BrettYoung	BY15-677	H,CL,TR	R	EXP	No	--	43	--	--	--	65	--	--	--	93	--	--	95	--				
Canterra	CS2200CL	H,CL,TR	R	CA	No	--	46	--	--	--	69	--	--	--	94	--	--	78	--				
Cibus	C1511	H,SU,TR	MR	CA	No	44	44	44	44	67	69	68	68	84	92	88	91	79	85				
Cibus	C1516	H,SU,TR	NA	CA	No	45	47	46	46	67	69	68	68	85	92	89	93	75	84				
Cibus	C5507	H,SU,TR	R	CA	No	--	45	--	--	--	66	--	--	--	93	--	--	79	--				
Cibus	C5522	H,SU,TR	R	CA	No	--	44	--	--	--	67	--	--	--	93	--	--	86	--				
Cibus	C5513	H,SU,TR	R	CA	No	--	46	--	--	--	68	--	--	--	94	--	--	83	--				
Dyna-Gro	DG200CL	H,CL,TR	R	CA	No	--	47	--	--	--	69	--	--	--	96	--	--	89	--				
Dyna-Gro	XCEED X122CL	H,CL,TR	R	CA	No	--	38	--	--	--	60	--	--	--	88	--	--	49	--				
Mycogen Seeds	Nexera 2020 CL	H,CL,HO	R	CA	Yes	44	50	47	47	65	70	68	68	86	97	92	95	43	69				
Mycogen Seeds	2022CL	H,CL,HO	R	CA	No	--	45	--	--	--	69	--	--	--	95	--	--	60	--				
Mycogen Seeds	CL370195H	H,CL,HO	R	EXP	No	--	43	--	--	--	69	--	--	--	93	--	--	69	--				
Mycogen Seeds	CL2562966	H,CL,HO	R	EXP	No	44	--	--	--	65	--	--	--	86	--	--	95	--	--				
Pioneer	45H76	H,CL,TR	R	CA	No	45	--	--	--	66	--	--	--	84	--	--	96	--	--				
Pioneer	46H75	H,CL,TR	R	CA	No	46	--	--	--	67	--	--	--	87	--	--	99	--	--				
RR Check ²	HyCLASS 955	H,RR,TR	R	CA	Yes	41	42	42	42	60	62	61	61	82	89	86	85	86	86				
RR Check ²	Dekalb 70-50CR	H,RR,TR	R	CA	Yes	42	42	42	42	63	65	64	64	82	90	86	83	91	87				
LSD 5%						0.9	1.5			1.3	1.7			2.4	1.5		5.6	12.4					
LSD 10%						0.7	1.3			1.1	1.4			2.0	1.2		4.7	10.3					

¹H-Hybrid, LL-Liberty Link, CL-Clearfield System, SU-Sulfonylurea.

TR-Traditional Oil Type, HO-High Oleic Oil Type.

²Blackleg Rating: MR-Moderately Resistant, R-Resistant. Rating provided by company.

³Status: CA-Commercially available, EXP-Experimental.

⁴% Cover-Visual rating of percent area of plot covered by plant growth. This is a measure of stand and vigor. Plants were at 5-6 leaf stage.

⁵Roundup Ready check variety.

Canola - Liberty Link, Clearfield and Sulfonylurea Varieties, Langdon 2014-2016

Lodging

Company/Brand	Variety	Height (in)				Oil ¹ (%)				Yield ¹ (lbs/a)					
		15	16	2yr		15	16	2yr		2014	2015	2016	2yr	3yr	
Bayer CropScience	InVigor L130	55	49	52	0.0	3.3	1.7	46.5	46.1	46.3	3522	3179	2410	2795	3037
Bayer CropScience	InVigor L252	53	46	50	0.0	4.8	2.4	48.6	48.2	48.4	4121	3393	2792	3093	3435
Bayer CropScience	InVigor L140P	54	46	50	0.0	5.3	2.7	47.4	46.2	46.8	3721	3540	2672	3106	3311
Bayer CropScience	InVigor 241C	54	47	51	0.0	4.0	2.0	45.5	44.4	45.0	--	3303	2591	2947	--
Bayer CropScience	InVigor L230	--	44	--	--	4.5	--	--	45.7	--	--	--	2779	--	--
Bayer CropScience	InVigor L233P	--	46	--	--	2.5	--	--	48.0	--	--	--	2866	--	--
Bayer CropScience	InVigor L157H	--	43	--	--	5.8	--	--	47.4	--	--	--	2534	--	--
Bayer CropScience	InVigor 5440	57	--	--	0.0	--	--	46.0	--	--	3545	3436	--	--	--
Bayer CropScience	InVigor L156 H	50	--	--	0.0	--	--	47.1	--	--	3651	3223	--	--	--
BrettYoung	BY16-6058	--	49	--	--	4.8	--	--	46.7	--	--	--	2877	--	--
BrettYoung	BY16-6059	--	49	--	--	5.0	--	--	47.4	--	--	--	2896	--	--
BrettYoung	BY15-677	--	48	--	--	5.0	--	--	46.6	--	--	--	2758	--	--
Canterra	CS2200CL	--	47	--	--	5.0	--	--	46.5	--	--	--	2603	--	--
Cibus	C1511	57	47	52	0.0	5.0	2.5	44.5	42.1	43.3	--	3043	2321	2682	--
Cibus	C1516	57	46	52	0.0	5.0	2.5	46.9	44.8	45.9	--	2837	1950	2394	--
Cibus	C5507	--	46	--	--	5.3	--	--	45.9	--	--	--	2334	--	--
Cibus	C5522	--	44	--	--	5.3	--	--	46.0	--	--	--	2250	--	--
Cibus	C5513	--	46	--	--	4.3	--	--	46.5	--	--	--	2291	--	--
Dyna-Gro	DG200CL	--	51	--	--	5.3	--	--	44.6	--	--	--	2798	--	--
Dyna-Gro	XCEED X122CL	--	44	--	--	1.0	--	--	43.0	--	--	--	1912	--	--
Mycogen Seeds	Nexera 2020 CL	53	41	47	0.0	5.5	2.8	48.1	46.5	47.3	3445	2894	1723	2309	2687
Mycogen Seeds	2022CL	--	42	--	--	4.8	--	--	46.0	--	--	--	2003	--	--
Mycogen Seeds	CL370195H	--	41	--	--	5.0	--	--	45.9	--	--	--	2319	--	--
Mycogen Seeds	CL2562966	56	--	--	0.0	--	--	48.8	--	--	--	3156	--	--	--
Pioneer	45H76	56	--	--	0.0	--	--	47.6	--	--	--	3268	--	--	--
Pioneer	46H75	55	--	--	0.0	--	--	46.8	--	--	--	3106	--	--	--
RR Check	HyCLASS 955	49	45	47	0.5	5.0	2.8	50.7	52.9	51.8	3873	3433	2640	3037	3315
RR Check	Dekalb 70-50CR	53	42	48	0.3	3.8	2.1	47.9	49.3	48.6	--	3288	2858	3073	--
LSD 5%		3.7	4.9		NS	1.1		1.4	1.6		421	311	351		
LSD 10%		3.1	4.1		0.3	0.9		1.2	1.3		351	259	294		

¹8.5% moisture

Canola - Roundup Ready, Langdon 2015-2016

Company	Variety	Type ¹	Blackleg Rating ²	Status ³	Clubroot Resistant	Days to First Flower				Days to End Flower				Days to Mature				% Cover ⁴	
						15	16	2yr	15	16	2yr	15	16	2yr	15	16	2yr	15	16
						49	45	47	73	67	70	96	94	95	73	78	76		
BrettYoung	6056CR	H,TR	R	CA	Yes	49	45	47	73	67	70	96	94	95	73	78	76		
BrettYoung	6074RR	H,TR	R	CA	No	49	45	47	73	67	70	97	95	96	75	92	84		
BrettYoung	6080RR	H,TR	R	CA	No	--	44	--	--	67	--	--	92	--	--	94	--		
BrettYoung	6076RR	H,TR	R	CA	Yes	--	47	--	--	68	--	--	95	--	--	75	--		
BrettYoung	6086CR	H,TR	R	CA	Yes	--	46	--	--	67	--	--	95	--	--	77	--		
BrettYoung	BY15-754	H,TR	R	EXP	No	--	45	--	--	66	--	--	92	--	--	70	--		
BrettYoung	BY16-068	H,TR	R	EXP	Yes	--	47	--	--	67	--	--	95	--	--	78	--		
BrettYoung	BY16-768	H,TR	R	EXP	No	--	45	--	--	68	--	--	93	--	--	66	--		
Canterra	CS2000	H,TR	R	CA	Yes	--	48	--	--	67	--	--	96	--	--	69	--		
Canterra	CS2100	H,TR	R	CA	No	--	44	--	--	67	--	--	92	--	--	77	--		
Cargill	Victory V12-1	H,HO	R	CA	No	50	48	49	71	67	69	95	95	95	73	84	79		
Cargill	Victory V22-1	H,HO	R	CA	No	52	47	50	72	67	70	95	94	95	70	86	78		
Cargill	Victory V12-3	H,HO	R	CA	Yes	--	46	--	--	67	--	--	94	--	--	95	--		
Croplan	HyCLASS 930	H,TR	R	CA	No	45	42	44	66	62	64	91	90	91	75	84	80		
Croplan	HyCLASS 955	H,TR	R	CA	Yes	46	42	44	67	64	66	91	90	91	83	81	82		
Croplan	HyCLASS 970	H,TR	R	CA	No	48	44	46	70	66	68	93	92	93	69	77	73		
Croplan	HyCLASS 972	H,TR	R	CA	No	48	46	47	72	68	70	93	93	93	68	68	68		
Dekalb	DKL70-07RR	H,TR	R	CA	No	47	44	46	68	67	68	92	91	92	75	74	75		
Dekalb	DKL38-48RR	H,TR	MIR	CA	No	47	42	45	68	65	67	92	90	91	70	85	78		
Dekalb	DKL70-50CR	H,TR	R	CA	Yes	48	43	46	70	67	69	93	91	92	79	88	84		
Dekalb	DKL70-10RR	H,TR	R	CA	No	47	44	46	68	65	67	91	90	91	74	80	77		
Dekalb	DKL30-20RR	H,TR	R	CA	No	--	41	--	--	62	--	--	90	--	--	89	--		
Dekalb	DKL71-14BL	H,TR	R	CA	No	--	42	--	--	64	--	--	91	--	--	90	--		
DL Seeds	H1509	H,TR	R	EXP	No	--	45	--	--	66	--	--	92	--	--	70	--		
DL Seeds	H1614	H,TR	R	EXP	No	--	43	--	--	66	--	--	92	--	--	82	--		
Dyna-Gro	DG531G	H,TR	R	CA	No	--	45	--	--	67	--	--	92	--	--	79	--		
Dyna-Gro	DG533G	H,TR	R	CA	No	--	44	--	--	67	--	--	93	--	--	80	--		
Integra	7150RR	H,TR	R	CA	No	45	43	44	65	64	65	92	92	92	74	72	73		
Integra	7257RR	H,TR	R	CA	No	--	44	--	--	65	--	--	90	--	--	69	--		
Mycogen	Nexera 1012 RR	H,HO	R	CA	No	53	48	51	75	68	72	96	96	96	74	65	70		
Mycogen	Nexera 1020 RR	H,HO	MIR	CA	Yes	51	47	49	73	68	71	94	95	95	80	71	76		
Mycogen	Nexera 1022 RR	H,HO	R	CA	No	52	48	50	74	68	71	96	95	96	64	65	65		
Mycogen	G5428584H	H,HO	R	EXP	Yes	--	46	--	--	67	--	--	92	--	--	82	--		
Nuseed	GT50	H,TR	R	EXP	No	--	46	--	--	68	--	--	94	--	--	54	--		
Nuseed	NCH13G046	H,TR	R	EXP	No	--	49	--	--	71	--	--	97	--	--	40	--		
Pioneer	45H33	H,TR	R	CA	Yes	48	45	47	68	68	68	92	92	92	86	81	84		
Pioneer	45CS40	H,TR	R	CA	Yes	--	45	--	--	66	--	--	92	--	--	88	--		
Pioneer	46M34	H,TR	MIR	CA	No	--	45	--	--	68	--	--	93	--	--	80	--		
Proseed	300 Mag	H,TR	R	CA	No	47	44	46	68	66	67	93	91	92	69	77	73		
Proseed	PS 5000	H,TR	R	CA	Yes	48	46	47	70	68	69	95	93	94	74	82	78		
Star	Star 402	H,TR	R	CA	No	46	43	45	67	65	66	93	91	92	68	69	69		
LSD 5%						1.2	1.4		2.0	1.8		2.0	1.6		13.7	13.8			
LSD 10%						1.0	1.2		1.7	1.5		1.6	1.3		11.4	11.6			

¹H-Hybrid, TR-Traditional Oil Type, HO-High Oleic Oil Type.

²Blackleg Rating: S-Susceptible, MS-Moderately Susceptible, MR-Moderately Resistant, R-Resistant. Rating provided by company.

³Status: CA-Commercially available, EXP-Experimental.

⁴% Cover-Visual rating of percent area of plot covered by plant growth. This is a measure of stand and vigor. Plants were at 5-6 leaf stage.

Canola - Roundup Ready, Langdon 2014-2016

Lodging

Company	Variety	Height (in)				Oil ¹ (%)				Yield ¹ (lbs/a)					
		15	16	2yr		15	16	2yr		14	15	16	2yr	3yr	
BrettYoung	6056CR	49	42	46	0.3	4.4	2.4	47.0	47.3	47.2	3256	3372	2280	2826	2969
BrettYoung	6074RR	48	45	47	0.0	3.7	1.9	47.6	46.1	46.9	--	3721	2679	3200	--
BrettYoung	6080RR	--	45	--	--	4.1	--	--	46.9	--	--	--	2791	--	--
BrettYoung	6076RR	--	49	--	--	4.9	--	--	45.2	--	--	--	2727	--	--
BrettYoung	6086CR	--	44	--	--	5.7	--	--	48.2	--	--	--	2687	--	--
BrettYoung	BY15-754	--	47	--	--	4.9	--	--	47.7	--	--	--	2491	--	--
BrettYoung	BY16-068	--	48	--	--	4.4	--	--	48.0	--	--	--	2598	--	--
BrettYoung	BY16-768	--	44	--	--	5.2	--	--	48.9	--	--	--	2189	--	--
Canterra	CS2000	--	48	--	--	4.8	--	--	46.4	--	--	--	2529	--	--
Canterra	CS2100	--	44	--	--	5.2	--	--	49.3	--	--	--	2752	--	--
Cargill	Victory V12-1	49	45	47	0.8	4.8	2.8	47.6	46.7	47.2	3463	3409	2697	3053	3190
Cargill	Victory V22-1	50	45	48	0.5	5.5	3.0	47.3	46.3	46.8	--	3244	2540	2892	--
Cargill	Victory V12-3	--	46	--	--	4.7	--	--	47.1	--	--	--	2865	--	--
Croplan	HyCLASS 930	47	39	43	1.8	5.8	3.8	52.4	52.0	52.2	3424	3601	2910	3256	3312
Croplan	HyCLASS 955	44	38	41	0.8	5.5	3.2	51.3	51.9	51.6	3337	3848	2717	3283	3301
Croplan	HyCLASS 970	48	44	46	0.3	4.5	2.4	50.1	49.2	49.7	--	3471	2938	3205	--
Croplan	HyCLASS 972	44	44	44	0.0	4.3	2.2	48.4	46.9	47.7	--	3588	2409	2999	--
Dekalb	DKL70-07RR	47	40	44	1.0	5.4	3.2	50.8	49.7	50.3	3291	3478	2495	2987	3088
Dekalb	DKL38-48RR	44	40	42	1.0	5.1	3.1	48.1	48.4	48.3	3334	3055	2503	2779	2964
Dekalb	DKL70-50CR	47	45	46	1.0	5.2	3.1	48.4	48.4	48.4	3555	3357	2600	2979	3171
Dekalb	DKL70-10RR	46	41	44	0.8	5.0	2.9	48.1	49.2	48.7	--	3759	2917	3338	--
Dekalb	DKL30-20RR	--	44	--	--	4.4	--	--	50.4	--	--	--	2960	--	--
Dekalb	DKL71-14BL	--	41	--	--	5.2	--	--	50.6	--	--	--	3156	--	--
DL Seeds	H1509	--	43	--	--	5.9	--	--	48.3	--	--	3640	2431	3036	--
DL Seeds	H1614	--	40	--	--	4.7	--	--	48.5	--	--	--	2644	--	--
Dyna-Gro	DG531G	--	42	--	--	3.5	--	--	48.8	--	--	--	2677	--	--
Dyna-Gro	DG533G	--	44	--	--	2.9	--	--	47.8	--	--	--	2579	--	--
Integra	7150RR	43	41	42	2.0	5.7	3.9	51.0	50.7	50.9	3138	3781	2653	3217	3191
Integra	7257RR	--	39	--	--	5.6	--	--	49.8	--	--	--	2711	--	--
Mycogen	Nexera 1012 RR	59	45	52	0.0	5.5	2.8	45.2	46.9	46.1	3237	3208	2421	2815	2955
Mycogen	Nexera 1020 RR	47	45	46	0.0	5.1	2.6	47.2	46.8	47.0	--	3596	2362	2979	--
Mycogen	Nexera 1022 RR	51	46	49	0.0	3.0	1.5	47.0	46.4	46.7	--	3174	2254	2714	--
Mycogen	G5428584H	--	44	--	--	3.8	--	--	47.7	--	--	--	2611	--	--
Nuseed	GT50	--	42	--	--	5.8	--	--	43.4	--	--	--	2070	--	--
Nuseed	NCH13G046	--	41	--	--	6.4	--	--	41.0	--	--	--	1824	--	--
Pioneer	45H33	48	44	46	0.8	5.3	3.1	48.5	48.4	48.5	--	3936	2893	3415	--
Pioneer	45CS40	--	44	--	--	4.6	--	--	47.9	--	--	--	2735	--	--
Pioneer	46M34	--	42	--	--	5.8	--	--	48.1	--	--	--	2561	--	--
Proseed	300 Mag	44	42	43	1.5	4.8	3.2	49.5	48.9	49.2	3330	3618	2549	3084	3166
Proseed	PS 5000	48	46	47	0.8	4.9	2.9	48.0	46.1	47.1	--	3747	2518	3133	--
Star	Star 402	43	41	42	1.3	4.9	3.1	52.1	52.9	52.5	3600	3749	2649	3199	3333
LSD 5%		5.3	3.8		0.9	1.1		1.1	1.8		322	367	367	367	367
LSD 10%		4.4	3.2		0.8	0.9		1.0	1.5		269	308	307	308	308

¹ 8.5% Moisture

Carinata, Langdon 2016							
Variety	Days to 1st Flower	Days to End Flower	Flower Duration (days)	Days to Mature	Height (in)	Lodging (0-9)	Yield (lbs/a)
A120	50	70	20	105	46	7.0	1614
20.111	49	69	21	103	48	6.5	2062
3A22.1	47	69	22	104	40	6.3	1862
5223	50	69	20	106	50	6.5	2185
M-01	50	70	20	106	48	7.8	1553
L140P*	46	69	23	94	46	6.8	2492
Mean	48	69	21	103	46	6.8	1961
C.V. %	4.0	0.7	10.2	1.0	8.5	12.5	10.0
LSD 5%	2.9	NS	NS	1.6	NS	NS	297
LSD 10%	2.4	0.6	NS	1.3	4.8	NS	244

*Liberty Link canola check

Mustard, Langdon 2016							
Variety	Days to 1st Flower	Days to End Flower	Flower Duration (days)	Days to Mature	Height (in)	Lodging (0-9)	Yield (lbs/a)
Tilney	34	67	33	93	45	4.8	1634
Andante	36	68	32	96	47	4.8	1715
Mean	35	67	32	94	46	4.8	1675
C.V. %	1.9	0.6	1.1	1.1	6.0	27.2	8.7
LSD 5%	1.5	NS	0.8	2.3	NS	NS	NS
LSD 10%	1.1	NS	0.6	1.7	NS	NS	NS

Dry Bean Summary, Langdon 2013-2015 ¹										
Variety	Type	Days to Maturity	Plant Height	Lodging	100 Seed Weight	Yield				
						2013	2014	2015	2 yr Avg.	3 yr Avg.
		DAP ²	(in)	(0-9)	(g)	-(lb/a)-				
LaPaz	Pinto	94	16	0.6	29.4	3324	2900	2151	2525	2792
Lariat	Pinto	92	17	1.0	31.2	2832	2445	2133	2289	2470
Stampede	Pinto	94	14	0.6	27.1	2720	3020	1877	2449	2539
Maverick	Pinto	91	10	5.0	36.9	2860	2848	2090	2469	2599
ND-307	Pinto	95	15	0.7	35.6	2792	3113	2029	2571	2645
Windbreaker	Pinto	94	12	0.0	33.0	2328	2822	1930	2376	2360
SF103-8	Pinto	97	14	0.0	35.6	--	2297	2188	2242	--
23ST27	Pinto	97	11	1.6	37.2	--	2524	2376	2450	--
HMS Medalist	Navy	96	13	1.0	16.1	2292	2286	1724	2005	2101
Ensign	Navy	96	14	0.0	20.4	2852	2703	2087	2395	2547
Vista	Navy	94	14	1.0	16.3	2584	2513	2129	2321	2409
T9905	Navy	99	14	0.0	21.0	2616	2571	2168	2369	2452
Rexeter	Navy	98	13	0.1	16.2	2424	1995	1904	1950	2108
Nautica	Navy	96	14	0.0	14.5	2372	1944	1660	1802	1992
Mist	Navy	99	16	0.7	18.3	2192	--	1606	--	--
Bolt	Navy	95	14	0.3	21.3	2008	--	1857	--	--
Fathom	Navy	98	14	0.3	20.9	--	--	1851	--	--
Avalanche	Navy	96	15	0.0	20.0	1952	2101	1923	2012	1992
Eclipse	Black	94	12	0.0	17.4	2568	2415	1932	2173	2305
Loreto	Black	97	13	0.3	15.7	2332	1944	1607	1776	1961
Zorro	Black	96	14	0.0	18.7	2580	2275	1933	2104	2263
Merlot	Small Red	97	13	3.7	34.0	2224	2180	1544	1862	1983
Rio Rojo	Small Red	96	12	1.4	26.0	2252	2656	1406	2031	2105
Rosie	Light Red Kidney	100	15	0.0	41.6	--	1607	1823	1715	--
Pink Panther ³	Light Red Kidney	98	14	0.0	50.5	--	1849	1532	1690	--
Inferno	Light Red Kidney	102	13	1.0	47.3	--	--	1927	--	--
Talon	Dark Red Kidney	96	14	0.0	42.3	--	1754	1681	1717	--
Montcalm	Dark Red Kidney	100	12	0.0	44.2	--	1672	1529	1601	--
Dynasty	Dark Red Kidney	99	12	0.3	50.1	--	--	1670	--	--
Mean		96	14	0.7		2446	2244	1874		
C.V. %		2.6	13.0	98.1		11.9	9.3	10.4		
LSD 5%		4.2	2.9	1.1		477	470	320		
LSD 10%		3.5	2.4	0.9		398	388	266		

¹ The 2016 trial was abandoned due to excessive moisture.

² DAP-Days after planting

³ Pink Panther had some preharvest shatter in 2015.

Dry Bean Summary, Pembina County 2014-2016

Variety	Type	100 Seed Weight (g)	Yield				
			2014	2015	2016	2 yr Avg.	3 yr Avg.
LaPaz	Pinto	34.5	2039	2961	2710	2835	2570
Lariat	Pinto	39.5	1790	2725	2430	2577	2315
Stampede	Pinto	35.0	1579	2519	2505	2512	2201
Maverick	Pinto	38.5	1783	2185	2664	2425	2211
Windbreaker	Pinto	39.0	1812	3130	2325	2727	2422
Palomino	Pinto	37.0	--	--	2590	--	--
Monterrey	Pinto	37.0	--	--	2901	--	--
SF103-8	Pinto	--	1415	2555	--	--	--
23ST27	Pinto	--	1442	2740	--	--	--
ND-307	Pinto	--	1947	2833	--	--	--
HMS Medalist	Navy	18.5	1793	1452	1775	1613	1673
Ensign	Navy	21.5	1426	1964	2121	2042	1837
Vista	Navy	17.5	1773	1950	2304	2127	2009
T9905	Navy	21.5	1697	2001	2450	2225	2049
Nautica	Navy	17.5	1419	2038	2072	2055	1843
Mist	Navy	21.5	--	1963	2161	2062	--
Fathom	Navy	21.0	--	1945	2138	2042	--
Avalanche	Navy	--	1493	2345	--	--	--
Rexeter	Navy	--	1655	2118	--	--	--
Bolt	Navy	--	--	2185	--	--	--
Eclipse	Black	19.5	1655	2077	2229	2153	1987
Loreto	Black	18.5	1472	1841	1871	1856	1728
Zorro	Black	19.5	1131	1876	2451	2164	1819
Merlot	Small Red	38.5	1558	2106	1890	1998	1851
Rio Rojo	Small Red	--	1890	1771	--	--	--
Rosie	Light Red Kidney	45.0	976	2018	1827	1923	1607
Pink Panther*	Light Red Kidney	54.5	646	1655	1635	1645	1312
Inferno	Light Red Kidney	52.5	--	2101	2647	2374	--
Rosetta	Pink	34.0	--	--	2223	--	--
Talon	Dark Red Kidney	42.5	726	1470	1582	1526	1259
Montcalm	Dark Red Kidney	49.5	795	1732	2016	1874	1514
Dynasty	Dark Red Kidney	63.6	--	1994	2188	2091	--
Mean			1528	2151	2228		
C.V. %			12.3	14.0	10.7		
LSD 5%			315	496	394		
LSD 10%			262	413	328		

*Pink Panther had some preharvest shatter in 2015 and 2016.

Field Pea, Langdon 2014-2016

Variety	Days to 1st Flower	Vine Length (in)	Canopy		Height Index ¹ (%)	Harvest Ease ² (0-9)	1000 KWT (g)	Test Weight (lbs/bu)	Yield			Average	
			Ht at Harvest (in)	Harvest					2014	2015	2016		year
Yellow Cotyledon Type													
Agassiz	53	36	18	18	49	6.5	169	62.5	80.2	77.3	40.0	58.6	65.8
DS Admiral	54	34	16	16	47	6.1	174	63.5	72.9	81.1	50.1	65.6	68.0
Mystique	55	36	17	17	49	6.9	207	62.7	69.2	83.6	34.8	59.2	62.5
Nette	52	33	14	14	42	7.2	180	64.0	80.4	79.4	49.6	64.5	69.8
Bridger	52	36	18	18	50	6.0	186	63.7	--	76.5	46.8	61.7	--
CDC Amarillo	57	36	21	21	59	5.6	179	63.7	--	82.4	38.8	60.6	--
CDC Saffron	56	37	18	18	49	6.6	183	63.5	--	78.6	43.8	61.2	--
AAC Carver	56	34	20	20	59	6.0	181	63.5	--	--	38.9	--	--
Abarth	55	36	17	17	47	6.1	187	63.0	--	--	35.6	--	--
AC Earlystar	54	37	18	18	49	6.0	172	63.4	--	--	46.9	--	--
Hyline	55	35	17	17	48	6.6	183	63.4	--	--	36.2	--	--
Jetset	54	35	20	20	55	5.3	204	63.1	--	--	56.9	--	--
Navarro	49	36	15	15	42	7.6	231	63.7	--	--	47.0	--	--
Salamanca	56	36	17	17	49	6.6	207	62.7	--	--	44.4	--	--
Spider	56	35	16	16	43	7.0	197	62.1	--	--	42.8	--	--
CDC Meadow	--	--	--	--	--	--	--	--	81.6	80.5	--	--	--
Durwood	--	--	--	--	--	--	--	--	--	76.6	--	--	--
Green Cotyledon Type													
CDC Striker	55	34	12	12	37	8.4	145	62.2	71.8	83.2	42.7	63.0	65.9
Cruiser	53	35	15	15	43	7.5	165	62.5	77.4	70.4	28.6	49.5	58.8
Arcadia	54	35	12	12	34	8.2	160	62.9	--	--	44.3	--	--
CDC Patrick	56	33	19	19	59	6.2	141	62.8	--	--	31.5	--	--
CDC Raezer	55	36	17	17	48	6.3	172	63.5	--	--	47.8	--	--
Majoret	--	--	--	--	--	--	--	--	68.7	76.3	--	--	--
Mean	54	35	17	17	48	6.6	181	63.1	74.6	78.8	42.4	63.0	65.9
C.V. %	1.1	6.7	15.6	15.6	17.8	16.2	5.5	1.2	10.1	4.9	11.5	11.5	11.5
LSD 5%	0.9	NS	3.7	3.7	12.1	1.5	21.0	1.1	NS	5.5	7.0	7.0	7.0
LSD 10%	0.7	NS	3.1	3.1	10.1	1.3	17.0	0.9	9.0	4.6	5.8	5.8	5.8

¹ Height Index: Plant height at time of harvest relative to plant height at the end of bloom.

² Harvest Ease: 1=plants standing erect, 9=plants laying horizontal.

Faba Bean, Langdon 2016															
Variety	Emergence (DAP) ¹	Plant Stand *		Days to 1st Flower	Days to End Flower	Days to Mature	Plant Height (in)	Pod Height (in)	Lodging (0-9)	1000 KWT (gms)	Protein (%)	Test Weight (lbs/bu)	Seed Yield		
		7DAE ³ (ft ²)	Harvest (ft ²)										Yield (bu/a)	Yield (lbs/a)	2yr Avg. (lbs/a)
Boxer	17.0	3.2	2.6	50	73	118	56	15	3.8	584	23.9	63.2	101.1	6052	5678
Fabelle	17.3	3.0	2.7	51	73	117	55	17	4.8	501	25.2	62.3	82.2	4921	--
Fanfare	17.0	2.9	2.8	50	72	119	54	17	4.8	609	23.5	63.6	94.0	5626	5614
Laura	17.0	2.5	2.6	50	73	118	58	15	3.8	558	23.8	63.1	84.5	5061	--
Sampo	15.3	2.4	2.9	45	70	101	50	13	5.8	228	25.0	63.8	37.4	2238	--
Snowdrop	17.0	2.6	2.4	52	74	113	58	17	6.5	350	21.9	62.9	69.6	4170	--
Tobasco	16.3	2.7	2.9	51	73	116	54	15	6.3	470	21.6	63.0	81.9	4901	4545
Vertigo	17.8	2.5	2.2	50	72	117	59	17	5.5	609	23.4	63.5	99.4	5952	--
Mean	17.1	2.7	2.5	50	73	115	56	16	5.4	--	23.6	63.3	79.6	4768	--
C.V. %	3.4	18.0	22.3	0.9	1.2	0.7	8.2	13.0	20.0	--	1.8	0.6	8.1	8.1	--
LSD 5%	0.8	NS	NS	0.7	1.3	1.2	NS	NS	1.6	--	0.6	0.5	9.3	556	--
LSD 10%	0.7	NS	NS	0.5	1.0	1.0	5.5	NS	1.3	--	0.5	0.4	7.7	462	--

¹ DAP - Days after planting

³ 7DAE - Seven days after emergence

*Targeted plant stand was 4 plants/ft²

Conventional - Liberty Link Soybean, Langdon 2016

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	Yield		
								2016	2 yr Avg.	2-site Avg. ³
Conventional:										
Asgrow (RR-Check)	AG 00632	00.6	9/20	34	1.8	35.6	14.2	52.1	50.6	57.2
Asgrow (RR-Check)	AG 00932	00.9	9/21	36	1.3	35.8	14.1	57.0	55.1	61.1
NDSU	ND Henson	0.0	9/19	34	0.8	35.5	15.4	53.5	54.0	59.0
NDSU	Ashtabula	0.4	9/26	37	0.3	35.2	15.2	59.9	61.6	62.9
Richland	MK0249	0.2	9/26	31	1.4	35.5	13.7	38.1	46.0	50.1
Liberty Link:										
NorthStar	NS 0095LL	0.9	9/18	30	1.2	36.0	14.8	47.6	48.7	54.8
NorthStar	NS 0129LL	0.1	9/25	32	0.5	35.4	14.4	62.6	57.8	65.1
Stine	01LH22	0.1	9/20	34	0.2	35.3	14.8	55.8	--	59.0
Stine	02LC26	0.1	9/25	34	0.3	34.5	15.3	56.3	--	60.7
Thunder	5401	0.1	9/25	35	0.8	35.0	14.9	62.7	--	66.1
Trial Mean			9/22	35	1.1	35.4	14.6	55.5		
C.V. %			4.6	5.2	53.3	1.2	1.7	5.8		
LSD 5%			1.5	2.6	0.9	0.9	0.5	4.6		
LSD 10%			1.2	2.1	0.7	0.7	0.4	3.8		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of conventional traits at Langdon REC and Walsh County (Park River).

Yield, oil and protein reported at 13% moisture.

Conventional - Liberty Link Soybean, Walsh County 2016

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	Yield		
								2016	2 yr Avg.	2-site Avg. ³
Conventional:										
Asgrow (RR-Check)	AG 00632	00.6	9/16	31	0.8	35.2	15.3	62.2	53.3	57.2
Asgrow (RR-Check)	AG 00932	00.9	9/17	36	0.5	35.0	15.2	65.1	51.7	61.1
NDSU	ND Henson	0.0	9/14	32	1.3	34.7	16.4	64.5	54.1	59.0
NDSU	Ashtabula	0.4	9/21	40	2.3	33.3	16.6	65.9	56.0	62.9
Richland	MK0249	0.2	9/23	34	4.3	33.6	15.5	62.2	52.8	50.1
Liberty Link:										
NorthStar	NS 0095LL	00.9	9/16	32	2.0	34.6	16.4	62.0	--	54.8
NorthStar	NS 0129LL	00.1	9/21	36	2.0	33.1	16.5	67.6	56.7	65.1
NorthStar	NS 0361LL	0.3	9/22	36	1.3	34.3	16.4	79.0	66.6	--
Stine	01LH22	0.1	9/16	33	0.0	34.2	16.5	62.1	--	59.0
Stine	02LC26	0.1	9/18	35	0.5	32.9	16.7	65.2	--	60.7
Thunder	5401	0.1	9/20	39	1.5	32.9	16.5	69.5	59.8	66.1
Trial Mean			9/18	36	2.0	34.0	16.1	65.2		
C.V. %			7.7	13.2	67.1	1.3	1.5	5.8		
LSD 5%			2.0	NS	1.9	0.9	0.5	5.4		
LSD 10%			1.6	NS	1.6	0.7	0.4	4.5		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of conventional traits at Langdon REC and Walsh County (Park River).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Langdon 2016

Brand	Variety	Maturity Group ¹	Plant					Yield		
			Maturity	Height	Lodging	Protein	Oil	2 yr	2-site	
			date ²	(in)	(0-9)	(%)	(%)	2016	Avg.	Avg. ³
			-----bu/a-----							
Croplan	R2T00516	00.5	9/17	35	1.9	35.6	14.8	62.1	--	--
Croplan	R2C00766	00.7	9/18	32	2.6	33.9	15.1	60.2	--	--
Croplan	R2T00700	00.7	9/17	35	1.8	34.5	15.3	61.7	--	--
Dyna-Gro	S005RY87	00.5	9/14	36	1.4	35.3	15.1	65.9	--	66.9
Dyna-Gro	S006RY97	00.6	9/16	33	1.9	34.1	15.4	66.0	--	68.9
Dyna-Gro	S009RY56	00.9	9/19	35	1.3	35.5	14.8	61.5	60.2	65.0
Hefty	H006R7	00.6	9/17	33	2.7	34.7	15.1	61.1	--	61.0
Hefty	H008R6	00.8	9/20	35	1.5	36.2	14.4	58.0	--	65.1
Hefty	H00R6	0.0	9/21	41	2.5	35.2	15.1	64.0	--	72.1
Integra	20087	00.8	9/17	32	1.5	36.5	14.1	72.9	64.9	76.8
Integra	20097	00.9	9/21	40	1.8	35.2	15.1	74.0	--	77.5
Integra	20215	00.9	9/23	34	0.1	36.6	13.6	68.8	--	--
Legacy	LS-0135 RR2	0.1	9/22	40	2.5	35.4	14.8	71.2	63.7	75.1
Legacy	LS-00835N RR2	00.8	9/20	36	1.9	35.9	14.4	56.3	55.7	65.4
Legacy	LS-0214 RR2	0.2	9/23	37	1.6	36.1	13.7	72.0	65.0	78.4
Legacy	LS-00834 RR2	00.8	9/17	33	0.6	35.4	14.4	65.5	59.8	65.0
Legend	LS 004R752	00.4	9/15	36	2.0	35.2	15.2	63.0	--	--
Legend	LS 006R760N	00.6	9/17	34	2.9	34.1	14.9	60.6	--	--
Legend	LS 007R653	00.7	9/14	37	1.2	32.8	15.4	60.6	--	--
Legend	LS 008R660N	00.8	9/19	36	1.5	36.5	14.1	61.0	59.5	--
NorthStar	NS 0012R2	00.1	9/4	33	0.0	34.0	15.7	54.0	--	54.4
NorthStar	NS 0052R2	00.5	9/15	37	2.7	35.6	15.1	63.1	--	63.2
NorthStar	NS 0072R2	00.7	9/23	36	0.9	36.2	14.4	67.2	--	68.7
NorthStar	NS 0081NR2	00.8	9/21	36	1.3	36.4	13.7	63.3	60.3	67.3
NuTech	6008R2	00.8	9/17	36	0.9	33.2	15.2	55.8	56.5	56.4
PFS	16R008N	00.8	9/22	34	1.5	36.7	13.9	59.6	60.7	64.4
PFS	16R01	0.1	9/22	41	2.4	36.0	14.6	69.8	61.5	74.7
Pioneer	P005T13R	00.5	9/11	29	0.0	35.9	14.9	52.7	--	--
Pioneer	P006T46R	00.6	9/12	31	0.5	34.1	15.6	56.9	--	--
Pioneer	P008T22R2	00.8	9/21	37	1.5	36.2	14.7	65.1	60.8	--
Pioneer	P01T06R	0.1	9/21	32	1.0	34.6	15.2	61.3	--	--
Prairie Brand	PB-00727R2	00.7	9/17	33	2.5	34.6	15.3	61.7	--	59.8
Prairie Brand	PB00856R2	00.9	9/20	37	1.8	36.3	14.4	60.6	61.9	66.6
Prairie Brand	PB00950R2	00.9	9/18	38	2.2	35.8	14.5	65.8	63.7	66.1
Prairie Brand	PB-0146R2	0.1	9/21	38	2.3	35.6	15.0	70.1	66.2	75.3

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Langdon 2016 (continued)

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	Yield		
								2016	2 yr Avg.	2-site Avg. ³
Proseed	10-08	00.8	9/19	37	2.1	35.9	14.2	66.5	66.2	67.0
Proseed	40-07	00.7	9/12	39	1.6	35.8	13.5	61.8	--	61.2
Proseed	50-08	00.8	9/21	36	2.1	35.6	14.4	62.6	60.2	68.7
REA	R00727	00.7	9/17	37	2.2	35.2	14.8	63.0	--	65.4
REA	R0216	0.2	9/23	41	2.5	35.6	14.9	72.0	66.8	70.3
Stine	02RD00	0.2	9/24	34	0.1	36.6	13.4	69.8	65.0	74.9
Syngenta/NK	S006-W5	00.6	9/10	35	0.5	36.2	15.0	62.8	--	61.8
Syngenta/NK	S007-Y4	00.7	9/11	31	0.6	34.8	15.0	61.2	57.5	62.9
Thunder	34006	00.6	9/16	36	0.9	35.4	14.3	71.3	62.3	70.1
Thunder	36008	00.8	9/20	36	1.8	36.0	14.3	61.3	60.0	65.6
Thunder	3601	0.1	9/22	42	2.7	35.4	15.1	71.8	--	76.7
Wensman	W30065NR2	00.6	9/16	33	2.0	34.3	15.1	59.0	--	--
Wensman	W30085NR2	00.8	9/20	36	1.3	36.5	14.0	61.6	61.2	68.6
Wensman	W3024R2	0.2	9/20	35	1.7	35.7	14.1	68.4	64.5	--
Trial Mean			9/18	36	1.6	35.4	14.7	63.8		
C.V. %			6.4	6.1	40.6	1.2	1.7	9.1		
LSD 5%			1.6	3.0	0.9	0.9	0.5	8.1		
LSD 10%			1.4	2.5	0.8	0.7	0.4	6.8		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Nelson County 2016

Brand	Variety	Maturity Group ¹	Maturity		Plant			Yield		
			Maturity date ²	Lodging (0-9)	Height (in)	Protein (%)	Oil (%)	2016	2 yr Avg.	2-site Avg. ³
								----- bu/a -----		
Dairyland	DSR-C918/R2Y	00.9	9/17	0.0	29	35.9	14.4	70.2	58.6	71.5
Dairyland	DSR-0305/R2Y	0.3	9/19	0.2	33	34.4	15.4	74.7	65.9	75.7
Dairyland	DST04-003/R2Y	0.4	9/22	0.1	33	35.7	14.6	69.2	--	73.8
Dairyland	DSR-0404/R2Y	0.4	9/20	0.5	31	34.2	14.9	66.8	60.9	70.8
Dyna-Gro	S009RY56	00.9	9/16	0.5	31	35.6	15.0	52.8	50.4	58.2
Dyna-Gro	S01RY86	0.1	9/16	0.5	35	34.7	16.0	72.9	63.8	70.3
Dyna-Gro	S03RY36	0.3	9/20	0.0	33	36.6	14.5	72.6	64.6	70.1
Hefty	H02R3	0.2	9/20	0.0	32	34.5	15.0	73.3	62.5	73.7
Hefty	H03R5	0.3	9/19	0.0	32	36.4	14.5	66.4	--	66.3
Integra	20087	00.8	9/17	0.1	29	35.9	14.6	68.7	57.7	70.1
Integra	20097	00.9	9/16	1.0	37	34.4	15.9	69.8	--	71.2
Integra	20126	0.1	9/20	0.5	36	35.1	14.9	73.2	61.4	70.9
Integra	20215	00.9	9/19	0.0	32	35.6	14.6	62.5	--	65.8
Legacy	LS-0135 RR2	0.1	9/16	1.0	37	34.5	16.0	69.8	59.8	72.3
Legacy	LS-00835N RR2	00.8	9/16	0.2	31	35.8	14.8	53.9	50.2	58.9
Legacy	LS-0214 RR2	0.2	9/19	0.6	35	35.4	14.8	69.1	61.9	70.3
Legacy	LS-00834 RR2	00.8	9/14	0.0	27	35.3	14.9	62.7	--	67.2
Legacy	LS-0334 RR2	0.3	9/22	0.0	35	35.7	14.7	80.5	68.0	78.6
Mycogen	5B013R2	0.1	9/18	1.7	37	34.6	15.9	72.2	--	72.3
Mycogen	5B024R	0.2	9/16	0.5	38	35.9	14.8	66.4	60.0	68.8
Mycogen	5G009R2	00.9	9/16	0.7	34	35.4	15.1	66.9	--	68.7
Mycogen	5G007R2	00.7	9/14	0.2	28	35.3	14.9	67.4	--	67.1
NorthStar	NS 0081NR2	00.8	9/17	0.6	31	35.8	14.8	59.1	--	64.7
NorthStar	NS 0111R2	0.1	9/18	0.7	35	34.7	15.7	69.8	62.6	71.7
NorthStar	NS 0200NR2	0.2	9/21	1.2	38	35.6	14.2	66.2	58.9	67.7
NorthStar	NS 0480NR2	0.4	9/21	1.4	34	35.3	14.5	64.8	59.9	69.9
PFS	16R01	0.1	9/16	1.2	36	34.4	15.8	71.7	60.6	72.2
PFS	15R04	0.4	9/22	0.4	32	34.4	14.9	70.4	61.1	--
Prairie Brand	PB00856R2	00.9	9/16	0.3	32	36.1	14.5	54.3	53.8	58.8
Prairie Brand	PB-0146R2	0.1	9/18	1.5	35	33.9	16.1	73.3	60.8	72.0
Prairie Brand	PB-0397R2	0.3	9/21	0.1	37	35.7	14.5	69.0	--	70.8
Prairie Brand	PB-0441R2	0.4	9/20	0.3	32	34.5	14.8	67.8	--	72.0
Proseed	30-20	0.2	9/19	0.6	36	35.2	14.8	73.7	64.7	73.7
REA	R0216	0.2	9/17	0.8	35	34.6	15.7	70.9	62.6	73.7
REA	64G94	0.4	9/20	0.6	34	33.0	16.4	63.4	59.8	65.5
Stine	02RD00	0.2	9/18	0.0	32	35.8	14.7	69.8	60.0	70.0

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Nelson County 2016 (continued)

Brand	Variety	Maturity Group ¹	Maturity date ²	Lodging (0-9)	Plant Height (in)	Protein (%)	Oil (%)	Yield		
								2016	2 yr Avg.	2-site Avg. ³
Syngenta/NK	S02-B4	0.2	9/15	0.6	33	34.3	15.3	68.2	--	68.3
Syngenta/NK	S04-D3	0.4	9/19	0.3	34	34.0	15.1	64.3	58.9	68.1
Thunder	34006	00.6	9/13	0.0	30	34.9	15.0	67.2	--	66.3
Thunder	36008	00.8	9/18	0.5	33	35.7	14.8	52.9	50.1	56.9
Thunder	3601	0.1	9/16	0.8	37	34.6	16.0	73.1	63.7	73.3
Thunder	Astro	00.8	9/16	0.0	32	34.9	14.6	66.2	55.6	66.5
Thunder	3503	0.3	9/20	0.0	34	36.6	14.3	76.0	65.0	--
Wensman	W30085NR2	00.8	9/17	0.4	31	35.6	14.9	55.2	53.2	--
Wensman	W3024R2	0.2	9/15	0.1	29	35.5	14.8	70.0	64.8	--
Trial Mean			9/17	0.4	33	35.1	15.0	67.1		
C.V. %			8.9	134.3	5.7	1.1	1.3	5.0		
LSD 5%			2.2	0.8	2.7	0.7	0.4	4.7		
LSD 10%			1.8	0.7	2.2	0.6	0.3	3.9		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Pembina County 2016

Brand	Variety	Maturity Group ¹	Plant		Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)			2016	2 yr Avg.	2-site Avg. ³
							-----bu/a-----		
Dyna-Gro	S005RY87	00.5	9/8	39	33.7	16.4	67.9	--	66.9
Dyna-Gro	S006RY97	00.6	9/10	33	32.3	16.3	71.8	--	68.9
Dyna-Gro	S009RY56	00.9	9/16	39	33.8	15.8	68.6	64.6	65.0
Hefty	H006R7	00.6	9/12	33	32.9	16.3	61.0	--	61.0
Hefty	H008R6	00.8	9/15	36	33.8	15.9	72.3	--	65.1
Hefty	H00R6	0.0	9/17	41	33.0	16.8	80.3	--	72.1
Integra	20087	00.8	9/16	33	34.4	15.1	80.7	--	76.8
Integra	20097	00.9	9/17	42	33.1	16.7	81.0	--	77.5
Legacy	LS-0135 RR2	0.1	9/17	43	33.5	16.4	79.1	66.8	75.1
Legacy	LS-00835N RR2	00.8	9/16	39	34.3	15.6	74.5	65.7	65.4
Legacy	LS-0214 RR2	0.2	9/18	41	33.3	16.0	84.9	67.5	78.4
Legacy	LS-00834 RR2	00.8	9/9	31	32.5	15.9	64.6	60.4	65.0
NorthStar	NS 0012R2	00.1	8/30	31	31.8	16.8	54.8	--	54.4
NorthStar	NS 0052R2	00.5	9/9	35	34.2	16.2	63.4	--	63.2
NorthStar	NS 0072R2	00.7	9/16	39	33.7	15.9	70.2	--	68.7
NorthStar	NS 0081NR2	00.8	9/13	37	33.2	15.9	71.4	66.8	67.3
NuTech	6008R2	00.8	9/11	35	31.7	16.9	57.1	56.5	56.4
PFS	16R008N	00.8	9/15	39	33.4	16.1	69.2	60.9	64.4
PFS	16R01	0.1	9/17	41	32.6	16.8	79.7	67.6	74.7
Prairie Brand	PB-00727R2	00.7	9/11	34	32.6	16.7	58.0	--	59.8
Prairie Brand	PB00856R2	00.9	9/16	37	34.4	15.6	72.5	67.2	66.6
Prairie Brand	PB00950R2	00.9	9/15	39	33.3	15.9	66.3	58.9	66.1
Prairie Brand	PB-0146R2	0.1	9/17	42	33.0	16.7	80.4	69.5	75.3
Proseed	10-08	00.8	9/15	39	33.1	15.9	67.5	58.2	67.0
Proseed	40-07	00.7	9/2	36	32.5	15.9	60.6	--	61.2
Proseed	50-08	00.8	9/15	39	34.1	15.8	74.9	66.0	68.7
REA	R00727	00.7	9/7	34	32.8	15.9	67.8	--	65.4
REA	R0216	0.2	9/17	43	32.9	16.6	68.6	62.8	70.3
Stine	02RD00	0.2	9/18	33	34.0	15.3	80.0	--	74.9
Syngenta/NK	S006-W5	00.6	9/6	28	33.0	16.7	60.7	--	61.8
Syngenta/NK	S007-Y4	00.7	9/8	30	33.3	16.3	64.7	59.4	62.9

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Lodging was very minimal and is not reported.

Roundup Ready Soybean, Pembina County 2016 (continued)

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield		
							2016	2 yr Avg.	2-site Avg. ³
Thunder	34006	00.6	9/10	35	33.0	16.3	69.0	59.0	70.1
Thunder	36008	00.8	9/16	38	33.6	15.6	69.9	65.2	65.6
Thunder	3601	0.1	9/16	43	33.5	16.5	81.7	--	76.7
Thunder	Astro	00.8	9/16	38	33.4	15.3	69.9	64.2	--
Thunder	3503	0.3	9/17	37	35.0	15.2	80.3	--	--
Wensman	W30048R2	00.4	9/8	35	33.7	16.3	60.7	--	--
Wensman	W30085NR2	00.8	9/15	38	34.5	15.5	75.7	64.3	68.6
Trial Mean			9/13	37	33.3	16.1	69.7		
C.V. %			3.8	5.7	1.4	1.9	8.8		
LSD 5%			2.3	3.0	1.0	0.6	8.6		
LSD 10%			2.0	2.5	0.8	0.5	7.2		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Walsh County 2016

Brand	Variety	Maturity Group ¹	Plant		Lodging	Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)				2016	2 yr Avg.	2-site Avg. ³
Channel	00806R2	00.8	9/16	43	0.9	34.7	15.3	70.0	63.9	--
Channel	0205R2	0.2	9/18	46	1.9	34.7	15.0	76.0	67.7	--
Channel	0209R2	0.2	9/18	46	3.9	32.8	16.7	74.7	67.8	--
Dairyland	DSR-C918/R2Y	00.9	9/16	36	0.9	34.5	15.3	72.9	68.0	71.5
Dairyland	DSR-0225/R2Y	0.2	9/17	50	4.7	33.1	16.4	75.0	--	--
Dairyland	DSR-0305/R2Y	0.3	9/19	38	0.9	33.4	15.8	76.7	72.6	75.7
Dairyland	DST04-003/R2Y	0.4	9/23	38	0.2	34.3	14.9	78.5	--	73.8
Dairyland	DSR-0404/R2Y	0.4	9/22	39	0.6	34.1	15.1	74.8	68.4	70.8
Dyna-Gro	S009RY56	00.9	9/18	37	1.8	34.2	15.5	63.6	63.1	58.2
Dyna-Gro	S01RY86	0.1	9/18	46	4.1	32.5	16.8	67.6	66.1	70.3
Dyna-Gro	S03RY36	0.3	9/21	39	3.6	34.7	15.2	67.6	65.2	70.1
Hefty	H02R3	0.2	9/21	38	1.2	33.9	15.1	74.2	66.6	73.7
Hefty	H03R5	0.3	9/21	37	2.1	35.4	15.2	66.3	--	66.3
Integra	20087	00.8	9/16	35	0.9	35.6	14.8	71.6	64.4	70.1
Integra	20097	00.9	9/18	42	4.4	33.6	16.2	72.6	--	71.2
Integra	20126	0.1	9/18	42	3.1	34.9	15.1	68.6	64.4	70.9
Integra	20215	00.9	9/20	39	0.4	35.5	14.5	69.1	--	65.8
Legacy	LS-0135 RR2	0.1	9/18	48	3.6	33.7	16.3	74.7	69.7	72.3
Legacy	LS-00835N RR2	00.8	9/17	39	3.4	35.1	15.0	63.9	61.7	58.9
Legacy	LS-0214 RR2	0.2	9/17	40	3.1	35.1	15.1	71.6	65.5	70.3
Legacy	LS-00834 RR2	00.8	9/16	35	0.9	35.2	14.7	71.7	--	67.2
Legacy	LS-0334 RR2	0.3	9/22	42	4.1	35.1	14.9	76.7	71.9	78.6
Mycogen	5B013R2	0.1	9/17	47	5.3	33.0	16.7	72.4	--	72.3
Mycogen	5B024R	0.2	9/17	42	1.9	34.7	15.1	71.2	64.4	68.8
Mycogen	5G009R2	00.9	9/18	42	2.3	34.1	15.1	70.4	--	68.7
Mycogen	5G007R2	00.7	9/15	36	1.2	34.5	14.9	66.9	--	67.1
NorthStar	NS 0072R2	00.7	9/18	41	1.6	34.9	14.9	66.6	--	--
NorthStar	NS 0081NR2	00.8	9/17	35	2.4	34.9	14.9	70.3	--	64.7
NorthStar	NS 0111R2	0.1	9/18	45	4.7	32.9	16.3	73.5	68.6	71.7
NorthStar	NS 0200NR2	0.2	9/21	49	3.6	33.8	14.9	69.2	64.5	67.7
NorthStar	NS 0480NR2	0.4	9/23	40	2.4	34.8	14.9	75.0	71.4	69.9
PFS	16R01	0.1	9/18	47	4.9	33.8	16.0	72.7	63.9	72.2
Prairie Brand	PB00856R2	00.9	9/18	41	3.7	34.9	15.2	63.2	63.0	58.8
Prairie Brand	PB-0146R2	0.1	9/19	45	4.4	33.5	16.5	70.7	67.6	72.0
Prairie Brand	PB-0397R2	0.3	9/22	40	2.7	34.4	14.9	72.6	--	70.8
Prairie Brand	PB-0441R2	0.4	9/22	39	0.5	33.7	14.9	76.2	--	72.0

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Walsh County 2016 (continued)

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	Yield		
								2016	2 yr Avg.	2-site Avg. ³
Proseed	30-20	0.2	9/19	41	4.3	34.7	15.2	73.6	69.9	73.7
Proseed	10-08	00.8	9/18	43	3.3	33.5	15.5	63.4	--	--
REA	R0216	0.2	9/18	46	5.3	33.0	16.4	76.5	70.4	73.7
REA	64G94	0.4	9/21	43	4.8	32.5	16.3	67.6	66.1	65.5
Stine	02RD00	0.2	9/21	33	0.5	34.4	15.0	70.3	65.9	70.0
Syngenta/NK	S02-B4	0.2	9/17	41	1.5	33.7	16.0	68.3	--	68.3
Syngenta/NK	S04-D3	0.4	9/19	41	1.5	33.7	15.0	71.8	67.2	68.1
Thunder	34006	00.6	9/15	37	0.7	33.9	15.5	65.4	--	66.3
Thunder	36008	00.8	9/18	37	2.3	34.8	15.4	60.9	60.6	56.9
Thunder	3601	0.1	9/18	43	5.0	33.2	16.5	73.6	69.4	73.3
Thunder	Astro	00.8	9/17	41	2.3	33.8	14.9	66.8	63.7	66.5
Wensman	W300099R2	00.9	9/18	41	1.7	33.7	16.0	66.2	65.2	--
Wensman	W3018R2	0.1	9/17	49	4.5	33.2	16.6	72.4	68.2	--
Trial Mean			9/18	41	2.7	34.1	15.5	70.7		
C.V. %			5.5	8.0	41.5	1.4	1.8	6.3		
LSD 5%			1.4	4.6	1.5	0.9	0.6	6.3		
LSD 10%			1.2	3.9	1.3	0.8	0.5	5.3		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready 2 Xtend Soybean, Langdon 2016

Brand	Variety	Maturity Group ¹	Plant					Yield	
			Maturity	Height	Lodging	Protein	Oil	2016	2-site Avg. ³
			date ²	(in)	(0-9)	(%)	(%)	-----bu/a-----	
Dyna-Gro	S007XT27	00.7	9/19	35	0.5	36.3	13.8	68.7	67.7
Hefty	H007X7	00.7	9/21	35	0.8	36.2	14.2	60.8	58.0
Hefty	H009X7	00.9	9/19	39	1.8	36.5	13.4	65.0	66.4
Integra	50098 R2X	00.9	9/22	40	2.0	36.7	13.3	66.8	70.1
Legacy	LS-00937 RRXT	00.9	9/20	38	2.0	35.7	13.5	71.0	72.4
Legacy	LS-0237 RRXT	0.2	9/21	42	2.0	36.2	13.9	72.0	76.0
PFS	17X009	00.9	9/17	40	1.8	36.0	13.5	70.4	73.3
Proseed	XT6007	00.7	9/21	35	1.0	36.0	13.8	67.4	67.6
Proseed	XT6009	00.9	9/22	38	2.0	36.1	13.3	70.1	71.5
Wensman	W10063NRX	00.6	9/21	34	0.8	35.7	13.9	67.3	67.4
Wensman	W1016RX	0.1	9/21	39	1.8	36.5	13.2	68.1	71.6
Trial Mean			9/20	38	1.5	36.2	13.6	68.0	
C.V. %			16.7	5.8	49.6	0.9	1.7	6.4	
LSD 5%			NS	3.2	1.1	NS	0.5	NS	
LSD 10%			NS	2.6	0.9	NS	0.4	5.2	

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready 2 Xtend Soybean, Pembina County 2016

Brand	Variety	Maturity Group ¹	Plant					Yield	
			Maturity	Height	Protein	Oil	2016	2-site Avg. ³	
			date ²	(in)	(%)	(%)	-----bu/a-----		
Dyna-Gro	S007XT27	00.7	9/10	34	32.6	16.1	66.6	67.7	
Hefty	H007X7	00.7	9/10	31	32.1	16.3	55.1	58.0	
Hefty	H009X7	00.9	9/16	40	33.2	15.3	67.7	66.4	
Integra	50098 R2X	00.9	9/17	40	33.9	15.0	73.4	70.1	
Legacy	LS-00937 RRXT	00.9	9/16	39	33.6	15.1	73.7	72.4	
Legacy	LS-0237 RRXT	0.2	9/16	44	33.4	15.7	79.9	76.0	
PFS	17X009	00.9	9/16	41	34.0	15.2	76.2	73.3	
Proseed	XT6007	00.7	9/10	35	33.0	16.1	67.7	67.6	
Proseed	XT6009	00.9	9/16	41	33.6	15.1	72.9	71.5	
Wensman	W10063NRX	00.6	9/10	36	33.1	16.0	67.4	67.4	
Wensman	W1016RX	0.1	9/16	41	33.9	14.9	75.0	71.6	
Trial Mean			9/14	38	33.3	15.5	70.5		
C.V. %			5.8	4.9	1.6	2.3	4.0		
LSD 5%			1.2	2.7	NS	0.8	4.1		
LSD 10%			1.0	2.3	1.0	0.6	3.4		

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Lodging was very minimal and is not reported.

Roundup Ready 2 Xtend Soybean, Nelson County 2016									
Brand	Variety	Maturity Group ¹	Plant					Yield	
			Maturity date ²	Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	2016	2-site Avg. ³
							-----bu/a-----		
Dyna-Gro	S04XT77	0.4	9/20	35	0.8	35.5	14.9	76.3	73.4
Hefty	H02X7	0.2	9/21	40	1.0	34.9	14.9	71.8	71.4
Hefty	H03X7	0.3	9/21	35	1.3	35.0	15.0	67.6	67.0
Integra	50098 R2X	00.9	9/20	36	1.0	34.7	14.6	74.1	70.2
Legacy	LS-00937 RRXT	00.9	9/20	36	1.5	35.1	14.4	70.5	69.6
Legacy	LS-0237 RRXT	0.2	9/20	38	1.5	34.6	15.2	73.5	73.3
Legacy	LS-0337 RRXT	0.3	9/21	35	0.5	35.5	14.6	69.7	70.7
Proseed	XT6009	00.9	9/19	37	1.8	35.6	14.1	71.9	69.6
Proseed	XT603	0.3	9/20	40	1.5	34.2	15.3	74.1	75.3
Proseed	XT604	0.4	9/21	35	0.3	35.3	15.0	75.1	73.3
Wensman	W1016RX	0.1	9/20	36	2.3	35.0	14.3	72.2	69.8
Wensman	W1037RX	0.3	9/20	42	2.0	34.6	15.0	71.7	70.1
Trial Mean			9/20	37	1.3	35.0	14.8	72.4	
C.V. %			5.4	4.8	52.8	1.0	1.9	5.9	
LSD 5%			NS	2.6	1.0	0.8	0.6	NS	
LSD 10%			NS	2.1	0.8	0.6	0.5	NS	

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready 2 Xtend Soybean, Walsh County 2016									
Brand	Variety	Maturity Group ¹	Plant					Yield	
			Maturity date ²	Height (in)	Lodging (0-9)	Protein (%)	Oil (%)	2016	2-site Avg. ³
							-----bu/a-----		
Dyna-Gro	S04XT77	0.4	9/19	39	2.3	34.8	15.2	70.5	73.4
Hefty	H02X7	0.2	9/20	50	6.8	33.8	15.5	71.0	71.4
Hefty	H03X7	0.3	9/20	40	3.3	34.1	15.1	66.4	67.0
Integra	50098 R2X	00.9	9/19	46	5.0	34.3	14.3	66.3	70.2
Legacy	LS-00937 RRXT	00.9	9/17	48	5.0	34.1	14.7	68.6	69.6
Legacy	LS-0237 RRXT	0.2	9/18	50	5.5	33.5	15.6	73.0	73.3
Legacy	LS-0337 RRXT	0.3	9/19	44	2.3	34.0	15.7	71.7	70.7
PFS	17X03	0.3	9/20	50	6.8	34.0	15.0	71.7	--
Proseed	XT6009	00.9	9/18	47	4.0	34.7	13.9	67.2	69.6
Proseed	XT603	0.3	9/20	49	6.5	34.4	15.0	76.5	75.3
Proseed	XT604	0.4	9/19	38	1.8	34.7	15.1	71.4	73.3
Wensman	W1016RX	0.1	9/19	45	4.3	34.5	14.0	67.3	69.8
Wensman	W1037RX	0.3	9/20	50	6.8	33.7	15.3	68.5	70.1
Trial Mean			9/20	46	4.6	34.2	14.9	70.0	
C.V. %			7.5	7.9	25.6	1.7	2.0	5.8	
LSD 5%			NS	5.2	1.7	NS	0.6	5.8	
LSD 10%			NS	4.3	1.4	NS	0.5	4.8	

¹Maturity Group provided by company.

²Days to physiological maturity at R7 stage (one brown pod on the main stem obtains mature brown or tan color).

³A 2-site average of our southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Oil Sunflower, Langdon 2016

Brand	Hybrid	Hybrid Type ¹	Status ²	Days to Plant		Stem Lodging	Oil (%)	Test Weight (lbs/bu)	Harvest Moist. (%)	Yield				
				Flower Height (in)	Plant Height (in)					@ 10% moisture	2016	2015	2014	Average
Croplan	545 CL	CL, NS, DMR	CA	78	70	0.9	44.4	34.4	25.1	2625	3405	3465	3435	3165
Croplan	549 CL HO	CL, HO, DMR	CA	66	67	1.5	47.0	34.2	9.4	--	3038	2880	2959	--
Croplan	553 CL HO	CL, HO, DMR	CA	79	66	5.5	44.0	33.7	26.1	--	3087	3120	3103	--
Croplan	432 E	EX, NS, DMR	CA	73	64	2.4	41.2	36.5	10.5	2822	3426	2449	2938	2899
Croplan	455 E HO	EX, HO, DMR	CA	76	66	0.9	43.4	33.9	17.4	--	--	3356	--	--
Croplan	458 HO	EX, HO, DMR	CA	76	69	0.3	45.6	33.4	12.7	2303	2831	2988	2909	2707
Croplan	EXP 15-117	CL, HO, DMR	Exp	77	66	0.4	42.6	32.7	12.3	--	2789	3060	2925	--
Croplan	EXP 15-118	CL, HO, DMR	Exp	77	62	0.0	42.8	33.0	12.0	--	2548	3322	2935	--
Croplan	EXP 15-187	CL, HO, DMR	Exp	79	71	0.2	41.1	34.7	16.8	--	2914	2972	2943	--
Croplan	EXP 16-211	CL, HO, DMR	Exp	74	61	0.0	46.2	33.4	13.7	--	--	3125	--	--
Croplan	EXP 16-001	CL, HO, DMR	Exp	75	59	1.2	44.8	32.4	10.2	--	--	2951	--	--
Croplan	EXP 16-002	CL, HO, DMR	Exp	75	65	0.3	46.5	34.3	11.3	--	--	2996	--	--
Croplan	EXP 16-003	CL, HO, DMR	Exp	78	68	1.2	46.4	32.0	22.6	--	--	3723	--	--
Croplan	EXP 16-288	CL, HO, DMR	Exp	78	61	1.4	49.4	34.8	18.2	--	--	2990	--	--
Croplan	EXP 16-290	CL, HO, DMR	Exp	76	64	3.5	47.6	36.6	14.3	--	--	3156	--	--
Nuseed	Talon	EX, NS, Dehull	CA	74	66	5.3	44.3	30.6	13.6	--	3287	3483	3385	3385
Nuseed	Cobalt II	CL, HO, DMR	CA	74	64	1.5	44.6	36.1	14.5	2656	2968	3083	3025	2902
Nuseed	Camaro II	CL, NS, DMR	CA	76	66	3.0	44.2	35.6	18.2	2956	3360	3068	3214	3128
Nuseed	Hornet	CL, HO, DMR	CA	78	67	3.5	45.7	33.3	19.6	2305	3736	3730	3733	3257
Nuseed	N4HM354	CL, HO, DMR	CA	74	63	0.3	46.8	37.5	11.3	--	--	3508	--	--
Nuseed	Falcon	EX, NS	CA	77	63	1.7	45.0	36.8	16.8	2475	3082	3038	3060	2865
Nuseed	Badger DMR	CL, NS, Conoil, DMR	CA	73	66	1.5	36.7	33.1	10.8	3005	2762	3799	3281	3189
Nuseed	N5LM307	CL, NS, Conoil, DMR	CA	74	63	0.5	39.3	31.5	13.1	--	--	2745	--	--
NuTech	63C4	CL, NS, DMR	CA	74	62	1.5	46.8	38.2	10.7	--	--	3191	--	--
NuTech	68H7	EX, HO, DMR	CA	76	73	1.4	43.8	37.2	14.7	3117	2837	3439	3138	3131

¹Type: HO = High Oleic, NS = NuSun, Trad = Traditional(linoleic), CL = Clearfield, EX= ExpressSun, DMR = Downy Mildew Resistant

²Status: CA-Commercially available, Exp-Experimental, CK-Long term hybrid check

³Days after planting

Oil, harvest yield and test weight were adjusted to 10% moisture.

Maturity Check: Days to mature; Honeycomb-108, 8N270-116, Falcon-120, 559CL-121.

Oil Sunflower, Langdon 2016 (continued)

Brand	Hybrid	Hybrid Type ¹	Status ²	Days to Plant		Stem Lodging (0-9)	Oil (%)	Test Weight (lbs/bu)	Harvest Moist. (%)	Yield				
				Flower (days) ³	Height (in)					2013	2014	2015	2yr	3yr	Average
Pioneer	P63HE60	EX, HO, DMR	CA	74	68	0.4	46.9	36.3	11.0	--	--	2704	--	--
Pioneer	P63ME70	EX, NS, DMR	CA	75	65	1.2	47.2	33.0	9.9	--	--	3201	--	--
Pioneer	P63HE90	EX, HO, DMR	CA	76	64	1.8	44.2	34.4	15.8	--	--	3476	--	--
Proseed	E50061CL	CL, HO, DMR	Exp	78	69	0.0	45.6	33.7	12.9	--	--	3292	--	--
Proseed	12G25	CL, HO	CA	75	65	1.1	47.3	36.5	14.4	--	--	3487	--	--
Proseed	E-31	CL, HO	CA	76	68	1.4	40.9	31.6	11.6	2770	2656	2665	2660	2697
Proseed	12G04	HO, DMR	CA	76	62	0.8	49.2	35.7	11.9	--	--	3116	--	--
Syngenta	SY7717	CL, HO, DMR	CA	74	65	0.7	45.4	33.7	10.2	2607	3278	2609	2943	2831
Syngenta	SY7919	CL, HO, DMR	CA	78	64	2.1	46.9	32.7	21.6	--	--	3426	--	--
Syngenta	NX64288	CL, HO, DMR	Exp	78	59	3.0	49.5	34.3	16.9	--	--	3349	--	--
Syngenta	NX64189	CL, HO, DMR	Exp	76	65	3.8	44.8	33.4	11.7	--	--	3095	--	--
USDA	894	Trad	CK	72	61	1.0	43.3	34.7	7.5	2500	2700	2263	2482	2488
Trial Mean				76	65	1.6	44.9	34.3	14.6	2267	2984	3143		
C.V. %				3.0	5.5	76.4	2.5	1.8	11.9	9.7	10.2	10.2		
LSD 5%				3.7	5.8	1.9	1.9	1.0	2.8	425	496	528		
LSD 10%				3.1	4.9	1.6	1.6	0.8	2.4	354	415	441		

¹Type: HO = High Oleic, NS = NuSun, Trad = Traditional(linoleic), CL = Clearfield, EX= ExpressSun, DMR = Downy Mildew Resistant

²Status: CA-Commercially available, Exp-Experimental, CK-Long term hybrid check

³Days after planting

Oil, harvest yield and test weight were adjusted to 10% moisture.

Maturity Check: Days to mature; Honeycomb-108, 8N270-116, Falcon-120, 559CL-121.

Confection (non-oil) Sunflower, Langdon 2016

Brand	Hybrid	Status ⁴	Days to Flower		Plant Height (in)	Stem Lodging (0-9)	Test Weight (lbs/bu)	Harvest Moist. (%)	Seed over screen				Yield		
			(days) ⁵	(days) ⁵					22/64	20/64	18/64	2014	2015	2016	2 yr	3 yr	Average
CanSun	Exp 64508 ²	Exp	72	66	3.3	25.2	10.3	62	89	96	--	--	3157	--	--
CanSun	Exp 39391DM ^{2,3}	Exp	74	64	8.3	23.2	16.7	24	48	77	--	--	2464	--	--
Nuseed	Panther DMR ³	CA	72	61	6.3	24.9	13.6	13	44	86	3026	3036	3143	3090	3068
RRC	2215	CA	75	71	1.0	25.6	14.0	54	85	94	--	--	3666	--	--
RRC	2215CL ¹	CA	77	71	1.0	24.7	16.7	48	84	95	--	--	3477	--	--
RRC	2205	Exp	74	69	1.7	24.3	14.3	57	73	84	--	--	3841	--	--
USDA	924	CK	73	65	2.3	27.1	15.1	23	56	80	3093	2646	2861	2754	2867
Trial Mean			74	67	3.4	25.0	14.4				3074	2729	3230		
C.V. %			1.4	5.8	37.0	4.6	11.3				9.6	7.8	9.0		
LSD 5%			1.8	NS	2.3	2.1	2.9				NS	377	515		
LSD 10%			1.5	5.6	1.8	1.7	2.4				NS	309	422		

¹CL-Clearfield, ²Express, ³Downy mildew resistant.

⁴Status: CA-Commercially available, Exp-experimental, CK-Long term hybrid check.

⁵Days after planting.

Harvest yield and test weight were adjusted to 10% moisture.

**NDSU Langdon Research Extension Center
2016 Faba Bean Seeding Rate Trial**

Faba Bean - 2016															Langdon
Variety/ Seeding Rate	Plant Stand		Days to 1st Flower	Days to End Flower	Days to Mature	Plant Ht (in)	Pod Ht (in)	Lodging ³ (0-9)	1000 KWT (g)	Protein (%)	Test Weight (lbs/bu)	Yield (lbs/a)	Pod		
	Emergence (DAP ¹)	Seedling (ft ²)											Harvest (ft ²)	1st Pod	Ht
Tabasco-3	18	2.9	3.6	49	71	117	51	13	5.3	476	22.0	63.4	4320		
Tabasco-4	18	4.8	5.0	49	71	117	52	15	5.0	465	22.4	62.9	5128		
Tabasco-5	17	6.2	5.8	50	71	117	54	16	5.3	479	22.1	62.8	5004		
Tabasco-6	16	6.3	6.2	49	70	117	55	16	6.5	474	22.0	62.7	5290		
Boxer-3	17	2.6	3.1	48	70	117	57	17	3.5	594	24.1	63.4	5733		
Boxer-4	17	4.7	4.7	47	70	117	55	15	3.8	590	23.9	63.2	5832		
Boxer-5	18	5.4	5.7	47	69	118	56	16	3.5	577	24.4	63.4	5759		
Boxer-6	17	5.8	6.2	47	69	117	53	15	4.5	583	23.9	63.6	6188		
Mean	17	4.8	5.0	48	70	117	54	15	4.7	530	23.1	63.2	5407		
C.V. %	3.7	19.1	24.9	1.8	1.0	0.7	6.6	6.6	19.0	3.0	2.1	1.0	8.1		
LSD 5%	0.9	1.4	1.8	1.3	1.0	NS	NS	1.5	1.3	23.3	0.7	NS	642		
LSD 10%	0.8	1.1	1.5	1.0	0.9	NS	NS	1.2	1.1	19.2	0.6	NS	531		

¹DAP-Days after planting ³Lodging; 0=none, 9=lying flat on ground NS-no statistical difference between treatments.

Planting Date: May 3 Harvest Date: September 20 Row Spacing: 6 inches

Previous Crop: Spring Wheat Tillage: Conventional Soil Type: Svea Barnes loam

Faba Beans are a long-maturing, cool season, annual legume that grow best under moist conditions. The current recommended seeding rate for Faba Beans is 4 seeds per square foot. Faba Beans are very large seeds often requiring a seeding rate of 3-4 bushels per acre, depending on the seed size. The research objective of this trial was to help determine the optimum seeding rate for our region. There were no significant differences in yield between the seeding rate of 3 to 6 seeds/ft² for the variety Boxer where the variety Tabasco had a significantly lower yield at the lowest seeding rate. Most of the other significant differences between agronomic traits occurred between varieties.

NDSU Langdon Research Extension Center 2016 Faba Bean Seeding Date Trial

Faba Bean - 2016															Langdon
Variety/ Seeding Date	Emergence (DAP ¹)	Plant Stand		Days to 1st Flower	Days to End Flower	Days to Mature (DAP ¹)	Plant Ht (in)	Pod Ht (in)	Lodging ³ (0-9)	1000 KWT (g)	Protein (%)	Test Weight (lbs/bu)	Yield (lbs/a)		
		Seedling (ft ²)	Harvest (ft ²)												
Tabasco															
May 3	18	3.9	4.5	50	72	116	51	14	4.2	455	21.3	62.5	4074		
May 13	13	4.9	4.5	46	67	113	54	14	5.2	487	22.1	63.1	4496		
May 23	11	3.8	4.5	44	66	110	48	16	6.2	416	21.9	62.8	4321		
June 6	9	4.2	5.0	40	73	115	56	20	4.0	415	20.6	60.0	2660		
Boxer															
May 3	19	4.2	3.9	49	71	116	55	15	2.5	558	24.0	63.6	5250		
May 13	13	4.6	4.6	44	65	113	57	16	4.0	595	23.6	63.0	5849		
May 23	11	3.3	4.5	43	67	109	55	17	4.5	550	24.4	63.1	4698		
June 6	10	3.0	4.6	38	69	115	59	22	2.8	563	23.4	59.4	2989		
Mean	13	4.0	4.5	44	69	113	54	20	4.2	505	22.7	62.2	4292		
C.V. %	2.5	8.9	23.9	3.6	3.4	1.0	3.9	6.3	13.0	0.9	2.0	3.9	5.8		
LSD 5%	--	0.5	NS	--	--	--	--	--	--	--	--	--	315		
LSD 10%	--	0.6	NS	--	--	--	--	--	--	--	--	--	384		
Variety means averaged over seeding dates															
Tabasco	13	4.2	4.6	45	69	113	52	16	4.9	443	21.5	62.1	3888		
Boxer	13	3.8	4.4	43	68	113	57	18	3.4	566	23.8	62.3	4697		
LSD 5%	0.3	0.3	NS	1.2	NS	NS	1.7	1.0	0.4	15.1	0.4	NS	192		
Seeding date means averaged over varieties															
May 3	18	4.1	4.2	49	71	116	53	15	3.4	507	22.7	63.0	4662		
May 13	13	4.7	4.6	45	66	113	55	15	4.6	541	22.8	63.0	5172		
May 23	11	3.6	4.5	43	66	109	51	17	5.4	483	23.1	63.0	4510		
June 6	9	3.6	4.8	39	71	115	57	21	3.4	489	22.0	59.7	2825		
LSD 5%	0.7	NS	NS	0.7	2.3	1.9	3.8	2.1	NS	42.5	0.7	0.8	543		

¹DAP=Days after planting, ³Lodging; 0=none, 9=lying flat on ground, NS=no statistical difference between treatments.

Planting Date: May 3, Harvest Date: September 20, Row Spacing: 6 inches, Previous Crop: Spring Wheat, Tillage: Conventional
Experimental Design: Split-Plot, A (--) in the LSD box indicates there was no significant interaction between seeding rate and date.

Faba Beans are a long-maturing, cool season, annual legume that grows best under moist conditions and needs to be planted early to obtain higher yields. The objective of this trial was to determine the optimum seeding date for our region. Differences occurred between the two varieties for many agronomic traits. Boxer had a higher yield than Tabasco. Both varieties responded similarly to seeding date for most agronomic traits and this resulted in few variety x date interactions. The June 6 seeding date had the lowest yield for both varieties. The May 3 seeding date was optimum for both varieties but differences were not always significant compared to the May 3 and 23 seeding date.

NDSU Langdon Research Extension Center
2-Row Barley Seeding Rate Study - 'ND Genesis' - 2016

Seeding Rate PLS/a ¹	Seeding Rate (bu/a)	Target Plant Stand (ft ²)	Plant Stand (ft ²)	Emergence (%)	Tillers/plant	Days to Head (DAP ²)	Plant Height (in.)
1000's/a	(bu/a)	(ft ²)	(ft ²)	(%)		(DAP ²)	(in.)
500	1.3	12	9.9	86	6.2	59	33
750	1.9	17	13.5	79	3.8	58	32
1000	2.5	23	17.7	78	2.2	57	33
1250	3.1	29	21.9	77	1.8	57	30
1500	3.8	34	25.9	75	1.5	57	33
1750	4.4	40	32.4	81	1.2	56	34
Trial Mean			20.2	79	2.8	57	32
C.V. %			13.8	12.2	28.8	1.3	6.4
LSD 5%			4.2	NS	2.1	1.0	2.9
LSD 10%			3.5	NS	1.5	0.8	2.4

Seeding Rate PLS/a ¹	Lodging (0-9) ³	1000 KWT (g)	Test Weight (lbs/bu)	% Plump (>6/64)	Protein (%)	2016 Yield (bu/a)	2015 Yield (bu/a)	2 yr Avg. Yield (bu/a)
1000's/a	(0-9) ³	(g)	(lbs/bu)	(>6/64)	(%)	(bu/a)	(bu/a)	(bu/a)
500	3.6	46.3	46.3	95	11.2	103.0	115.1	109.0
750	4.5	45.5	46.8	95	11.3	107.8	120.8	114.3
1000	3.7	46.0	47.0	96	10.9	108.7	122.1	115.4
1250	3.1	45.0	47.3	96	10.9	104.6	125.4	115.0
1500	4.8	44.0	46.4	94	11.4	107.6	125.1	116.4
1750	4.1	42.5	46.5	94	11.5	105.6	131.7	118.7
Trial Mean	4.0	44.9	46.7	95	11.2	106.2	125.7	--
C.V. %	61.8	3.5	2.6	4.2	5.3	6.4	5.3	--
LSD 5%	2.4	2.3	1.7	5.4	0.9	9.1	9.4	--
LSD 10%	2.0	1.9	1.4	4.5	0.8	7.6	7.8	--

¹Germination 98%, 1000 KWT - 53.1 g. PLS=pure live seed.

²DAP - Days after planting.

³Lodging: 0=none, 9=lying flat on ground.

Planting Date: May 2

Harvest Date: August 15

Previous Crop: Soybean

Seeding Rate Effect on Yield and other Agronomic Traits of Soybeans-2016

Bryan Hanson, Travis Hakanson, Lawrence Henry, NDSU Langdon Research Extension Center

Seeding rate trials were embedded in soybean variety trials at two off-station locations in 2016. Populations ranged from 150,000 to 225,000 pure live seed per acre (pls/a). Seeding rates were adjusted for seed size and germination (90%). The variety Asgrow AG00632 (maturity group 00.6) was seeded at Cavalier (Pembina County) and Pekin (Nelson County). Seeding dates were May 25 and May 20 for Cavalier and Pekin, respectively. Row spacing was six inches.

The LSD's and C.V.% were determined using data from the entire variety trial at each location. Means are calculated from the seeding rates. There was a slight delay in maturity at the lower seeding rates at Pekin. Plant height, protein and oil differences among seeding rates were small and mostly non-significant at the two locations. There was no significant difference among seeding rates for yield at Cavalier. At the Pekin, location the 125,000 pls/a seeding rate was significantly lower than the 200,000 pls/a seeding rate. Combined results from studies conducted in 2011, 2012, 2014, 2015 and 2016 indicate that a seeding rate between 175,000 and 200,000 pls/a would result in optimum yields.

Pembina County - Cavalier - 2016

Seeding Rate pls/a	Maturity Date	Height (in)	Protein (%)	Oil (%)	Yield (bu/a)
150,000	9/9	34.6	33.1	16.1	57.7
175,000	9/10	35.5	33.4	16.1	62.9
200,000	9/9	36.6	32.8	16.4	61.9
225,000	9/9	34.4	32.7	16.3	61.9
Mean	9/9	35.3	33.0	16.2	61.1
C.V.%	3.8	5.7	1.4	1.9	8.8
LSD 5%	2.3	3.0	1.0	0.6	8.6
LSD 10%	2.0	2.5	0.8	0.5	7.2

Nelson County - Pekin - 2016

Seeding Rate pls/a	Maturity Date	Height (in)	Protein (%)	Oil (%)	Yield (bu/a)
150,000	9/13	28.3	34.9	15.2	60.5
175,000	9/13	30.3	34.7	15.3	61.6
200,000	9/13	30.0	34.9	15.1	65.2
225,000	9/15	30.7	35.0	15.1	63.5
Mean	9/14	29.8	34.9	15.2	62.7
C.V.%	8.9	5.7	1.1	1.3	5.0
LSD 5%	2.2	2.7	0.7	0.4	4.7
LSD 10%	1.8	2.2	0.6	0.3	3.9

Combined soybean yield data from various locations in 2011, 2012, 2014, 2015 and 2016.

Seeding Rate pls/a	Yield (bu/a)											
	CA 2015	LA 2015	PR 2015	PR 2014	PK 2014	LK 2012	LA 2012	VE 2012	VO 2011	LA 2011	CA 2016	PK 2016
125,000		45.2	49.5	47.5	42.6	56.0	38.5		46.2	59.4		
150,000	46.9	47.1	49.7	48.9	43.1	60.8	44.3	49.1	46.4	61.0	57.7	60.5
175,000	46.5	47.4	52.0	50.7	48.8	62.7	42.1	47.7	48.9	63.6	62.9	61.6
200,000	48.0	53.1	52.6	51.1	46.6	64.0	42.5	52.5	50.6	64.7	61.9	65.2
225,000	47.4	50.6	54.3	50.7	48.1				50.5	65.2	61.9	63.5
250,000									50.5	65.7		

Locations: VE-Vesleyville, CA-Cavalier, LK-Lakota, LA-Langdon, PR-Park River, PK-Pekin, VO-Voss.

Average Yield (bu/a)

Seeding Rate pls/a	Average Yield (bu/a)			
	12-site Avg	8-site Avg	7-site Avg	2-site Avg
125,000		48.1		52.8
150,000	51.3	50.2	49.0	53.7
175,000	52.9	52.0	51.1	56.3
200,000	54.4	53.1	52.4	57.7
225,000			52.4	57.9
250,000				58.1

Row Spacing and Seeding Rate Influence on Spring Canola Performance in the Northern Great Plains

Bryan Hanson¹, Burton Johnson², Travis Hakanson¹, Lawrence Henry¹ and Paula Petersen²

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Introduction and Objective

- Spring canola is an important economic crop in North Dakota averaging 1.04 million acres annually the last 10 years.
- The canola industry is looking for ways to expand acreage in areas where row crops such as soybean, corn, dry bean and sugarbeets are grown.
- In these areas, there is potential to use row crop equipment to seed canola in wider row spacing than the current recommended 6 to 7 inches.
- Rising seed costs are a concern in canola production and the use of lower seeding rates in wider row spacing could enhance crop revenue.

The study objective was to investigate the optimum row spacing in conjunction with varying seeding rates to determine the greatest economic return per acre in canola production.

Methods and Materials

- Field experiments were conducted at two locations, Langdon and Prosper, North Dakota
- Experimental design was a RCBD with a split-plot arrangement and four replications
 - Main plot – Three row spacing of 6, 12 and 24 inches
 - Subplots – Four seeding rates of 3, 6, 9, and 12 pure live seeds/ft².
- Variety – Liberty Link InVigor L140P, 1000 kernel weight – 4.55g, Germination – 97%
- Seed cost - \$12.30/lb with insecticide and fungicide treatment
- October market price – 2015 - \$14.13/cwt, 2016 - \$14.70/cwt
- Net Return \$/acre = grain value/acre – seed cost/acre.
- Traits reported in this report: Yield (lbs/acre) and Net Return \$/acre

Table 1. Seeding rates, seed cost and target seeds per linear foot of row for trials at Langdon and Prosper, ND in 2015 and 2016.

Seeding Rate Seeds/ft ²	Seeding Rate lbs/acre	Seed Cost/acre	Seeds/acre	Targeted seeds per linear foot of row		
				6" row	12" row	24" row
3	1.35	16.61	131K	1.5	3.0	6.0
6	2.68	32.96	261K	3.0	6.0	12.0
9	4.05	49.82	392K	4.5	9.0	18.0
12	5.35	65.81	522K	6.0	12.0	24.0

Results

Yield

Langdon 2015 (Table 2)

- A significant seeding rate x row spacing interaction occurred for yield.
- There were no significant yield differences between row spacings and 3 seeds/ft² seeding rate.
- Yield generally increased as seeding rate increased at row spacings of 12 and 24 inches.

Langdon 2016 (Table 3)

- The 6 and 12 inch row spacings yielded significantly more than the 24 inch row spacing.
- The 3 seeds/ft² seeding rate yielded less than the 6, 9, and 12 seeds/ft² seeding rate.

Prosper 2015 and 2016 (Table 4)

- Yield at the 6 inch row spacing was significantly higher than both the 12 and 24 inch row spacing in both 2015 and 2016 when averaged across seeding rates.
- Yields at the 9 and 12 seeds/ft² seeding rate were significantly higher than the two lower seeding rates in 2015 while in 2016 the 6, 9, and 12 seeds/ft² were significantly higher than the lowest seeding rate when averaged across row spacing.

Table 2. Canola yield (lbs/acre) at four seeding rates and three row spacings at Langdon, 2015.

Row Spacing Inches	Seeding Rate seeds/ft ²			
	3	6	9	12
6	2635	3373	3355	3448
12	2515	3195	3675	3952
24	2477	2768	2925	3190
LSD 5% 322 Compare two seeding rates at same row spacing				
LSD 5% 483 Compare two row spacings at same or different seeding rate				

Table 3. Canola yield at three row spacings averaged across four seeding rates and four seeding rates averaged across three row spacings at Langdon, 2016.

Row Spacing Inches	Yield lbs/acre	Seeding Rate Seeds/ft ²	Yield lbs/acre
6	3011	3	2222
12	2954	6	2803
24	2269	9	2950
		12	3006
LSD 5%	174		244

Table 4. Canola yield (lbs/acre) at four seeding rates averaged across three row spacings and three row spacings averaged across four seeding rates at Prosper 2015 and 2016.

Seeding Rate Seeds/ft ²	Prosper 2015	Prosper 2016	Row Width Inches	Prosper 2015	Prosper 2016
3	1720	1513	6	2194	2333
6	1985	1999	12	1891	1776
9	2165	2131	24	1972	1737
12	2206	2152			
LSD 5%	147	257		108	322

Net Return \$/acre

Langdon 2015 (Table 5)

- The 3 seeds/ft² seeding rate had the lowest Net Return \$/acre at all row spacings.
- Net Return \$/acre at the 12 inch row spacing was not significantly different at the 9 and 12 seeds/ft² seeding rate.
- Net Return \$/acre at the 6 inch row spacing was highest at the seeding rate of 6 seeds/ft² but was not significantly different than the two higher seeding rates.

Langdon 2016 (Table 6)

- Highest Net Return \$/acre was at the 6 and 12 inch row spacing when averaged across seeding rates.
- Highest Net Return \$/acre for seeding rate was at 6, 9, and 12 seeds/ft² when averaged across row spacings.

Prosper 2015 and 2016 (Table 7)

- Net Return \$/acre at the 6 inch row spacing was significantly higher than the 12 or 24 inch row spacing in both 2015 and 2016 when averaged across seeding rates.
- Net Return \$/acre was significantly lower at the 3 seeds/ft² compared to the 6 and 9 seeds/ft² seeding rates in 2015 and the 6, 9, and 12 seeds/ft² seeding rate in 2016 when averaged across row spacings.

Table 5. Canola Net Return \$/acre at four seeding rates and three row spacings at Langdon, 2015.

Row Spacing Inches	Seeding Rate seeds/ft ²			
	3	6	9	12
6	356	443	425	421
12	339	418	470	493
24	334	359	364	385
LSD 5% 46 Compare two seeding rates at same row spacing				
LSD 5% 62 Compare two row spacings at same or different seeding rate				

Table 6. Canola Net Return \$/acre at three row spacings averaged across four seeding rates and four seeding rates averaged across three row spacings at Langdon, 2016.

Row Spacing Inches	Yield lbs/acre	Seeding Rate Seeds/ft ²	Yield lbs/acre
6	401	3	310
12	393	6	379
24	292	9	383
		12	375
LSD 5%	26		36

Table 7. Canola Net Return \$/acre at four seeding rates averaged across three row spacings and three row spacings averaged across four seeding rates at Prosper 2015 and 2016.

Seeding Rate Seeds/ft ²	Prosper 2015	Prosper 2016	Row Width Inches	Prosper 2015	Prosper 2016
3	226	206	6	269	301
6	247	260	12	226	219
9	256	263	24	238	214
12	245	250			
LSD 5%	21	38		15	47

Conclusions

- At Langdon, the optimum combination of row spacing and seeding rate for Net Return \$/acre was seeding in a 6 or 12 inch row spacing at a seeding rate of 6 or 9 seeds/ft².
- At Prosper, the optimum combination of row spacing and seeding rate for Net Return \$/acre was seeding in a 6 inch row spacing at a seeding rate of 6 or 9 seeds/ft².

Appreciation is extended to the Northern Canola Growers Association and Walsh County Crop Improvement Association for providing funding for this study.

Impact of Previous Crop on Soybean and Canola Yield

Bryan Hanson, Travis Hakanson, Lawrence Henry, NDSU Langdon Research Extension Center

Canola and soybean are currently two of the more profitable crops that have competed for acres in the region. Some growers will plant one or the other, but not always both in a short crop rotation. Since both crops are moderately susceptible to sclerotinia stem rot, many growers have avoided planting them close together in a crop rotation. However, while not ideal from a disease standpoint, there is some evidence there may be an advantage to growing soybean on canola ground or vice versa. The objective of this study was to:

1. Determine if soybean yield is greater following canola than wheat.
2. Determine if canola yield is greater following soybean than wheat.

Planned crop sequence to evaluate effect of previous crop on soybean and canola yield

Treatment	Year 1	Year 2	Year 3
1	Wheat	Wheat	Soybean
2	Wheat	Canola	Soybean
3	Wheat	Wheat	Canola
4	Wheat	Soybean	Canola

There were 2 replications of the sequences conducted in 2013-2015 and 2014-2016

The trial was a randomized complete block design with four replications. Individual research plots were 30 by 30 ft. Soil was tested every year for N-P-K-S and plots were fertilized for optimum growth. Liberty Link InVigor L252 was used to more easily control volunteers in the following RR soybean crop with the variety Asgrow AG00632 RR. Fungicides were applied to reduce disease in each crop, especially sclerotinia in canola and soybean.

Summary

No significant differences were seen in the cropping sequences for yield, plant stands, days to flower, plant height, test weight, protein, or oil. Very little disease was observed.

This same cropping sequence trial was also conducted at North Central Research Extension Center at Minot and the Carrington Research Extension Center. No significant differences were seen in the cropping sequence for yield or other agronomic traits at either location.

These results indicate that soybeans can be planted on canola ground or vice versa with proper crop management.

Soybean on wheat vs canola (Langdon 2015)

Crop Sequence	2013		2014		2015		2016		Plant		Test	
	Crop	Crop	Crop	Crop	Yield bu/a	Stand ft ²	Days to flower	Days to mature	Height in	Weight lbs/bu	Protein %	Oil %
1	Wheat	Wheat	Soybean	Soybean	39.5	5.3	50.3	101.3	38.3	57.3	33.6	15.9
2	Wheat	Canola	Soybean	Soybean	41.1	6.3	50.3	101.0	37.2	57.0	33.0	16.1
LSD 5%					NS	NS	NS	NS	NS	0.2	NS	NS

Soybean on wheat vs canola (Langdon 2016)

Crop Sequence	2014		2015		2016		2017		Plant		Test	
	Crop	Crop	Crop	Crop	Yield bu/a	Stand ft ²	Days to flower	Days to mature	Height in	Lodging 0-9	Weight lbs/bu	Protein %
1	Wheat	Wheat	Canola	Canola	54.8	7.0	46.5	115.8	37.1	0.5	57.1	34.8
2	Wheat	Canola	Soybean	Soybean	56.1	5.5	47.0	115.5	38.8	0.3	57.3	35.3
LSD 5%					NS	NS	NS	NS	NS	NS	NS	NS

Canola on wheat vs soybean (Langdon 2015)

Crop Sequence	2013		2014		2015		2016		Plant		Test	
	Crop	Crop	Crop	Crop	Yield bu/a	Stand ft ²	Days to flower	Days to mature	Height in	Weight lbs/bu	Oil %	
3	Wheat	Wheat	Canola	Canola	3335	12.4	47.0	88.8	56.7	51.9	49.3	
4	Wheat	Soybean	Canola	Canola	3330	11.6	46.3	88.8	56.2	52.1	48.4	
LSD 5%					NS	NS	NS	NS	NS	NS	NS	

Canola on wheat vs soybean (Langdon 2016)

Crop Sequence	2014		2015		2016		2017		Plant		Test	
	Crop	Crop	Crop	Crop	Yield bu/a	Stand ft ²	Days to flower	Days to mature	Height in	Lodging 0-9	Weight lbs/bu	Oil %
3	Wheat	Wheat	Canola	Canola	2840	13.4	46.5	95.3	48.0	4.0	52.4	48.1
4	Wheat	Soybean	Canola	Canola	2756	12.9	47.0	95.3	47.5	3.5	52.6	48.7
LSD 5%					NS	NS	NS	NS	NS	NS	NS	NS

Survey and Creating Awareness on Identification and Management Plan of Clubroot of Canola in Northeastern North Dakota

Venkat Chapara, Lesley Lubenow and Naeem Kalwar

Survey Procedure: Clubroot scouting was done visually by inspecting canola crop roots. The disease survey was conducted in seven northeastern counties of North Dakota. Counties selected were Pembina, Walsh, Nelson, Ramsey, Towner, Rolette and Cavalier. County selection was done on hypothesis of clubroot propagule movement in all directions through equipment, soil or water to neighboring counties of Cavalier. In each county, one field in every 2,500 acres was selected and scouted. GPS coordinates were gathered to identify the positive fields with intent to keep monitoring for future research. In all, a minimum of 15-20 fields per county were targeted for scouting. The survey was done in two phases.

1st phase:

In the growing season, stems were sampled from distinct patches of diseased or prematurely senescing plants in the field. Patches visible from the edge of the field were checked by digging out plants and observing the roots for symptoms of clubroot.

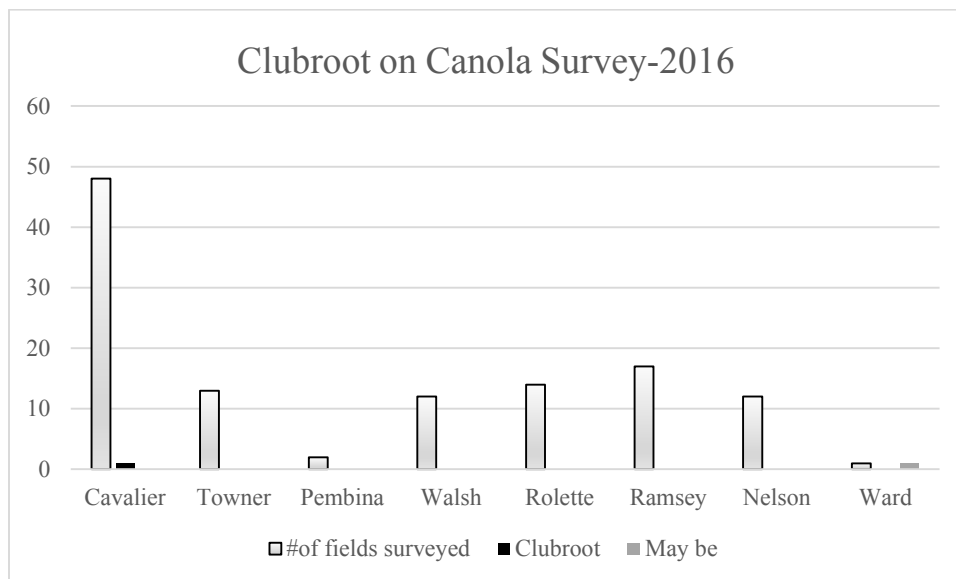
2nd phase:

After swathing:

The methodology of scouting at swathing was based on the methodology followed in Canada by the Alberta Agricultural and Rural Development (AARD) for clubroot disease survey. AARD indicated that the incidence of clubroot is more in the field entrances. The survey was done from the fields' main entrances. From the main entrance in the field, the survey group walked along in a "W" pattern by stopping at 10 spots and uprooting 10 consecutive stems from the ground at each spot. Excess soil was shook off. Roots then were visually examined for presence of galls. At sample sites where infection was observed or suspected, root specimens with galls, along with soil, were double bagged and labeled with the field location. Infected roots and soil samples from possible fields with clubroot were submitted to Dr. Luis Del Rio's laboratory for molecular confirmation and pH determination, respectively. Each sampling point was separated by 100 meters. In all, roots of 100 stems were evaluated for the presence of clubroot and incidence was noted. Disease severity was done by using a rating scale.

Clubroot Rating Scale: In fields where clubroot is found, roots within the 1 m² area at each sampling location were dug from the soil and rated on a four-point scale, where: 0 = no galls, 1 = a few small galls, 2 = moderate galling and 3 = severe galling.

Figure 1: Fields surveyed in 2016 for prevalence of clubroot over eight counties.



In all, 119 fields were surveyed by our research group in eight counties (Figure 1). One positive clubroot field has been identified in Cavalier County. The level of clubroot incidence in the positive clubroot field was 99% with severe galling (Rating Scale = 3).

Clubroot on canola awareness Meetings:

Clubroot on canola awareness meetings were conducted in Cavalier, Pembina, Walsh, and Towner Counties during the crop season for growers and other commodity groups.

Acknowledgements:

Funding provided by the North Central Canola Research Program and the Northern Canola Grower's Association.

The NDSU extension agents who helped in the survey and for conducting clubroot awareness meetings.

Fungicide Evaluation to Manage White Mold in Canola

Amanda Arens and Venkat Chapara

The research trial was conducted at the Langdon Research Extension Center. The trial was planted on May 5th, 2016 with the canola variety “DKL 30-42 (Roundup Ready)” in a randomized complete block design and replicated four times. The trial location followed recommended practices for land preparation, fertilization, seeding rate and weed control.

The plot size was 5 ft. wide x 16 ft. long with a canola border between each plot. The trial was irrigated with an overhead sprinkler system set at 10 minutes every two hours from 7:00 PM to 6:00 AM beginning one week before the start of bloom to four weeks after bloom to help increase disease infection levels. Fungicides were applied at 20% bloom using a CO₂-pressurized backpack style sprayer with a three nozzle boom (XR-8002) at 20 GPA. The level of white mold infection obtained in the research plots was completely from natural infection. Fifty plants were counted within each plot and the level of incidence was noted and severity levels were recorded for each plant prior to swathing on August 22 using a 0-5 scale, where 1=superficial lesions or small branch infected; 2=large branch(es) dead; 3=main stem at least 50% girdled; 4=main stem girdled but plant produced good seed; 5=main stem girdled, much reduced yield. A white mold disease severity index was calculated with a weighted scale of incidence and severity ratings.

Treatment	Dosage Fl. oz/A	White Mold			Yield lbs/A
		% Incidence	% Severity	Index	
Priaxor + NIS	6	10	1.6	0.43	2053
Non-Treated Check	Check	74	53	3.6	1421
Proline + NIS	5	7	0.6	0.29	2081
Quash + NIS	3	7	0.7	0.31	2214
Endura	5	53	28	2.5	1480
Thiophanate Methyl	2 lbs/A	7	0.5	0.3	1874
Mean		24	14	1.3	1910
CV%		34	55	33	12.4
LSD (5%)		13	11	0.6	347
NIS: Non-Ionic Surfactant at 0.25% v/v					

Langdon received above average rainfall during the growing season. The results indicate there were significant differences obtained among the variables tested when compared with the non-treated check. The fungicide Quash, followed by Proline and Priaxor gave the highest yields. Whereas, Thiophanate-Methyl had the lowest white mold incidence, severity and index.

Acknowledgements: Bryan Hanson, Travis Hakanson and Lawrence Henry for their technical support

Management of Blackleg in Canola with Fungicides

Amanda Arens and Venkat Chapara

The research trial was conducted at the Langdon Research Extension Center. The trial was planted on May 9th, 2016 with the canola variety “DKL 30-42 (Roundup Ready)” in a randomized complete block design and replicated four times. The trial location followed recommended practices for land preparation, fertilization, seeding rate and weed control.

The plot size was 5 ft. wide x 16 ft. long with a canola border between each plot. Two applications of fungicides were applied at the 2-4 leaf stage and 14 days after the first application using a CO₂-pressurized backpack style sprayer with a three nozzle boom (XR-8002) at 20 GPA. The level of blackleg obtained was completely from natural infection. The severity of blackleg infection was evaluated on 100 plants averaged over four replications after swathing on August 22. Individual plants were uprooted, cut through the basal part of the stem and scored on the percent of diseased tissue visible in the cross-section. The ratings were zero when no diseased tissue was visible in the cross-section, and 100 if the diseased tissue occupied 100 percent of the cross-section with significant constriction of affected tissues, drying of tissue and brittle or the plant was completely dead. The results indicate there were significant differences obtained among the variables tested when compared with that of the non-treated check. There were no significant differences observed among the fungicide treatments in blackleg incidence or severity levels, however, all the fungicide treatments were significantly differing in blackleg incidence and severity levels from that of the non-treated check.

Treatment	Dosage	Blackleg	
	Fl. oz/A	% Incidence	% Severity
Headline + NIS	6	9	23
Priaxor + NIS	6	10	15
Proline + NIS	4.3	11	15
Non-Treated Check	Check	26	42
Mean		14	53
CV%		39	24
LSD (5%)		8	19
1st application timing: at 2-4 leaf stage			
2nd application timing: at 14 days after First spray			
NIS: Non-Ionic Surfactant at 0.25% v/v			

Yield data (not shown) was impacted by excessive rainfall during the crop season that resulted in the development of white mold. A blanket application of fungicide was not applied for white mold control at bloom stage. Yield results are unreliable because any yield differences observed among the treatments cannot be attributed to a specific disease.

Management of Fusarium Head Blight in Spring Barley Cultivars with Fungicides

Venkat Chapara, Amanda Arens, and Andrew Friskop

Objective: To evaluate the efficacy of fungicides in single and sequential applications to manage Fusarium head blight (FHB) in barley.

Methods:

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with four replications.

Previous crop: Soybean

Cultivars of barley tested: Tradition and Quest

Planting: 1.2 million pure live seeds/A was planted on May 2, 2016. A border plot was planted between treated plots to minimize interference from spray drift.

Plot size: Seven rows at six inch spacing. 5 ft. x 20 ft., mowed back to 5 ft. x 16 ft.

Herbicides Applied: Axial XL (16.4 Fl. oz/A) + Huskie (15 Fl. oz/A)

Inoculation: Plots were inoculated by spreading corn spawn inoculum at around boot stage (Feekes 9-10) at the rate of 300 g/plot.

Disease development: Supplemental moisture was provided by running overhead irrigation from Feekes 9 to 11.25 at the rate of one hour per day to create a conducive environment for FHB development.

Fungicide treatments: Fungicides were applied, with CO₂-pressurized backpack sprayer with a three nozzle boom (XR-8002) and the water volume used was 20 GPA. Fungicide application was made at Feekes 10.51(Full head emergence) on June 28 and 4 days after the first spray (July 3, 2016).

Disease Assessment: FHB incidence was calculated by counting the number of heads showing FHB symptoms out of 50 heads that were rated for severity. FHB head severity was rated using 0-100% scale on arbitrary 50 heads, excluding two outer rows. FHB index (Index) was calculated using formula: Index = (SEV*INC)/100.

Harvest: Plots were harvested on August 24 with a small plot combine and the yield was determined.

Data Analysis: Statistical analysis was done using SAS. Fisher’s least significant difference (LSD) was used to compare means at $p (\alpha = 0.05)$. Actual means are presented in the table for simplicity of understanding.

Results:

The barley variety “Tradition” had the lowest FHB incidence, severity, index, and DON content when treated with the combination of Provaro + Caramba applied at Feekes 10.51 and repeated 4 days after the first application (Table 1). Likewise, the same treatment has higher yield, test weight and plump than the other fungicide treatments and was significantly different from both inoculated and non-inoculated checks. On the barley variety “Quest” the combination treatment of Provaro + Caramba applied at Feekes 10.51 and repeated 4 days after the first application was significantly different in efficacy against the variables tested (Table 1) and were followed by other combination treatments. However, all the fungicide treatments were significantly different when compared with inoculated and non-inoculated checks.

Table 1: Fungicides tested alone and in combinations on two barley varieties at two application timings to manage Fusarium head blight and evaluation of their influence on yield and other grain characteristics: toxin (DON) content, test weight, and plump.

Variety	Treatments	Dosage Fl. oz/A	Application Timing	Fusarium Head Blight Incidence (%)	Severity (%)	Index	DON (ppm)	Test Weight (lbs/bu)	Plump (%)	Yield (bu/A)
Tradition	Untreated check (Inoculated)	...	...	37	13	5.2	20.4	43	82	86
Tradition	Provaro	6.5	Heading	9	8	0.68	8.03	45	89	100
Tradition	Provaro+Caramba	6.5 + 14	Heading + 4 days after heading	3	2	0.06	1.8	46	92	101
Tradition	Caramba+Folicur B	14 + 4	Heading + 4 days after heading	8	4	0.47	9.1	45	90	101
Tradition	Proline+Folicur B	5.7 + 4	Heading + 4 days after heading	15	6	2.2	5	46	91	99
Tradition	Untreated check (non-inoculated)	...	...	20	10	2.1	16.9	43	81	81
Quest	Untreated check (Inoculated)	...	...	45	18	9.2	15.1	42	77	76
Quest	Provaro	6.5	Heading	20	10	2.4	9.8	43	80	84
Quest	Provaro+Caramba	6.5 + 14	Heading + 4 days after heading	8	6	0.42	2.2	45	86	96
Quest	Caramba+Folicur B	14 + 4	Heading + 4 days after heading	7	4	0.3	4	44	85	94
Quest	Proline+Folicur B	5.7 + 4	Heading + 4 days after heading	7	4	0.3	2.6	45	84	92
Quest	Untreated check (non-inoculated)	...	...	24	9	2.2	10	42	79	83
			Mean	17	8	2.1	8.7	44	85	91
			CV %	72	63	131	62	2	4	11
			LSD (5%)	17	7	4	8	1	5	14

Note: Untreated check (non-inoculated) received no artificial inoculum

DON: Deoxynivalenol

Acknowledgements: Bryan Hanson, Travis Hakanson and Lawrence Henry for their technical support.

Efficacy of Stratego and Provaro for the Control of Leaf and Head Disease in Spring Barley

Venkat Chapara and Amanda Arens

Objective: To evaluate the efficacy of fungicides to manage leaf and head disease (FHB) in spring barley.

Methods:

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with four replications.

Previous crop: Soybean

Cultivar of barley tested: Pinnacle (2-row barley)

Planting: 1.2 million pure live seeds/A was planted on May 2, 2016. A border plot was planted between treated plots to minimize interference from spray drift.

Plot size: Seven rows at six inch spacing. 5 ft. x 20 ft., mowed back to 5 ft. x 16 ft.

Herbicides Applied: Axial XL (16.4 Fl. oz/A) + Huskie (15 Fl. oz/A)

Inoculation: Plots were inoculated by spreading corn spawn inoculum at around boot stage (Feekes 9-10) at the rate of 300 g/plot.

Fungicide treatments: Fungicides were applied, with CO₂-pressurized backpack sprayer with three nozzle booms (XR-8002).

Fungicide application was made at herbicide application timing (June 5 with water volume of 10 GPA) and at Feekes 10.51 or full head emergence stage (July 3, with water volume of 20 GPA).

Disease Assessment: FHB incidence was calculated by counting the number of heads showing FHB symptoms out of 50 heads that were rated for severity. FHB head severity was rated using 0-100% scale on arbitrary 50 heads, excluding two outer rows. FHB index was calculated using formula: Index = (SEV*INC)/100.

Harvest: Plots were harvested on August 24 with a small plot combine and the yield was determined.

Data Analysis: Statistical analysis was done using SAS. Fisher's least significant difference (LSD) was used to compare means at p ($\alpha = 0.05$). Actual means are presented in the table for simplicity of understanding.

Results:

The lowest FHB incidence, severity, index, DON and yield were observed in a fungicide combination treatment of Stratego + Prosaros applied at herbicide timing and at Feekes 10.51, respectively. Likewise, Prosaros applied at Feekes 10.51 (Table 1).

Table 1: Fungicides tested alone and in combinations on barley at two application timings to manage foliar diseases and Fusarium head blight and evaluation of their influence on yield and other grain characteristics: toxin (DON) content, test weight, and plump.

Treatment	Dosage		Foliar Disease		Fusarium Head Blight		DON ppm	Test Weight lbs/A	Plump (%)	Yield bu/A
	Fl. oz/A	% Incidence	% Severity	% Incidence	% Severity	Index				
Stratego (A)	4	37	7	31	13	3.6	8.8	45	91	75
Prosaro+NIS (B)	6.5	14	4	12	10	1.2	4.2	46	95	93
Stratego (A)and Prosaros+NIS (B)	4 + 6.5	10	3	13	8	1.0	4.7	46	95	93
Non-Treated	Check	58	12	48	14	7.2	9.2	45	93	85
	Mean	30	6	26	11	3.3	6.7	46	93	86
	CV %	42	50	47	34	68	33	2	2	12
	LSD (5%)	19	5	19	ns	3	3	ns	ns	16
A in Parenthesis indicate Application timing at herbicide timing										
B in Parenthesis indicate Application timing at full head emergence										
Foliar Disease data consists of net blotch and spot blotch together.										
DON: Deoxynivalenol										
NIS: Non-Ionic Surfactant at 0.125 v/v										

Acknowledgements: Bryan Hanson, Travis Hakanson and Lawrence Henry for their technical support and Bayer Crop Science for funding.

Management of Fusarium Head Blight in Durum Wheat Cultivars with Fungicides

Venkat Chapara, Amanda Arens, and Andrew Friskop

Objective: To evaluate the efficacy of fungicides in single and sequential applications to manage Fusarium head blight (FHB) in durum wheat.

Methods:

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with four replications.

Previous crop: Soybean

Cultivars of durum tested: Carpio and Divide

Planting: 1.2 million pure live seeds/A was planted on May 2, 2016. A border plot was planted between treated plots to minimize interference from spray drift.

Plot size: Seven rows at six inch spacing. 5 ft. x 20 ft., mowed back to 5 ft. x 16 ft.

Herbicides Applied: Prowl H₂O (36 Fl. oz/A) + Sierra (1 Fl. oz/A) + Huskie (15 Fl. oz/A)

Inoculation: Plots were inoculated by spreading corn spawn inoculum at around boot stage (Feekes 9-10) at the rate of 300 g/plot.

Disease development: Supplemental moisture was provided by running overhead irrigation from Feekes 9 to 11.25 at the rate of one hour per day to create a conducive environment for FHB development.

Fungicide treatments: Fungicides were applied, with CO₂-pressurized backpack sprayer with a three nozzle boom (XR-8002) and the water volume used was 20 GPA. Fungicide application was made at Feekes 10.51 (anthesis) on July 11 and repeated 4 days after the first application (July 15, 2016).

Disease Assessment: FHB incidence was calculated by counting the number of heads showing FHB symptoms out of 50 heads that were rated for severity. FHB head severity was rated using 0-100% scale on arbitrary 50 heads, excluding two outer rows. FHB index (Index) was calculated using formula: Index = (SEV*INC)/100.

Harvest: Plots were harvested on August 24 with a small plot combine and the yield was determined.

Data Analysis: Statistical analysis was done using SAS. Fisher's least significant difference (LSD) was used to compare means at $p (\alpha = 0.05)$. Actual means are presented in the table for simplicity of understanding.

Results:

Both durum varieties had the lowest FHB incidence, severity, index, DON content, FDK, and yield when treated with the combination fungicide treatments applied at Feekes 10.51 and repeated 4 days after the first application (Table 1) and were significantly different from the untreated (inoculated and non-inoculated) checks.

Table 1: Fungicides tested alone and in combinations on two durum varieties at two application timings to manage Fusarium head blight and evaluation of their influence on yield and other grain characteristics: toxin (DON) content, FDK, and test weight.

Durum Variety	Fungicide	Dosage		Application timing	Fusarium Head Blight			DON (ppm)	FDK (%)	Yield (bu/A)	Test Weight (lbs/bu)
		Fl. oz/A	...		Incidence (%)	Severity (%)	Index				
Carpio	Untreated check (Inoculated)	...	...	...	91	39	36	12.5	4	14	51
Carpio	Prosaro	6.5	Anthesis	Anthesis	71	24	18	14.5	4	35	54
Carpio	Prosaro+Caramba	6.5 + 14	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	23	9	3	2.8	5	55	58
Carpio	Caramba+Folicur B	14 + 4	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	31	17	5	4.5	4	47	56
Carpio	Prolite+Folicur B	5.7 + 4	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	32	14	5	2.0	4	58	58
Carpio	Untreated check (non-inoculated)	...	...	...	86	42	36	9.5	10	14	51
Divide	Untreated check (Inoculated)	...	...	...	89	41	36	18.3	5	12	50
Divide	Prosaro	6.5	Anthesis	Anthesis	77	29	23	12.5	4	33	53
Divide	Prosaro+Caramba	6.5 + 14	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	36	14	6	3.5	4	53	56
Divide	Caramba+Folicur B	14 + 4	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	58	23	14	4.5	4	46	55
Divide	Prolite+Folicur B	5.7 + 4	Anthesis+4 days after anthesis	Anthesis+4 days after anthesis	56	18	11	3.2	4	48	56
Divide	Untreated check (non-inoculated)	...	...	...	91	56	55	13.8	3	21	51
				Mean	62	27	21	8.6	5	36	54
				CV %	20	30	39	49.9	49	18	2
				LSD (5%)	18	12	12	6.2	3	9	3

Note: Untreated check (non-inoculated) received no artificial inoculum

DON: Deoxyvalenol

FDK: Fusarium Damaged Kernels

Acknowledgements: Bryan Hanson, Travis Hakanson and Lawrence Henry for their technical support

Management of Fusarium Head Blight in Spring Wheat Cultivars with Fungicides

Venkat Chapara, Amanda Arens, and Andrew Friskop

Objective: To evaluate the efficacy of fungicides in single and sequential applications to manage Fusarium head blight (FHB) in hard red spring wheat (HRSW).

Methods:

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with four replications.

Previous crop: Soybean

Cultivars of HRSW tested: WB Mayville and SY Ingmar

Planting: 1.2 million pure live seeds/A was planted on May 2, 2016. A border plot was planted between treated plots to minimize interference from spray drift.

Plot size: Seven rows at six inch spacing. 5 ft. x 20 ft., mowed back to 5 ft. x 16 ft.

Herbicides Applied: Axial XL (16.4 Fl. oz/A) + Huskie (15 Fl. oz/A) + Prowl H₂O (36 Fl. oz/A)

Inoculation: Plots were inoculated by spreading corn spawn inoculum at around boot stage (Feekes 9-10) at the rate of 300 g/plot.

Disease development: Supplemental moisture was provided by running overhead irrigation from Feekes 9 to 11.25 at the rate of one hour per day to create conducive environment for FHB development.

Fungicide treatments: Fungicides were applied, with CO₂-pressurized backpack sprayer with three nozzle boom (XR-8002) and the water volume used was 20 GPA. Fungicide application was made at Feekes 10.51 (anthesis) on July 4 and repeated 4 days after the first spray (July 8, 2016).

Disease Assessment: FHB incidence was calculated by counting the number of heads showing FHB symptoms out of 50 heads that were rated for severity. FHB head severity was rated using 0-100% scale on arbitrary 50 heads, excluding two outer rows. FHB index (Index) was calculated using formula: Index = (SEV*INC)/100.

Harvest: Plots were harvested on August 24 with a small plot combine and the yield was determined.

Data Analysis: Statistical analysis was done using SAS. Fisher's least significant difference (LSD) was used to compare means at $p (\alpha = 0.05)$. Actual means are presented in the table for simplicity of understanding.

Results:

Both the HRSW varieties had the lowest FHB incidence, severity, index, DON content, FDK, and yield when treated with the combination fungicide treatments applied at Feekes 10.51 and repeated 4 days after the first application (Table 1) followed by Prostaro alone and were significantly different from the untreated (inoculated and non-inoculated) checks.

Table 1: Fungicides tested alone and in combinations on two HRSW varieties at two application timings to manage Fusarium head blight and evaluation of their influence on yield and other grain characteristics: toxin (DON) content, FDK, and test weight.

HRSW Variety	Fungicide	Dosage Fl. oz/A	Application timing	Fusarium Head Blight			DON (ppm)	FDK (%)	Yield (bu/A)	Test Weight (lbs/bu)
				Incidence (%)	Severity (%)	Index				
WB Mayville	Untreated check (Inoculated)	...	...	54	21	11.5	6.2	10	24	55
WB Mayville	Prostaro	6.5	Anthesis	13	6	0.91	2.3	5	47	57
WB Mayville	Prostaro+Caramba	6.5 + 14	Anthesis+4 days after anthesis	7	3	0.91	1.3	1	58	58
WB Mayville	Caramba+Folicur B	14 + 4	Anthesis+4 days after anthesis	13	7	0.94	0.9	4	55	58
WB Mayville	Proline+Folicur B	5.7 + 4	Anthesis+4 days after anthesis	11	7	0.78	1.4	3	55	58
WB Mayville	Untreated check (non-inoculated)	...	...	56	20	11.4	6.5	12	30	55
SY Ingmar	Untreated check (Inoculated)	...	...	48	12	6.02	3.8	5	33	57
SY Ingmar	Prostaro	6.5	Anthesis	12	6	0.91	2.8	2	56	59
SY Ingmar	Prostaro+Caramba	6.5 + 14	Anthesis+4 days after anthesis	4	2	0.08	0.6	1	68	60
SY Ingmar	Caramba+Folicur B	14 + 4	Anthesis+4 days after anthesis	5	3	0.19	0.9	2	66	59
SY Ingmar	Proline+Folicur B	5.7 + 4	Anthesis+4 days after anthesis	7	2	0.77	0.8	1	67	60
SY Ingmar	Untreated check (non-inoculated)	...	...	46	10	4.5	5.8	5	38	57
			Mean	23	8	50	2.8	4	50	58
			CV %	28	35	3.1	35	53	13	1
			LSD (5%)	9	4	2.3	1.4	3	9	1

Note: Untreated check (non-inoculated) received no artificial inoculum

DON: Deoxynivalenol

FDK: Fusarium Damaged Kernels

Acknowledgements: Bryan Hanson, Travis Hakanson and Lawrence Henry for their technical support

DETERMINING THE ECONOMIC RESPONSE OF SODIC SOILS TO REMEDIATION BY GYPSUM, ELEMENTAL SULFUR AND VERSALIME IN NORTHEAST NORTH DAKOTA ON TILED FIELDS

By

Naeem Kalwar (Extension Area Specialist/Soil Health)

INTRODUCTION:

Saline and sodic soils have been reported in North Dakota since the 1960s. NDSU Extension Bulletin No. 2 reported more than 1 million acres affected by high salt levels, whereas, more than 2 million acres are said to have excessive levels of sodium (Salt Affected Problem Soils in North Dakota, Their Properties and Management by Gordon A. Johnsgard, reprinted in 1974). This is a result of high salt and sodium levels in the soil parent material and the underlying sodium-rich shale present in the bedrock below the soil sediments. Rising groundwater levels and resulting capillary rise of soil water leads to the accumulation of excessive soluble salts (salinity) and sodium (sodicity).

Saline soils will have excessive levels of soluble salts in the soil solution which are a combination of positively and negatively charged ions (for example, table salt; Na^+Cl^-). High levels of ions (positive and negative) from soluble salts restrict normal water uptake by plant roots, even when soils are visibly wet, resulting in drought-stressed plants (“osmotic effect”).

Saline soils having higher levels of calcium (Ca^{2+})-based salts will have good structure. That happens as calcium (Ca^{2+}) ions encourage aggregation of soil particles called flocculation (clumping together), resulting in well-defined pores facilitating free water movement through the soil profile.

In contrast to saline soils, sodic soils are highly saturated with sodium ions (Na^+) at the soil cation exchange sites. Sodic soils have extremely poor soil structure with dense soil layers, resulting in very slow permeability of water through the soil profile. The poor structure of sodic soils is due to three reasons:

- High sodium levels in combination with low salt levels can promote “soil dispersion,” which is the opposite of flocculation. Ions such as sodium (Na^+), and in some cases magnesium (Mg^{2+}), cause the breakdown of soil aggregates (soil dispersion), resulting in poor soil structure (low “tilth” qualities). Forces that hold clay particles together with soil aggregates are weakened greatly when excessive sodium (Na^+) ions are attached to the clay particles and when wet clay particles break away easily from soil aggregates.
- As excessive sodium (Na^+) levels increase, the tendency of soil aggregates is to disperse, and the released clay and silt particles then clog soil pores when washed down the soil profile.
- When highly saturated with sodium (Na^+) ions, the degree of swelling of expanding-type clays (smectite) increases. These soils are common in our region. As these soils swell (expand), the larger pores responsible for water drainage are constricted (Brady, C.B., and Weil, R.R. 2008. Pages 420 and 422, Chapter 10, “The Nature and Properties of Soils,” 14th edition, revised).

Due to poor soil structure, when wet, sodic soils will be gummy and may seem like they have “no bottom” to them, and when dry, they can be very hard.

OBJECTIVES:

Remediation of soil sodicity requires application of amendments that supply Ca^{2+} followed by salinity remediation practices of improving soil drainage and lowering the groundwater level. Ca^{2+} displaces Na^+ from the cation exchange sites and Na^+ moves into soil solution where it converts into a salt (Na_2SO_4) and leaches out with rainfall or irrigation.

An effective way to lower groundwater levels is to install a field tile drainage system. Since tiles are generally three to four feet below the surface, the efficiency of a tile drainage system depends upon the permeability of soil layers above the tiles. This requires analyzing soils for salts and Na^+ . In case of high Na^+ levels, not adding Ca^{2+} can render tiling ineffective. That could be achieved by sampling the areas in question and getting the samples analyzed by a soil laboratory. For detailed information on how to properly sample soils, please refer to the NDSU Publication: SF-1809; "Soil Testing Unproductive Areas". Another NDSU publication that provides detailed information regarding the suitability of soils for tiling is: SF-1617; "Evaluation of Soils for Suitability for Tile Drainage Performance". Challenges for landowners considering tiling could be:

- 1. What if high levels of sodium in the soils they would like to tile exist?**
- 2. If there are excess levels of sodium requiring application of soil amendments, what should be done first; apply the amendments or tile the land?**

In July 2014, the Langdon Research Extension Center (LREC) tilled a field that had excessive levels of Na^+ and moderately high levels of soluble salts. This consisted of 12 research plots with three replications. In order to replicate field conditions, the project site was tilled in July 2014 prior to starting sodicity remediation by applying soil amendments that are suitable and easily available to northeast North Dakota growers.

The following objectives were set in order to achieve research goals.

- Can tiling be successful on sodic or saline-sodic soils prior to starting sodicity remediation?
- Comparing the relationship between varying water table levels and resulting soil salt and sodium levels.
- Analyzing water samples from the lift station, upstream and downstream for human and livestock health.

TRIAL LOCATION AND SITE DESCRIPTION:

This trial site is located at the NDSU Langdon Research Extension Center, Langdon, North Dakota. As per web soil survey, soil series are Cavour-Cresbard and Hamerly-Cresbard loams.

TRIAL DESIGN AND PLOT SIZE:

Trial design is randomized complete block. Each plot is 325 X 80 feet.

METHODOLOGY:

Soil Chemical Analysis

Four feet deep soil samples in 12" increments from each plot were collected in September 2014 and June 2016. Overall, there were 48 soil samples per year (12 plots x 4 depths = 48 samples). All samples and depths were analyzed for Salts (Electrical Conductivity) and sodium (Sodium Adsorption Ratio) along with other chemical properties.

Weekly Groundwater Level Measurements

Groundwater levels were measured on a weekly basis from May-October through the observation wells in each plot in 2015 and 2016.

Water Sample Analysis

Water samples were collected from the Langdon REC Groundwater Management Research Project site (lift station), upstream and downstream in fall-2015 and May, July and September of 2016. The samples were analyzed by the ND Department of Health for Group 2 complete mineral chemistry, Group 7 trace metals and Group 30 nutrients.

Treatments and Replications

Soil amendment rates were calculated to bring the SAR (SAR-final) numbers to an acceptable level of 3 in the 1st foot. This was done by deducting three from the actual SAR numbers (SAR-initial). SAR-final values were converted into Exchangeable Sodium Percentage (ESP) by using the formula given in “Diagnosis and Improvement of Saline and Alkali Soils” (USDA Salinity Laboratory Staff, Agriculture Handbook No. 60, 1954. Page-26). Gypsum rates were then calculated by using standard formula given in the same handbook (page-49). For each ton of 100% pure gypsum, 0.19 ton of 100% pure elemental sulfur was applied (Reclaiming Saline, Sodic, and Saline-Sodic Soils. University of California, ANR Publication 8519, August 2015). Considering the very low solubility of VersaLime, for each ton of 100% pure gypsum, three tons of VersaLime were applied. Differences in amendment purities were compensated by using the formula given in “Reclaiming Sodic and Saline/Sodic Soils” (Drought Tips Number 92-33, University of California Cooperative Extension, 1993).

The following treatments were applied in three replications.

- i. Control.
- ii. Full rate of 99.5% pure gypsum to lower soil SAR-final levels to 3.
- iii. Full rate of VersaLime to lower the soil SAR-final levels to 3.
- iv. Full rate of 90% pure elemental sulfur (S^o) to lower the soil SAR-final levels to 3.

Details of amendment rates for each treatment and replication is in the table below.

Treatment number	99.5% Gypsum tons/plot	90% Elemental Sulfur tons/plot	VersaLime tons/plot
R1T1	0	0	0
R1T2	4.47	0	0
R1T3	0	0	8.74
R1T4	0	2.10	0
R2T1	0	0	0
R2T2	7.25	0	0
R2T3	0	0	30.45
R2T4	0	0.61	0
R3T1	0	0	0
R3T2	10.67	0	0
R3T3	0	0	22.93
R3T4	0	2.16	0
Total	22.40	4.87	62.14

Note: Gypsum and elemental sulfur were applied on June 29th, whereas, VersaLime was applied on July 23rd 2015. After spreading, all of the amendments were rototilled into the soil. Control plots were also rototilled for uniformity purposes. Control structures for all of the treatment were fully opened right after the incorporation of the amendments in order to simulate free drainage and achieve maximum leaching conditions.

RESULTS AND DISCUSSION:

Can Tiling Be Successful on Sodic or Saline-Sodic Soils Prior to Starting Sodicty Remediation

Soil salt and sodium levels were assessed at the time of tiling and two years after tiling. Tiling prior to starting sodicty remediation can actually elevate the soil sodium levels due to the leaching of soluble salts under improved drainage conditions.

Cumulative data showed a decrease in soil salt levels (EC) ranging from 42.17% to 71.85% for all treatments and depths. Unit decreases ranged from -3.57 to -6.52 dS/m.

Soil pH increased for all treatments and depths. The percent difference ranged from 7.17% to 18.64%, whereas, unit increases ranged from 0.53 to 1.28.

Soil sodium levels gave mixed results. Seven out of the 16 results showed a decrease in SAR levels ranging from 3.29% to 32.66% with unit decreases of -0.44 to -5.15. Nine remaining results showed an increase in SAR levels. The increase difference in percentage ranged between 6.90% and 28.46%. Unit increases ranged from 1.09 to 5.04.

Cumulative Data		Before Amendments (2014)			After Amendments (2016)			Differences					
Trt. #	Depth (in.)	EC (dS/m)	pH	SAR	EC (dS/m)	pH	SAR	EC Dif. (%)	EC Dif. (dS/m)	pH Dif. (%)	pH Dif. (units)	SAR Dif. (%)	SAR Dif. (units)
T1 (CT)	0-12"	9.07	6.91	13.97	2.55	7.78	11.03	-71.85	-6.52	12.49	0.86	-21.08	-2.95
	12-24"	7.32	6.97	11.19	3.17	7.72	8.85	-56.72	-4.15	10.71	0.75	-20.95	-2.34
	24-36"	7.00	7.31	11.66	2.52	7.91	9.94	-63.98	-4.48	8.26	0.60	-14.77	-1.72
	36-48"	6.21	7.05	13.52	2.15	8.10	13.07	-65.34	-4.06	14.95	1.05	-3.29	-0.44
T2 (GP)	0-12"	9.41	6.88	16.32	3.40	7.63	20.39	-63.92	-6.02	11.00	0.76	24.90	4.06
	12-24"	9.53	6.98	17.56	4.63	7.94	19.11	-51.38	-4.90	13.81	0.96	8.83	1.55
	24-36"	9.18	7.08	17.72	4.43	7.99	22.76	-51.71	-4.75	12.90	0.91	28.46	5.04
	36-48"	10.21	7.26	21.86	3.49	8.10	23.81	-65.83	-6.72	11.47	0.83	8.91	1.95
T3 (VL)	0-12"	9.20	6.89	15.77	3.47	7.83	10.62	-62.27	-5.73	13.59	0.94	-32.66	-5.15
	12-24"	10.03	7.14	13.72	4.71	7.83	14.88	-53.06	-5.32	9.72	0.69	8.41	1.15
	24-36"	9.17	7.35	15.85	4.46	7.88	16.94	-51.40	-4.71	7.17	0.53	6.90	1.09
	36-48"	8.39	7.19	20.01	3.51	8.05	18.84	-58.20	-4.88	11.91	0.86	-5.83	-1.17
T4 (ES)	0-12"	9.49	6.85	18.74	4.33	7.74	16.49	-54.32	-5.15	13.05	0.89	-11.99	-2.25
	12-24"	8.47	7.01	15.40	4.90	7.99	18.54	-42.17	-3.57	13.93	0.98	20.36	3.14
	24-36"	8.55	7.03	15.16	4.64	7.86	18.62	-45.79	-3.92	11.85	0.83	22.80	3.46
	36-48"	9.14	6.89	17.03	3.72	8.17	19.43	-59.34	-5.42	18.64	1.28	14.06	2.40

Note: CT stands for control, GP for gypsum, VL for VersaLime (beetlime) and ES for elemental sulfur.

Relationship Between Groundwater Levels and the Varying Salt and Sodium Levels

Though there are no conclusive results yet, however, two plots with the shallowest average groundwater levels in 2015 and 2016 (R3T2 and R3T4) showed the highest increase for sodium (SAR), whereas, salts levels (EC) decreased considerably.

Treatment	2015 Av. GW Level (feet)	2016 Av. GW Level (feet)	2015-2016 Av. GW Level (feet)	Difference (feet)
R1T1 (CT)	4.89	3.52	4.21	1.38
R1T2 (GP)	5.14	3.47	4.31	1.67
R1T3 (VL)	5.65	4.53	5.09	1.11
R1T4 (ES)	4.13	3.63	3.88	0.50
R2T1 (CT)	4.70	4.29	4.50	0.42
R2T2 (GP)	4.73	4.27	4.50	0.46
R2T3 (VL)	5.14	4.45	4.79	0.69
R2T4 (ES)	4.71	4.33	4.52	0.38
R3T1 (CT)	3.74	3.53	3.64	0.21
R3T2 (GP)	3.73	2.69	3.21	1.03
R3T3 (VL)	4.10	3.25	3.68	0.85
R3T4 (ES)	3.14	2.70	2.92	0.44

Water Quality Draining from the Research Project Site for Human and Livestock Health

All minerals and nutrients affecting human and livestock health, were found to be within the acceptable limits in the samples coming out the Langdon REC Groundwater Management Research Project site.

CONCLUSION:

Based on two year's cumulative data, it could be concluded that soil sodium levels did increase considerably in 56.25% samples. Increased sodium levels mean higher amendment costs and longer wait to achieve maximum productivity. Landowners considering tiling, should consider the following recommendations before installing an expensive tile system. That will save them money and ensure correct use of technology:

- Potential fields **“should be analyzed for salts and sodium”**.
- If sodicity is established, **“application of soil amendments should be considered before tiling”**.

EFFECT OF TREATED AND UNTREATED HOMOGENEOUS BLENDS OF NITROGEN AND SULFUR VERSUS STRAIGHT FERTILIZERS ON THE YIELD AND QUALITY OF CANOLA SEED IN NORTHEAST NORTH DAKOTA

By

Naeem Kalwar (Extension Area Specialist/Soil Health)

Introduction

Nitrogen and sulfur are two of the thirteen essential plant nutrients that plant roots absorb from the soil. Nitrogen is not only an essential component of all proteins, but is also taken up by the plants in large quantities. Its deficiency often results in slow and growth stunted plants along with chlorosis. Being a secondary plant nutrient, sulfur is also required in higher quantities by the plants. Apart from being a structural component of the amino acids, proteins, vitamins and enzymes, sulfur is also essential for the production of chlorophyll.

Since canola is especially responsive to sulfur, general North Dakota State University fertilizer recommendation for nitrogen and sulfur are 130 to 150 pounds of nitrogen and 15 to 30 pounds of sulfur in sulfate form (SO_4^-)/acre for a yield potential of 2000 to 3000 pounds of canola seed/acre. (North Dakota Fertilizer Recommendation Tables and Equations, 2010. SF-882, Revised).

In order to fulfill these nutritional requirements, producers often apply a physical blend of urea and ammonium sulfate (AS). While a physical blend may have the nutrient quantities applicators would be aiming for, once spread on the field it may result in uneven nutrient streaking. Another option could be a treated (with urea inhibitors) or untreated homogeneous blend, containing optimum quantities of nitrogen and sulfur.

Objectives

Considering the high nutritional requirements of canola versus most crops, a fertilizer trial was conducted at the Langdon Research Extension Center in 2016 on behalf of Yara North America, Inc. The objective of the trial was to compare the effects of different untreated (Amidas, UreaS, Urea + ES) and treated (with N stabilizer/urea inhibitor; Amidas 2.0, UreaS 2.0 and Urea 2.0 + ES) homogeneous blends of nitrogen and sulfur versus physical blends of straight fertilizers, on the yield and quality of canola seed.

Trial Location

Trial site was located at the NDSU Langdon Research Extension Center, Langdon, North Dakota.

Treatments and Replications

Based on the soil analysis results, no treatment received phosphorous and potassium application. Also, sulfur was only applied through the homogeneous blends. Sulfur applied through homogeneous blends varied in form (SO_4^{2-} versus S^0). Sulfur rates/acre also varied as calculations were based on N rates. Considering that, full NDSU recommended rate included 150 pounds of N, no P, no K and 21 to 36.58 pounds of S /acre (depending upon S % in the homogeneous blend). T1 served as control and did not receive any fertilizer. T2 included full NDSU recommended rate through straight fertilizers with no S. T3, T4 and T5 received full NDSU recommended rates through Amidas, UreaS and Urea + ES blends. T6 received rates similar to T2 with the exception that it included Agrotain-treated urea. T7, T8 and T9 received the three homogeneous blends treated with N inhibitors (Amidas 2.0, UreaS 2.0 and Urea 2.0 + ES) at full NDSU recommended rates. T10 to T17 were similar to T2 to T9 except that both N and S rates were reduced by 30%. Overall there were seventeen treatments and four replications. Agrotain-treated urea was treated with AGROTAIN ULTRA stabilizer at the rate of 3 quarts/ton.

Details of the treatments, fertilizer/blend type and nutrients quantities/acre are given in the below table.

Treat. #	Fertilizer Type / Blend	Explanation	N (lb/ac)	P (lb/ac)	K (lb/ac)	S (lb/ac)
T1	TSP + KCl	Full rates of P and K with no N and S (control)	0	0	0	0
T2	Urea + TSP + KCl	Full rates of N, P and K with no S	150	0	0	0
T3	(Amidas) + TSP + KCl	Full rates of N, P, K and S	150	0	0	21.0
T4	(UreaS) + TSP + KCl	Full rates of N, P, K and S	150	0	0	29.6
T5	(Urea + ES) + TSP + KCl	Full rates of N, P, K and S	150	0	0	36.6
T6	Agrotain Urea + TSP + KCl	Full rates of N, P and K with no S	150	0	0	0
T7	(Amidas 2.0) + TSP + KCl	Full rates of N, P, K and S	150	0	0	21.0
T8	(UreaS 2.0) + TSP + KCl	Full rates of N, P, K and S	150	0	0	29.6
T9	(Urea 2.0 + ES) + TSP + KCl	Full rates of N, P, K and S	150	0	0	36.6
T10	Urea + TSP + KCl	Full rates of P and K with 30% less N and no S	105	0	0	0
T11	(Amidas) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	14.7
T12	(UreaS) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	20.7
T13	(Urea + ES) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	25.6
T14	Agrotain Urea + TSP + KCl	Full rates of P and K with 30% less N and no S	105	0	0	0
T15	(Amidas 2.0) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	14.7
T16	(UreaS 2.0) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	20.7
T17	(Urea 2.0 + ES) + TSP + KCl	Full rates of P, K and S with 30% less N	105	0	0	25.6

Note:

- No fall-nitrogen was applied. Full rates of all fertilizer types were hand-broadcasted and harrowed-in before planting on May 18th, 2016.
- Full rates were based on NDSU recommended rates of N, P, K and S to target 3000 pounds/acre yield potential.
- No treatment received any P and K application as soil P and K levels were found to be sufficient.
- UreaS was a homogeneous mix of Urea + AS (38-0-0-7.5).
- Urea + ES was a homogeneous mix of Urea and elemental sulfur (41-0-0-10).
- Amidas was a homogeneous mix of Urea + AS (40-0-0-5.6).
- Blends with 2.0 were treated with N stabilizers; urea inhibitors.

Design and Plot Size

Trial was planted in a randomized complete block design. Each plot size was 15 X 25 feet including borders.

Planting

Location	Variety	Planting Date	Seed Rate (lbs./acre)	Drilling Space
Langdon REC	DKL72-40 Canola	May 18, 2016	4	7" width 1" depth

Leaf and Plant Sampling

Thirty 5th leaves from the top at full bloom stage were collected from each treatment on July 8th, 14th, 15th, 18th and 22nd and analyzed for total N and S.

Twelve to 15 whole plants at pod formation stage were collected from each treatment on August 4th and 5th and were analyzed for total N and S.

Harvesting

Plots were swathed on August 23rd and combined on September 1st, 2016.

Results and Discussion

Data was analyzed using SAS statistical package 9.4 at 95% confidence interval. Statistical data is given in the table below.

Treatments	Harvest Data					Plant Samples		Leaf Samples	
	Yield/acre (lbs)	Test Wt. (lbs/bu.)	1000 Seed Wt. (g)	Seeds / Pound	Oil (%)	T. N (%)	S (%)	T. N (%)	S (%)
1	2042	51.94	3.60	126620	51.43	1.80	0.23	4.85	0.70
2	2302	52.63	3.70	123778	47.33	2.30	0.20	5.33	0.51
3	2654	52.57	3.55	128638	47.22	2.13	0.32	5.53	1.04
4	2630	53.04	3.40	134577	47.25	2.62	0.46	5.47	1.11
5	2607	52.60	3.75	121190	48.45	2.39	0.32	5.43	0.91
6	2525	52.63	3.60	126388	47.05	2.48	0.28	5.43	0.87
7	2455	53.16	3.50	131001	46.25	2.52	0.38	5.49	1.00
8	2816	52.63	3.60	126554	47.05	2.55	0.40	5.27	0.90
9	2694	53.00	3.65	124896	47.06	2.50	0.36	5.40	0.91
10	2404	52.75	3.60	126980	46.97	2.19	0.27	5.18	0.61
11	2558	52.60	3.60	125998	48.22	2.39	0.33	5.59	0.88
12	2422	52.77	3.40	134151	46.95	2.44	0.36	5.14	1.03
13	2439	52.49	3.80	120035	47.85	2.30	0.25	5.50	0.97
14	2456	52.32	3.50	129704	47.89	2.26	0.27	5.12	0.72
15	2550	52.77	3.60	126785	46.65	2.59	0.36	5.48	1.05
16	2366	52.54	3.80	119532	47.71	2.41	0.33	5.23	0.96
17	2622	52.70	3.60	127851	47.72	2.16	0.29	5.21	0.94
HIGH MEAN	2816	53.16	3.800	134577	51.43	2.62	0.46	5.59	1.11
LOW MEAN	2042	51.94	3.400	119532	46.25	1.80	0.20	4.85	0.51
MEAN	2502	52.66	3.60	126745.70	47.59	2.35	0.32	5.33	0.89
C.V. %	10.02	0.84	8.62	8.84	2.69	17.77	32.68	5.21	33.42
LSD	356.12	0.62	0.44	15917	1.82	0.59	0.14	0.39	0.42
No. OF REPS	4	4	4	4	4	4	4	4	4
F-VALUE	1.99	1.58	0.56	0.57	3.14	0.97	1.61	1.93	1.22
Pr > F (α 0.05)	0.032	0.108	0.897	0.888	0.001	0.500	0.100	0.039	0.283

For yield (cleaned) in pounds/acre, there were statistically significant differences. T8 was significantly higher than T1, T2, T7, T10, T12, T13, T14 and T16, whereas, numerically higher than rest of the treatments. T1 (control) was found significantly lower than all of treatments except T2 and T16. Overall, numerically T8 had the highest and T1 had the lowest yield/acre.

There were no significant differences for test weight between any of the treatments. Numerically, T7 had the highest, whereas, T1 had the lowest test weight.

For 1000 kernel weight, no significant differences were observed. Numerically, T13 had the highest weight and T12 had the lowest weight for 1000 seeds.

For seeds/pound, there were no statistically significant differences. Numerically, T4 had the highest, whereas, T16 had the lowest number of seeds/pound.

Significant differences were observed for oil percentage among the treatments. T1 was significantly higher than rest of the treatments. Also, T5 was significantly higher than T7.

For leaf N and S concentration in percentage at full bloom stage, there were significant differences for total N percentage, whereas, no significant differences for S percentage were observed. For N percentage, T11 was significantly higher than T1, T10, T12, and T14. T1 was significantly lower for N percentage than all of the treatments, except T10, T12, T14, T16 and T17. For S, numerically, T4 had the highest and T2 had the lowest percentage.

For plant N and S concentrations in percentage at the pod development stage, there were no significant differences between any of the treatments. Numerically, T4 had the highest and T1 had the lowest total N percentage, whereas, for S, T4 had the highest and T2 had the lowest percentage.

Summary

Significantly highest canola seed yield/acre (2816 pounds/acre) was recorded for T8 at 150 pounds of N and 29.60 pounds of SO₄-S by applying the homogeneous blend of UreaS 2.0 treated with N stabilizer.

Numerically highest test weight (53.16 pounds/bushel) was recorded for T7, at 150 pounds of N and 21 pounds of SO₄-S by applying the homogeneous blend of Amidas treated with N stabilizer (Amidas 2.0).

Numerically highest weight for 1000 kernels (3.80 grams) was recorded for T13 at 105 pounds of N + 25.60 pounds of S^o-S by applying the homogeneous blend of Urea + ES.

Numerically highest seed/pound (134577) was recorded for T4 at 150 pounds of N + 29.60 pounds of SO₄-S by applying the homogeneous blend of UreaS.

Significantly highest oil percentage (51.43%) was recorded for T1 receiving no N or S application.

Numerically highest total N percentage (2.62%) among plant samples was recorded for T4 receiving 150 pounds of N + 29.60 pounds of SO₄-S by applying the homogeneous blend of UreaS.

Numerically highest S percentage (0.46%) among plant samples was also recorded for T4 receiving 150 pounds of N + 29.60 pounds of SO₄-S by applying the homogeneous blend of UreaS.

Significantly highest total N percentage (5.59%) among leaf samples was recorded for T11 receiving 105 pounds of N + 14.70 pounds of SO₄-S by applying the homogeneous blend of Amidas.

Numerically highest S percentage (1.11%) among leaf samples was recorded for T4 receiving 150 pounds of N + 29.60 pounds of SO₄-S by applying the homogeneous blend of UreaS.

Langdon REC Foundation Seed Stocks Program

The Langdon REC supports a Foundation Seed Stocks Program to help increase and distribute the newest NDSU varieties of HRSW, Durum, Barley and Flax. We also periodically increase seed for the University of Minnesota and South Dakota Ag Experiment Station. Each year approximately 350 acres are planted for the FSS program. The harvested acreage is available for sale to producers and seedsmen in the region. The varieties of crops that are available for the 2017 growing season are listed below:

HRSW – Glenn, Faller, Prosper, Elgin-ND, Linkert, Bolles

Barley – Lacey

Flax – Omega

Growers who have grown seed for certification in one of the last four years who request seed prior to December 1 will be guaranteed an allocation. Any seed inventories available after December 1 will be sold on a first come, first serve basis. Seed availability and prices may be obtained by calling the Langdon Research Extension Center.

Visit our website at www.ag.ndsu.edu/langdonrec/

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