



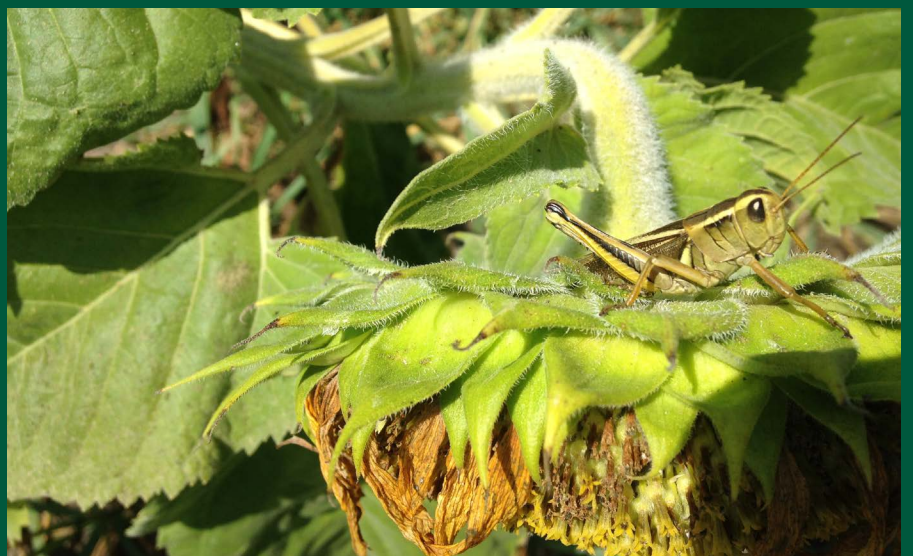
Langdon Research Extension Center

NORTH DAKOTA STATE UNIVERSITY

2015 ANNUAL RESEARCH REPORT

Annual Research Report No. 90

December 2015



NDSU Research and Extension Faculty and Staff Involved with the Langdon Research Extension Center

Randy Mehlhoff	Director
Bryan Hanson	Research Agronomist
Dr. Venkat Chapara	Research Plant Pathologist
Naeem Kalwar	Area Extension Specialist/Soil Health
Lesley Lubenow	Area Extension Specialist/Agronomy
Sara Schuchard-McGregor	Administrative Assistant
Travis Hakanson	Research Specialist/Agronomy
Lawrence Henry	Research Specialist/Agronomy
Kevin Beauchamp	Research Technician/Small Plot Research & Foundation Seed
James Chaput	Research Technician/Foundation Seed
Amanda Arens	Research Technician/Crop Protection
Allison Noll	Farm Business Management Instructor, LRSC
Dr. Anitha Chirumamilla	Cavalier County Extension Agent
Macine Lukach	Cavalier County Extension Agent

2015 Seasonal Employees

Mariah Bata	Julia Kartes	Corey Schrader	Justina Klindt
Stephanie Reko	Jaime Lundquist	Janet Hall	

Langdon Research Extension Center Advisory Board

Dr. Anitha Chirumamilla	Cavalier County Extension Agent
Paul Berntson	Producer, Adams, ND
Tom Borgen	Cavalier County Commission, Langdon, ND
Shannon Duerr	Cavalier County JDA
Leon Hiltner	Producer, Wales, ND
Janet Jacobson	Producer, Wales, ND
Bruce Lewallen	Producer, Bisbee, ND
Joe Miller	Producer, Park River, ND, ND District 10 Senator
David Monson	Producer, Osabrock, ND, ND District 10 Representative
Scott Nelson	Producer, Lakota, ND
Chuck Damschen	Producer, Hampden, ND, ND District 10 Representative
Kent Schluchter	Producer, Cavalier, ND
Aaron Johnson	Producer, Edmore, ND
Dennis Brown	Producer, Milton, ND
JoAnn Rodenbiker	Northern Plains Electric Cooperative, SBARE Member

NDSU Langdon Research Extension Center

9280 107th Ave. N.E.

Langdon, ND 58249

(701) 256-2582

fax (701) 256-2580

Website: www.ag.ndsu.edu/langdonrec

Email: NDSU.Langdon.REC@ndsu.edu

Table of Contents

Overview	4
2015 Crop Management - Langdon.....	5
2015 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	19-21
Langdon Durum	22
Off-Station Durum	23
HRWW	24
Corn.....	25
Langdon Barley	26
Off-Station Barley.....	27
Oats.....	28-29
Flax	30
Canola - Conventional.....	31-32
Canola - Roundup Ready	33-34
Langdon Dry Bean	35
Off-Station Dry Bean	36
Field Peas	37
Faba Beans and Buckwheat.....	38
Conventional Soybeans	39
Liberty Link Soybeans	40
Roundup Ready Soybeans.....	41-48
Sunflower	49-51
Energy Sugarbeet	52
Crop Production Research.....	53-60
Crop Disease Research.....	61-66
Soil Health & Fertility Research.....	67-73
Foundation Seed Increase.....	74
LREC Groundwater Management Project Layout	75

The 2015 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 at 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 2015. 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 Agricultural Improvement Association.

2015 Weather Summary

The 2015 growing season (May-September) was wetter and warmer compared to the 30-year average from 1981 to 2010 at Langdon. Precipitation from April-August was slightly higher than normal but rainfall in September was 5.63 inches or 3.60 inches above normal. Fall recharge at Langdon for September through October 2014 was 1.28 inches or 1.95 inches below normal. Precipitation from November 2014 through March 2015 was 2.50 inches or 0.75 inches below normal. Snowfall for 2014-2015 was 32.2 inches, less than one inch below normal. Winter temperatures were 0.3° F below normal. Soil moisture was below normal coming into spring allowing an earlier spring planting which started in mid to late April around the region. Rainfall was above normal with slightly below normal temperatures in May. Rainfall ranged from 104-166 percent of normal across the region from April-September with the Red River Valley area receiving the highest rainfall amounts. Temperatures generally averaged 1-2° F above normal between April through September with a small pocket in eastern Walsh County averaging 1-2° F below normal. A hard late killing freeze on May 30 in the northern tier of counties out of the valley resulted in many acres of canola being replanted. Yields were generally good for the cool and warm season crops. Soybean yields were reduced in some areas due to a dry period from mid-July to mid-August. The fall season was warmer and wetter than normal with good soil moisture recharge heading into next spring.

2015 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	April 29	Aug. 11	6
Buckwheat	soybean	700,000 pls	1000 lb	May 29	Sept. 28	6
Canola - LL, CL	soybean	610,000 pls	2500 lb	May 20	Aug. 31	6
Canola - RR	soybean	610,000 pls	2500 lb	May 12	Aug. 31	6
Corn	wheat	28,000 thinned	150 bu	May 5	Oct. 15	30
Durum	soybean	1.50 million pls	60 bu	April 28	Aug. 19	6
Dry Bean	wheat	70,000-90,000 pls	2000 lb	May 22	Sept. 16	30
Faba Bean	wheat	192,000 pls	4000 lbs	May 5	Sept. 3	6
Field Pea	wheat	300,000 pls	60 bu	May 5	Aug. 18	6
Flax	soybean	2.8 million pls	40 bu	May 29	Sept. 21	6
HRSW	soybean	1.50 million pls	60 bu	April 28	Aug. 19	6
HRWW	hrsw	1.25 million pls	100 bu	Sept. 15, 2014	Aug. 7	6
Oats	soybean	1.0 million pls	120 bu	April 29	Aug. 18	6
Soybean - Conventional	wheat	200,000 pls	60 bu	May 22	Sept. 30	6
Soybean - LL	wheat	200,000 pls	60 bu	May 22	Sept. 30	6
Soybean - RR	barley	200,000 pls	60 bu	May 22	Oct. 1	6
Sunflower - Confection	wheat	17,000 thinned	2500 lb	May 21	Oct. 16	30
Sunflower - Oil	wheat	20,000 thinned	2500 lb	May 21	Oct. 16	30
Soil Type - Svea-Barnes loam						

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 - Lakota
Katelyn Hain - Nelson County Agent
Lesley Lubenow - LREC Area Extension Specialist

2015 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	April 24	Aug. 12	6
Barley	wheat	1.25 million pls	100 bu	April 24	Aug. 12	6
Soybean	wheat	200,000 pls	60 bu	June 1	Oct. 7	6
Dry Bean	wheat	70,000-90,000 pls	2000 lb	May 28	Sept. 22	30
Park River (Walsh)						
HRSW	cover crop	1.50 million pls	65 bu	May 14	Aug. 26	6
Soybean	wheat	200,000 pls	60 bu	May 26	Oct. 6	6
Pekin (Nelson)						
HRSW	soybean	1.50 million pls	60 bu	April 16	Aug. 14	6
Soybean	wheat	200,000 pls	60 bu	May 23	Oct. 2	6
Cando (Towner)						
HRSW	soybean	1.50 million pls	60 bu	April 30	Aug. 25	6
Barley	soybean	1.25 million pls	100 bu	April 30	Aug. 25	6
Durum	soybean	1.50 million pls	60 bu	April 30	Aug. 25	6
Energy Beet	soybean	45,000 thinned	20 tons	May 27	Oct. 9	30
Location	Soil Type					
Cavalier	Fargo 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*	2015	Normal		Normal*	2015	Normal
April	1.24	0.74	-0.50	April	38.1	40.5	+2.4
May	2.29	3.39	+1.10	May	51.5	50.8	-0.7
June	3.24	4.29	+1.05	June	60.8	63.2	+2.4
July	2.86	2.95	+0.09	July	66.2	68.1	+1.9
August	2.59	1.48	-1.11	August	64.5	66.3	+1.8
September	2.03	5.63	+3.60	September	54.5	60.8	+6.3
Total	14.25	18.48	+4.23	Total	55.9	58.3	+2.4

*114 year average

Monthly Growing Degree Days and Normals-Langdon

	Wheat Growing Degree Days			Corn Growing Degree Days			Sunflower Growing Degree Days		
	2015	Normal	Deviation	2015	Normal	Deviation	2015	Normal	Deviation
April	345	274	+71	--	--	--	--	--	--
May	571	613	-42	225	219	+6	322	314	+8
June	903	875	+28	416	356	+60	586	519	+67
July	1052	1018	+34	549	499	+50	729	685	+44
August	947	962	-15	480	457	+23	660	642	+18
September	798	671	+127	371	255	+116	516	358	+158
Total	4616	4413	+203	2041	1786	+255	2813	2518	+295

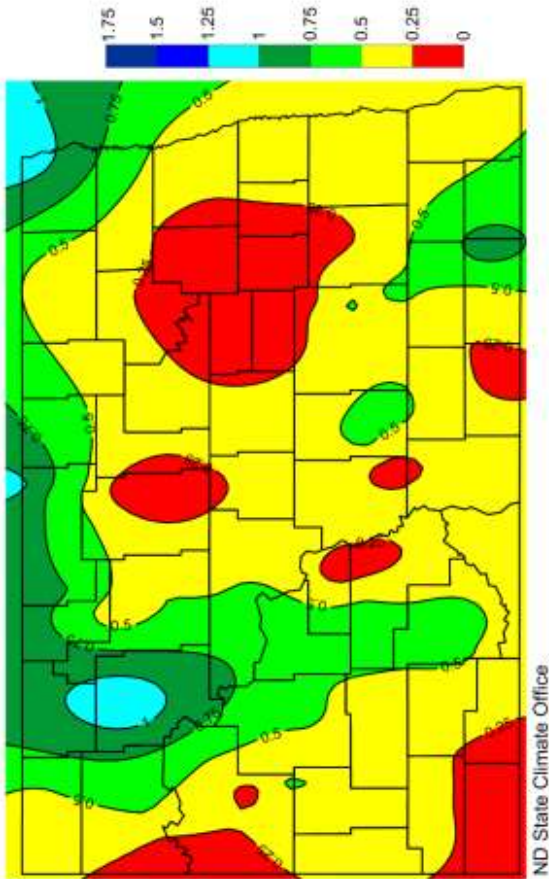
Frost Dates, Langdon and Selected Cities

	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
2015	30-May	30-May	29-Sep	15-Oct	122	138
Cavalier						
Normal	16-May	5-May	24-Sep	5-Oct	131	153
2015	30-May	12-May	29-Sep	29-Sep	122	140
Park River						
Normal	8-May	30-Apr	30-Sep	10-Oct	145	163
2015	30-May	9-May	29-Sep	7-Oct	122	151
Pekin						
Normal	18-May	3-May	22-Sep	30-Sep	127	150
2015	30-May	19-May	29-Sep	9-Oct	122	143

Normals are from the NWS. The 2015 frost dates are from the nearest reporting NDAWN station.

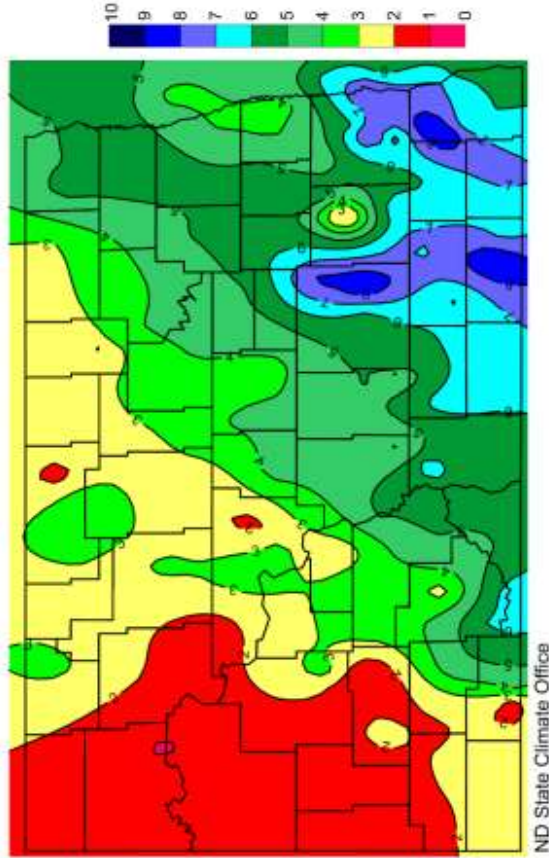
North Dakota April 2015 Precipitation (inches)

(Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



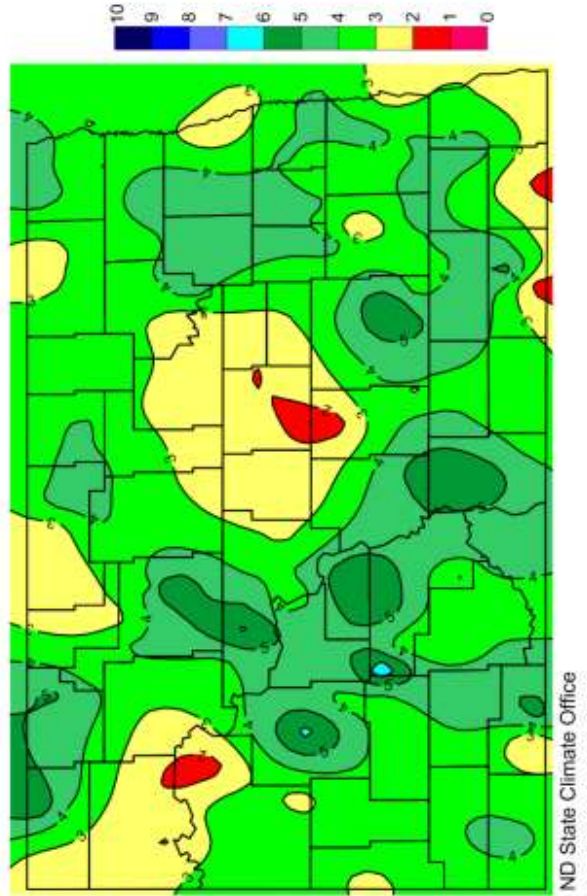
North Dakota May 2015 Precipitation (inches)

(Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



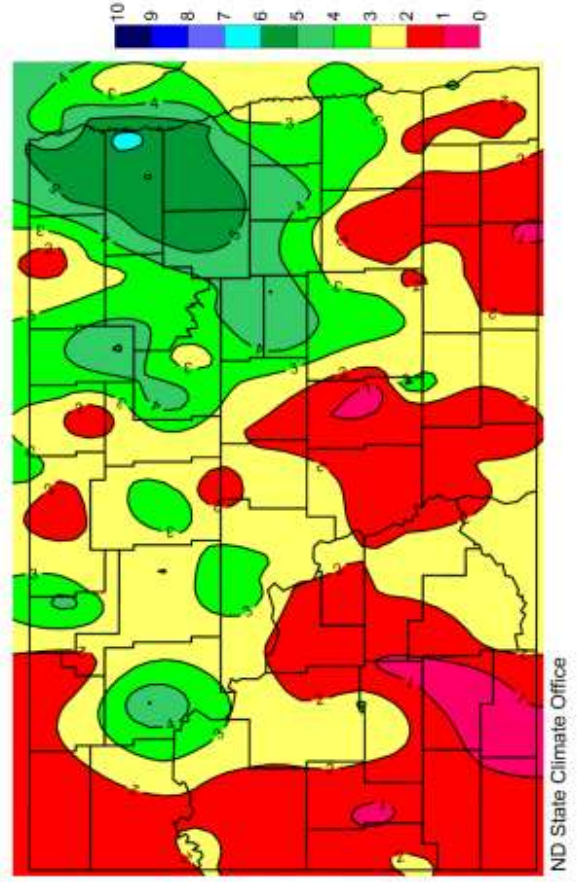
North Dakota June 2015 Precipitation (inches)

(Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)

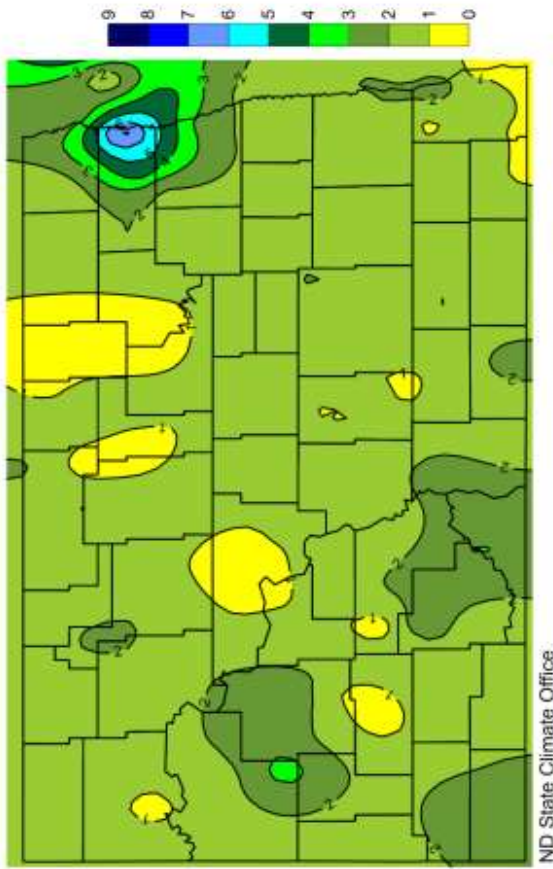


North Dakota July 2015 Precipitation (inches)

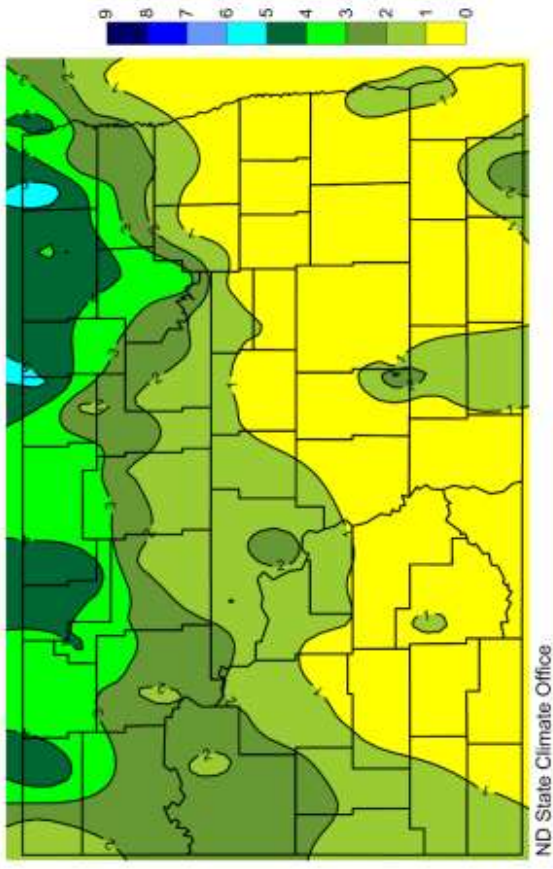
(Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



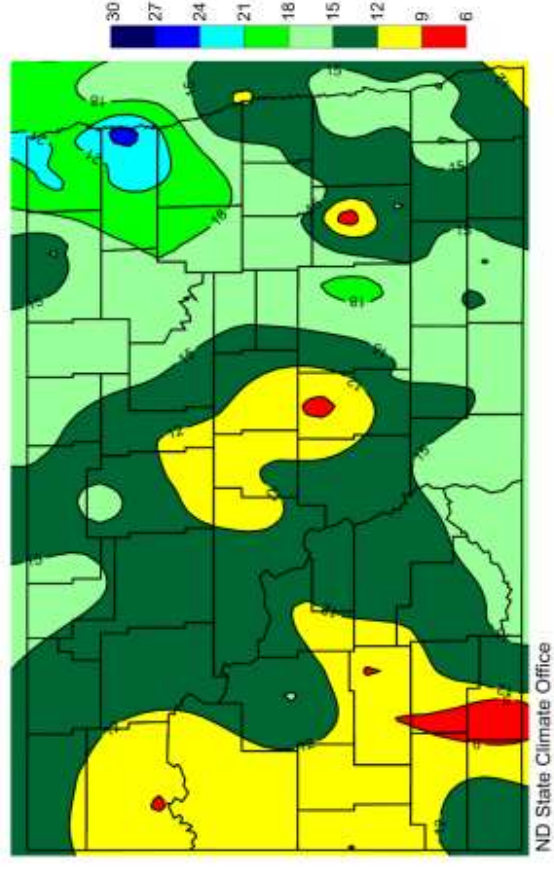
North Dakota August 2015 Precipitation (inches)
 (Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



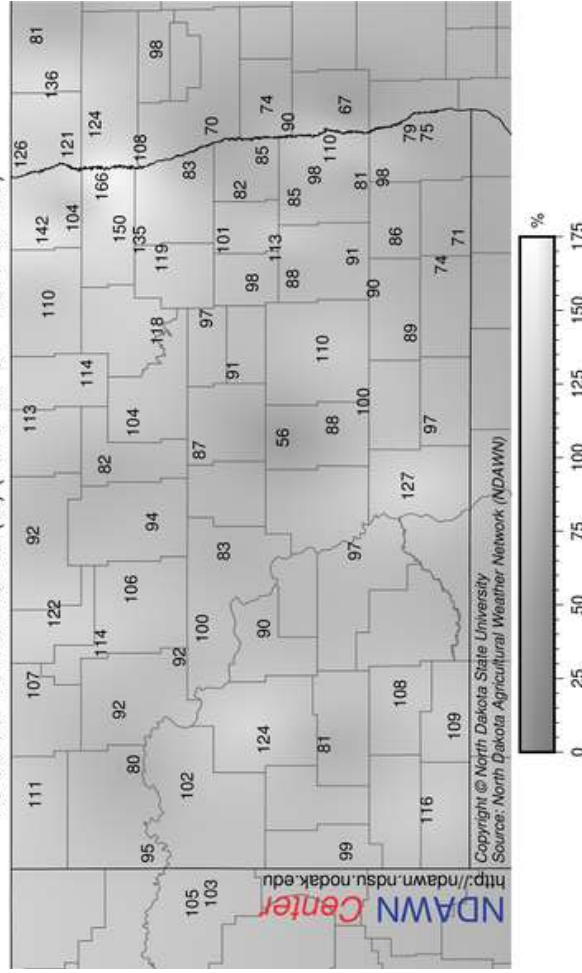
North Dakota September 2015 Precipitation (inches)
 (Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



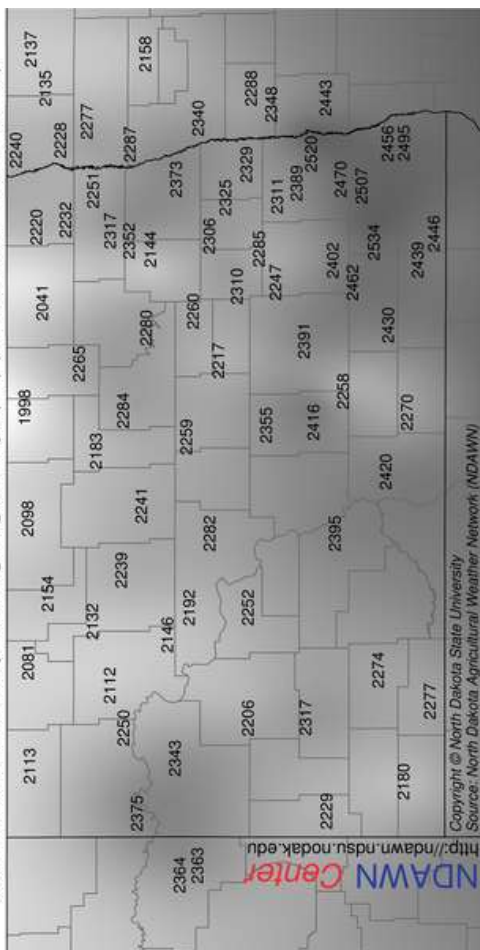
**North Dakota 2015 Growing Season
 (April through September) Precipitation (inches)**
 (Data from NWS Cooperative Network and the North Dakota Agricultural Weather Network)



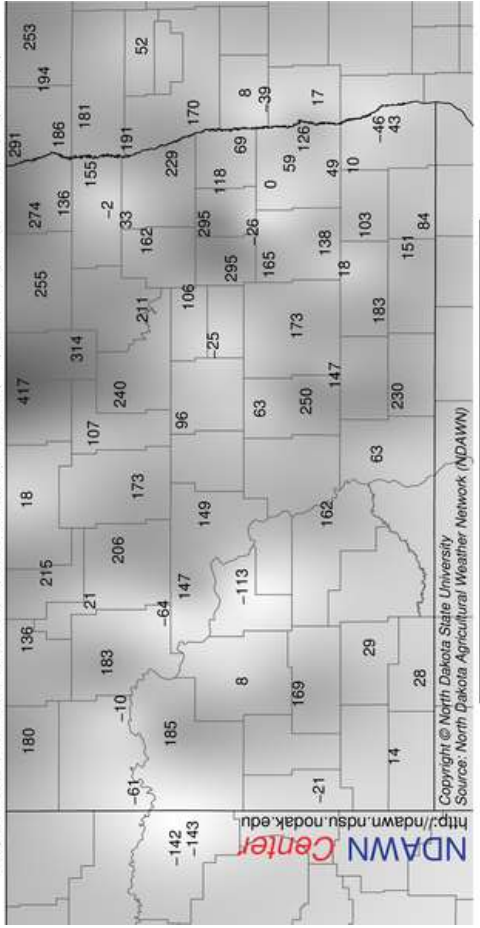
Percent of Normal Rainfall (%) (2015-04-01 - 2015-09-30)



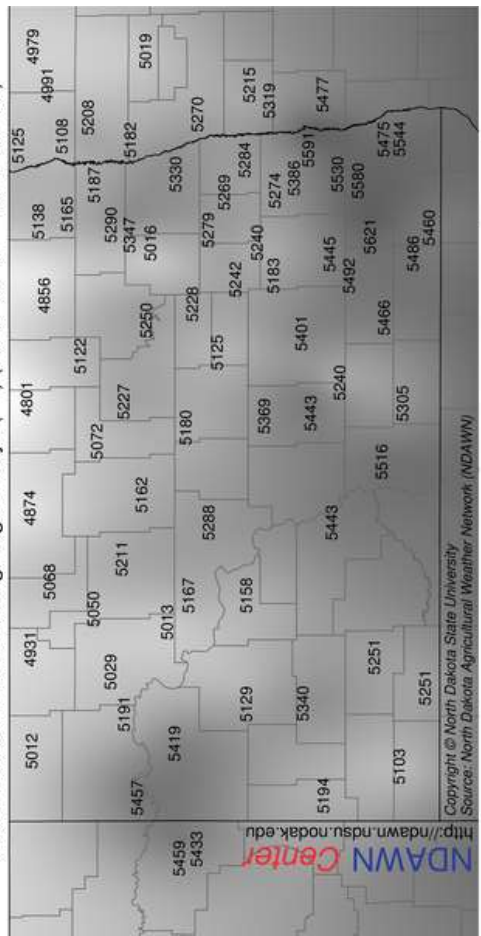
Corn Accumulated Daily Growing Degree Days (°F) (2015-05-01 – 2015-09-30)



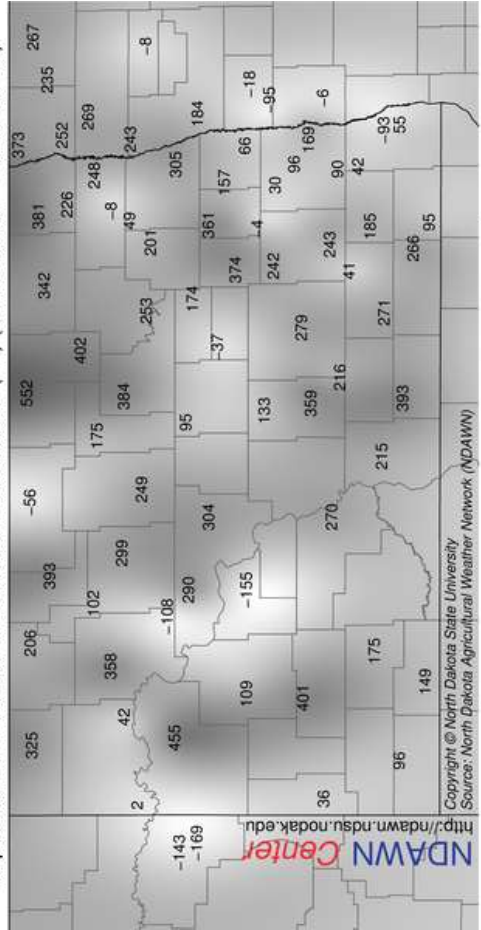
Departure from Normal Corn Accumulated GDD (°F) (2015-05-01 – 2015-09-30)



Accumulated Wheat Growing Degree Days (°F) (2015-04-01 – 2015-09-30)



Departure from Normal Wheat Accumulated GDD (°F) (2015-04-01 – 2015-09-30)



Average Data by Crop and Year Across Sites

HRSW	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)					Height (in)					Days to Head							
	5	4	5	5	15	11	12	13	14	15	15	5	4	5	5	15	4	5	5	5	15	12	13	14	15	3yr		
Variety	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	12	13	14	15	3yr	12	13	14	15	3yr
Faller	71	80	96	93	60	83	59.7	58.5	61.3	60.9	58.2	60.1	15.0	12.4	13.4	13.2	13.9	13.5	38	34	35	33	34	63	53	51	64	56
Barlow	63	72	82	81	57	73	60.5	59.3	61.8	61.6	59.5	61.0	15.7	13.8	14.1	14.2	14.7	14.3	39	33	35	34	34	60	50	48	63	54
Prosper	74	79	92	90	57	80	59.9	58.6	61.2	60.9	58.2	60.1	14.9	12.8	13.2	13.3	13.9	13.5	37	34	36	34	35	63	53	51	64	56
Samsom	66	71	86	85	63	78	59.1	58.7	60.2	59.9	57.1	59.1	15.2	13.6	13.7	13.3	13.6	13.5	31	29	31	30	30	60	52	50	63	55
Rollag	61	68	80	79	63	74	60.4	59.2	62.1	61.8	60.1	61.3	16.0	14.1	14.7	14.5	15.2	14.8	33	30	33	31	31	60	52	50	63	55
SY Soren	62	73	81	77	54	71	59.9	58.7	61.7	61.1	58.8	60.5	15.7	13.5	14.6	14.2	14.8	14.5	32	29	30	29	29	61	51	49	63	54
WB-Mayville	63	71	80	75	55	70	59.8	58.7	60.9	60.6	58.1	59.9	15.7	13.9	14.6	14.1	14.7	14.5	31	29	31	29	30	61	50	49	62	54
LCS Breakaway	--	74	82	78	57	72	--	60.0	62.6	62.3	56.8	60.6	--	13.9	14.6	14.4	14.6	14.5	34	30	31	31	31	60	50	48	62	53
Elgin-ND	--	75	88	82	59	76	--	58.1	61.2	60.7	58.2	60.0	--	13.1	14.3	14.0	14.4	14.2	40	36	37	36	36	61	51	50	64	55
Forefront	--	74	77	76	59	71	--	59.3	61.2	60.9	60.3	60.8	--	12.6	14.6	14.4	14.3	14.4	36	35	38	37	37	59	48	47	61	52
LCS Powerplay	--	72	89	83	58	77	--	58.8	61.7	61.6	58.9	60.7	--	12.7	13.6	13.7	14.0	13.8	34	32	34	31	32	61	52	51	64	56
SY Rowyn	--	--	84	82	61	76	--	--	61.0	61.1	59.3	60.5	--	--	13.8	13.5	14.0	13.8	--	30	33	30	31	--	50	49	63	54
Linkert	--	--	77	75	63	72	--	--	61.3	60.6	59.4	60.4	--	--	15.0	14.6	15.0	14.9	--	28	31	30	30	--	52	51	63	55
Prevail	--	--	--	81	62	--	--	--	--	60.6	58.9	--	--	--	--	13.8	13.8	--	--	--	36	34	--	--	--	50	62	--
SY Ingmar	--	--	--	79	62	--	--	--	--	61.5	60.1	--	--	--	--	14.4	14.7	--	--	--	31	32	--	--	--	50	63	--
WB9507	--	--	--	91	55	--	--	--	--	60.0	55.8	--	--	--	--	13.8	13.8	--	--	--	34	33	--	--	--	49	62	--
LCS Ignacu	--	--	--	85	63	--	--	--	--	61.0	60.2	--	--	--	--	11.5	12.1	--	--	--	34	32	--	--	--	53	65	--
LCS Nitro	--	--	--	87	62	--	--	--	--	59.8	57.9	--	--	--	--	12.0	12.8	--	--	--	33	31	--	--	--	53	65	--
HRS 3361	--	--	--	82	71	--	--	--	--	60.1	57.5	--	--	--	--	13.6	13.0	--	--	--	34	32	--	--	--	51	63	--
HRS 3419	--	--	--	87	67	--	--	--	--	59.3	58.2	--	--	--	--	12.6	12.8	--	--	--	34	33	--	--	--	54	66	--
Bolles	--	--	--	--	55	--	--	--	--	--	58.3	--	--	--	--	--	15.8	--	--	--	--	--	32	--	--	--	65	--
Focus	--	--	--	--	63	--	--	--	--	60.6	--	--	--	--	--	14.0	--	--	--	--	--	37	--	--	--	58	--	
SY Valda	--	--	--	--	62	--	--	--	--	58.8	--	--	--	--	--	14.0	--	--	--	--	--	31	--	--	--	64	--	
WB9653	--	--	--	--	60	--	--	--	--	56.2	--	--	--	--	--	13.4	--	--	--	--	--	31	--	--	--	64	--	
HRS 3530	--	--	--	--	65	--	--	--	--	59.0	--	--	--	--	--	14.1	--	--	--	--	--	36	--	--	--	65	--	
HRS 3504	--	--	--	--	65	--	--	--	--	56.9	--	--	--	--	--	13.3	--	--	--	--	--	31	--	--	--	65	--	
Cardale	--	--	--	--	53	--	--	--	--	56.4	--	--	--	--	--	15.4	--	--	--	--	--	33	--	--	--	63	--	
RB07	66	75	85	83	--	--	59.5	58.4	61.0	60.6	--	--	15.5	13.4	14.5	14.1	--	--	35	32	34	--	--	59	51	48	--	--
Jenna	65	73	85	81	--	--	58.8	57.5	59.9	60.0	--	--	15.5	13.4	14.0	13.9	--	--	34	32	33	--	--	64	54	53	--	--
Vantage	63	62	80	74	--	--	61.4	60.4	62.8	62.2	--	--	16.5	14.8	15.5	15.6	--	--	35	31	34	--	--	64	55	53	--	--
WB-Digger	68	77	93	82	--	--	58.6	58.9	60.7	59.8	--	--	15.0	12.9	13.9	13.6	--	--	36	34	34	--	--	61	53	53	--	--
LCS Albany	--	72	94	84	--	--	--	57.4	61.6	60.4	--	--	--	12.2	12.8	12.5	--	--	34	33	34	--	--	65	56	54	--	--
Advance	--	74	86	77	--	--	--	59.3	62.1	61.2	--	--	--	13.3	13.1	13.3	--	--	41	31	33	--	--	57	52	52	--	--
Norden	--	69	82	80	--	--	--	59.9	62.6	62.6	--	--	--	13.2	13.8	13.5	--	--	34	31	33	--	--	61	53	49	--	--
HRS 3378	--	--	--	80	--	--	--	--	--	61.1	--	--	--	--	--	12.9	--	--	--	--	33	--	--	--	--	50	--	--
Glenn	60	70	78	--	--	--	62.4	61.8	63.3	--	--	--	15.8	14.1	14.6	--	--	41	34	--	--	--	59	49	--	--	--	
Brennan	61	71	--	--	--	--	60.0	59.3	--	--	--	15.4	13.7	--	--	--	--	31	--	--	--	--	60	--	--	--	--	

Average Data by Crop and Year Across Sites

Durum	Yield (bu/a)						Test Weight (lbs/bu)						Height (in)						Days to Head											
	3	3	2	2	2	2	3	3	2	2	2	2	3	3	2	2	2	2	3	3	2	2	2	2	3	3	2	2	2	2
No. Sites	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Alkabo	62	69	86	69	61	72	59.2	58.5	61.3	59.2	60.7	60.4	38	38	42	40	36	39	55	64	52	57	64	58	55	64	52	57	64	58
Lebsock	63	68	79	69	67	72	59.7	58.8	61.1	59.6	62.2	61.0	39	38	41	39	37	39	54	62	51	55	63	56	54	62	51	55	63	56
Tioga	60	71	88	67	67	74	57.7	58.2	60.7	58.5	60.3	59.8	40	41	45	43	39	42	57	63	53	58	65	59	57	63	53	58	65	59
Divide	59	67	84	68	70	74	58.0	58.6	60.0	58.5	60.4	59.6	40	40	44	42	38	41	58	64	53	59	65	59	58	64	53	59	65	59
Carpio	62	69	90	67	74	77	59.6	58.7	61.6	58.4	61.0	60.3	39	40	45	41	38	41	57	65	54	59	66	60	57	65	54	59	66	60
Joppa	67	66	94	71	71	76	58.7	58.5	60.7	58.7	60.6	59.3	39	41	42	41	38	41	56	63	52	59	64	57	56	63	52	59	64	57
Grenora	61	67	89	--	--	--	57.8	57.3	60.2	--	--	--	37	37	40	--	--	--	56	63	52	--	--	--	56	63	52	--	--	--
DG Max	59	65	83	--	--	--	58.7	58.3	60.7	--	--	--	40	39	43	--	--	--	55	63	52	--	--	--	55	63	52	--	--	--
Westhope	61	66	--	--	--	--	58.9	58.4	--	--	--	--	39	39	--	--	--	--	57	64	--	--	--	--	57	64	--	--	--	--

Barley	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Plump (%)						Days to Head					
	3	3	2	3	3	8	3	3	2	3	3	8	3	3	2	3	3	8	3	3	2	3	3	8	3	3	2	3	3	8
No. Sites	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Lacey	94	99	135	123	110	123	49.8	47.9	50.4	50.0	49.2	49.9	13.4	12.5	12.6	13.1	13.2	13.0	94	83	99	95	93	96	59	58	49	63	57	57
Tradition	97	77	138	124	109	124	49.8	46.1	50.7	49.5	48.4	49.5	13.0	12.9	12.5	12.7	13.0	12.7	92	80	99	94	92	95	62	58	49	61	56	56
Quest	98	95	132	123	107	121	48.6	46.8	48.8	48.1	47.8	48.2	13.1	12.2	12.3	12.9	12.9	12.7	84	75	96	92	87	92	60	60	49	63	57	57
Innovation	--	94	130	130	109	123	--	47.0	49.4	49.8	48.5	49.2	--	12.7	12.4	13.3	13.2	13.0	--	81	98	97	92	96	59	58	48	61	56	56
Pinnacle*	99	--	--	--	114	--	50.8	--	--	--	49.6	--	12.0	--	--	11.8	--	95	--	--	--	95	--	--	--	--	--	63	--	
ND Genesis*	--	--	--	--	105	--	--	--	--	--	48.1	--	--	--	--	10.8	--	--	--	--	--	94	--	--	--	--	--	64	--	
Celebration	91	80	135	125	--	--	48.7	45.9	49.7	49.2	--	--	14.3	13.5	13.6	13.6	--	90	83	99	94	--	--	62	59	50	--	--	--	
Stellar-ND	99	92	132	126	--	--	48.8	46.7	49.6	48.6	--	--	12.8	12.2	12.3	12.7	--	94	85	99	97	--	--	60	59	49	--	--	--	

*2-row barley

HRSW Summary, Langdon 2011-2015															
Variety	Days to Head						Height (in)						Lodging (0-9)		
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	10	15	2yr
Barlow	54	61	52	53	61	55	38	37	33	37	36	35	1.5	2.1	1.8
Faller	57	63	55	54	62	57	37	37	35	35	36	35	0.8	1.6	1.2
Glenn	53	60	52	52	60	55	38	40	34	37	38	36	0.0	0.4	0.2
Prosper	57	64	55	53	63	57	37	37	34	36	36	35	1.5	3.4	2.5
RB07	54	60	53	52	59	55	36	34	32	35	33	33	2.1	0.4	1.3
LCS Albany	59	65	57	55	63	58	34	32	32	35	33	33	1.8	0.0	0.9
Samson	58	61	55	54	61	57	31	30	29	32	32	31	0.2	0.2	0.2
Vantage	60	67	58	56	68	61	36	35	31	34	34	33	0.0	0.1	0.1
Elgin-ND	56	61	54	53	61	56	39	38	36	39	38	38	1.8	1.6	1.7
Norden	56	62	56	52	61	56	33	33	31	33	35	33	0.3	0.0	0.2
Alpine	57	62	54	54	62	57	36	35	32	35	36	34	2.8	0.5	1.7
Rollag	55	61	53	53	61	56	34	31	30	33	32	32	0.8	0.0	0.4
LCS Powerplay	56	62	54	53	62	56	34	34	33	34	34	34	--	1.0	--
SY Soren	55	62	55	53	61	56	32	31	29	31	32	31	--	0.1	--
Forefront	51	58	51	52	59	54	42	35	35	39	39	38	--	0.6	--
WB Mayville	56	62	53	51	60	55	32	29	29	33	31	31	--	0.4	--
Advance	53	58	54	55	62	57	35	40	31	34	35	33	--	1.0	--
LCS Breakaway	--	60	52	53	60	55	--	32	29	33	33	32	--	1.2	--
Prevail	--	61	53	54	60	56	--	38	33	36	35	35	--	0.0	--
Linkert	--	--	55	54	62	57	--	--	28	29	31	29	--	0.1	--
MS Stingray	--	--	58	56	65	60	--	--	33	36	37	35	--	0.1	--
SY Rowyn	--	--	52	53	61	55	--	--	30	33	34	32	--	0.1	--
LCS Iguacu	--	--	57	55	63	58	--	--	31	35	34	33	--	0.0	--
Bolles	--	--	56	55	64	58	--	--	32	35	35	34	--	0.5	--
HRS 3378	--	--	55	55	62	57	--	--	31	34	34	33	--	0.3	--
HRS 3361	--	--	56	54	62	57	--	--	32	34	33	33	--	0.2	--
SY Ingmar	--	--	--	54	62	--	--	--	--	32	32	--	--	0.4	--
LCS Nitro	--	--	--	56	63	--	--	--	--	34	34	--	--	1.0	--
WB9507	--	--	--	52	60	--	--	--	--	34	35	--	--	0.9	--
HRS 3419	--	--	--	58	64	--	--	--	--	33	35	--	--	0.2	--
MS-Chevelle	--	--	--	51	60	--	--	--	--	33	34	--	--	0.2	--
Cardale	--	--	--	52	61	--	--	--	--	36	35	--	--	1.0	--
Focus	--	--	--	--	56	--	--	--	--	--	39	--	--	1.9	--
LCS Pro	--	--	--	--	61	--	--	--	--	--	38	--	--	0.6	--
WB9653	--	--	--	--	62	--	--	--	--	--	32	--	--	0.3	--
SY Valda	--	--	--	--	62	--	--	--	--	--	33	--	--	0.3	--
HRS 3530	--	--	--	--	64	--	--	--	--	--	39	--	--	0.1	--
Redstone	--	--	--	--	66	--	--	--	--	--	35	--	--	0.0	--
Prestige	--	--	--	--	59	--	--	--	--	--	35	--	--	0.1	--
HRS 3504	--	--	--	--	62	--	--	--	--	--	33	--	--	0.2	--
LCS Prime	--	--	--	--	60	--	--	--	--	--	36	--	--	0.6	--
Brick	50	60	50	49	--	--	39	39	33	37	--	--	1.8	--	--
Velva	57	63	56	55	--	--	38	36	33	36	--	--	0.0	--	--
Breaker	57	63	56	55	--	--	35	33	33	35	--	--	1.0	--	--
Brennan	57	61	54	54	--	--	32	29	27	32	--	--	3.7	--	--
Jenna	59	65	56	55	--	--	34	32	33	34	--	--	2.2	--	--
Select	52	57	50	51	--	--	39	36	33	36	--	--	1.8	--	--
WB Digger	55	62	55	55	--	--	36	35	32	35	--	--	1.6	--	--
Alsen	56	61	--	--	--	--	36	35	--	--	--	--	0.4	--	--
LSD 5%	1.3	1.5	1.0	1.3	0.7		1.9	1.6	1.8	1.9	1.5		1.3	1.6	
LSD 10%	--	1.2	0.8	1.1	0.6		--	1.3	1.5	1.6	1.3		--	1.3	

HRSW Summary, Langdon 2011-2015																		
Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Barlow	66	72	94	86	74	84	61.7	60.3	61.7	62.9	62.1	62.2	15.6	12.7	14.2	13.9	14.1	14.1
Faller	79	85	112	96	74	94	60.8	59.4	60.7	62.2	60.5	61.1	14.4	11.3	13.4	12.3	12.3	12.7
Glenn	58	68	91	76	75	81	62.9	62.6	63.0	64.0	64.5	63.8	15.6	13.1	14.6	14.4	14.3	14.4
Prosper	77	84	110	93	71	91	60.8	59.7	60.3	62.4	60.4	61.0	14.8	11.2	13.2	12.4	12.6	12.7
RB07	70	74	96	88	74	86	60.3	58.8	60.4	62.1	61.5	61.3	15.2	12.3	14.5	13.8	13.5	13.9
LCS Albany	72	79	105	95	68	90	61.1	58.8	61.4	61.9	60.0	61.1	14.2	10.9	12.8	11.7	12.3	12.3
Samson	62	72	92	86	79	86	59.2	60.1	59.8	60.9	60.4	60.4	15.1	12.6	13.9	12.5	12.5	13.0
Vantage	58	67	86	81	68	78	61.8	61.4	62.1	63.5	63.1	62.9	16.0	13.0	15.8	14.4	14.7	15.0
Elgin-ND	71	76	99	90	73	87	60.9	59.2	61.1	62.3	60.8	61.4	15.4	12.0	14.1	13.7	13.6	13.8
Norden	67	73	90	81	73	81	62.6	61.3	62.2	63.2	61.7	62.4	14.9	12.1	13.9	13.2	13.5	13.5
Alpine	60	79	99	92	73	88	58.7	59.0	59.8	61.1	61.0	60.6	15.2	11.6	13.8	12.9	13.3	13.3
Rollag	63	70	83	85	75	81	61.4	60.0	61.6	63.0	61.5	62.0	16.1	12.6	14.8	14.1	14.0	14.3
LCS Powerplay	67	75	101	88	71	87	61.1	59.6	61.0	62.4	61.2	61.5	15.0	11.5	13.5	13.4	12.9	13.3
SY Soren	64	71	86	85	74	82	60.6	59.9	61.4	63.2	61.8	62.1	15.6	12.4	14.8	13.4	13.8	14.0
Forefront	58	78	89	74	72	78	61.3	60.6	60.5	62.1	62.7	61.8	15.4	11.4	14.3	13.8	13.6	13.9
WB Mayville	58	70	86	81	66	78	59.9	59.9	60.3	61.4	60.3	60.7	15.6	12.9	14.5	13.6	13.9	14.0
Advance	70	81	97	85	75	85	61.4	60.1	61.7	62.6	61.9	62.1	14.3	12.1	12.9	12.6	12.5	12.7
LCS Breakaway	--	76	88	77	74	80	--	61.4	62.2	62.9	62.2	62.4	--	12.6	14.5	13.7	13.7	14.0
Prevail	--	74	89	85	74	82	--	58.8	60.2	61.9	61.7	61.3	--	11.5	14.0	13.3	13.0	13.4
Linkert	--	--	81	82	76	80	--	--	60.8	62.2	61.1	61.4	--	--	15.4	13.6	14.5	14.5
MS Stingray	--	--	118	93	62	91	--	--	59.9	60.1	56.6	58.9	--	--	11.4	10.7	10.9	11.0
SY Rowyn	--	--	95	87	78	86	--	--	60.7	62.2	61.8	61.6	--	--	14.0	12.9	12.7	13.2
LCS Iguacu	--	--	94	91	73	86	--	--	60.2	62.0	61.9	61.4	--	--	12.4	11.6	11.3	11.8
Bolles	--	--	94	86	73	84	--	--	61.0	61.6	60.9	61.2	--	--	15.4	13.8	15.1	14.8
HRS 3378	--	--	90	87	72	83	--	--	61.0	62.7	61.7	61.8	--	--	13.3	12.4	12.4	12.7
HRS 3361	--	--	98	85	66	83	--	--	60.5	61.3	58.6	60.1	--	--	13.5	13.5	12.5	13.2
SY Ingmar	--	--	--	87	74	--	--	--	--	62.9	61.5	--	--	--	--	13.7	13.9	--
LCS Nitro	--	--	--	91	75	--	--	--	--	61.5	60.5	--	--	--	--	11.8	12.0	--
WB9507	--	--	--	87	61	--	--	--	--	60.4	57.7	--	--	--	--	13.1	11.9	--
HRS 3419	--	--	--	89	83	--	--	--	--	60.0	60.6	--	--	--	--	12.3	12.5	--
MS-Chevelle	--	--	--	91	80	--	--	--	--	62.1	60.5	--	--	--	--	12.5	12.5	--
Cardale	--	--	--	84	61	--	--	--	--	61.4	57.2	--	--	--	--	13.8	13.8	--
Focus	--	--	--	73	73	--	--	--	--	62.3	62.4	--	--	--	--	13.9	13.2	--
LCS Pro	--	--	--	--	76	--	--	--	--	--	62.0	--	--	--	--	--	13.5	--
WB9653	--	--	--	--	74	--	--	--	--	--	58.1	--	--	--	--	--	12.5	--
SY Valda	--	--	--	--	79	--	--	--	--	--	60.7	--	--	--	--	--	13.0	--
HRS 3530	--	--	--	--	77	--	--	--	--	--	60.3	--	--	--	--	--	12.8	--
Redstone	--	--	--	--	79	--	--	--	--	--	61.2	--	--	--	--	--	12.7	--
Prestige	--	--	--	--	78	--	--	--	--	--	61.2	--	--	--	--	--	12.9	--
HRS 3504	--	--	--	--	85	--	--	--	--	--	58.2	--	--	--	--	--	12.7	--
LCS Prime	--	--	--	--	78	--	--	--	--	--	61.6	--	--	--	--	--	11.9	--
Brick	67	76	81	78	--	--	61.7	60.6	61.5	62.6	--	--	14.3	11.2	13.9	13.4	--	--
Velva	69	72	99	93	--	--	60.1	59.2	60.2	61.2	--	--	14.7	12.1	13.8	12.5	--	--
Breaker	67	75	99	83	--	--	62.2	61.3	61.9	62.7	--	--	14.9	12.1	14.1	13.0	--	--
Brennan	61	70	75	80	--	--	60.0	59.6	59.6	62.5	--	--	15.1	12.5	14.8	13.8	--	--
Jenna	72	74	95	87	--	--	59.4	58.4	59.0	61.4	--	--	14.8	12.3	13.8	12.7	--	--
Select	71	78	84	77	--	--	61.9	60.4	61.7	62.6	--	--	15.1	11.7	14.0	13.7	--	--
WB Digger	66	80	99	90	--	--	59.5	59.8	60.4	61.9	--	--	14.4	11.8	14.1	12.8	--	--
Alsen	54	68	--	--	--	--	60.4	60.1	--	--	--	--	15.9	12.4	--	--	--	--
LSD 5%	4.6	4.0	5.7	6.6	5.9		0.5	0.5	0.4	0.7	0.8		0.6	0.6	0.4	0.8	0.4	
LSD 10%	--	3.3	4.8	5.5	5.0		--	0.4	0.3	0.5	0.6		--	0.5	0.3	0.7	0.4	

HRSW Summary, Pembina County 2011-2015*

Variety	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)					Lodging (0-9)	
	11	13	14	15	3yr	11	13	14	15	3yr	11	13	14	15	3yr	15	16
Faller	71	100	88	50	79	60.3	61.4	61.7	56.0	59.7	14.2	13.6	13.8	14.8	14.1	5.5	
Prosper	74	99	80	49	76	59.9	61.4	61.9	55.7	59.7	14.4	13.3	13.7	14.8	13.9	5.9	
Samson	64	83	72	49	68	59.3	60.5	60.0	53.8	58.1	15.2	13.3	13.8	13.9	13.7	1.2	
Barlow	68	87	75	43	68	62.2	62.2	61.4	56.3	60.0	15.0	14.2	14.3	15.2	14.6	5.2	
Rollag	54	85	72	50	69	58.6	62.3	62.3	57.6	60.7	15.8	14.6	14.9	15.6	15.0	0.5	
SY Soren	65	82	66	46	64	61.0	61.6	61.3	56.8	59.9	15.3	14.1	15.0	15.0	14.7	2.9	
WB-Mayville	66	83	64	45	64	60.6	61.7	61.2	54.7	59.2	15.3	14.7	14.2	15.1	14.7	0.1	
LCS Breakaway	--	86	63	44	64	--	62.9	62.8	55.5	60.4	--	14.6	15.3	15.3	15.1	5.1	
Forefront	--	81	68	53	67	--	61.3	61.0	57.6	60.0	--	14.4	15.1	14.6	14.7	5.2	
Linkert	--	80	66	53	66	--	61.7	60.9	56.9	59.8	--	14.8	15.5	14.9	15.1	0.2	
LCS Powerplay	--	92	75	38	68	--	61.8	62.3	54.3	59.5	--	13.4	13.6	15.2	14.1	6.0	
SY Rowyn	--	90	66	53	70	--	61.1	61.4	57.5	60.0	--	13.3	14.4	14.3	14.0	4.6	
Elgin-ND	--	93	75	44	71	--	61.0	61.3	55.0	59.1	--	14.2	14.5	15.0	14.6	4.7	
Prevail	--	--	79	47	--	--	--	61.2	55.1	--	--	--	13.8	14.5	--	4.5	
SY Ingmar	--	--	67	56	--	--	--	62.2	57.9	--	--	--	15.2	14.8	--	0.0	
WB9507	--	--	78	45	--	--	--	60.3	52.9	--	--	--	15.0	14.6	--	5.2	
LCS Ignacu	--	--	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	
HRS 3361	--	--	81	58	--	--	--	60.6	56.7	--	--	--	14.3	12.8	--	2.1	
HRS 3419	--	--	87	60	--	--	--	59.6	56.0	--	--	--	12.2	13.2	--	1.8	
Bolles	--	--	--	44	--	--	--	--	56.0	--	--	--	--	15.9	--	4.3	
Focus	--	--	--	50	--	--	--	--	58.3	--	--	--	--	14.4	--	7.9	
SY Valda	--	--	--	47	--	--	--	--	55.6	--	--	--	--	15.0	--	3.7	
WB9653	--	--	--	42	--	--	--	--	54.0	--	--	--	--	14.6	--	5.1	
HRS 3530	--	--	--	62	--	--	--	--	57.8	--	--	--	--	14.0	--	4.7	
HRS 3504	--	--	--	51	--	--	--	--	55.2	--	--	--	--	13.7	--	2.8	
Cardale	--	--	--	48	--	--	--	--	55.8	--	--	--	--	15.8	--	3.5	
RB07	70	88	73	--	--	61.2	61.1	60.7	--	--	15.0	14.5	14.7	--	--	--	
Jenna	65	87	76	--	--	59.3	60.5	60.3	--	--	14.9	13.5	14.7	--	--	--	
Vantage	64	79	68	--	--	62.0	63.3	62.6	--	--	15.9	14.4	15.3	--	--	--	
WB-Digger	72	94	75	--	--	58.2	61.2	60.4	--	--	14.3	14.2	14.0	--	--	--	
Advance	--	88	70	--	--	--	62.0	62.0	--	--	--	13.2	13.6	--	--	--	
LCS Albany	--	95	84	--	--	--	61.4	61.5	--	--	--	12.5	12.1	--	--	--	
Norden	--	80	71	--	--	--	62.9	63.2	--	--	--	13.8	13.7	--	--	--	
HRS 3378	--	--	77	--	--	--	--	61.8	--	--	--	--	13.4	--	--	--	
Glenn	68	82	--	--	--	63.3	63.1	--	--	--	15.7	14.8	--	--	--	--	
Brennan	65	--	--	--	--	61.4	--	--	--	--	15.3	--	--	--	--	--	
LSD 5%	5.3	5.3	8.3	7.2	--	1.1	0.4	0.5	1.5	--	0.3	0.5	0.5	0.8	1.9	--	
LSD 10%	--	4.4	6.9	6.0	--	--	0.3	0.4	1.2	--	--	0.4	0.4	0.7	1.6	--	

*The 2012 Pembina trial was lost to hail.

HRSW Summary, Walsh County 2011-2015

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Faller	65	82	87	93	62	81	58.3	61.3	59.9	61.4	57.3	59.5	15.2	11.9	12.3	11.8	15.2	13.1	5.5	0.5	3.1	0.0	6.5	3.2
Prosper	71	87	81	96	53	77	59.4	61.6	59.8	61.5	56.6	59.3	14.7	12.4	12.2	12.1	15.0	13.1	5.0	0.3	4.0	0.3	7.4	3.9
Samson	70	72	92	88	72	84	59.1	60.7	59.8	61.1	56.6	59.2	14.9	13.7	13.0	12.0	14.2	13.1	2.5	0.0	0.0	0.0	1.7	0.6
Barlow	57	76	73	81	59	71	59.7	60.9	60.8	62.2	59.0	60.7	15.4	14.0	12.5	13.1	15.6	13.7	4.5	1.5	2.2	1.8	5.7	3.2
LCS Powerplay	62	76	81	91	62	78	59.5	61.1	60.5	62.0	58.9	60.5	15.0	12.6	13.2	12.0	14.6	13.3	5.8	0.0	3.6	0.0	5.8	3.1
Rollag	63	74	80	82	62	75	60.5	62.0	61.6	62.3	59.3	61.1	15.6	13.9	13.6	13.4	16.5	14.5	3.8	0.0	0.2	0.0	2.1	0.8
SY Soren	62	79	82	84	55	74	59.2	61.2	60.9	61.5	58.1	60.2	15.3	13.9	13.8	13.6	15.9	14.4	4.5	0.0	0.0	0.2	1.1	0.4
WB-Mayville	63	74	79	77	56	71	59.9	60.3	59.6	61.4	57.0	59.3	15.3	14.2	13.8	13.3	15.0	14.0	1.0	0.0	0.1	0.0	0.4	0.2
Elgin-ND	--	77	80	83	56	73	--	60.3	60.4	61.4	56.4	59.4	--	13.2	13.5	12.2	15.5	13.7	--	1.5	4.1	0.5	6.5	3.7
LCS Breakaway	--	80	80	85	57	74	--	61.7	61.8	62.9	58.0	60.9	--	13.7	13.8	13.1	15.6	14.2	--	1.0	2.4	0.0	4.3	2.2
Forefront	--	80	75	79	60	71	--	61.8	59.7	61.4	58.5	59.9	--	12.5	14.1	13.4	15.9	14.5	--	1.3	6.4	6.2	7.9	6.8
Linkert	--	--	77	79	65	74	--	--	60.8	61.4	58.7	60.3	--	--	13.6	13.9	15.9	14.5	--	--	0.0	0.0	0.0	0.0
SY Rowyn	--	--	76	85	63	74	--	--	59.6	61.5	58.0	59.7	--	--	13.1	12.0	15.4	13.5	--	--	3.6	0.3	5.0	3.0
Prevail	--	--	--	84	65	--	--	--	--	60.8	57.5	--	--	--	--	13.2	14.7	--	--	--	--	2.7	6.3	--
SY Ingmar	--	--	--	81	68	--	--	--	--	61.9	60.0	--	--	--	--	13.2	15.4	--	--	--	--	0.0	0.9	--
WB9507	--	--	--	92	59	--	--	--	--	60.6	54.2	--	--	--	--	11.7	15.5	--	--	--	--	0.0	7.1	--
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	--
HRS 3361	--	--	--	85	66	--	--	--	--	60.6	57.1	--	--	--	--	12.2	13.8	--	--	--	--	0.0	2.1	--
HRS 3419	--	--	--	93	68	--	--	--	--	59.9	57.8	--	--	--	--	11.3	13.2	--	--	--	--	0.0	0.6	--
Bolles	--	--	--	--	59	--	--	--	--	--	57.3	--	--	--	--	--	16.6	--	--	--	--	--	5.7	--
Focus	--	--	--	--	62	--	--	--	--	--	59.2	--	--	--	--	--	15.4	--	--	--	--	--	5.8	--
SY Valda	--	--	--	--	66	--	--	--	--	--	58.9	--	--	--	--	--	14.9	--	--	--	--	--	3.8	--
WB9653	--	--	--	--	69	--	--	--	--	--	57.0	--	--	--	--	--	14.0	--	--	--	--	--	2.3	--
HRS 3504	--	--	--	--	70	--	--	--	--	--	57.1	--	--	--	--	--	14.2	--	--	--	--	--	2.6	--
Cardale	--	--	--	--	51	--	--	--	--	--	55.4	--	--	--	--	--	17.2	--	--	--	--	--	6.0	--
HRS 3530	--	--	--	--	67	--	--	--	--	--	58.3	--	--	--	--	--	15.6	--	--	--	--	--	7.2	--
Jenna	63	78	80	89	--	--	57.8	60.1	58.0	60.8	--	--	15.6	13.8	13.7	13.0	--	--	6.8	0.0	0.6	0.0	--	--
Vantage	66	69	80	82	--	--	61.7	63.3	62.1	63.2	--	--	16.5	14.6	15.6	14.4	--	--	0.3	0.0	0.0	0.0	--	--
LCS Albany	72	75	90	89	--	--	58.8	60.1	60.9	61.0	--	--	13.5	11.7	12.5	11.0	--	--	4.3	0.0	0.1	0.0	--	--
RB07	65	78	86	88	--	--	57.6	60.8	60.0	61.3	--	--	15.2	13.1	13.4	12.9	--	--	6.5	0.0	2.6	0.0	--	--
WB-Digger	62	80	89	88	--	--	58.0	60.8	59.6	61.0	--	--	15.4	12.9	12.8	12.2	--	--	5.0	0.0	1.1	0.1	--	--
Norden	--	72	78	83	--	--	--	62.3	61.9	63.0	--	--	--	13.4	12.9	12.7	--	--	--	0.0	0.0	0.0	--	--
Advance	--	79	84	83	--	--	--	61.3	61.2	61.9	--	--	--	13.5	12.2	12.6	--	--	--	2.8	1.3	0.1	--	--
HRS 3378	--	--	--	85	--	--	--	--	--	62.2	--	--	--	--	--	12.1	--	--	--	--	--	0.0	--	--
Glenn	60	74	69	--	--	--	62.5	64.0	62.7	--	--	--	15.6	14.0	12.8	--	--	--	3.3	0.3	0.9	--	--	--
Brennan	63	74	--	--	--	--	59.8	61.1	--	--	--	--	15.0	13.6	--	--	--	--	3.3	0.0	--	--	--	--
LSD 5%	5.8	4.0	6.9	5.0	8.4	--	1.0	0.6	0.5	0.4	1.1	--	0.7	0.7	0.8	0.7	0.6	--	2.7	0.7	2.8	0.8	1.7	--
LSD 10%	--	3.3	5.8	4.2	7.0	--	--	0.5	0.4	0.4	0.9	--	--	0.5	0.7	0.6	0.5	--	--	0.6	2.3	0.7	1.5	--

HRSW Summary, Nelson County 2011-2015

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)		SFL*
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	14	15	
Faller	83	81	95	102	60	86	60.6	57.3	63.2	60.7	57.6	60.5	14.4	13.5	14.0	14.1	13.0	13.7	2.2	85	
Barlow	68	77	81	88	63	77	59.8	58.6	63.3	61.4	59.5	61.4	15.4	14.3	14.9	14.7	14.0	14.5	0.9	42	
Prosper	84	77	88	100	59	82	60.5	57.1	63.2	60.5	58.0	60.6	14.5	13.8	13.7	13.9	13.0	13.5	2.1	78	
Rollag	67	69	85	85	74	81	60.9	57.8	63.8	61.7	60.9	62.1	15.6	15.5	15.1	14.8	15.0	15.0	0.4	3	
Samson	65	75	87	98	61	82	59.0	57.9	61.9	60.4	56.1	59.5	14.8	14.3	14.2	14.0	13.8	14.0	0.0	11	
SY Soren	62	75	85	81	50	72	59.0	57.3	63.6	60.9	57.4	60.6	15.0	14.2	15.2	14.3	14.1	14.5	0.2	92	
WB-Mayville	70	76	85	86	59	77	59.8	58.3	62.8	61.0	58.9	60.9	15.7	14.5	15.0	14.4	14.1	14.5	0.1	71	
LCS Breakaway	--	75	83	94	59	79	--	59.1	63.9	62.7	59.5	62.0	--	14.6	15.0	14.8	13.6	14.5	0.8	62	
Elgin-ND	--	82	91	91	63	82	--	57.1	62.7	60.5	58.7	60.6	--	13.9	15.0	14.5	13.6	14.4	2.1	80	
Forefront	--	73	80	81	62	74	--	57.5	63.1	60.9	61.8	61.9	--	13.8	15.4	14.7	13.4	14.5	3.3	76	
LCS Powerplay	--	76	91	87	63	80	--	58.2	63.7	61.6	58.8	61.4	--	13.6	13.9	14.5	13.1	13.8	3.0	34	
Linkert	--	--	77	83	70	76	--	--	62.9	60.6	60.2	61.2	--	--	15.6	15.0	15.0	15.2	0.1	3	
SY Rowyn	--	--	86	93	63	80	--	--	62.4	61.3	58.8	60.8	--	--	14.2	13.8	13.1	13.7	1.7	50	
Prevail	--	--	--	83	70	--	--	--	60.5	60.7	--	--	--	--	14.5	13.2	--	--	3.0	23	
SY Ingmar	--	--	--	86	62	--	--	--	61.5	60.2	--	--	--	--	14.9	14.2	--	--	1.6	52	
WB9507	--	--	--	104	56	--	--	--	60.0	56.1	--	--	--	--	14.6	12.8	--	--	1.2	85	
LCS Ignacu	--	--	--	95	62	--	--	--	61.1	60.2	--	--	--	--	11.4	11.7	--	--	2.1	52	
LCS Nitro	--	--	--	99	66	--	--	--	59.8	58.1	--	--	--	--	12.4	11.9	--	--	2.5	53	
HRS 3361	--	--	--	86	52	--	--	--	60.0	56.4	--	--	--	--	13.9	12.2	--	--	0.6	74	
HRS 3419	--	--	--	91	71	--	--	--	59.3	57.6	--	--	--	--	13.4	12.6	--	--	0.3	0	
Bolles	--	--	--	--	54	--	--	--	--	58.1	--	--	--	--	--	15.2	--	--	--	76	
Focus	--	--	--	70	--	--	--	--	61.4	--	--	--	--	--	--	13.0	--	--	--	65	
SY Valda	--	--	--	64	--	--	--	--	58.1	--	--	--	--	--	--	13.2	--	--	--	55	
WB9653	--	--	--	54	--	--	--	--	53.5	--	--	--	--	--	--	12.4	--	--	--	84	
HRS 3530	--	--	--	63	--	--	--	--	58.4	--	--	--	--	--	--	13.2	--	--	--	69	
HRS 3504	--	--	--	58	--	--	--	--	54.7	--	--	--	--	--	--	12.8	--	--	--	75	
Cardale	--	--	--	60	--	--	--	--	55.3	--	--	--	--	--	--	14.4	--	--	--	73	
ND820	--	--	--	63	--	--	--	--	60.9	--	--	--	--	--	--	13.9	--	--	--	41	
ND821	--	--	--	67	--	--	--	--	60.3	--	--	--	--	--	--	14.1	--	--	--	42	
ND822	--	--	--	68	--	--	--	--	61.3	--	--	--	--	--	--	14.5	--	--	--	28	
RB07	68	78	81	93	--	--	59.6	57.5	63.0	60.8	--	--	15.5	14.1	15.1	14.7	--	--	2.5	--	
Jenna	64	76	92	83	--	--	58.4	56.1	62.3	60.1	--	--	15.2	14.0	14.2	14.4	--	--	2.5	--	
WB-Digger	74	79	99	94	--	--	59.1	57.8	62.1	59.6	--	--	14.8	13.8	14.3	14.2	--	--	2.5	--	
Vantage	71	62	86	78	--	--	60.5	59.1	63.6	62.2	--	--	16.5	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	--	
Norden	--	72	89	92	--	--	--	58.5	64.1	63.0	--	--	--	14.0	14.1	13.8	--	--	0.1	--	
Advance	--	74	84	85	--	--	--	58.4	64.0	60.9	--	--	--	13.9	13.4	13.7	--	--	2.2	--	
HRS 3378	--	--	--	87	--	--	--	--	60.9	--	--	--	--	--	--	13.3	--	--	2.0	--	
Glenn	61	77	79	--	--	--	61.5	60.9	64.7	--	--	--	15.2	14.9	15.4	--	--	--	--	--	
Brennan	59	74	--	--	--	--	59.1	58.6	--	--	--	--	15.0	14.4	--	--	--	--	--	--	
LSD 5%	5.2	6.9	6.5	5.0	4.4	--	0.7	1.0	0.4	0.5	1.1	--	0.6	0.7	0.5	0.4	0.6	--	1.1	18.7	
LSD 10%	--	5.7	5.4	4.2	3.7	--	0.9	0.4	0.4	0.9	--	--	--	0.5	0.4	0.3	0.5	--	0.9	--	

*Stripe Rust Severity on Flag Leaf

HRSW Summary, Towner County 2011-2015

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Protein (%)						Lodging (0-9)		
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr	14	15	2yr
Faller	61	71	85	84	56	75	58.6	55.8	61.1	58.6	59.6	59.8	16.6	13.0	13.9	14.1	14.1	14.0	6.5	1.3	3.9
Barlow	54	64	73	75	47	65	58.9	57.3	60.8	59.9	60.8	60.5	17.3	14.0	14.8	15.1	14.6	14.8	2.6	0.9	1.8
Prosper	65	70	79	79	55	71	59.1	56.1	61.3	58.3	60.4	60.0	16.3	13.7	13.7	14.3	13.9	14.0	6.4	0.6	3.5
Samson	71	64	77	81	53	70	58.7	56.0	59.2	57.2	58.4	58.3	15.8	13.9	14.3	14.0	13.8	14.0	0.2	0.2	0.2
Rollag	60	60	68	70	54	64	60.8	57.1	61.4	59.9	61.3	60.9	16.8	14.4	15.4	15.4	15.0	15.3	0.3	0.0	0.2
SY Soren	57	66	71	67	45	61	59.8	56.5	61.2	58.8	59.8	59.9	17.2	13.6	15.2	14.5	15.0	14.9	1.1	0.4	0.8
WB-Mayville	57	64	68	66	47	60	58.9	56.1	60.0	58.0	59.5	59.2	16.4	13.9	14.9	14.8	15.2	15.0	0.0	0.1	0.1
LCS Breakaway	--	65	72	72	49	64	--	57.9	62.0	60.4	48.9	57.1	--	14.6	15.1	14.9	14.9	15.0	2.8	0.3	1.6
Elgin-ND	--	63	75	71	59	68	--	55.8	60.8	58.0	60.2	59.7	--	13.3	14.7	14.9	14.4	14.7	5.1	0.4	2.8
Forefront*	--	66	58	76	50	62	--	57.3	60.7	59.0	61.0	60.2	--	12.5	15.0	14.9	14.2	14.7	7.7	0.4	4.1
LCS Powerplay	--	61	81	74	56	70	--	56.4	61.3	59.5	61.3	60.7	--	13.0	14.0	14.8	14.1	14.3	4.6	0.2	2.4
Linkert	--	--	70	64	50	61	--	--	60.1	57.9	59.9	59.3	--	--	15.7	15.1	14.9	15.2	0.3	0.0	0.2
SY Rowyn	--	--	73	78	50	67	--	--	61.1	59.2	60.3	60.2	--	--	14.2	14.3	14.4	14.3	0.9	1.1	1.0
Prevail	--	--	--	74	55	--	--	--	--	58.5	59.7	--	--	--	--	14.0	13.6	--	5.4	0.5	3.0
SY Ingmar	--	--	--	74	51	--	--	--	--	59.1	60.9	--	--	--	--	15.0	15.0	--	1.3	0.2	0.8
WB9507	--	--	--	93	54	--	--	--	--	58.5	58.2	--	--	--	--	14.6	14.2	--	3.5	0.6	2.1
LCS Iguacu	--	--	--	74	45	--	--	--	--	58.7	60.4	--	--	--	--	11.7	12.7	--	1.6	0.3	1.0
LCS Nitro	--	--	--	76	53	--	--	--	--	57.0	58.9	--	--	--	--	12.9	12.7	--	1.8	0.7	1.3
HRS 3361	--	--	--	73	50	--	--	--	--	58.1	58.6	--	--	--	--	13.9	13.7	--	0.7	0.4	0.6
HRS 3419	--	--	--	77	53	--	--	--	--	57.7	58.9	--	--	--	--	13.7	12.3	--	0.0	0.3	0.2
Bolles	--	--	--	--	46	--	--	--	--	59.0	--	--	--	--	--	16.4	--	--	--	0.7	--
Focus	--	--	--	--	58	--	--	--	--	61.8	--	--	--	--	--	13.8	--	--	--	1.3	--
SY Valda	--	--	--	--	56	--	--	--	--	60.8	--	--	--	--	--	13.9	--	--	--	0.9	--
WB9653	--	--	--	--	61	--	--	--	--	58.5	--	--	--	--	--	13.5	--	--	--	0.5	--
HRS 3530	--	--	--	--	57	--	--	--	--	60.3	--	--	--	--	--	14.8	--	--	--	0.2	--
HRS 3504	--	--	--	--	62	--	--	--	--	59.3	--	--	--	--	--	13.3	--	--	--	0.2	--
Cardale	--	--	--	--	47	--	--	--	--	58.5	--	--	--	--	--	15.9	--	--	--	0.7	--
RB07	58	71	75	73	--	--	58.7	56.5	60.3	57.9	--	--	16.7	13.9	14.9	14.6	--	--	3.2	--	--
Jenna	62	64	73	70	--	--	58.9	55.5	59.5	57.2	--	--	16.9	13.5	15.0	14.9	--	--	0.8	--	--
Vantage	56	50	70	61	--	--	61.0	57.9	62.7	59.5	--	--	17.6	15.7	16.5	17.2	--	--	4.2	--	--
WB-Digger	65	68	85	65	--	--	58.3	57.0	60.4	56.3	--	--	16.0	13.1	14.0	14.6	--	--	3.2	--	--
Advance	--	61	78	64	--	--	--	57.5	61.7	58.6	--	--	--	13.5	13.7	14.1	--	--	4.0	--	--
LCS Albany	--	60	78	67	--	--	--	54.7	61.0	57.7	--	--	--	13.4	13.2	14.3	--	--	5.5	--	--
Norden	--	59	74	71	--	--	--	57.3	61.9	60.7	--	--	--	13.1	14.1	14.3	--	--	0.2	--	--
HRS 3378	--	--	--	66	--	--	--	--	--	58.1	--	--	--	--	--	13.3	--	--	3.7	--	--
Glenn	53	60	70	--	--	--	62.0	59.5	63.2	--	--	--	16.9	14.3	15.3	--	--	--	--	--	--
Brennan	58	67	--	--	--	--	59.9	57.8	--	--	--	--	16.7	14.1	--	--	--	--	--	--	--
LSD 5%	5.8	4.7	6.1	5.5	6.6		1.3	0.9	0.6	0.7	0.8		0.5	0.6	0.4	0.3	0.5		1.3	NS	
LSD 10%	--	4.0	5.1	4.6	5.5		--	0.7	0.5	0.6	0.7		--	0.5	0.3	0.3	0.4		1.1	NS	

*Forefront had some shelling prior to harvest in 2013.

HRSW Disease Summary, Langdon 2015

Variety	<u>Stripe Rust</u>			<u>Fusarium Head Blight</u>			Yield (bu/a)	Test Weight (lbs/bu)
	% Incidence	% Severity	Flag Leaf* (%)	% Incidence	% Severity	Index		
Glenn	100	34	16.0	3	1.4	0.0	74.8	64.5
Faller	100	94	80.0	9	4.2	0.4	74.1	60.5
Barlow	64	20	8.8	13	9.0	1.2	73.5	62.1
Prosper	100	82	66.0	9	11.0	1.2	70.8	60.4
Elgin-ND	100	66	35.0	10	7.2	0.7	72.9	60.8
RB07	100	76	67.0	10	7.9	0.8	74.3	61.5
Rollag	56	12	8.0	5	3.5	0.2	75.0	61.5
Norden	100	74	59.0	12	5.8	0.9	72.9	61.7
Linkert	41	34	4.0	19	12.3	2.3	76.1	61.1
Bolles	68	20	8.5	7	3.5	0.3	73.0	60.9
Forefront	58	26	16.5	0	0.0	0.0	71.6	62.7
Advance	100	64	40.0	10	4.9	0.5	74.6	61.9
Prevail	97	54	32.5	3	2.9	0.1	73.6	61.7
Focus	100	63	35.0	7	5.0	0.4	72.5	62.4
LCS Albany	100	94	82.0	16	10.5	1.6	68.2	60.0
LCS Powerplay	100	67	54.0	8	2.1	0.2	70.9	61.2
LCS Breakaway	74	28	17.0	6	6.8	0.5	73.6	62.2
LCS Iguacu	93	34	15.0	16	5.6	0.9	73.3	61.9
LCS Nitro	67	22	12.0	19	8.8	1.7	75.0	60.5
LCS Pro	100	54	31.5	18	9.2	1.6	75.6	62.0
LCS Prime	100	67	47.0	9	6.7	0.8	78.1	61.6
MS Stingray	100	93	80.0	15	5.7	0.8	62.0	56.6
MS Chevelle	100	59	32.5	6	4.6	0.6	80.1	60.5
Vantage	97	68	25.0	14	9.3	1.3	67.8	63.1
WB Mayville	100	90	74.0	12	7.9	1.0	65.9	60.3
WB9507	100	98	95.5	8	13.5	1.3	60.8	57.7
WB9653	100	72	50.0	16	7.7	1.3	73.8	58.1
Samson	100	53	22.5	26	14.7	4.2	79.4	60.4
Alpine	100	54	28.5	11	6.5	0.8	72.6	61.0
SY Soren	92	49	23.5	15	4.9	0.8	74.0	61.8
SY Rowyn	85	45	21.0	3	2.9	0.1	77.6	61.8
SY Ingmar	94	56	27.5	12	4.2	0.5	74.2	61.5
SY Valda	100	66	33.0	16	6.3	1.0	79.3	60.7
HRS 3378	100	89	74.0	16	8.4	1.3	71.6	61.7
HRS 3361	100	68	44.0	20	7.0	1.4	66.4	58.6
HRS 3419	0	0	0.0	7	4.9	0.4	82.7	60.6
HRS 3530	100	95	87.0	19	6.3	1.3	77.0	60.3
HRS 3504	100	68	53.5	16	10.4	1.7	75.4	58.2
Redstone	12	4	3.3	8	3.3	0.4	79.1	61.2
Prestige	100	61	26.5	7	4.2	0.3	77.7	61.2
Cardale	100	95	91.0	11	6.4	0.7	61.2	57.2
Trial Mean	86	55	38.3	11	6.5	0.8	73.3	61.2
C.V. %	21.4	26.7	37.6	43.4	54.8	81.1	5.8	0.9
LSD 5%	37.1	29.3	28.8	9.4	7.1	1.4	5.9	0.8

*Stripe Rust Severity on Flag leaf

Planting Date: April 28

Harvest Date: August 19

HRSW Disease Summary, Pembina County 2015

Variety	<u>Fusarium Head Blight</u>			DON (ppm)	Yield (bu/a)	Test Weight (lbs/bu)
	% Incidence	% Severity	Index			
Faller	36	13.7	5.2	2.4	49.9	56.0
Barlow	30	17.9	6.2	2.9	42.8	56.3
Prosper	39	23.2	9.5	2.5	49.3	55.7
Elgin-ND	17	12.1	2.1	3.0	43.6	55.0
Rollag	15	9.2	1.7	0.7	49.7	57.6
Linkert	31	25.2	7.9	2.6	52.7	56.9
Bolles	63	23.4	15.7	3.9	43.8	56.0
Forefront	10	13.0	1.8	1.1	53.4	57.6
Prevail	52	27.8	14.6	3.5	47.1	55.1
Focus	18	23.9	5.5	2.0	49.7	58.3
SY Soren	15	16.8	3.2	2.9	45.9	56.8
SY Rowyn	46	15.2	7.3	3.2	53.0	57.5
SY Ingmar	20	8.6	1.5	3.0	56.2	57.9
SY Valda	57	26.3	15.5	2.9	46.5	55.6
WB Mayville	35	26.1	9.9	6.3	44.8	54.7
WB9507	29	24.7	7.4	2.5	44.6	52.9
WB9653	70	40.6	27.9	2.3	41.9	54.0
Samson	56	25.6	14.2	9.5	49.3	53.8
LCS Powerplay	24	13.3	4.5	3.1	38.2	54.3
LCS Breakaway	26	17.7	4.9	2.6	43.8	55.5
LCS Iguacu	33	21.0	7.2	2.2	62.3	59.0
LCS Nitro	50	23.6	12.5	3.7	49.1	55.2
HRS 3361	15	9.2	1.7	3.1	58.2	56.7
HRS 3419	39	27.4	14.6	4.1	59.8	56.0
HRS 3530	43	20.7	10.2	3.7	61.8	57.8
HRS 3504	45	19.3	9.3	2.1	50.9	55.2
Cardale	18	13.8	2.8	1.9	48.1	55.8
Trial Mean	34	19.8	8.0	3.0	49.2	56.2
C.V. %	40.0	49.0	79.0	30.1	10.3	1.8
LSD 5%	22.0	15.8	10.3	1.9	6.0	1.2

Planting Date: April 24

Harvest Date: August 12

HRSW Disease Summary, Walsh County 2015

Variety	<u>Stripe Rust</u>			<u>Fusarium Head Blight</u>			Yield (bu/a)	Test Weight (lbs/bu)
	% Incidence	% Severity	Flag Leaf* (%)	% Incidence	% Severity	Index		
Faller	47	10	5.5	20	10.6	2.3	61.7	57.3
Barlow	13	7	1.1	20	16.7	4.3	58.8	59.0
Prosper	37	12	6.4	21	12.5	2.6	52.8	56.6
Elgin-ND	7	2	1.4	22	9.7	2.1	56.3	56.4
Rollag	3	1	0.8	18	8.7	1.6	62.4	59.3
Linkert	1	1	1.0	22	7.3	1.6	65.4	58.7
Bolles	10	3	2.2	20	6.7	1.4	58.9	57.3
Forefront	5	1	0.4	14	12.0	1.5	59.8	58.5
Prevail	67	0	0.1	9	5.9	0.6	65.3	57.5
Focus	5	1	1.1	9	4.6	0.5	61.6	59.2
SY Soren	37	20	14.8	18	12.5	2.3	54.7	58.1
SY Rowyn	5	2	1.6	14	5.7	0.8	62.6	58.0
SY Ingmar	3	1	0.5	13	6.7	1.1	68.2	60.0
SY Valda	7	1	1.1	15	7.4	1.1	66.4	58.9
WB Mayville	4	1	1.0	28	16.7	4.5	56.4	57.0
WB9507	58	28	16.8	21	9.3	2.2	59.2	54.2
WB9653	3	1	0.6	18	9.8	1.8	69.3	57.0
Samson	7	2	0.9	29	9.1	2.6	71.5	56.6
LCS Powerplay	7	6	5.3	13	7.5	0.9	62.0	58.9
LCS Breakaway	10	1	0.6	20	11.7	2.3	57.3	58.0
LCS Iguacu	25	4	3.3	16	8.9	1.5	70.7	59.6
LCS Nitro	11	3	2.1	16	8.9	1.5	65.2	56.7
HRS 3361	12	2	1.2	24	9.8	2.4	65.9	57.1
HRS 3419	5	1	0.4	9	5.2	0.5	67.9	57.8
HRS 3530	7	1	0.5	18	9.1	1.6	66.7	58.3
HRS 3504	2	1	0.3	23	12.1	3.0	70.2	57.1
Cardale	0	0	0.0	18	10.3	1.9	50.8	55.4
Trial Mean	12	4	2.5	17	9.3	1.8	61.9	57.9
C.V. %	120.3	192.9	205.7	33.5	43.8	70.9	9.6	1.4
LSD 5%	24.0	12.7	8.5	9.5	6.6	2.1	8.4	1.1

*Stripe Rust Severity on Flag Leaf

Planting Date: May 4

Harvest Date: August 26

Durum Summary, Langdon 2011-2015

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)						Height (in)						Days to Head					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	09	10	11	15	4yr	12	13	14	15	3yr	12	13	14	15	3yr			
AC Commander	54	71	95	88	59	81	57.1	58.0	59.9	60.7	57.7	59.4	0.0	5.0	0.0	1.0	1.5	32	34	35	30	33	65	58	57	64	60			
AC Navigator	47	64	89	84	52	75	57.3	58.3	60.1	61.3	58.0	59.8	2.2	4.7	0.5	0.8	2.1	34	36	35	29	33	65	57	55	63	58			
Alkabo	65	75	97	85	70	84	60.5	60.0	61.5	62.2	61.6	61.8	0.0	3.7	0.7	0.5	1.2	39	39	40	39	39	65	58	56	64	59			
Ben	64	74	90	80	72	81	60.1	60.2	61.3	62.8	61.7	61.9	1.8	3.5	0.4	2.3	2.0	42	41	42	40	41	64	57	56	64	59			
Grenora	64	76	98	86	77	87	59.0	58.7	60.8	62.1	61.3	61.4	2.8	5.1	1.1	0.8	2.5	39	38	38	37	38	64	58	56	63	59			
Lebsock	69	79	89	79	72	80	60.6	60.0	61.2	62.6	61.7	61.8	0.0	3.3	0.3	3.8	1.9	40	38	39	38	38	64	57	55	63	58			
Maier	64	73	91	83	74	82	59.2	59.1	60.4	62.0	61.5	61.3	1.3	5.7	0.2	0.5	1.9	39	38	39	37	38	65	57	55	63	58			
Mountrail	61	77	103	87	80	90	59.1	59.0	60.3	61.8	60.7	60.9	3.8	5.3	0.1	2.0	2.8	41	39	40	39	39	65	58	57	64	60			
Pierce	66	77	101	82	73	85	60.7	60.3	61.9	62.3	61.9	62.0	1.5	5.1	0.4	3.0	2.5	41	40	41	39	40	65	58	55	63	59			
Strongfield	63	73	102	85	65	84	59.9	59.5	61.2	60.6	59.6	60.5	0.0	6.3	0.2	3.8	2.6	39	39	39	39	39	66	59	57	64	60			
Tioga	65	78	96	84	76	85	59.5	59.4	60.9	61.9	61.5	61.4	1.5	4.4	1.2	0.3	1.9	41	41	43	41	42	65	58	56	64	59			
Carpio	71	79	105	79	85	90	61.6	60.3	61.9	60.6	61.3	61.3	0.0	5.9	0.0	1.0	1.7	41	41	40	39	40	66	59	58	66	61			
Alzada	50	61	73	80	61	71	56.5	56.7	59.6	57.7	57.6	58.3	0.0	7.2	0.3	0.0	1.9	31	29	33	30	31	62	56	54	61	57			
Divide	65	75	94	84	78	85	59.9	60.0	60.2	61.4	61.0	60.9	--	5.8	0.3	1.8	--	40	40	41	40	40	66	59	58	64	60			
CDC Verona	57	70	103	76	70	83	59.4	59.0	61.2	60.7	59.8	60.6	--	4.4	0.4	0.8	--	40	40	40	37	39	66	60	56	64	60			
Rugby	58	67	86	74	66	75	59.8	59.4	60.6	62.1	61.4	61.4	--	--	0.3	4.0	--	46	44	43	42	43	65	57	57	62	59			
Joppa	75	75	102	86	82	90	60.1	60.0	60.7	61.9	61.3	61.3	1.7	4.7	0.7	0.5	1.9	42	37	42	40	40	64	58	57	64	60			
VT Peak	--	--	97	81	75	84	--	--	61.7	62.6	62.5	62.3	--	--	--	0.5	--	--	38	40	38	39	--	57	56	64	59			
MS Dart	--	--	--	85	--	--	--	--	--	61.8	--	--	--	--	--	--	--	--	--	39	--	--	--	--	57	--	--			
DG Max	64	69	90	--	--	--	60.4	59.7	61.0	--	--	--	0.7	5.1	0.4	--	--	41	39	--	--	--	65	57	--	--	--			
DG Star	69	73	--	--	--	--	60.4	59.0	--	--	--	--	0.5	2.9	0.6	--	--	41	--	--	--	--	63	--	--	--	--			
Dilse	61	70	--	--	--	--	59.7	59.4	--	--	--	--	1.9	5.5	0.2	--	--	40	--	--	--	--	66	--	--	--	--			
LSD 5%	6.5	4.6	6.4	4.9	7.6		0.8	0.8	0.5	1.0	0.9		2.0	1.3	1.4	NS		1.5	1.7	1.6	2.7		0.9	1.0	1.1	1.2				
LSD 10%	--	3.8	5.3	4.1	6.4		--	0.7	0.4	0.9	0.7		--	--	--	2.2		1.3	1.4	1.4	2.3		0.8	0.9	0.9	1.0				

Durum Summary, Towner County 2011-2015

Variety	Yield (bu/a)					Test Weight (lbs/bu)					Height (in)					Days to Head																													
	11	12	13	14	15	11	12	13	14	15	11	12	13	14	15	12	13	14	15	12	13	14	15	12	13	14	15	12	13	14	15	12	13	14	15	12	13	14	15	12	13	14	15		
Alkabo	61	57	74	52	52	60.0	56.9	61.0	56.2	59.8	59.0	59.0	59.0	59.0	59.0	36	45	40	33	39	62	46	58	64	56	62	46	58	64	56	62	46	58	64	56	62	46	58	64	56	62	46	58	64	56
Lebsock	57	51	68	58	61	59.9	57.1	61.0	56.5	62.7	60.1	60.1	60.1	60.1	60.1	35	44	39	35	39	60	45	55	63	54	60	45	55	63	54	60	45	55	63	54	60	45	55	63	54	60	45	55	63	54
Tioga	50	57	79	50	57	57.6	56.5	60.5	55.1	59.1	58.2	58.2	58.2	58.2	58.2	39	49	42	37	43	61	47	59	66	57	61	47	59	66	57	61	47	59	66	57	61	47	59	66	57	61	47	59	66	57
Divide	51	52	73	51	61	56.9	56.8	59.8	55.6	59.7	58.4	58.4	58.4	58.4	58.4	38	47	42	36	42	62	47	59	65	57	62	47	59	65	57	62	47	59	65	57	62	47	59	65	57	62	47	59	65	57
Carpio	52	56	75	55	62	58.7	57.0	61.2	56.1	60.7	59.3	59.3	59.3	59.3	59.3	38	48	41	37	42	63	48	60	66	58	63	48	60	66	58	63	48	60	66	58	63	48	60	66	58	63	48	60	66	58
Joppa	60	52	85	56	60	59.0	56.7	60.7	55.4	59.9	58.7	58.7	58.7	58.7	58.7	39	46	40	35	40	62	46	60	64	57	62	46	60	64	57	62	46	60	64	57	62	46	60	64	57	62	46	60	64	57
Grenora	59	53	80	--	--	58.4	55.7	59.5	--	--	--	--	--	--	--	34	41	--	--	--	61	45	--	--	--	61	45	--	--	--	61	45	--	--	--	61	45	--	--	--					
DG Max	55	53	75	--	--	58.9	56.4	60.4	--	--	--	--	--	--	--	38	46	--	--	--	61	46	--	--	--	61	46	--	--	--	61	46	--	--	--	61	46	--	--	--					
LSD 5%	5.3	NS	6.7	NS	NS	1.3	NS	0.5	NS	NS	NS	NS	NS	NS	NS	2.6	1.2	1.9	2.4	1.2	0.6	1.3	2.3	1.2	0.6	1.3	2.3	1.2	0.6	1.3	2.3	1.2	0.6	1.3	2.3										
LSD 10%	--	NS	5.5	NS	NS	--	NS	0.4	NS	NS	NS	NS	NS	NS	NS	2.1	1.0	1.5	2.0	1.0	0.5	1.1	1.9	1.0	0.5	1.1	1.9	1.0	0.5	1.1	1.9	1.0	0.5	1.1	1.9										



HRWW Summary, Langdon 2012-2015																				
Variety	Yield (bu/a)					Test Weight (lbs/bu)					Days to Head		Height (in)		Winter Survival (%)		Protein (%)			
	12	13	14	15	3yr	12	13	14	15	3yr	15	15	15	15	12	13	14	15	3yr	
	Julian	Days to Head					Test Weight (lbs/bu)					Days to Head		Height (in)		Winter Survival (%)		Protein (%)		
AC Broadview	81	91	78	76	82	60.3	58.2	59.6	58.9	58.9	168	168	31	31	96	8.8	11.8	12.4	11.3	11.8
Accipiter	74	107	74	73	85	61.9	60.1	59.8	59.7	59.9	172	172	32	32	88	9.1	11.5	10.7	11.8	11.3
CDC Falcon	76	101	76	76	84	61.1	60.8	60.5	58.6	60.0	169	169	30	30	90	9.3	12.0	11.9	11.7	11.9
Decade	80	85	73	84	81	61.8	60.4	60.9	61.3	60.9	166	166	29	29	99	9.6	13.8	13.8	12.0	13.2
Ideal	75	96	68	80	81	60.9	61.8	60.7	60.9	61.1	168	168	28	28	91	9.6	12.7	11.1	11.3	11.7
Jerry	70	96	72	76	81	61.1	59.7	60.2	59.7	59.9	171	171	35	35	90	9.5	13.0	13.3	12.0	12.8
Lyman	70	99	72	84	85	61.5	60.8	59.9	61.2	60.6	165	165	33	33	93	10.0	14.2	13.7	11.6	13.2
Overland	75	92	69	90	84	61.4	61.4	60.8	61.2	61.1	165	165	34	34	98	9.4	13.2	13.1	10.9	12.4
Peregrine	76	86	76	78	80	61.0	60.7	60.3	60.7	60.6	172	172	36	36	93	9.3	11.6	12.0	11.0	11.5
SY Wolf	73	82	72	84	79	62.0	60.8	61.1	61.6	61.2	164	164	30	30	97	10.1	12.7	12.8	11.4	12.3
WB Matlock	79	103	76	70	83	62.0	61.3	60.6	60.6	60.8	170	170	32	32	90	9.0	12.2	12.2	12.2	12.2
AC Emerson	--	79	76	85	80	--	61.9	59.9	62.0	61.3	170	170	33	33	98	--	13.4	12.3	11.8	12.5
Flourish	--	103	69	75	82	--	60.4	60.5	59.1	60.0	170	170	30	30	85	--	12.1	12.2	11.9	12.1
Moats	--	100	75	77	84	--	61.3	59.6	59.7	60.2	171	171	35	35	85	--	12.2	12.9	11.7	12.3
AC Gateway	--	--	71	79	--	--	--	59.2	61.3	--	170	170	31	31	90	--	--	13.5	12.3	--
CDC Chase	--	--	--	85	--	--	--	--	61.6	--	170	170	36	36	93	--	--	--	11.2	--
Colter	--	--	--	82	--	--	--	--	57.1	--	170	170	33	33	98	--	--	--	11.4	--
Northern	--	--	--	84	--	--	--	--	59.8	--	170	170	30	30	97	--	--	--	11.7	--
Redfield	--	--	--	79	--	--	--	--	60.5	--	165	165	30	30	95	--	--	--	11.5	--
LSD 5%	7.2	11.1	5.3	8.1		0.7	1.4	1.1	0.8		1.3	1.3	2.9	2.9	8.3	0.9	0.6	0.9	0.5	
LSD 10%	--	--	--	6.7		--	--	--	0.7		1.1	1.1	2.4	2.4	6.9	--	--	--	0.4	

Planted into 6 inch wheat stubble.

Fungicides were used in 2012-2015.

No lodging in trial.

Corn Grain, Langdon 2015

Brand	Hybrid	RM ¹	Days to	Harvest	Test	Yield
			Silk	Moisture	Weight	2015
			(%)	(lbs/bu)	-----bu/a-----	
Integra	2803	78	87	22.6	55.9	120.0
Integra	9301	80	87	25.9	57.5	121.3
Integra	9302	80	88	26.1	57.4	111.9
Integra	9272	77	86	27.2	58.1	128.1
Legacy	L1713 VT2PRO	78	88	23.5	56.6	110.7
Legacy	L1814 VT2PRO	79	88	24.8	56.4	118.0
Legacy	L2213 VT2PRO	80	88	24.0	56.7	116.6
NorthStar Genetics	NS 77-311	77	89	23.8	57.4	122.4
NS Genetics/Viking	VS 78-510	78	86	27.3	59.6	135.0
NS Genetics/Viking	VS 81-481	81	89	26.6	57.5	109.6
Nuseed	8001 VT2P RIB	80	87	26.7	57.0	119.5
NuTech Seed	5F-781	81	85	26.0	56.3	148.8
NuTech Seed	3A-080	80	87	23.9	53.3	129.8
NuTech Seed	5F-379	79	87	23.6	54.3	126.9
NuTech Seed	5F-775	77	85	23.0	54.5	128.0
PFS	21N78	78	86	23.5	56.7	129.4
PFS	71D83	81	87	25.1	56.8	122.5
Pioneer	P7332R	73	84	22.8	55.9	135.1
Proseed	1480 VT2P	80	87	25.6	57.0	116.6
Proseed	1280 VT2P	80	85	25.7	57.5	120.8
Proseed	1378 VT2P	78	88	23.5	54.4	125.4
REA Hybrids	1B730-RIB	73	82	24.4	61.0	111.4
REA Hybrids	1B731-RIB	73	82	23.8	59.3	107.7
REA Hybrids	1B790-RIB	79	87	24.3	57.1	126.7
Thunder	4377RR	77	87	27.2	58.3	120.8
Thunder	4578RR	78	84	22.6	55.5	130.5
Thunder	5181RR	81	89	26.3	55.6	122.9
Thunder	7578VT2PRIB	78	87	22.6	56.3	113.5
Thunder	6180VT2PRIB	80	88	26.0	56.3	117.2
Wensman	W6050RR	74	86	23.7	57.9	118.4
Wensman	W8076VT2RIB	79	85	26.6	57.8	132.1
Wensman	W80809VT2RIB	80	88	24.8	55.5	110.1
Trial Mean			87	24.8	56.4	122.8
C.V. %			1.4	3.3	1.8	8.9
LSD 5%			2.0	1.3	1.7	18.0
LSD 10%			1.6	1.1	1.4	15.0

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

Barley Summary, Langdon 2011-2015																						
Variety	Yield (bu/a)						Test Weight (lbs/bu)						Lodging (0-9)			Plump (%)						
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	08	15	2yr	11	12	13	14	15	3yr	
Lacey	110	97	164	134	128	142	49.6	48.5	50.9	52.1	51.1	51.4	2.8	0.9	1.9	94	86	98	99	97	98	
Stellar-ND	116	94	159	142	129	143	48.6	48.4	50.0	50.9	49.6	50.2	1.0	0.7	0.9	95	88	99	99	97	98	
Tradition	114	69	163	133	131	142	49.3	47.0	50.9	51.9	49.8	50.9	1.0	1.3	1.2	92	81	98	98	96	97	
Celebration	108	78	165	144	130	146	49.3	47.0	50.3	51.9	49.6	50.6	1.0	1.0	1.0	95	86	98	98	97	98	
Quest	108	94	163	130	124	139	48.7	48.2	49.3	50.3	49.4	49.7	0.5	0.8	0.7	87	76	96	96	92	95	
Innovation	117	91	160	138	128	142	48.7	47.4	50.2	51.8	50.2	50.7	--	0.7	--	92	81	98	99	97	98	
AC Metcalfe*	93	71	154	125	120	133	49.4	47.6	52.5	53.3	51.4	52.4	3.0	2.0	2.5	88	81	97	97	95	96	
CDC Copeland*	89	86	172	127	122	140	49.2	47.6	49.9	50.9	49.1	50.0	1.3	1.8	1.6	92	84	96	97	91	95	
Conlon*	99	83	138	126	111	125	51.6	49.3	52.5	52.4	51.9	52.3	2.3	0.9	1.6	97	92	99	99	96	98	
Pinnacle*	115	91	180	138	132	150	51.1	49.7	53.1	53.9	51.9	53.0	0.3	0.2	0.3	95	91	98	98	97	98	
Rawson*	107	83	166	122	124	137	49.4	47.7	51.8	52.1	49.0	51.0	3.5	3.0	3.3	95	95	99	99	97	98	
Conrad*	98	77	155	125	120	133	50.1	47.7	51.2	52.7	50.4	51.4	3.5	1.0	2.3	92	88	97	98	94	96	
ND Genesis*	114	93	174	128	125	142	49.4	48.1	51.3	52.6	50.5	51.5	--	0.4	--	96	90	98	98	96	97	
CDC Meredith*	--	--	--	--	116	--	--	--	--	--	48.6	--	--	4.9	--	--	--	--	--	--	92	--
LSD 5%	10.9	6.4	10.3	6.7	9.4		0.8	0.8	0.6	0.9	0.9		NS	1.6		3.3	3.9	0.7	0.9	2.5		
LSD 10%	--	5.4	8.6	5.5	7.8		--	0.7	0.5	0.7	0.7		--	1.3		--	3.3	0.6	0.8	2.1		

*2-row

Barley Summary, Langdon 2011-2015																		
Variety	Height (in)						Protein (%)						Days to Head					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Lacey	36	37	28	33	37	33	13.3	12.2	12.5	12.2	13.5	12.7	51	61	52	52	61	55
Stellar-ND	34	35	29	33	37	33	12.4	12.0	12.5	12.3	12.7	12.5	51	63	53	52	61	55
Tradition	36	34	29	33	39	34	12.7	12.2	12.5	12.0	12.8	12.4	53	64	52	52	60	55
Celebration	35	34	28	33	37	33	13.7	13.3	13.6	12.9	14.3	13.6	54	65	53	53	61	56
Quest	38	37	31	34	37	34	12.7	12.2	12.2	12.2	12.8	12.4	52	62	54	52	61	56
Innovation	33	37	26	32	36	31	12.5	12.8	12.4	13.0	13.6	13.0	51	61	52	50	60	54
AC Metcalfe*	35	31	32	29	37	33	13.7	12.7	11.7	12.6	13.2	12.5	54	65	56	54	62	57
CDC Copeland*	36	35	35	32	40	36	12.9	12.1	11.8	12.2	12.3	12.1	56	65	59	56	66	60
Conlon*	34	35	30	30	37	32	12.7	12.8	11.7	12.4	12.8	12.3	49	57	50	48	56	51
Pinnacle*	35	35	31	33	37	34	12.0	11.7	11.3	11.5	12.1	11.6	54	62	55	53	61	56
Rawson*	36	33	31	32	37	33	11.9	11.6	10.8	11.7	12.1	11.5	50	61	52	50	58	53
Conrad*	31	28	29	27	34	30	12.7	12.0	12.3	12.7	13.3	12.8	55	65	57	55	64	59
ND Genesis*	33	32	32	32	36	33	10.5	10.7	10.3	11.8	11.0	11.0	52	62	56	54	61	57
CDC Meredith*	31	--	--	--	36	--	12.1	--	--	--	12.9	--	53	--	--	--	65	--
LSD 5%	3.3	1.7	2.0	1.9	2.1		0.7	0.9	0.6	0.8	0.4		1.0	1.2	1.1	1.3	1.1	
LSD 10%	--	1.5	1.7	1.6	1.7		--	0.8	0.5	0.7	0.4		--	1.0	0.9	1.1	0.9	

*2-row

Barley Summary, Towner County 2010-2015

Variety	Yield (bu/a)					Test Weight (lbs/bu)					Lodging (0-9)					Protein (%)					Plump (%)											
	10	11	12	14	15	3yr	10	11	12	14	15	3yr	14	15	2yr	10	11	12	14	15	3yr	10	11	12	14	15	3yr	10	11	12	14	15
Lacey	118	77	83	117	108	103	50.8	49.3	46.4	48.7	48.3	47.8	6.8	3.8	5.3	12.2	13.7	14.2	14.8	13.6	14.2	95	95	72	88	90	83	95	95	72	88	90
Tradition	123	81	68	117	104	96	50.6	49.1	45.5	47.6	48.3	47.1	8.0	2.5	5.3	12.4	13.4	14.4	14.4	13.6	14.1	96	93	76	85	90	84	96	93	76	85	90
Quest	120	81	78	130	104	104	48.4	46.7	45.3	47.8	47.4	46.8	7.5	3.3	5.4	12.3	13.6	13.6	15.3	13.7	14.2	87	80	66	86	87	80	87	80	66	86	87
Innovation	--	--	76	130	105	104	--	--	45.6	48.5	47.8	47.3	7.3	4.0	5.7	--	--	14.3	14.8	13.7	14.3	--	--	71	92	91	85	--	--	71	92	91
Pinnacle*	121	79	--	--	109	--	51.7	49.6	--	--	48.4	--	--	3.8	--	10.9	12.4	--	--	11.9	--	98	94	--	--	93	--	98	94	--	--	93
ND Genesis*	--	--	--	--	105	--	--	--	--	--	46.8	--	--	3.5	--	--	--	--	--	10.8	--	--	--	--	--	93	--	--	--	--	--	93
Celebration	116	71	73	114	--	--	49.5	47.8	44.6	47.4	--	--	8.8	--	--	12.8	15.1	14.1	15.8	--	--	92	89	77	86	--	--	92	89	77	86	--
Stellar-ND	112	83	75	118	--	--	49.2	48.3	45.1	48.1	--	--	7.3	--	--	11.8	13.5	13.1	14.2	--	--	97	95	78	93	--	--	97	95	78	93	--
LSD 5%	NS	5.6	10.0	NS	NS	NS	0.7	0.8	NS	NS	NS	NS	NS	NS	NS	0.4	0.4	NS	0.8	0.6	0.6	2.8	3.7	8.3	4.4	NS	2.8	3.7	8.3	4.4	NS	
LSD 10%	--	--	7.3	NS	NS	NS	--	--	NS	NS	1.0	NS	NS	NS	NS	--	--	NS	0.6	0.5	0.5	--	--	6.0	3.6	NS	--	--	6.0	3.6	NS	

*2-row barley

Barley Summary, Pembina County 2011-2015

Variety	Yield (bu/a)					Test Weight (lbs/bu)					Lodging (0-9)					Protein (%)					Plump (%)										
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	15	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	
Lacey	95	116	106	117	95	106	50.4	48.9	49.9	49.2	48.2	49.1	1.5	13.2	11.1	12.6	12.2	12.4	12.4	12.4	93	91	99	98	92	96	93	91	99	98	92
Tradition	97	94	113	121	92	109	51.0	45.8	50.4	49.0	47.0	48.8	4.3	12.9	12.0	12.4	11.6	12.5	12.2	12.2	92	84	99	98	90	96	92	84	99	98	90
Quest	105	111	100	108	93	100	50.3	46.9	48.3	46.3	46.5	47.0	3.3	13.0	10.8	12.3	11.3	12.1	11.9	11.9	86	84	96	94	83	91	86	84	96	94	83
Innovation	--	113	101	122	94	106	--	47.9	48.6	49.0	47.5	48.4	2.3	--	--	11.0	12.4	12.0	12.4	12.3	--	90	98	99	89	95	--	90	98	99	89
Pinnacle*	102	--	--	--	100	--	51.8	--	--	--	48.6	--	1.8	11.7	--	--	--	11.3	--	--	96	--	--	--	94	--	96	--	--	--	94
ND Genesis*	--	--	--	--	86	--	--	--	--	--	47.0	--	3.8	--	--	--	--	10.6	--	--	--	--	--	--	94	--	--	--	--	--	94
Celebration	95	88	105	117	--	--	49.1	46.0	49.0	48.2	--	--	--	14.2	13.1	13.6	12.2	--	--	88	85	99	99	--	--	88	85	99	99	--	
Stellar-ND	100	108	104	117	--	--	49.6	46.5	49.2	46.9	--	--	--	12.5	11.4	12.1	11.7	--	--	92	88	99	98	--	--	92	88	99	98	--	
LSD 5%	7.0	6.1	NS	NS	6.8	--	0.8	1.4	0.6	0.7	1.1	--	NS	0.7	0.9	0.6	NS	0.5	0.5	3.2	2.2	0.5	0.8	5.3	--	3.2	2.2	0.5	0.8	5.3	
LSD 10%	--	5.0	NS	NS	5.6	--	0.5	0.5	0.5	0.5	0.9	--	NS	--	0.7	0.5	NS	0.4	0.4	--	1.8	0.4	0.7	4.3	--	--	1.8	0.4	0.7	4.3	

*Two row barley

Barley trials are conducted in Pembina County in odd numbered years and Walsh County in even numbered years. 2012 and 2014 data is from Walsh County.

Oat Summary, Langdon 2011-2015

Variety	Yield (bu/a)						Test Weight (lbs/bu)						Days to Head					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
AC Pinnacle	184	173	235	180	177	198	37.1	36.5	40.2	38.9	36.9	38.7	61	65	58	58	66	61
Beach	147	173	204	138	174	172	41.9	39.9	40.9	42.3	40.8	41.3	58	63	56	55	63	58
CDC Dancer	152	166	229	175	176	193	42.0	39.7	39.9	38.5	39.4	39.3	59	65	56	56	64	59
HiFi	177	170	216	171	159	182	40.7	39.2	38.7	40.1	37.2	38.7	58	64	57	56	64	59
Hyttest	123	140	176	127	139	147	42.8	41.6	41.3	42.0	41.8	41.7	54	62	54	54	63	57
Killdeer	158	169	208	178	161	182	38.3	37.1	38.1	39.4	37.7	38.4	55	63	55	55	62	57
Otana	112	144	188	144	135	156	36.5	37.5	37.5	39.2	34.8	37.2	59	64	56	57	64	59
Rockford	180	166	211	152	149	170	42.0	40.6	39.5	41.3	38.4	39.7	59	64	58	56	64	59
Souris	162	167	202	184	138	174	41.1	38.7	38.7	40.7	36.6	38.7	57	64	57	55	64	59
Stallion	157	154	194	157	160	170	42.3	38.7	40.8	41.9	41.2	41.3	57	62	56	55	64	58
Furlong	141	158	218	186	157	187	38.4	38.2	38.5	38.8	38.7	38.7	62	65	59	58	64	60
CDC Minstrel	154	169	232	178	160	190	36.3	35.2	37.7	39.5	34.9	37.4	57	63	57	55	64	59
Newburg	177	168	228	176	162	188	40.1	38.2	38.2	40.0	37.8	38.7	58	63	56	55	63	58
Leggett	185	154	221	165	190	192	41.3	38.6	38.8	40.9	39.3	39.7	58	65	57	55	64	59
Jury	161	162	225	166	151	181	41.9	39.7	39.7	41.1	38.7	39.8	57	62	56	56	63	58
Horsepower	--	160	171	160	135	155	--	39.5	39.1	40.6	38.3	39.3	--	61	53	54	61	56
Goliath	--	--	212	165	171	182	--	--	39.7	43.8	40.4	41.3	--	--	57	56	65	59
Paul*	--	--	--	134	127	--	--	--	--	43.9	45.1	--	--	--	--	58	65	--
Deon	--	--	--	163	186	--	--	--	--	40.5	39.2	--	--	--	--	57	65	--
Morton	130	149	195	--	--	--	40.5	39.8	39.2	--	--	--	57	63	57	--	--	--
Stark*	139	130	180	--	--	--	45.4	43.8	42.8	--	--	--	60	66	59	--	--	--
Shelby 427	152	143	189	--	--	--	41.9	39.7	40.7	--	--	--	52	60	54	--	--	--
Buff*	104	108	--	--	--	--	48.6	45.4	--	--	--	--	52	60	--	--	--	--
LSD 5%	13.4	10.1	14.3	15.5	16.9		1.1	0.9	1.3	1.9	1.1		1.1	0.7	1.2	0.9	1.0	
LSD 10%	--	8.5	12.0	13.0	14.2		--	0.7	1.1	1.6	0.9		--	0.6	1.0	0.8	0.9	

*Naked-hull variety

Oat Summary, Langdon 2011-2015

Variety	Height (in)						Protein (%)						Lodging (0-9)					
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	09	10	11	12	15	3yr
AC Pinnacle	45	42	42	44	48	45	9.7	13.7	14.0	10.6	8.1	10.9	0.8	8.5	0.0	2.0	1.5	1.2
Beach	48	45	43	47	51	47	11.9	15.2	16.0	10.4	10.6	12.3	0.0	8.7	0.0	0.0	0.4	0.1
CDC Dancer	48	44	42	45	48	45	11.0	13.7	14.5	8.6	8.1	10.4	0.0	8.2	0.0	0.0	1.3	0.4
HiFi	45	42	42	44	47	44	14.4	15.3	15.6	9.7	9.5	11.6	0.0	6.3	0.0	1.7	2.6	1.4
Hystest	46	42	44	45	50	46	15.4	17.8	18.9	10.3	13.2	14.1	0.3	8.4	0.0	3.4	4.7	2.7
Killdeer	39	38	37	39	44	40	10.4	14.4	14.6	11.2	9.3	11.7	1.0	8.8	0.0	2.0	2.6	1.5
Otana	47	43	44	46	50	47	10.9	14.8	14.3	16.0	9.7	13.3	7.3	9.0	0.0	5.9	4.1	3.3
Rockford	46	43	42	44	48	45	13.6	16.4	16.4	11.4	10.2	12.7	1.0	6.8	0.0	0.2	2.0	0.7
Souris	42	39	39	40	45	41	13.1	14.8	15.2	10.1	8.6	11.3	0.0	6.5	0.0	0.0	0.9	0.3
Stallion	47	43	44	45	48	46	14.0	16.2	17.4	8.4	12.6	12.8	3.3	8.3	0.0	5.9	1.7	2.5
Furlong	44	41	42	46	47	45	11.3	16.0	17.8	10.6	9.9	12.8	1.8	9.0	0.0	1.2	0.9	0.7
CDC Minstrel	43	39	39	42	45	42	9.2	12.6	12.9	9.5	7.0	9.8	0.0	8.9	0.0	0.4	0.3	0.2
Newburg	49	44	45	48	50	48	13.0	14.9	14.7	9.5	9.1	11.1	0.8	7.5	0.0	2.6	3.2	1.9
Leggett	43	40	41	41	48	43	13.7	16.4	16.8	8.7	11.7	12.4	1.8	7.3	0.0	0.5	3.0	1.2
Jury	50	42	47	49	51	49	13.0	15.5	15.5	9.2	9.9	11.5	1.5	7.8	0.0	4.2	2.3	2.2
Horsepower	--	38	36	36	41	38	--	15.2	15.9	10.1	9.3	11.8	--	--	--	0.1	0.0	--
Goliath	--	--	47	52	52	50	--	--	15.9	12.9	10.9	13.2	--	--	--	--	0.3	--
Paul*	--	--	--	46	49	--	--	--	--	8.5	15.1	--	0.8	5.4	--	--	1.0	--
Deon	--	--	--	46	48	--	--	--	--	10.2	11.8	--	--	--	--	--	0.6	--
Morton	48	45	44	--	--	--	13.3	16.4	15.5	--	--	--	0.5	6.0	0.0	0.0	--	--
Stark*	46	44	44	--	--	--	12.1	17.4	19.2	--	--	--	1.0	6.7	0.0	0.3	--	--
Shelby 427	43	40	40	--	--	--	14.0	16.0	17.9	--	--	--	--	7.1	0.0	0.9	--	--
Buff*	40	38	--	--	--	--	14.4	18.4	--	--	--	--	0.0	7.8	0.0	0.0	--	--
LSD 5%	2.4	2.1	1.9	2.1	2.2		1.0	0.5	--	--	--		2.0	1.2	NS	2.6	2.1	
LSD 10%	--	1.8	1.6	1.8	1.8		--	0.5	--	--	--		--	--	--	2.2	1.8	

*Naked-hull variety

Flax Summary, Langdon 2011-2015																											
Variety	Yield (bu/a)					Test Weight (lbs/bu)					Lodging (0-9)			Height (in)					Days to Flower								
	11	12	13	14	15	3yr	11	12	13	14	15	3yr	09	10	2yr	11	12	13	14	15	3yr	11	12	13	14	15	3yr
Carter*	41	37	38	40	36	38	53.5	52.9	53.4	52.1	53.0	52.8	1.5	0.0	0.8	28	25	19	25	26	23	50	58	50	49	46	48
CDC Arras	40	33	40	40	37	39	53.0	52.5	53.6	51.8	51.9	52.4	3.3	0.5	1.9	28	25	21	26	30	26	50	57	51	49	47	49
CDC Bethune	37	32	39	39	38	38	52.8	52.6	53.8	52.3	51.9	52.7	2.0	0.0	1.0	28	25	20	26	30	25	50	58	51	48	48	49
Hanley	41	35	41	37	37	38	53.1	52.0	53.7	52.0	52.2	52.6	2.5	0.5	1.5	29	26	20	25	30	25	50	57	51	48	48	49
Lightning	40	35	40	38	35	38	53.3	52.5	53.6	52.3	52.1	52.7	0.5	0.3	0.4	27	25	20	27	28	25	50	57	51	48	48	49
Linott	44	33	39	39	35	38	53.4	52.7	53.5	52.2	51.9	52.5	3.3	0.0	1.7	29	26	21	25	30	25	50	58	51	49	48	49
McGregor	44	34	37	40	39	39	53.4	52.5	53.4	51.7	51.8	52.3	2.8	0.0	1.4	28	25	21	25	29	25	50	59	51	49	48	49
Neché	37	33	40	38	37	38	53.0	52.5	53.8	52.2	52.5	52.8	2.0	0.2	1.1	29	25	21	27	30	26	51	58	51	48	47	49
Nekoma	38	34	38	38	37	38	53.1	52.7	53.7	52.3	52.6	52.9	2.8	0.2	1.5	28	25	20	26	30	25	49	57	50	48	47	48
Omega*	42	32	39	36	36	37	53.5	52.8	53.7	52.4	53.1	53.1	4.3	0.0	2.2	28	24	20	25	26	24	51	58	51	50	47	49
Pembina	45	33	38	38	37	38	53.1	52.6	53.3	52.0	52.8	52.7	1.0	0.3	0.7	29	25	21	26	29	25	50	57	50	51	49	50
Prairie Blue	44	35	34	40	38	37	53.0	52.2	53.2	51.7	51.7	52.2	1.5	0.7	1.1	27	24	19	25	28	24	51	58	51	49	49	50
Prairie Thunder	41	37	45	42	37	41	53.3	53.0	53.9	52.0	51.5	52.5	2.0	0.7	1.4	25	26	22	27	30	26	48	59	50	50	49	50
Rahab 94	40	35	32	40	38	37	53.0	52.0	53.0	51.5	50.2	51.6	2.0	0.0	1.0	25	24	20	24	27	24	50	58	50	48	48	49
Webster	43	35	45	39	35	40	53.6	52.7	54.0	52.1	52.2	52.8	3.3	0.0	1.7	30	25	21	27	30	26	52	59	51	50	49	50
York	44	35	39	38	35	37	53.3	52.5	53.6	52.0	52.4	52.7	2.5	0.0	1.3	28	24	19	25	30	25	50	56	50	48	49	49
Prairie Grande	38	33	31	35	37	34	53.0	52.0	53.3	51.4	51.0	51.9	2.8	0.7	1.8	24	23	18	22	27	22	48	55	51	47	46	48
CDC Sorrel	41	33	38	38	40	39	52.9	51.9	53.0	51.8	52.3	52.4	5.0	1.0	3.0	30	25	22	27	31	27	52	57	52	52	48	51
CDC Glas	--	39	42	43	41	42	--	51.8	52.5	51.2	50.8	51.5	--	--	--	--	26	21	26	29	25	--	60	51	51	50	51
CDC Sanctuary	--	32	42	38	41	41	--	52.0	53.3	51.5	50.7	51.8	--	--	--	--	24	21	25	28	25	--	59	51	52	49	51
Prairie Sapphire	--	36	47	38	38	41	--	51.5	52.7	51.0	51.4	51.7	--	--	--	--	25	22	26	26	25	--	58	51	51	46	49
Shape	--	37	45	38	40	41	--	51.8	53.0	51.3	51.4	51.9	--	--	--	--	25	22	25	27	25	--	58	50	49	45	48
GoldND*	--	--	--	37	36	--	--	--	--	52.2	52.3	--	--	--	--	--	--	--	27	30	--	--	--	--	50	50	--
Neela	--	--	--	39	39	--	--	--	--	51.9	51.9	--	--	--	--	--	--	--	25	28	--	--	--	--	52	48	--
LSD 5%	5.9	3.3	6.0	NS	3.0		0.3	0.3	0.4	0.4	0.7		2.2	0.8		1.9	1.1	1.8	1.5	1.9		1.1	0.6	1.2	1.5	0.7	
LSD 10%	--	2.8	5.0	NS	2.5		--	0.2	0.3	0.3	0.6		--	--	--	--	1.0	1.5	1.3	1.6		--	0.5	1.0	1.3	0.6	

*Yellow seeded.

Canola - Liberty Link, Clearfield Varieties, Langdon 2014-2015

Company/Brand	Variety	Type ¹	Blackleg		Clubroot	Days to First		Days to End		Days to		% Cover ⁴		
			Rating ²	Status ³		Resistant	Flower	Flower	Mature	Mature	14	15	2yr	
Bayer CropScience	InVigor L130	H,LL,TR	R	CA	No	14	15	2yr	14	15	2yr	14	15	2yr
Bayer CropScience	InVigor 5440	H,LL,TR	R	CA	No	45	43	44	64	65	65	89	84	87
Bayer CropScience	InVigor L156 H	H,LL,TR	R	CA	No	46	44	45	65	65	65	91	85	88
Bayer CropScience	InVigor L252	H,LL,TR	R	CA	No	45	43	44	64	65	65	91	85	88
Bayer CropScience	InVigor L140p	H,LL,TR	R	CA	No	46	44	45	64	63	64	91	84	88
Bayer CropScience	InVigor 241C	H,LL,TR	R	CA	No	45	42	44	62	61	62	87	82	85
Cibus	C1511	H,SU,TR	MR	CA	No	--	44	--	--	65	--	--	84	--
Cibus	C1516	H,SU,TR	NA	CA	No	--	44	--	--	67	--	--	84	--
Mycogen Seeds	Nexera 2020 CL	H,CL,HO	R	CA	Yes	45	44	45	65	65	65	92	86	89
Mycogen Seeds	CL2562966	H,CL,HO	R	EXP	No	--	44	--	--	65	--	--	86	--
Pioneer	45H76	H,CL,TR	R	CA	No	--	45	--	--	66	--	--	84	--
Pioneer	46H75	H,CL,TR	R	CA	No	--	46	--	--	67	--	--	87	--
RR Check ⁵	HyCLASS 955	H,RR,TR	R	CA	Yes	41	41	41	61	60	61	86	82	84
RR Check ⁵	Dekalb 70-50CR	H,RR,TR	R	CA	Yes	--	42	--	--	63	--	--	82	--
LSD 5%						0.6	0.9		1.1	1.3		3.1	2.4	
LSD 10%						0.5	0.7		0.9	1.1		2.6	2.0	

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

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.

⁵Roundup Ready check variety.

Canola - Liberty Link, Clearfield Varieties, Langdon 2013-2015

Lodging

Company/Brand	Variety	Height (in)			Lodging (0-9)			Oil ¹ (%)			Yield ¹ (lbs/a)				
		14	15	2yr	13	15	2yr	14	15	2yr	2013	2014	2015	2yr	3yr
Bayer CropScience	InVigor L130	46	55	51	0.5	0.0	0.3	43.0	46.5	44.8	3714	3522	3179	3351	3472
Bayer CropScience	InVigor 5440	51	57	54	0.3	0.0	0.2	42.6	46.0	44.3	4094	3545	3436	3491	3692
Bayer CropScience	InVigor L156 H	49	50	50	1.5	0.0	0.8	44.1	47.1	45.6	3739	3651	3223	3437	3538
Bayer CropScience	InVigor L252	49	53	51	1.3	0.0	0.7	45.4	48.6	47.0	3968	4121	3393	3757	3827
Bayer CropScience	InVigor L140p	48	54	51	--	0.0	--	43.6	47.4	45.5	--	3721	3540	3631	--
Bayer CropScience	InVigor 241C	--	54	--	--	0.0	--	--	45.5	--	--	--	3303	--	--
Cibus	C1511	--	57	--	--	0.0	--	--	44.5	--	--	--	3043	--	--
Cibus	C1516	--	57	--	--	0.0	--	--	46.9	--	--	--	2837	--	--
Mycogen Seeds	Nexera 2020 CL	48	53	51	--	0.0	--	46.3	48.1	47.2	--	3445	2894	3170	--
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	42	49	46	2.8	0.5	1.7	49.3	50.7	50.0	3551	3873	3433	3653	3619
RR Check	Dekalb 70-50CR	--	53	--	--	0.3	--	--	47.9	--	--	--	3288	--	--
LSD 5%		3.0	3.7		0.8	NS		1.5	1.4		491	421	311		
LSD 10%		2.5	3.1		0.7	0.3		1.3	1.2		408	351	259		

¹8.5% moisture

Canola - Roundup Ready, Langdon 2014-2015

Company	Variety	Type ¹	Blackleg Rating ²		Status ³	Clubroot Resistant		Days to First Flower			Days to End Flower			Days to Mature			% Cover ⁴		
			Rating	Type		Resistant	14	15	2yr	14	15	2yr	14	15	2yr	14	15	2yr	
Brett Young	6070RR	H,TR	R		CA	No	41	47	44	62	69	66	88	95	92	82	83	83	
Brett Young	6056CR	H,TR	R		CA	Yes	44	49	47	63	73	68	89	96	93	82	73	78	
Brett Young	6064RR	H,TR	R		CA	No	--	49	--	--	71	--	--	96	--	--	80	--	
Brett Young	6074RR	H,TR	R		CA	No	--	49	--	--	73	--	--	97	--	--	75	--	
Cargill	Victory V12-1	H,HO	R		CA	No	46	50	48	64	71	68	89	95	92	86	73	80	
Cargill	Victory V22-1	H,HO	R		CA	No	--	52	--	--	72	--	--	95	--	--	70	--	
Croplan	HyCLASS 930	H,TR	R		CA	No	40	45	43	61	66	64	85	91	88	80	75	78	
Croplan	HyCLASS 955	H,TR	R		CA	Yes	42	46	44	60	67	64	85	91	88	84	83	84	
Croplan	HyCLASS 970	H,TR	R		CA	No	--	48	--	--	70	--	--	93	--	--	69	--	
Croplan	HyCLASS 972	H,TR	R		CA	No	--	48	--	--	72	--	--	93	--	--	68	--	
Dekalb	DKL70-07	H,TR	R		CA	No	42	47	45	61	68	65	85	92	89	83	75	79	
Dekalb	DKL38-48	H,TR	MR		CA	No	43	47	45	61	68	65	85	92	89	82	70	76	
Dekalb	DKL70-50CR	H,TR	R		CA	Yes	42	48	45	62	70	66	85	93	89	83	79	81	
Dekalb	DKL70-10	H,TR	R		CA	No	--	47	--	--	68	--	--	91	--	--	74	--	
Integra	7150RR	H,TR	R		CA	No	40	45	43	60	65	63	85	92	89	79	74	77	
Integra	7156RR	H,TR	R		CA	No	--	46	--	--	68	--	--	91	--	--	79	--	
Mycogen	Nexera 1012 RR	H,HO	R		CA	No	47	53	50	66	75	71	89	96	93	83	74	79	
Mycogen	Nexera 1020 RR	H,HO	R		CA	No	--	51	--	--	73	--	--	94	--	--	80	--	
Mycogen	Nexera 1022 RR	H,HO	R		CA	Yes	--	52	--	--	74	--	--	96	--	--	64	--	
Pioneer	45H31	H,TR	R		CA	No	--	48	--	--	69	--	--	93	--	--	78	--	
Pioneer	45H33	H,TR	R		CA	Yes	--	48	--	--	68	--	--	92	--	--	86	--	
Proseed	44 Mag	H,TR	R		CA	No	43	48	46	62	71	67	87	93	90	73	68	71	
Proseed	300 Mag	H,TR	R		CA	No	42	47	45	61	68	65	87	93	90	82	69	76	
Proseed	PS 5000	H,TR	R		CA	Yes	--	48	--	--	70	--	--	95	--	--	74	--	
Star	Star 402	H,TR	R		CA	No	41	46	44	60	67	64	85	93	89	81	68	75	
LSD 5%							1.0	1.2		1.5	2.0		1.4	2.0		4.1	13.7		
LSD 10%							0.8	1.0		1.3	1.7		1.2	1.6		3.4	11.4		

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 2013-2015

Company	Variety	Lodging (0-9)										Oil ¹ (%)						Yield ¹ (lbs/a)					
		Height (in)		13		15		2yr		14		15		13		14		15		2yr		3yr	
		14	15	2yr	13	15	2yr	13	15	2yr	14	15	2yr	13	15	2yr	14	15	2yr	13	14	15	2yr
Brett Young	6070RR	46	47	47	0.3	1.3	0.8	0.3	42.9	48.4	45.7	0.8	3504	3158	3735	3447	3466						
Brett Young	6056CR	46	49	48	--	0.3	--	42.9	47.0	45.0	--	--	3256	3372	3314	--							
Brett Young	6064RR	--	49	--	--	0.3	--	--	49.1	--	--	--	--	3754	--	--							
Brett Young	6074RR	--	48	--	--	0.0	--	--	47.6	--	--	--	--	3721	--	--							
Cargill	Victory V12-1	45	49	47	0.2	0.8	0.5	41.7	47.6	44.7	0.5	3938	3463	3409	3436	3603							
Cargill	Victory V22-1	--	50	--	--	0.5	--	--	47.3	--	--	--	--	3244	--	--							
Croplan	HyCLASS 930	40	47	44	0.8	1.8	1.3	46.1	52.4	49.3	1.3	3781	3424	3601	3513	3602							
Croplan	HyCLASS 955	41	44	43	1.3	0.8	1.1	45.0	51.3	48.2	1.1	3481	3337	3848	3593	3555							
Croplan	HyCLASS 970	--	48	--	--	0.3	--	--	50.1	--	--	--	--	3471	--	--							
Croplan	HyCLASS 972	--	44	--	--	0.0	--	--	48.4	--	--	--	--	3588	--	--							
Dekalb	DKL70-07	44	47	46	1.2	1.0	1.1	44.4	50.8	47.6	1.1	3433	3291	3478	3385	3401							
Dekalb	DKL38-48	42	44	43	1.0	1.0	1.0	43.4	48.1	45.8	1.0	3280	3334	3055	3195	3223							
Dekalb	DKL70-50CR	44	47	46	--	1.0	--	44.0	48.4	46.2	--	--	3555	3357	3456	--							
Dekalb	DKL70-10	--	46	--	--	0.8	--	--	48.1	--	--	--	--	3759	--	--							
Integra	7150RR	40	43	42	1.9	2.0	2.0	45.4	51.0	48.2	2.0	3310	3138	3781	3460	3410							
Integra	7156RR	--	42	--	--	1.3	--	--	46.5	--	--	--	--	3814	--	--							
Mycogen	Nexera 1012 RR	52	59	56	0.0	0.0	0.0	40.8	45.2	43.0	0.0	3514	3237	3208	3223	3320							
Mycogen	Nexera 1020 RR	--	47	--	--	0.0	--	--	47.2	--	--	--	--	3596	--	--							
Mycogen	Nexera 1022 RR	--	51	--	--	0.0	--	--	47.0	--	--	--	--	3174	--	--							
Pioneer	45H31	--	46	--	--	0.3	--	--	48.8	--	--	--	--	3831	--	--							
Pioneer	45H33	--	48	--	--	0.8	--	--	48.5	--	--	--	--	3936	--	--							
Proseed	44 Mag	40	46	43	--	0.8	--	43.5	49.3	46.4	--	--	2857	3487	3172	--							
Proseed	300 Mag	43	44	44	--	1.5	--	44.3	49.5	46.9	--	--	3330	3618	3474	--							
Proseed	PS 5000	--	48	--	--	0.8	--	--	48.0	--	--	--	--	3747	--	--							
Star	Star 402	43	43	43	0.3	1.3	0.8	46.7	52.1	49.4	0.8	3545	3600	3749	3675	3631							
LSD 5%		3.4	5.3		1.0	0.9		1.4	1.1			465	322	367									
LSD 10%		2.9	4.4		0.9	0.8		1.2	1.0			390	269	308									

¹ 8.5% Moisture

Dry Bean Summary, Langdon 2013-2015

Variety	Type	Days to Maturity	Plant Height	Lodging	100 Seed Weight	Yield				
						2013	2014	2015	2 yr Avg.	3 yr Avg.
		DAP¹	(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*	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		

¹DAP-Days after planting

*Pink Panther had some preharvest shatter in 2015.

Dry Bean Summary, Pembina County 2013-2015

Variety	Type	Plant			100 Seed		Yield		
		Height (in)	Lodging (0-9)	Weight (g)	2013	2014	2015	2 yr Avg.	3 yr Avg.
LaPaz	Pinto	13	2.6	32.8	3820	2039	2961	2500	2940
Lariat	Pinto	11	1.8	35.9	3460	1790	2725	2257	2658
Stampede	Pinto	11	2.1	34.5	3348	1579	2519	2049	2482
Maverick	Pinto	9	5.1	37.6	3456	1783	2185	1984	2475
ND-307	Pinto	12	2.8	38.1	3540	1947	2833	2390	2773
Windbreaker	Pinto	11	2.6	42.2	3392	1812	3130	2471	2778
SF103-8	Pinto	9	2.6	35.2	--	1415	2555	1985	--
23ST27	Pinto	11	4.3	36.1	--	1442	2740	2091	--
HMS Medalist	Navy	10	1.3	16.7	3420	1793	1452	1622	2222
Ensign	Navy	10	2.7	20.5	3728	1426	1964	1695	2373
Vista	Navy	15	1.7	20.2	3432	1773	1950	1861	2385
T9905	Navy	10	1.6	19.8	3484	1697	2001	1849	2394
Rexeter	Navy	9	2.3	17.8	3516	1655	2118	1887	2430
Nautica	Navy	12	1.0	15.5	3204	1419	2038	1729	2220
Mist	Navy	13	1.6	19.2	3492	--	1963	--	--
Bolt	Navy	12	1.7	21.6	3208	--	2185	--	--
Fathom	Navy	10	2.0	16.9	--	--	1945	--	--
Avalanche	Navy	11	0.7	17.6	3440	1493	2345	1919	2426
Eclipse	Black	9	0.6	17.0	3436	1655	2077	1866	2389
Loreto	Black	10	4.0	17.8	3392	1472	1841	1657	2235
Zorro	Black	10	1.4	19.3	3576	1131	1876	1504	2194
Merlot	Small Red	8	4.8	36.0	2968	1558	2106	1832	2211
Rio Rojo	Small Red	10	3.5	27.8	2972	1890	1771	1830	2211
Rosie	Light Red Kidney	10	1.8	42.9	--	976	2018	1497	--
Pink Panther*	Light Red Kidney	13	0.4	44.9	--	646	1655	1151	--
Inferno	Light Red Kidney	12	2.2	47.8	--	--	2101	--	--
Talon	Dark Red Kidney	9	0.5	39.4	--	726	1470	1098	--
Montcalm	Dark Red Kidney	10	0.7	43.7	--	795	1732	1263	--
Dynasty	Dark Red Kidney	10	1.4	49.1	--	--	1994	--	--
Mean		11	2.2		3395	1528	2151		
C.V. %		19.4	49.7		6.9	12.3	14.0		
LSD 5%		NS	1.8		382	315	496		
LSD 10%		NS	1.5		319	262	413		

*Pink Panther had some preharvest shatter in 2015.

Field Pea, Langdon 2015														
Variety	Days to 1st Flower	Days to Mature	Vine Length (in)	Canopy Ht at Harvest (in)	Height Index (%)	Harvest Ease ² (0-9)	Protein (%)	1000 KWT (g)	Test Weight (lbs/bu)	Yield			Average	
										2013	2014	2015		year
Yellow Cotyledon Type														
Agassiz	57	92	39	16	41	6.8	24.6	217	64.2	90.7	80.2	77.3	78.8	82.7
DS Admiral	54	90	36	13	37	7.0	23.8	227	64.3	69.0	72.9	81.1	77.0	74.3
CDC Meadow	55	89	35	14	40	7.8	23.4	204	64.8	73.0	81.6	80.5	81.1	78.4
Mystique	56	95	43	18	41	4.5	24.7	237	64.3	79.9	69.2	83.6	76.4	77.6
Nette	55	91	35	15	44	7.8	23.8	231	65.3	64.2	80.4	79.4	79.9	74.7
Bridger	55	91	36	17	48	5.0	24.1	226	65.1	--	--	76.5	--	--
CDC Amarillo	58	94	41	16	41	4.5	24.1	234	64.3	--	--	82.4	--	--
CDC Saffron	57	92	37	14	39	6.5	24.6	229	65.0	--	--	78.6	--	--
Durwood	56	93	43	21	49	3.5	24.7	241	64.7	--	--	76.6	--	--
Green Cotyledon Type														
CDC Striker	55	92	33	10	32	8.3	24.0	217	64.7	67.6	71.8	83.2	77.5	74.2
Cruiser	55	92	39	15	40	7.3	25.4	205	64.2	67.5	77.4	70.4	73.9	71.8
Majoret	56	92	35	13	38	7.5	25.9	235	64.5	74.4	68.7	76.3	72.5	73.1
Mean	56	92	38	15	41	6.4	24.4	225	64.6	71.1	74.6	78.8		
C.V. %	1.2	1.2	9.1	14.3	14.0	17.7	1.6	4.4	0.7	8.7	10.1	4.9		
LSD 5%	0.9	1.6	4.9	3.1	8.2	1.6	0.6	22.0	0.7	8.9	NS	5.5		
LSD 10%	0.8	1.3	4.1	2.6	6.8	1.3	0.5	17.9	0.5	7.4	9.0	4.6		

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 Summary, Langdon 2015							
Variety	Days to 1st Flower	Days to Mature	Plant Height (in)	Lodging (0-9)	1000 KWT (g)	Test Weight (lbs/bu)	Yield (lbs/a)
MNA 71230	53	107	42	0.8	609	64.4	5,601
Tobasco	54	104	41	1.5	440	62.8	4,188
Boxer	53	105	41	0.5	583	63.5	5,304
Mistral	54	109	43	1.5	583	64.2	4,007
Merlin	54	107	42	1.5	610	63.3	4,178
MNA69360	52	106	42	0.3	572	63.2	5,116
Mean	53	106	42	1.0	566	63.6	4,732
C.V. %	0.9	1.9	1.9	86.3	--	0.7	7.4
LSD 5%	0.7	NS	NS	NS	--	0.7	524
LSD 10%	0.6	2.5	1.0	NS	--	0.6	431

Buckwheat Summary, Langdon 2015					
Variety	Days to 1st Flower	Plant Height (in)	Lodging (0-9)	Test Weight (lbs/bu)	Yield (lbs/a)
Manor	36	50.6	1.8	37.7	796
Springfield	35	53.4	1.3	37.5	828
Koma	37	49.3	2.8	38.4	855
Kota	35	50.9	0.5	38.6	757
Horizon	37	52.1	1.0	37.4	836
Mean	36	51.3	1.5	37.9	814
C.V. %	1.8	3.0	63.9	3.7	10.2
LSD 5%	1.0	2.3	1.4	NS	NS
LSD 10%	0.8	1.9	1.2	NS	NS

Conventional Soybean, Langdon 2015

Brand	Variety	Maturity Group ¹	Maturity Date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield	
							2015	2 yr Avg.
Asgrow ³	AG 00932	00.9	9/4	43	35.8	15.1	53.1	46.3
Asgrow ³	AG 00632	00.6	9/2	42	35.6	15.3	49.1	--
NDSU	ND Henson	0.0	9/8	37	35.6	16.8	54.4	48.8
NDSU	Ashtabula	0.4	9/13	43	34.3	17.4	63.3	52.7
NDSU	Traill	0.0	9/8	38	37.0	15.4	45.8	40.1
Richland IFC	MK0249	0.2	9/11	37	35.1	15.4	53.9	44.9
Trial Mean			9/9	40	35.5	16.2	53.9	
C.V. %			1.4	6.7	1.1	1.7	6.6	
LSD 5%			2.1	3.8	0.9	0.6	5.1	
LSD 10%			1.8	3.2	0.7	0.5	4.2	

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).

³Roundup Ready check variety.

Yield, oil and protein reported at 13% moisture.

Conventional Soybean, Walsh County 2015

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield		
							2015	2 yr Avg.	2-Site Avg. ³
Asgrow ⁴	AG 00932	00.9	9/10	32	33.5	16.6	41.5	53.7	47.3
Asgrow ⁴	AG 00632	00.6	9/7	28	33.5	17.2	41.2	--	45.2
NDSU	ND Henson	0.0	9/12	27	32.0	18.4	43.6	53.4	49.0
NDSU	Ashtabula	0.4	9/16	31	30.4	18.5	46.0	56.1	54.7
NDSU	Traill	0.0	9/11	27	34.2	17.0	37.1	48.0	41.5
Richland IFC	MK0249	0.2	9/17	27	30.9	17.2	43.3	49.9	48.6
Trial Mean			9/13	29	32.0	17.7	43.0		
C.V. %			9.1	9.1	2.0	1.5	9.9		
LSD 5%			1.7	NS	1.4	0.6	NS		
LSD 10%			1.4	3.1	1.1	0.5	5.1		

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 trials at Langdon REC and Walsh County (Park River).

⁴Roundup Ready check variety.

Yield, oil and protein reported at 13% moisture.

Liberty Link Soybean, Langdon 2015

Brand	Variety	Maturity Group ¹	Maturity Date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield	
							2015	2 yr Avg.
							-----bu/a-----	
Hefty	H008L3	00.8	9/2	34	35.1	16.8	51.8	44.6
Integra	30080LL	00.8	9/2	33	34.5	16.9	47.8	43.3
Northstar	NS 0095LL	00.9	9/4	33	34.6	16.8	49.9	44.1
Northstar	NS 0129LL	0.1	9/8	36	32.9	17.1	53.0	46.1
NuTech	3022LL	0.2	9/7	32	32.5	18.1	52.0	--
Trial Mean			9/5	33	33.9	17.1	50.9	
C.V. %			0.8	4.7	0.7	1.8	7.2	
LSD 5%			1.2	2.1	0.6	0.8	NS	
LSD 10%			1.0	1.7	0.5	0.6	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).
Yield, oil and protein reported at 13% moisture.

Liberty Link Soybean, Walsh County 2015

Brand	Variety	Maturity Group ¹	Maturity Date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield		
							2015	2 yr Avg.	2-Site Avg. ³
							-----bu/a-----		
Hefty	H008L3	00.8	9/12	28	33.2	17.7	48.0	57.0	49.9
Integra	30080LL	00.8	9/11	27	33.4	17.5	45.8	55.0	46.8
Northstar	NS 0361NLL	0.3	9/18	34	31.7	17.8	54.1	--	--
Northstar	NS 0129LL	0.1	9/14	29	31.9	17.6	45.7	56.8	49.4
NuTech	3022LL	0.2	9/13	29	32.6	17.7	45.1	--	48.6
Thunder Seed	5401LL	0.1	9/14	32	31.9	17.4	50.1	55.0	--
Trial Mean			9/14	30	32.4	17.6	48.1		
C.V. %			5.1	6.4	1.5	1.2	7.1		
LSD 5%			0.9	2.5	NS	NS	4.5		
LSD 10%			0.8	2.1	1.0	NS	3.7		

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 LL trials at Langdon REC and Walsh County (Park River).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Langdon 2015

Brand	Variety	Maturity Group ¹	Plant		Lodging	Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)				2015	2 yr Avg.	2-site Avg. ³
								-----bu/a-----		
Croplan	R2T0041	00.4	9/5	41	1.4	33.8	16.1	49.9	44.3	--
Croplan	R2T00800	00.8	9/7	40	0.5	33.7	16.8	56.6	48.7	--
Croplan	R2T0091	00.9	9/6	41	0.8	34.5	16.4	57.7	48.6	--
Dyna-Gro	S006RY75	00.6	8/31	42	1.1	34.9	15.0	53.1	44.0	51.6
Dyna-Gro	S008RY43	00.8	9/3	39	0.8	33.2	16.7	56.1	--	52.9
Dyna-Gro	S009RY56	00.9	9/10	41	1.4	34.1	16.6	59.0	--	59.8
Dyna-Gro	S01RY86	0.1	9/8	43	1.9	33.9	17.2	65.2	--	58.0
Hefty	H007Y12	00.7	9/2	38	1.0	34.3	17.2	52.6	46.1	51.3
Hefty	H007R5	00.7	8/30	39	0.2	34.2	15.5	52.4	--	50.1
Hefty	H008R3	00.8	9/3	40	0.6	33.4	16.5	53.7	45.6	52.2
Hefty	H009R3	00.9	9/10	36	0.0	35.2	15.7	61.1	53.9	60.1
Hefty	H009R5	00.9	9/3	40	1.0	34.7	16.8	53.4	--	50.8
Integra	20076N	00.6	8/30	41	0.8	34.7	15.0	46.1	40.8	48.5
Integra	20031	00.7	9/5	41	0.3	34.4	15.7	56.5	48.2	54.7
Integra	20084N	00.8	9/9	38	1.1	34.8	16.0	55.2	--	--
Integra	20087	00.8	9/5	34	0.2	34.8	15.8	56.8	--	--
Legacy Seeds	LS-00834 RR2	00.8	9/3	34	0.3	34.8	15.3	54.1	45.9	55.2
Legacy Seeds	LS-00835N RR2	00.8	9/10	40	2.4	34.8	16.1	55.1	--	56.0
Legacy Seeds	LS-0135 RR2	0.1	9/7	42	1.1	33.6	17.7	56.3	--	55.4
Legacy Seeds	LS-0214 RR2	0.2	9/9	40	0.9	35.0	16.6	58.0	50.0	54.1
Legend	LS 003R21	00.3	9/2	37	0.4	34.7	16.6	51.8	42.9	--
Legend	LS009R20	00.9	9/5	41	0.7	32.4	16.8	57.4	--	--
Legend	LS 007R22	00.7	9/4	40	1.5	34.6	15.9	55.6	--	--
Legend	LS008R660	00.8	9/10	40	1.6	34.2	16.3	58.1	--	--
Legend	LS 008R560	00.8	9/11	36	0.2	34.6	15.8	62.7	--	--
Mycogen	5B005R2	00.5	9/2	37	0.3	35.2	16.0	46.6	43.4	46.5
Mycogen	5B007R2	00.7	9/1	35	0.1	34.0	15.6	53.9	--	50.8
Mycogen	5G009R2	00.9	9/4	42	0.8	33.7	16.0	59.7	51.8	55.6
Mycogen	5J009R2	0.1	9/7	35	0.5	35.5	15.7	56.3	--	55.4
Mycogen	X55008R2	00.8	9/10	39	0.8	34.0	16.4	58.9	--	57.0
NorthStar	NS 0060NR2	00.6	8/29	40	0.3	34.2	15.1	47.8	42.9	48.1
NorthStar	NS 0080R2	00.8	9/2	39	0.2	33.9	16.0	56.7	47.9	57.3
NorthStar	NS 0081NR2	00.8	9/9	40	0.6	33.7	16.5	57.3	--	59.8
NuTech	6007	00.7	9/2	35	0.0	35.1	16.4	50.0	44.4	50.3
NuTech	6008R2	00.7	9/5	45	1.2	32.5	17.0	57.2	--	56.5

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 our northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Langdon 2015 (continued)

Brand	Variety	Maturity Group ¹	Plant		Lodging	Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)				2015	2 yr Avg.	2-site Avg. ³
NuTech	6021	0.2	9/4	35	0.0	35.2	16.2	53.3	--	58.0
PFS	15R006N	00.6	8/29	40	0.0	33.7	15.3	46.1	40.6	45.9
PFS	16R008N	00.8	9/5	42	0.5	33.1	17.4	61.7	--	57.1
PFS	16R01	0.1	9/9	40	1.4	34.1	16.5	53.3	--	54.4
Pioneer	P01T23R	0.1	9/4	36	0.0	33.3	17.2	55.8	--	--
Pioneer	P008T22R2	00.8	9/5	42	0.3	34.1	16.8	56.6	--	--
Pioneer	P006T78R	00.6	8/29	32	0.0	34.8	16.2	49.7	--	--
Prairie Brand	PB-00766R2	00.7	9/1	40	0.0	33.8	15.2	49.8	44.7	52.6
Prairie Brand	PB-00844R2	00.8	9/5	39	1.1	33.9	16.7	53.4	48.2	52.9
Prairie Brand	PB-00856R2	00.8	9/11	41	2.2	34.9	16.1	63.3	--	62.6
Prairie Brand	PB-00950R2	00.9	9/6	41	0.5	33.4	16.5	61.6	51.1	56.5
Prairie Brand	PB-0146R2	0.1	9/7	43	1.0	33.5	17.4	62.2	--	60.4
Proseed	P2 11-07	00.7	9/2	38	0.1	33.4	16.7	54.8	48.6	--
Proseed	P2 10-08 RR2Y	00.8	9/5	42	1.4	35.0	16.6	65.8	53.1	57.3
Proseed	PX 5008	00.8	9/9	38	1.5	34.5	15.7	57.7	--	57.4
Proseed	30-07	00.7	9/1	34	0.0	33.9	16.5	55.6	45.8	54.6
REA	55G14	00.5	9/3	42	0.2	34.4	15.7	50.7	44.6	49.9
REA	R0216	0.2	9/7	43	1.2	34.8	15.2	61.5	--	59.2
Stine Seed	01RE00	0.1	9/7	38	0.0	33.9	17.2	62.6	53.2	--
Stine Seed	02RD00	0.2	9/11	37	0.0	34.0	16.2	60.1	--	--
Syngenta NK	S007-Y4	00.7	8/31	36	0.2	34.9	15.7	53.8	47.4	53.9
Syngenta NK	S02-R2	0.2	9/7	39	1.8	33.8	16.2	62.9	--	59.9
Thunder Seed	32005	00.5	8/31	38	0.6	35.8	15.6	53.5	--	52.7
Thunder Seed	34006	00.6	9/2	39	0.0	35.3	15.6	53.3	--	51.2
Thunder Seed	35007N	00.7	9/1	42	1.5	34.5	14.8	53.7	46.4	51.5
Thunder Seed	360008N	00.8	9/10	40	2.4	35.2	16.0	58.7	--	59.6
Thunder Seed	Astro	0.0	9/6	42	0.1	34.4	15.8	57.0	50.4	57.8
Wensman	W30061NR2	00.6	8/31	42	0.4	34.4	14.7	55.7	47.3	--
Wensman	W30085NR2	00.8	9/9	38	1.0	34.2	16.5	60.9	--	56.8
Wensman	W30099R2	00.9	9/8	41	0.1	33.8	16.7	61.0	50.3	60.2
Wensman	W3018R2	00.1	9/5	44	0.7	34.4	17.1	62.0	--	59.4
Wensman	W3024R2	00.2	9/8	36	0.3	34.8	15.8	60.7	52.1	60.0
Trial Mean			9/4	39	0.7	34.2	16.2	55.7		
C.V. %			2.2	4.4	131.5	1.9	2.1	8.6		
LSD 5%			7.8	2.4	1.3	1.3	0.7	6.7		
LSD 10%			6.5	2.0	1.1	1.1	0.6	5.6		

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, Pembina County 2015

Brand	Variety	Maturity Group ¹	Plant		Lodging	Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)				2015	2 yr Avg.	2-site Avg. ³
Dyna-Gro	S006RY75	00.6	9/4	27	0.1	33.8	16.1	50.1	51.8	51.6
Dyna-Gro	S008RY43	00.8	9/13	27	0.0	32.1	17.3	49.7	--	52.9
Dyna-Gro	S009RY56	00.9	9/15	31	1.3	33.9	16.4	60.6	--	59.8
Dyna-Gro	S01RY86	0.1	9/15	31	1.3	32.5	17.3	50.8	--	58.0
Hefty	H007Y12	00.7	9/11	28	0.0	33.8	17.1	50.0	53.8	51.3
Hefty	H007R5	00.7	9/8	24	0.0	34.8	16.0	47.9	--	50.1
Hefty	H008R3	00.8	9/13	26	0.2	32.3	16.9	50.7	52.0	52.2
Hefty	H009R3	00.9	9/18	29	0.1	34.2	16.1	59.2	59.6	60.1
Hefty	H009R5	00.9	9/12	31	0.1	34.9	16.8	48.2	--	50.8
Integra	20076N	00.6	9/5	28	0.2	34.4	16.1	50.9	49.4	48.5
Integra	20031	00.7	9/14	30	0.2	34.0	16.1	52.9	52.5	54.7
Legacy Seeds	LS-00834 RR2	00.8	9/13	25	0.1	33.7	16.4	56.3	53.4	55.2
Legacy Seeds	LS-00835N RR2	00.8	9/16	29	1.8	33.6	16.5	56.9	--	56.0
Legacy Seeds	LS-0135 RR2	0.1	9/17	33	1.3	32.9	17.1	54.5	--	55.4
Legacy Seeds	LS-0214 RR2	0.2	9/16	29	1.8	33.1	16.3	50.2	55.0	54.1
Mycogen	5B005R2	00.5	9/10	25	0.2	33.8	17.4	46.4	50.4	46.5
Mycogen	5B007R2	00.7	9/9	24	0.1	33.6	16.4	47.7	--	50.8
Mycogen	5G009R2	00.9	9/14	30	0.7	33.2	16.8	51.6	54.1	55.6
Mycogen	5J009R2	0.1	9/14	25	0.3	34.2	16.2	54.5	--	55.4
Mycogen	X55008R2	00.8	9/15	28	0.5	33.0	16.5	55.1	--	57.0
NorthStar	NS 0060NR2	00.6	9/5	27	0.0	33.2	16.5	48.3	47.5	48.1
NorthStar	NS 0080R2	00.8	9/13	28	0.0	34.1	16.1	57.9	57.6	57.3
NorthStar	NS 0081NR2	00.8	9/16	31	1.6	33.9	16.7	62.3	--	59.8
NuTech	6007	00.7	9/13	26	0.8	34.5	16.9	50.5	--	50.3
NuTech	6008R2	00.7	9/12	27	0.3	31.8	17.8	55.9	--	56.5
NuTech	6021	0.2	9/14	25	0.0	34.2	16.8	62.6	--	58.0
PFS	15R006N	00.6	9/5	27	0.0	34.2	16.0	45.7	47.2	45.9
PFS	16R008N	00.8	9/16	30	1.2	33.1	17.3	52.5	--	57.1
PFS	16R01	0.1	9/16	29	0.2	34.1	16.4	55.5	--	54.4
Prairie Brand	PB-00766R2	00.7	9/6	30	0.1	33.1	16.3	55.4	52.8	52.6

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, Pembina County 2015 (continued)

Brand	Variety	Maturity Group ¹	Plant		Lodging (0-9)	Protein (%)	Oil (%)	Yield		
			Maturity date ²	Height (in)				2015	2 yr Avg.	2-site Avg. ³
								-----bu/a-----		
Prairie Brand	PB-00844R2	00.8	9/12	27	0.8	32.9	16.9	52.5	55.1	52.9
Prairie Brand	PB-00856R2	00.8	9/15	31	0.8	34.0	16.4	61.9	--	62.6
Prairie Brand	PB-00950R2	00.9	9/13	31	0.0	33.4	16.7	51.4	53.9	56.5
Prairie Brand	PB-0146R2	0.1	9/16	34	1.9	32.8	17.7	58.6	--	60.4
Proseed	P2 10-08 RR2Y	00.8	9/13	30	0.2	34.5	16.2	48.8	--	57.3
Proseed	PX 5008	00.8	9/16	30	1.3	33.6	16.2	57.1	--	57.4
Proseed	30-07	00.7	9/10	25	0.0	34.5	16.2	53.6	52.8	54.6
Proseed	P2 20-08	00.8	9/14	29	0.8	32.3	17.0	52.1	56.0	--
REA	55G14	00.5	9/8	28	0.1	34.8	15.7	49.1	45.9	49.9
REA	R0216	0.2	9/16	32	1.9	33.5	16.9	56.9	--	59.2
REA	62G22	0.2	9/14	32	0.0	34.3	16.3	53.7	--	--
Syngenta NK	S007-Y4	00.7	9/10	25	0.0	32.4	17.6	54.1	51.7	53.9
Syngenta NK	S02-R2	0.2	9/13	28	0.4	35.2	15.8	56.9	--	59.9
Thunder Seed	32005	00.5	9/7	27	0.0	33.4	17.0	51.9	50.7	52.7
Thunder Seed	34006	00.6	9/12	24	0.1	32.2	17.5	49.0	--	51.2
Thunder Seed	35007N	00.7	9/4	28	0.0	33.8	16.0	49.2	50.0	51.5
Thunder Seed	360008N	00.8	9/15	25	1.4	34.4	16.3	60.5	--	59.6
Thunder Seed	Astro	0.0	9/16	28	0.1	33.6	16.3	58.6	56.9	57.8
Wensman	W30085NR2	00.8	9/15	28	0.6	33.4	16.7	52.8	--	56.8
Wensman	W30099R2	00.9	9/17	31	0.8	33.2	17.0	59.4	59.8	60.2
Wensman	W3018R2	00.1	9/17	35	2.4	33.1	17.4	56.9	--	59.4
Wensman	W3024R2	00.2	9/15	28	0.4	34.2	16.0	59.3	58.0	60.0
Trial Mean			9/12	28	0.5	33.6	16.6	53.3		
C.V. %			11.0	10.6	138.4	2.2	2.2	9.7		
LSD 5%			1.9	4.2	1.0	1.5	0.8	7.2		
LSD 10%			1.6	3.5	0.8	1.3	0.6	6.0		

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 northern region. Langdon REC and Pembina County (Cavalier).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Walsh County 2015

Brand	Variety	Maturity Group ¹	Maturity date ²	Plant Height (in)	Protein (%)	Oil (%)	Yield		
							2015	2 yr Avg.	2-site Avg. ³
							-----bu/a-----		
Channel	00806R2	00.8	9/12	43	34.3	16.2	57.8	--	--
Channel	0205R2	0.2	9/13	47	33.9	16.5	59.5	--	--
Channel	0209R2	0.2	9/13	43	31.7	17.9	60.9	--	--
Dairyland Seed	DSR-C918/R2Y	00.9	9/12	36	33.9	16.5	63.2	--	55.1
Dairyland Seed	DST01-000/R2Y	0.1	9/12	42	32.6	17.8	63.8	--	57.9
Dairyland Seed	DSR-0305/R2Y	0.3	9/15	41	33.4	16.3	68.5	--	62.8
Dairyland Seed	DSR-0404/R2Y	0.4	9/15	39	33.8	16.0	61.9	--	58.4
Dyna-Gro	S009RY56	00.9	9/13	40	33.5	16.4	62.6	--	55.2
Dyna-Gro	S01RY86	0.1	9/13	44	32.4	17.8	64.5	--	59.5
Dyna-Gro	S02RY74	0.2	9/12	34	33.5	16.7	62.9	62.8	58.8
Dyna-Gro	S03RY36	0.3	9/17	38	34.7	16.5	62.8	--	59.7
Hefty	H008R3	00.8	9/9	37	32.2	17.0	58.1	57.4	50.2
Hefty	H009R3	00.9	9/14	36	33.9	16.3	59.5	62.0	52.4
Hefty	H009R5	00.9	9/8	39	33.5	17.1	53.3	--	48.0
Hefty	01R4	0.1	9/14	36	33.8	15.9	57.6	59.0	51.9
Hefty	02R3	0.2	9/17	38	33.6	15.9	59.0	--	55.4
Integra	20031	00.7	9/13	40	33.5	16.5	61.6	60.1	54.5
Integra	20084N	00.8	9/14	36	33.5	16.6	59.3	--	55.3
Integra	20087	00.8	9/12	35	33.9	16.5	57.3	--	52.0
Integra	20126	0.1	9/14	39	33.8	16.5	60.1	61.6	54.9
Integra	20300	0.1	9/16	39	33.9	15.9	61.3	--	55.9
Legacy Seeds	LS-00835N RR2	00.8	9/13	37	33.4	16.8	59.5	--	53.0
Legacy Seeds	LS-0135 RR2	0.1	9/13	47	33.0	17.5	64.6	--	57.1
Legacy Seeds	LS-0214 RR2	0.2	9/13	40	33.2	16.6	59.4	62.9	57.0
Legacy Seeds	LS-0334 RR2	0.3	9/19	38	33.5	16.8	67.1	65.5	61.4
Legacy Seeds	LS-0134 RR2	0.3	9/15	35	33.7	16.3	62.2	63.3	59.0
Mycogen	5J009R2	0.1	9/11	34	34.4	16.1	60.0	--	55.4
Mycogen	5B012R2	0.1	9/13	39	32.9	17.2	62.2	61.4	55.4
Mycogen	5B024R2	0.2	9/12	43	34.4	16.7	57.6	--	55.5
Mycogen	X550013R2	0.1	9/12	41	33.1	17.8	59.2	--	57.2
Mycogen	5B033R2	0.3	9/16	38	34.5	16.1	64.0	--	60.8
NorthStar	NS 0090R2	00.9	9/12	33	34.5	15.9	58.6	--	52.4
NorthStar	NS 0111R2	0.1	9/13	42	32.3	18.2	63.7	--	59.5
NorthStar	NS 0200NR2	0.2	9/17	46	33.2	16.0	59.8	--	55.6
NorthStar	NS 0480NR2	0.4	9/18	43	34.0	16.1	67.7	--	61.4

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 southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Walsh County 2015 (continued)

Brand	Variety	Maturity Group ¹	Plant				Yield		
			Maturity	Height	Protein	Oil	2015	2 yr Avg.	2-site Avg. ³
			date ²	(in)	(%)	(%)	bu/a		
NorthStar	NS 0088R2	00.8	9/10	40	32.4	17.3	56.5	56.2	54.8
NuTech	6007	00.7	9/10	31	33.1	17.5	50.1	53.6	45.0
NuTech	6008R2	00.7	9/9	40	31.7	17.8	61.8	--	54.7
NuTech	6021	0.2	9/10	32	33.9	16.9	57.1	57.5	53.6
PFS	16R01	0.1	9/13	36	33.5	16.6	55.1	--	52.4
PFS	15R04	0.4	9/18	40	33.1	16.4	63.2	63.6	57.5
Prairie Brand	PB-00856R2	00.8	9/14	39	33.6	17.0	62.7	--	58.0
Prairie Brand	PB-0146R2	0.1	9/12	44	32.4	18.1	64.6	--	56.4
Prairie Brand	PB-0240R2	0.2	9/13	43	34.7	16.1	60.8	59.0	55.8
Prairie Brand	PB-0291R2	0.2	9/14	38	33.3	16.6	62.0	63.5	57.5
Prairie Brand	X14033R2	0.3	9/15	37	34.4	16.3	59.4	--	56.6
Proseed	P2 10-08 RR2Y	00.8	9/12	41	33.6	16.8	61.7	61.3	--
Proseed	30-20	0.2	9/14	41	33.9	16.2	66.3	67.1	61.0
Proseed	P2 20-30	0.3	9/17	41	34.9	15.6	67.6	67.2	60.4
Proseed	PX 501	0.2	9/13	42	32.5	17.8	65.9	--	60.2
Proseed	40-30N	0.3	9/17	49	33.9	16.0	59.7	--	--
REA	61G24	0.1	9/15	35	34.7	16.0	62.0	62.3	58.2
REA	R0216	0.2	9/14	45	32.7	17.9	64.3	--	59.2
REA	64G94	0.4	9/18	43	31.4	17.9	64.6	61.9	60.4
REA	62G22	0.2	9/12	45	34.7	16.4	60.4	59.8	53.5
Stine Seed	01RE00	0.1	9/12	35	33.4	16.7	63.1	62.8	59.6
Stine Seed	02RD00	0.2	9/15	37	33.4	16.5	61.6	--	55.9
Syngenta NK	S04-D3	0.4	9/14	40	33.6	16.2	62.6	--	58.1
Syngenta NK	S02-R2	0.2	9/12	38	34.0	16.4	64.8	--	58.1
Thunder Seed	360008N	00.8	9/13	38	33.5	16.8	60.3	--	53.8
Thunder Seed	Astro	0.0	9/13	43	33.4	16.7	60.6	61.2	52.9
Thunder Seed	3601	0.1	9/12	42	32.7	17.7	65.3	--	59.7
Thunder Seed	3503	0.3	9/16	38	34.5	16.4	61.8	--	57.9
Wensman	W30085NR2	00.8	9/13	38	34.7	16.3	60.0	--	55.7
Wensman	W30099R2	00.9	9/14	42	32.8	17.1	64.1	65.6	57.1
Wensman	W3018R2	00.1	9/12	45	33.0	17.8	64.1	--	58.0
Wensman	W3024R2	00.2	9/11	37	33.2	17.0	60.0	60.0	59.8
Trial Mean			9/13	39	33.5	16.7	60.7		
C.V. %			10.4	7.4	1.9	2.2	6.2		
LSD 5%			1.9	4.1	1.3	0.7	5.3		
LSD 10%			1.6	3.4	1.1	0.6	4.4		

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 southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Nelson County 2015

Brand	Variety	Maturity Group ¹	Maturity		Plant			Yield		
			date ²	Lodging (0-9)	Height (in)	Protein (%)	Oil (%)	2015	2 yr Avg.	2-site Avg. ³
								----- bu/a -----		
Dairyland Seed	DSR-C918/R2Y	00.9	9/13	0.8	28	35.3	15.9	47.0	54.9	55.1
Dairyland Seed	DST01-000/R2Y	0.1	9/16	5.3	37	34.2	17.1	51.9	--	57.9
Dairyland Seed	DSR-0305/R2Y	0.3	9/14	0.7	31	34.5	16.6	57.1	61.8	62.8
Dairyland Seed	DSR-0404/R2Y	0.4	9/15	1.1	32	34.9	16.1	54.9	56.0	58.4
Dyna-Gro	S009RY56	00.9	9/15	2.1	32	34.6	16.3	47.9	--	55.2
Dyna-Gro	S01RY86	0.1	9/16	5.9	38	34.4	17.3	54.6	--	59.5
Dyna-Gro	S02RY74	0.2	9/11	0.0	32	34.8	16.4	54.8	55.9	58.8
Dyna-Gro	S03RY36	0.3	9/16	0.4	31	35.7	16.2	56.6	--	59.7
Hefty	H008R3	00.8	9/9	3.5	30	33.6	16.9	42.3	--	50.2
Hefty	H009R3	00.9	9/12	0.2	29	35.1	16.0	45.2	52.7	52.4
Hefty	H009R5	00.9	9/10	1.3	34	34.6	16.7	42.8	--	48.0
Hefty	01R4	0.1	9/14	0.1	30	35.4	15.8	46.1	49.1	51.9
Hefty	02R3	0.2	9/15	1.1	31	34.3	16.2	51.8	53.1	55.4
Integra	20031	00.7	9/12	3.3	34	33.7	16.4	47.4	52.4	54.5
Integra	20084N	00.8	9/15	1.2	30	34.3	16.2	51.3	--	55.3
Integra	20087	00.8	9/10	0.9	27	35.7	15.8	46.8	--	52.0
Integra	20126	0.1	9/14	2.0	34	35.0	16.2	49.6	57.2	54.9
Integra	20300	0.1	9/15	0.2	31	35.1	15.7	50.6	--	55.9
Legacy Seeds	LS-00835N RR2	00.8	9/13	0.1	30	35.0	16.2	46.5	--	53.0
Legacy Seeds	LS-0135 RR2	0.1	9/16	2.6	35	34.4	17.2	49.7	--	57.1
Legacy Seeds	LS-0214 RR2	0.2	9/14	1.6	33	35.2	16.3	54.7	59.5	57.0
Legacy Seeds	LS-0334 RR2	0.3	9/22	0.4	32	35.2	15.9	55.6	60.2	61.4
Legacy Seeds	LS-0134 RR2	0.3	9/14	0.0	30	34.5	16.3	55.8	59.3	59.0
Mycogen	5J009R2	0.1	9/11	0.7	31	35.5	15.9	50.9	--	55.4
Mycogen	5B012R2	0.1	9/12	4.8	32	34.6	16.6	48.7	51.5	55.4
Mycogen	5B024R2	0.2	9/14	4.8	37	35.5	16.0	53.5	56.3	55.5
Mycogen	X550013R2	0.1	9/14	4.9	38	34.0	17.3	55.2	--	57.2
Mycogen	5B033R2	0.3	9/14	0.2	33	34.1	16.8	57.5	--	60.8
NorthStar	NS 0090R2	00.9	9/11	0.9	31	36.0	16.2	46.1	--	52.4
NorthStar	NS 0111R2	0.1	9/16	5.7	38	34.2	17.4	55.4	--	59.5
NorthStar	NS 0200NR2	0.2	9/20	3.5	39	35.1	15.5	51.5	--	55.6
NorthStar	NS 0480NR2	0.4	9/17	0.7	32	35.0	16.0	55.0	--	61.4

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 southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Roundup Ready Soybean, Nelson County 2015 (continued)

Brand	Variety	Maturity Group ¹	Maturity		Plant			Yield		
			date ²	Lodging (0-9)	Height (in)	Protein (%)	Oil (%)	2015	2 yr Avg.	2-site Avg. ³
								----- bu/a -----		
NorthStar	NS 0088R2	00.8	9/12	4.2	35	32.7	17.1	53.2	54.5	54.8
NuTech	6007	00.7	9/7	1.2	29	36.1	16.1	39.9	44.7	45.0
NuTech	6008R2	00.7	9/10	4.5	36	32.2	17.3	47.6	--	54.7
NuTech	6021	0.2	9/9	0.3	28	35.4	16.7	50.0	--	53.6
PFS	16R01	0.1	9/15	2.8	33	34.7	16.5	49.6	--	52.4
PFS	15R04	0.4	9/20	1.5	33	34.4	16.5	51.8	57.7	57.5
Prairie Brand	PB-00856R2	00.8	9/15	3.2	32	34.9	16.0	53.4	--	58.0
Prairie Brand	PB-0146R2	0.1	9/15	3.1	36	34.6	17.0	48.2	--	56.4
Prairie Brand	PB-0240R2	0.2	9/16	5.0	38	34.3	16.3	50.8	56.1	55.8
Prairie Brand	PB-0291R2	0.2	9/15	0.0	30	35.5	15.5	52.9	54.4	57.5
Prairie Brand	X14033R2	0.3	9/16	0.6	31	36.0	16.0	53.9	--	56.6
Proseed	30-20	0.2	9/14	2.1	35	35.2	16.1	55.7	56.8	61.0
Proseed	P2 20-30	0.3	9/16	0.6	31	34.7	16.4	53.3	58.8	60.4
Proseed	PX 501	0.2	9/15	5.1	34	33.4	17.6	54.5	--	60.2
Proseed	30-09	00.9	9/15	0.0	29	35.6	15.5	53.2	--	--
REA	61G24	0.1	9/14	0.2	29	34.5	16.2	54.5	57.8	58.2
REA	R0216	0.2	9/17	5.8	36	34.0	17.0	54.2	--	59.2
REA	64G94	0.4	9/20	4.5	36	33.3	17.5	56.3	54.8	60.4
REA	62G22	0.2	9/13	2.4	37	34.8	16.5	46.6	51.2	53.5
Stine Seed	01RE00	0.1	9/8	0.1	30	35.0	16.6	56.1	--	59.6
Stine Seed	02RD00	0.2	9/14	0.1	28	35.6	16.1	50.3	--	55.9
Stine Seed	03RF30	0.3	9/18	2.1	31	36.2	15.9	50.3	--	--
Syngenta NK	S04-D3	0.4	9/15	1.5	34	33.8	16.3	53.5	--	58.1
Syngenta NK	S02-R2	0.2	9/10	1.7	30	35.4	16.2	51.4	--	58.1
Thunder Seed	360008N	00.8	9/14	2.2	30	36.0	15.8	47.3	--	53.8
Thunder Seed	Astro	0.0	9/13	1.4	36	34.5	16.1	45.1	52.5	52.9
Thunder Seed	3601	0.1	9/16	3.3	37	33.6	17.6	54.2	--	59.7
Thunder Seed	3503	0.3	9/15	1.0	31	35.8	16.1	54.1	--	57.9
Wensman	W30085NR2	00.8	9/16	1.3	32	35.2	16.2	51.3	--	55.7
Wensman	W30099R2	00.9	9/15	2.5	37	33.7	17.1	50.2	54.8	57.1
Wensman	W3018R2	0.1	9/16	3.6	37	34.0	17.3	52.0	--	58.0
Wensman	W3024R2	0.2	9/13	0.1	32	34.9	16.3	59.6	--	59.8
Trial Mean			9/14	2.0	33	34.7	16.4	51.4		
C.V. %			14.8	65.4	7.6	1.8	2.1	8.6		
LSD 5%			2.9	1.8	3.5	1.2	0.7	6.2		
LSD 10%			2.5	1.5	2.9	1.0	0.6	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 southern region. Walsh County (Park River) and Nelson County (Pekin).

Yield, oil and protein reported at 13% moisture.

Confection (non-oil) Sunflower, Langdon 2015

Brand	Hybrid	Status ³	Days to		Stem Lodging	Test Weight	Harvest Moist.	Seed over screen				Yield			
			Flower (days)	Plant Height (in)				(0-9)	(lbs/bu)	(%)	22/64	20/64	18/64	2013	2014
CanSun	Exp 2755	EXP	71	64	4.0	22.6	16.2	52	85	92	--	--	2531	--	--
CanSun	Exp 9255	EXP	70	63	2.7	22.2	15.2	61	92	97	--	--	1892	--	--
NuSeed	6946 DMR ³	CA	69	61	2.0	22.7	14.0	24	80	91	--	2812	3151	2982	--
NuSeed	Jaguar II ¹	CA	70	63	1.3	21.9	16.4	69	95	97	--	--	3077	--	--
NuSeed	Panther DMR ³	CA	68	63	0.3	23.8	13.5	36	91	96	--	3026	3036	--	--
NuSeed	X9180 ²	CA	70	63	1.0	22.2	15.1	71	96	97	3929	2753	2767	2760	3150
USDA	924	CK	68	60	0.0	23.9	16.6	37	85	93	3666	3093	2646	2870	3135
Trial Mean			70	62	1.6	22.8	15.3				3640	3074	2729		
C.V. %			0.8	3.2	38.9	3.0	10.5				8.3	9.6	7.8		
LSD 5%			1.0	NS	1.1	1.2	NS				496	NS	377		
LSD 10%			0.8	NS	0.9	1.0	NS				414	NS	309		

¹ Clearfield hybrid, ² Downy mildew resistant.

³ Status: CA-Commercially available, EXP-Experimental, CK-Long term hybrid check.

Oil Sunflower, Langdon 2015 (continued)

Brand	Hybrid	Hybrid Type ¹	Status ²	Days to Flower		Plant Height (in)	Stem Lodging (0-9)	Oil ³ (%)	Test Weight (lbs/bu)	Harvest Moist. (%)	Yield @ 10% moisture		
				(days)	(in)						2013	2014	2015
NuSeed	NHK12M055	CL, HO, DMR	EXP	71	65	0.4	45.1	34.5	12.1	--	--	3276	--
NuTech Seed	68H7	EX, HO, DMR	CA	74	73	0.1	44.7	34.2	14.1	--	--	3117	2977
NuTech Seed	69M2	EX, NS, DMR	CA	75	68	0.7	43.9	31.2	13.2	--	--	3071	3236
Proseed	E-85 CL	CL, HO, DMR	CA	74	73	2.3	40.2	29.5	12.6	3618	2341	2640	2491
Proseed	E-31 CL	CL, HO, DMR	CA	74	69	0.6	39.6	30.2	12.6	3540	2770	2656	2713
Proseed	E-21 CL	CL, HO, DMR	CA	74	70	1.0	39.3	31.8	14.3	3230	2684	2848	2766
Proseed	E-362436	Trad, HO, DMR	CA	72	72	2.3	41.2	31.7	12.7	4070	2787	2608	2697
Proseed	E-31051 CL	CL, HO, DMR	CA	74	72	0.0	38.9	32.7	13.6	--	--	2594	--
Proseed	E-1402 CL	CL, HO, DMR	CA	75	69	0.3	39.6	30.7	12.7	--	--	2828	--
Proseed	E-53051 CL	CL, HO, DMR	CA	70	69	0.0	40.2	32.2	13.3	--	--	2779	--
Proseed	E-79051	Trad, HO, DMR	CA	75	69	0.7	39.0	30.6	13.2	--	--	3105	--
SunOpta	4415 HO/CL/DM	CL, HO, DMR	CA	74	70	0.0	42.0	31.1	14.1	--	--	2930	--
SunOpta	4421 CL	CL, HO	CA	75	71	0.0	35.8	29.5	15.0	--	--	2686	--
Syngenta	7111 HO/CL/DM	CL, HO, DMR	CA	70	63	0.0	40.4	33.0	12.1	3059	2399	2896	2648
Syngenta	SY7717	CL, HO, DMR	CA	72	66	0.0	43.2	31.4	12.4	--	--	2607	2942
Syngenta	3845 HO	Trad, HO	CA	74	66	0.3	46.8	33.2	12.1	--	--	3260	--
Syngenta	3495 NS/CL/DM	CL, NS, DMR	CA	75	67	1.0	43.1	33.6	11.5	--	--	2661	2752
Thunder	35H92	CL, HO, DMR	CA	72	65	0.0	43.5	33.6	13.0	--	--	2758	--
Thunder	42H94	CL, HO, DMR	CA	76	68	1.3	44.4	31.1	13.0	--	--	3379	--
Thunder	11N94	CL, NS, DMR	CA	74	67	0.3	44.6	34.4	12.8	--	--	3091	--
USDA	894	Trad	CK	71	61	3.3	40.9	30.9	12.1	3343	2500	2700	2600
Trial Mean				74	68	0.5	42.3	32.2	13.1	3479	2667	2984	
C.V. %				1.0	2.9	65.6	2.9	1.9	5.8	9.0	9.7	10.2	
LSD 5%				1.1	3.2	1.4	2.0	1.0	1.3	516	425	496	
LSD 10%				1.0	2.7	1.2	1.6	0.8	1.1	430	354	415	

¹Type: HO-High Oleic, NS-NuSun, Trad-Traditional, CL-Clearfield, EX-Express, DMR-Downy Mildew Resistant.

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

³Oils were adjusted to 10% moisture. Oil % of Traditional hybrids were adjusted for oil type.

Maturity Checks: Days to Flower; Honeycomb=63, 8N270=68, Falcon=75, 559CL=76

Energy Sugarbeet Summary, Cando 2014-2015								
Company	Variety	Sugar Content (%)		Sugar Yield (lb/a)		Root Yield (tons/a)		Avg. Root Yield
		14	15	14	15	14	15	2 yr
SES Vanderhave	SV RR1141E	15.5	14.4	11,432	10,227	37.1	35.7	36.2
SES Vanderhave	SV RR1143E	16.5	15.8	10,191	8,683	30.9	27.5	29.2
Betaseed	x403	16.2	15.6	12,829	8,413	39.7	27.0	33.4
Betaseed	x406	16.4	15.0	10,653	8,947	32.7	29.7	31.2
Betaseed	x525	--	15.3	--	10,592	--	34.9	--
Syngenta	SY1404	--	16.4	--	9,575	--	29.2	--
Syngenta	SY1405	--	16.1	--	9,552	--	29.7	--
Syngenta	SY1406	--	16.6	--	9,508	--	28.7	--
Syngenta	HM 173RR	15.8	--	8,331	--	26.6	--	--
Syngenta	HM4300RR	17.1	--	10,596	--	31.0	--	--
Syngenta	HM4022RR	16.3	--	10,358	--	31.8	--	--
SES Vanderhave	SV RR1142E	15.5	--	11,152	--	36.2	--	--
Betaseed	x402	15.5	--	11,584	--	37.5	--	--
Mean		16.1	15.6	10,792	9,437	33.7	30.3	
LSD 10%		NS	0.8	1,599	NS	4.9	NS	



North Dakota Agricultural Experiment Station Langdon Research Extension Center Agronomy Lab. Completed 2015.

Industrial Hemp Performance in North Dakota - 2015 NDSU Langdon Research Extension Center

Bryan K. Hanson¹, Burton L. Johnson², Anndrea Hermann³, Travis W. Hakanson¹, Lawrence E. Henry¹, and Venkat Chapara¹
¹North Dakota State University Langdon Research Extension Center, Langdon, ND; ²North Dakota State University, Plant Sciences, Fargo, ND,
³The Ridge International Cannabis Consulting, Kleeefeld, MB, Canada.

After a 70-plus year absence in production, industrial hemp (*Cannabis sativa* L., THC level of 0.3% or less) is being grown in university research trials in several states across the U.S. Our effort begins the process of defining the basic guidelines for production that will aid in crop commercialization in North Dakota. The objective of this study was to screen genotypes (Table 1) from various sources, monitor and record plant growth and development, determine grain and fiber yield, note pest incidence, and record agronomic traits.

Table 1. Industrial hemp cultivars and characteristics for the Langdon 2015 field studies.

Cultivar	Country	Type	Purpose	Maturity (d)
Alyssa	Canada	Monoecious	Dual	110+
Canda	Canada	Monoecious	Dual	110+
CRX-1	Canada	Dioecious	Dual	105+
CRX-2	Canada	Dioecious	Grain	103+
CRS-1	Canada	Dioecious	Grain	110+
Finola	Canada	Dioecious	Grain	100+
Fedora 17	France	Monoecious	Fiber	120+
Felina 32	France	Monoecious	Fiber	120+
Ferimon	France	Monoecious	Fiber	120+
Futura 75	France	Monoecious	Fiber	120+
Santhica 27	France	Monoecious	Fiber	120+
CHG	Australia	Monoecious	Fiber	120+

- Industrial hemp is day-length (photo-period) sensitive and flowers the same time period every year.
- Dual purpose cultivars are bred to be used for both grain and fiber production.
- Dioecious cultivars have separate male and female plants.
- Monoecious cultivars have separate male and female flowers on the same plant.
- Plant height is an important consideration in determining end use of the crop. Shorter cultivars tend to have less fiber and are more suited to grain production.
- Fiber and dual purpose cultivars are taller.

Seeding dates varied as to when the seed was received. The Canadian trial was planted on May 27 at a seeding rate of 12 pure live seeds/ft². Plot size was 21 feet long x 4 feet wide and consisted of four 12 inch spaced rows. The fiber harvest date was August 5. Grain harvest was August 27 for Finola and September 3 for all other varieties. Finola* (Table 2) had significantly lower grain yield, than all other cultivars which may have resulted from bird damage, even though it was harvested earlier to reduce this potential problem. Plant stand ranged from 2.2 to 6.2 plants/ft² with seedling mortality ranging from 48 to 75%. The dual purpose cultivars, Alyssa and Canda, had the greatest plant height. Growth rate for the cultivars ranged from 1.5 to 2.3 inches/day from June 18 to July 30, and 3.7 inches/day from June 25 and July 2 (data not shown).

Table 2. Grain and fiber yield and various agronomic traits of Canadian Industrial hemp cultivars.

Cultivar	Plant Stand (Plants/ft ²)	Seedling Mortality (%)	Seedling Vigor (0-9)	Plant Height (inches)	Fiber Yield (lbs/ac)	1000 KWT (g)	Test Weight (lbs/bu)	Grain Yield (lbs/ac)
Alyssa	2.2	82	3.8	98	7498	19.6	40.5	1154
Canda	4.7	61	6.5	93	6980	20.5	41.5	1263
CFX-1	5.7	53	7.8	83	4648	19.0	41.9	1363
CFX-2	6.2	48	7.8	81	4438	17.5	42.5	1189
CRS-1	3.0	75	3.8	89	5037	18.4	42.5	1062
Finola	4.9	59	6.8	71	2203	15.0	42.3	632*
Mean	4.4	63	6.0	86	5134	18.3	41.9	1110
C.V. %	15.1	9.0	9.2	3.7	17.2	6.4	1.0	14.0
LSD 5%	1.0	7.0	0.8	4.8	1334	1.8	0.7	234
LSD 10%	0.8	8.6	0.7	3.9	1097	1.5	0.5	192

The French trial was planted on June 5 and then replanted on June 9 due to a 2.36 inch rainfall in two hours on June 6 which resulted in severe soil crusting. The Australian cultivar was planted on June 16. Seeding rate was 12 pure live seeds/ft². Plot size was 21 feet long x 4 feet wide and consisted of four 12 inch spaced rows. The fiber harvest dates were August 29 and September 30 for French and the Australian cultivars, respectively. Grain harvest was September 28 for the French cultivars while the Australian cultivar was late maturing and did not flower so no yield was obtained. Plant stand was severely reduced from soil crusting on the June 5 seeding date with an average seedling mortality of 93% (Table 3). Stands were much improved on the June 9 seeding date, but seedling mortality was still 52% while the Australian cultivar, seeded on June 16 had the lowest seedling mortality of 34%. There was some lodging and stalk breakage, a result of high wind events on July 18, 19 and 28 (35 to 43 mph gusts). No significant differences were observed for plant height among the French cultivars. Grain yield of Santhica 27 was significantly less than the other cultivars. Fiber yield did not differ significantly among cultivars.

Table 3. Grain and fiber yield and various agronomic traits of French and Australian industrial hemp cultivars.

Cultivar	June 5				June 9				1000 KWT (g)	Test Weight (lbs/bu)	Grain Yield (lbs/a)
	Plant Stand ¹ (Plants/ft ²)	Seedling Mortality ¹ (%)	Plant Stand (Plants/ft ²)	Seedling Mortality (%)	Vigor (0-9)	Lodging (0-9)	Plant Height (inches)	Fiber Yield (lbs/a)			
Fedora 17	1.0	91	5.7	53	8.5	2.5	96	7255	16.5	42.2	926
Felina 32	1.2	90	6.3	48	8.8	2.0	95	7029	15.2	42.3	797
Ferimon	1.1	91	6.3	48	8.5	3.8	93	6754	14.9	42.2	749
Futura 75	0.7	94	5.3	56	7.8	2.5	99	7320	17.0	41.4	888
Santhica 27	0.4	97	5.6	54	7.8	3.3	98	6527	15.5	40.6	434
Mean	0.9	93	5.8	52	8.3	2.8	96	6977	15.8	41.7	759
C.V. %	66.5	5.3	20.8	19.6	6.4	36.7	2.1	17.8	2.2	1.0	16.5
LSD 5%	NS	NS	NS	NS	NS	NS	3.1	NS	0.5	0.6	193
LSD 10%	NS	NS	NS	NS	0.7	NS	2.5	NS	0.4	0.5	158

¹Plant stand for June 5 planting prior to working up, recorded on June 16.

Australian industrial hemp

CHG	7.9	34	9.0	3.5	105	8162
-----	-----	----	-----	-----	-----	------

Conclusions

- Industrial hemp appears to be adapted to the Langdon region of North Dakota.
- Grain and fiber yields were comparable to research data from Canada.
- French cultivars, planted 10 days later, had lower grain yields, but higher fiber yields than Canadian cultivars while the Australian cultivar planted on June 16 was the tallest and had the greatest fiber yield of all cultivars tested, but did not produce grain possibly due to the lateness of planting.
- Seed mortality is an important issue in hemp production and not well understood and requires further research for improvement.
- Additional studies to identify superior cultivars plus other crop production practices are needed.

Acknowledgements

Appreciation is extended to Hemp Genetics International Inc., Canada; Parkland Industrial Hemp Growers, Canada; Hemp Oil Canada, Inc; Cooperative Centrale des Producteurs de Semences de Chanvre, France; and Ecofibre Industries Operations Pty, LTD, Australia; for their interest in the study and providing the seed.

NDSU Langdon Research Extension Center
2-Row Barley Seeding Rate Study - 'ND Genesis' - 2015

Seeding Rate PLS/a ¹	Seeding Rate (bu/a)	Target Plant Stand (ft ²)	Emergence (%)	Tillers/plant	Days to Head (DAP ²)	Plant Height (in.)	Lodging (0-9) ³
1000's/a	(bu/a)	(ft ²)	(%)		(DAP ²)	(in.)	(0-9) ³
500	1.3	12	59	13.7	64	37	0.1
750	1.9	17	68	7.4	63	38	0.8
1000	2.5	23	64	6.4	62	38	1.5
1250	3.1	29	67	4.3	61	36	0.4
1500	3.8	34	65	3.8	60	38	1.6
1750	4.4	40	71	2.8	60	37	1.9
Trial Mean			66	6.4	62	37	1.1
C.V. %			9.9	24.9	1.2	3.9	89.9
LSD 5%			NS	2.4	1.1	2.1	1.6
LSD 10%			NS	2	0.9	1.7	1.3

Seeding Rate PLS/a ¹	1000 KWT (g)	Test Weight (lbs/bu)	% Plump (>6/64)	% Protein (%)	Yield (bu/a)	Gross Return ⁴ (\$/a)	Net Return ⁵ (\$/a)	
1000's/a	(g)	(lbs/bu)	(>6/64)	(%)	(bu/a)	(\$/a)	(\$/a)	
500	51.9	49.6	95	11.0	115.1	540	529	
750	51.1	49.6	94	11.0	120.8	574	557	
1000	50.1	50.4	95	10.9	122.1	580	557	
1250	50.5	50.5	96	11.0	125.4	589	561	
1500	49.9	50.4	96	11.0	125.1	591	557	
1750	50.6	50.9	96	11.0	131.7	621	582	
Trial Mean		50.7	50.2	95	11.0	123.4	583	557
C.V. %		2.6	1.2	1.8	2.6	5.3	4.6	4.8
LSD 5%		NS	0.9	2.5	0.4	9.4	40	NS
LSD 10%		NS	0.7	2.1	0.4	7.8	33	NS

¹Germination 94%, 1000 KWT - 54.6 g. PLS=pure live seed.

²DAP - Days after planting.

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

⁴Gross return based on spring 2015 seed price of \$8.50/bu and a contract price of \$4.75/bu.

⁵Net return = Gross return - Seed price.

Planting Date: April 29

Harvest Date: August 11

Previous Crop: Soybean

Emergence was reduced due to soil crusting.

Seeding Rate Effect on Yield and other Agronomic Traits of Soybean-2015

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

Seeding rate trials were embedded in soybean variety trials at three off-station locations in 2015. Populations ranged from 125,000 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 Langdon, Cavalier (Pembina County) and Park River (Walsh County). Seeding dates were May 22, June 1, and May 26 for Langdon, Cavalier and Park River, 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 Langdon and Park River. Plant height, protein and oil differences among seeding rates were small and mostly non-significant at the various locations. There was no significant difference between the 150,000 and 225,000 pls/a seeding rates for yield at Langdon. At the Cavalier location there was no significant difference in yield between the seeding rates. Yield at Park River was statistically the same for the three highest seeding rates. Combined results from studies conducted in 2011, 2012, 2014 and 2015 would seem to indicate that a seeding rate between 175,000 and 200,000 pls/a would result in optimum yields.

Langdon - 2015

Seeding Rate pls/a	Maturity Date	Height (in)	Protein (%)	Oil (%)	Yield (bu/a)
125,000	9/4	42	33.3	16.4	45.2
150,000	9/3	41	34.5	15.9	47.1
175,000	9/2	41	33.4	16.1	47.4
200,000	9/2	41	33.2	16.1	53.1
225,000	9/1	42	33.8	16.1	50.6
Mean	9/2	41	33.6	16.1	48.7
C.V.%	2.2	4.4	1.9	2.1	8.6
LSD 5%	7.8	2.4	1.1	0.6	6.7
LSD 10%	6.5	2.0	1.3	0.7	5.6

Pembina County - Cavalier - 2015

Seeding Rate pls/a	Maturity Date	Height (in)	Protein (%)	Oil (%)	Yield (bu/a)
150,000	9/10	28	34.2	16.7	46.9
175,000	9/9	28	34.5	16.2	46.5
200,000	9/11	31	33.5	16.7	48.0
225,000	9/10	29	34.1	16.3	47.4
Mean	9/10	28	33.6	16.5	47.2
C.V.%	11.0	10.6	2.2	2.2	9.7
LSD 5%	1.9	4.2	1.5	0.8	7.2
LSD 10%	1.6	3.5	1.3	0.6	6.0

Walsh County - Park River - 2015

Seeding					
Rate	Maturity	Height	Protein	Oil	Yield
pls/a	Date	(in)	(%)	(%)	(bu/a)
125,000	9/7	38	35.2	16.3	49.5
150,000	9/8	36	34.2	16.8	49.7
175,000	9/4	37	34.2	16.4	52.0
200,000	9/6	38	33.6	16.8	52.6
225,000	9/6	40	33.9	16.5	54.3
Mean	9/6	38	34.2	16.6	51.6
C.V.%	10.4	7.4	1.9	2.2	6.2
LSD 5%	1.9	4.1	1.3	0.7	5.3
LSD 10%	1.6	3.4	1.1	0.6	4.4

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

Seeding	Yield (bu/a)									
	CA	LA	PR	PR	PK	LK	LA	VE	VO	LA
	2015	2015	2015	2014	2014	2012	2012	2012	2011	2011
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
175,000	46.5	47.4	52.0	50.7	48.8	62.7	42.1	47.7	48.9	63.6
200,000	48.0	53.1	52.6	51.1	46.6	64.0	42.5	52.5	50.6	64.7
225,000	47.4	50.6	54.3	50.7	48.1				50.5	65.2
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	Average Yield (bu/a)			
Rate	10-site	8-site	7-site	2-site
pls/a	Avg	Avg	Avg	Avg
125,000		48.1		52.8
150,000	49.7	50.2	49.0	53.7
175,000	51.0	52.0	51.1	56.3
200,000	52.6	53.1	52.4	57.7
225,000			52.4	57.9
250,000				58.1

Canola Seeding Rate and Hybrid Influence on Spring Canola Performance in Northeast North Dakota, 2015.

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

Spring canola has become a viable economic alternative for many producers in North Dakota. Previous research conducted on seeding rates in North Dakota focused on open pollinated and hybrid non-herbicide tolerant lines. Advances in canola breeding have lead producers to favor seeding herbicide tolerant Roundup Ready (RR) and Liberty Link (LL) hybrids. Rising seed prices have resulted in producer consideration of lower seeding rates to reduce costs. This field study examined the effects of seeding rates on yield and agronomic traits of a RR and LL hybrid. The study was conducted at Langdon, ND in a randomized complete block design in a split plot arrangement with hybrids as main plots and seeding rates as subplots. Plots consisted of seven rows with a six inch spacing. Seeding rates were 3, 6, 9, 12 and 15 pure live seed (pls)/ft². The seeding rates, in lbs/a and hybrid seed lots sizes are given in Table 1. The trial was planted on May 12. The trial was replanted on June 4 because of soil crusting and a freeze of 25° F on May 30. Both of these resulted in some stand reductions. Unfortunately, on June 5 we received 2.36 inches of rain in less than two hours. This again resulted in some severe crusting problems and stand reductions. Precipitation was near normal and temperatures above normal for the growing period and were nearly ideal to produce very high yields. The trial was conducted using best management practices for canola including fertility, fungicide and harvest management. Each hybrid was sprayed with its corresponding herbicide trait for weed control. Two hybrid cultivars were used; Liberty Link InVigor L130 and Roundup Ready HyCLASS 955.

Seeding rate and hybrid cultivar comparisons are averaged over hybrids and seeding rates. There was no significant difference between hybrids for yield, net return, percent emergence and harvest stand (Table 3). InVigor L130 matured later and was taller while HyCLASS 955 exhibited a higher oil content and greater percent cover.

Plant emergence was low due to soil crusting but no significant differences were observed between seeding rates (Table 2). Days to flower, end flower, flower duration, and maturity were delayed at the 3 pls/ft² seeding rate compared to other seeding rates. This was probably a result of increased branching from the lower plant density. The higher the seeding rate the faster percent ground cover was attained. No lodging was observed in the trial. Seeding rate had no effect on percent oil content, which supports previous research.

Yield generally increased with higher seeding rates up to 12 pls/ft². The 3 pls/ft² seeding rate yielded significantly less than the 6, 9, 12, or 15 pls/ft² seeding rate. The 12 and 15 pls/ft² seeding rate yielded significantly greater than all other seeding rates. Net return was calculated by multiplying yield times a market price of \$ 0.1413/lb minus seed cost. Seed cost was \$11.60 and \$10.98/lb for InVigor L130 and HyCLASS 955, respectively. There was no significant difference in net return between the canola hybrids. Net return/a was the greatest at a seeding rate of 12 pls/ft² and was significantly higher than the three lower seeding rates. In 2013 and 2014, the optimum seeding rate for greatest net return/a for this study was between 9 and 12 pls/ft².

Table 1. Seeding rates in plts/ft² vs lbs/a for InVigor L130 and HyCLASS 955 in 2015.

Seeding Rate	InVigor L130		HyCLASS 955	
	Seedlot size in seeds/lb		Seedlot size in seeds/lb	
	95,000	98,000	95,000	98,000
Seeds/ft ²	-----lbs/a-----			
3	1.5	1.3	1.3	1.3
6	2.9	2.7	2.7	2.7
9	4.3	4.0	4.0	4.0
12	5.8	5.4	5.4	5.4
15	7.2	6.7	6.7	6.7

Table 2. Seeding rate effect on canola yield and other agronomic traits averaged over cultivars, Langdon 2015.

Seeding Rate	Emergence		Harvest		End Flower		Maturity (DAP)	Cover (%)	Height (in)	Oil (%)	Net Return	
	Stand (plts/ft ²)	Stand (%)	Stand (plts/ft ²)	Stand (plts/ft ²)	Flower (DAP)	Flower (DAP)					(\$)	(lbs/a)
3	1.1	35	1.3	1.3	40.0	64.8	87.0	15.6	50.0	47.8	310	2309
6	2.5	41	2.1	2.1	39.8	63.1	85.2	40.6	49.6	47.7	370	2841
9	3.8	42	3.4	3.4	39.0	62.1	84.6	61.2	49.6	47.9	373	2974
12	5.8	48	4.8	4.8	38.5	61.2	83.6	76.2	48.7	47.4	402	3296
15	6.2	41	5.8	5.8	38.5	61.0	83.8	82.5	49.2	47.8	386	3289
LSD 5%	0.9	NS	0.7	0.7	0.5	0.7	0.9	10.3	NS	NS	27.74	196
C.V. %	22.6	21.9	20.0	20.0	1.2	1.1	1.1	18.0	5.0	2.2	7.2	6.4

Table 3. Comparison of two canola cultivars averaged over seeding rates, Langdon 2015.

Variety	ES	ES%	HS	1STF ¹	END	FD	DM	Cover ²	HT	OIL	Return	Yield
InVigor L130	3.4	37.5	3.3	40.6	65.4	24.7	86.6	49.8	52.3	46.3	376	3017
HyCLASS 955	4.3	45.5	3.6	37.6	59.6	21.9	83.2	60.8	46.5	49.2	361	2868
LSD 5%	0.9	NS	NS	1.2	1.6	1.2	0.7	6.5	3.6	2.2	NS	NS

¹DAP=Days after planting.

²Visual rating of percent area of plot covered by plant growth. Rated at 5-6 leaf stage.

Management of White Mold in Canola with Foliar Fungicides, Langdon 2015

Venkat Chapara and Amanda Arens
Langdon Research Extension Center

A field study was planted on June 4 at the NDSU Langdon Research Extension Center located in Langdon, ND. The trial experimental design was a randomized complete block with four replications. Plots were seven rows spaced at six inch row spacing and a row length of 20 feet trimmed to 15 feet for harvest. The cultivar ‘DLK 30-42 RR’ was seeded at a rate of 14 live seed per square foot. An untreated border plot was planted between treated plots to minimize interference from spray drift. The previous crop was hrsw. Roundup Power Max (16 oz/a) + Kicker (0.25% v/v) were used to control weeds. Warrior was applied on June 9th at a rate of 1.92 oz/a for flea beetle control. The plots were not inoculated. Fungicides were applied with a CO₂ backpack sprayer equipped with a three nozzle boom (XR8001) operated at 40 psi delivering a water volume of 20 GPA. Fungicide application was made at 20% flowering on July 9 (wind speed 12 MPH, 75° F at 2:30pm) and at 40% flowering on July 13th (wind speed 3 MPH, 75° F at 2:30pm).

White mold disease was rated on 100 random plants (ten plants in ten different spots) using 0-5 scale, 1=superficial lesions or few pods 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 and much reduced yield. Plots were harvested on August 27 with a plot combine. Yield, test weight and oil content were determined. Data was analyzed in SAS. Fisher’s least significant difference (LSD) was used to compare means at P≤0.05.

Results

None of the fungicide treatments were statistically significantly different from the untreated check in terms of white mold incidence, yield, test weight and oil content (Table 1). However, the fungicide Proline had reduced white mold severity significantly compared to the other treatments. A severity rating of 1.6 indicates that the plants were infected with superficial lesions.

Table 1. Effect of fungicide treatments on white mold incidence, severity, yield and oil content of canola, Langdon 2015.

Treatment	Rate of Application	White Mold		Yield (bu/a)	Test	
		Incidence (%)	Severity Scale		Weight (lbs/bu)	Oil (%)
Untreated Check	--	15	3.7	44.5	49.9	45.1
1Double Nickel LC	1.06 qts/a	12	2.0	41.5	50.0	45.4
2Double Nickel LC	2.1 qts/a	10	2.3	45.7	49.9	44.6
Proline	4.3 fl oz/a	8	1.6	52.2	50.2	44.7
Trial Mean		12	2.4	45.9	50.0	45.0
C.V.%		67.1	35.0	18.2	0.5	1.9
LSD 5%		11.9	1.3	12.9	0.4	1.3
P≤0.05		0.63	0.02	0.34	0.42	0.56

*Significantly different from other treatments.

Acknowledgements: The trial was funded by Certis Bio.

Management of Soybean Root Diseases in Multiple Planting Dates and Environments of North Dakota

Dr. Venkat Chapara¹, Dr. Michael Wunsch², Amanda Arens¹, Eric Eriksmoen³ and Dr. Pravin Gautam¹
¹NDSU Langdon Research Extension Center, ²NDSU Carrington Research Extension Center, ³NDSU North Central Research Extension Center

A two year field study (2014 and 2015) was conducted with an objective of evaluating the efficacy of fifteen seed treatment chemicals against the prevalent root rot and damping off causing pathogens in soybeans in North Dakota. The benefit from this research is to pin point a specific chemistry or mix of seed treatments that are efficient in controlling all root disease causing pathogens. A knowledge gap exists in understanding the efficacy of the seed treatments at multiple planting dates and environments in North Dakota. With soybean acres increasing, it is imperative to study root disease so growers will have sufficient information available for successful soybean production.

The study was conducted in three locations (Langdon, Minot and Carrington) in North Dakota with two planting dates at each location at least fifteen days apart. Cultivar selection was based on each location's environment and growing conditions. Langdon and Minot planted Syngenta SY007-Y4, maturity group 00.5, while Carrington planted Syngenta S04-D3, maturity group 0.4.

This two year research trial gave us an opportunity to test two soybean varieties, two planting dates under three environmental conditions and two tillage options (Langdon and Carrington were done under conventional tillage, whereas, no-till conditions in Minot). Current research has met all the conditions to evaluate the efficacy of a seed treatment chemical. The early planting date at each location was seeded when soil temperatures were below 50°F, exposing the seed to different pathogens and varying temperatures before it emerged. Fifteen seed treatment chemical products that contain the active ingredients metalaxyl or mefenoxam, which are effective against *Pythium* and *Phytophthora*, were used. Other active ingredients, e.g., azoxystrobin, trifloxystrobin, ipconazole, captan, carboxin, fludioxonil, thiram, sedaxane and thiophanate methyl, which are effective against *Fusarium* and *Rhizoctonia*, were also used in this study.

Our preliminary results indicate that the root rot and damping off incidence and severity in all locations was very low. There were no significant differences observed in the disease incidence and severity in any of the locations but there were significant differences observed in incidence and severity among the planting dates. Differences existed between the yields among the planting dates across locations but no significant differences were seen among treatments. This was more evident in 2015. It is difficult to determine what the risk of soybean root rots might be prior to planting in any season and not all seed treatment fungicides are equally effective against all fungal pathogens. Preliminary data indicated that *Pythium* and *Rhizoctonia* were the major pathogens in the three locations tested. Results from this research have generated specific information on the most efficient seed treatments to control root diseases, and their impact on yield and quality of soybean in multiple planting situations. This information can now be used by growers as a guide in the decision making process to select appropriate seed treatment depending on the prevalent pathogens specific to a location for the control of root diseases. Yield data generated provides additional information to decide on the selection of seed treatments.

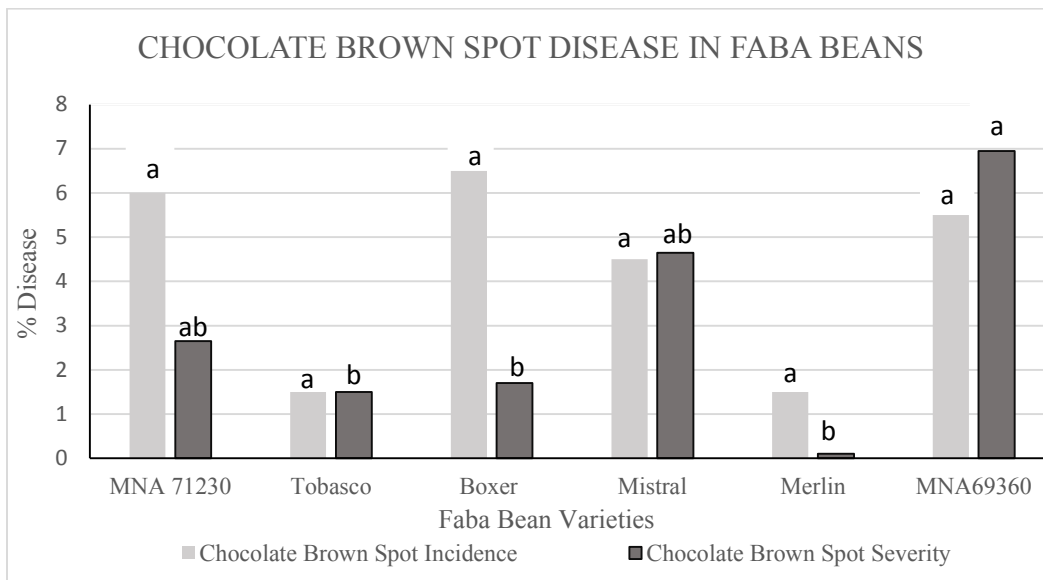
Acknowledgements: This trial was funded by the North Dakota Soybean Council.

Chocolate Brown Spot Disease Incidence and Severity on Faba Bean Varieties tested at the Langdon Research Extension Center, Langdon 2015

Venkat Chapara and Bryan Hanson
NDSU Langdon Research Extension Center

This is the first year of varietal testing of faba beans at the NDSU Langdon Research Extension Center. With an objective to know the prevalent diseases of a new emerging crop, we monitored the crop throughout the growing season for the major diseases that infect faba beans. Chocolate brown spot of faba beans was the only disease found and the observations on its incidence and severity are presented below in Figure 1. Chocolate brown spot is caused mainly by two species of *Botrytis*: *fabae* and *cinerea*. The disease can be diagnosed by dark-brown spots surrounded by an orange-brown ring on leaves, flowers and stems. Cool temperatures of 59-72° F and relative humidity above 80% are ideal conditions for disease development. When disease data was compared with yield, there were no correlations found between disease incidence and severity. No significant differences were found in disease incidence. However, there were significant differences found among different varieties in terms of disease severity.

Figure 1. Incidence and severity of Chocolate brown spot on faba beans.



*Means with the same letter in Figure 1 are not significantly different.

Efficacy of Fungicides to Fusarium Head Blight in Barley, Langdon 2015

Venkat Chapara¹, Andrew Friskop², and Amanda Arens¹
¹NDSU Langdon Research Extension Center, Langdon, ND and ²NDSU Plant Pathology Department, Fargo, ND

A field study was planted on April 29 at the NDSU Langdon Research Extension Center located in Langdon, ND. The trial experimental design was a randomized complete block with four replications. Plots were seven rows spaced at six inch row spacing and a row length of 20 feet trimmed to 15 feet for harvest. The variety ‘Tradition’ was seeded at a rate of 1.2 million pure live seeds/a. An untreated border plot was planted between treated plots to minimize interference from spray drift. The previous crop was hrsw. Huskie Complete (1 pt/a) + Prowl H₂O (2.7 pts/a) were used to control weeds. The plots were inoculated by spreading corn spawn inoculum at boot stage (Feekes 9-10) at a rate of 286g/plot. Supplemental moisture was provided by running overhead irrigation from Feekes 10.5 to 11.25 at the rate of one hour per day to provide a conducive environment for Fusarium Head Blight (FHB) development. Fungicides were applied with a CO₂ backpack sprayer equipped with a three nozzle boom (XR8001) operated at 40 psi delivering a water volume of 20 GPA. Fungicide application was made at Feekes 10.51 (10% flowering) on July 9 (wind speed 12 MPH, 75°F at 2:30pm).

Percent FHB incidence (INC) was calculated by counting the number of heads showing FHB symptoms from 50 randomly selected heads, excluding the two outer rows. FHB head severity (SEV) was rated using a 0-100% scale from those same heads. FHB index (FHBI) was calculated using the formula FHBI=(SEV*INC)/100. Plots were harvested on August 21 with a plot combine. Yield, test weight, percent plump and DON were determined. Statistical analysis was done using SAS. Fisher’s least significant difference (LSD) was used to compare means at P≤0.05.

Results

The lowest FHB incidence, severity and index was observed in the treatments Teagro+Prosaro and Prosaro (Table 1). DON content was lowest with Prosaro. The treatment Teagro + Prosaro had the highest yield while the lowest yield was the untreated check.

Table 1. Fungicide effects on Fusarium head blight, yield, and various agronomic traits of barley, Langdon 2015.

Treatment	Rate of Application		Fusarium Head Blight			Test			
	(fl oz/a)	Timing (Feekes)	% Incidence	% Severity	Index	Yield (bu/a)	Weight (lbs/bu)	DON (ppm)	Plump (%)
Muscle 3.6F	4+0.125%v/v	10.51	53	10.8	7.4	118.8	48.0	1.6	95
Caramba	13.5+0.125%v/v	10.51	61	15.8	10.7	105.9	47.3	1.3	91
Teagro + Prosaro	5.2 + 6.5	10.51	31	6.5	2.1	120.8	47.8	1.0	94
Prosaro	6.5+0.125%v/v	10.51	46	7.0	4.3	116.7	48.3	0.8	95
Untreated Check	-		63	17.1	12.9	103.6	47.2	2.4	91
Trial Mean			51	10.3	7.4	113.2	47.7	1.4	93
C. V. %			44.4	67.8	103.9	12.4	1.2	32.3	3.0
LSD 5%			10.6	10.8	11.5	21.2	0.9	0.7	4.2

All treatments were applied with NIS @ 0.125% v/v.

Efficacy of Fungicides to Fusarium Head Blight in Spring Wheat, Langdon 2015

Venkat Chapara¹, Andrew Friskop², and Amanda Arens¹

¹NDSU Langdon Research Extension Center, Langdon, ND and ²NDSU Plant Pathology Department, Fargo, ND

A field study was planted on April 29 at the NDSU Langdon Research Extension Center located in Langdon, ND. The trial experimental design was a randomized complete block with four replications. Plots were seven rows spaced at six inch row spacing and a row length of 20 feet trimmed to 15 feet for harvest. The variety ‘Vantage’ was seeded at a rate of 1.2 million pure live seeds/a. An untreated border plot was planted between treated plots to minimize interference from spray drift. The previous crop was hrsw. Huskie Complete (1 pt/a) + Prowl H₂O (2.7 pt/a) were used to control weeds. The plots were inoculated by spreading corn spawn inoculum at boot stage (Feekes 9-10) at a rate of 286g/plot. Supplemental moisture was provided by running overhead irrigation from Feekes 10.5 to 11.25 at the rate of one hour per day to provide a conducive environment for Fusarium Head Blight (FHB) development. Fungicides were applied with a CO₂ backpack sprayer equipped with a three nozzle boom (XR8001) operated at 40 psi delivering a water volume of 10 GPA. Fungicide application was made at Feekes 10.51 (10% flowering) on July 9 (wind speed 12 MPH, 75° F at 2:30pm).

Percent FHB incidence (INC) was calculated by counting the number of heads showing FHB symptoms from 50 randomly selected heads, excluding the two outer rows. FHB severity (SEV) was rated using a 0-100% scale from those same heads. FHB index (FHBI) was calculated using the formula $FHBI=(SEV*INC)/100$. Plots were harvested on August 21 with a plot combine. Yield and test weight were determined. Statistical analysis was done using SAS. Fisher’s least significant difference (LSD) was used to compare means at $P\leq 0.05$.

Results

The lowest FHB incidence and severity was with Caramba at 13.5 fl oz/a while the highest FHB incidence and severity was with the untreated check. Prosaro at 6.5 fl oz/a had the lowest FHB index and the untreated check had the highest.

The treatments Caramba at 13.5 fl oz/a and Prosaro at 6.5 fl oz/a had the highest yields while the lowest yield was in the untreated check.

Table 1. Fungicide treatment effects on Fusarium head blight and yield of ‘Vantage’ spring wheat, Langdon 2015.

Treatment	Rate of Application (fl oz/a)	Application Timing (Feekes)	Fusarium Head Blight			Yield (bu/a)
			% Incidence	% Severity	Index	
Tebustar + NIS	4.0	10.51	39	39	15.6	37.5
Muscle 3.6F + NIS	4.0	10.51	46	35	15.8	38.9
Orius + NIS	4.0	10.51	45	35	15.6	38.0
Aproach Prima	6.8	10.51	37	28	10.3	43.3
Aproach + NIS	12.0	10.51	44	27	12.2	44.4
Untreated Check	--	--	55	41	22.7	32.6
Prosaro + NIS	8.2	10.51	48	33	15.2	41.2
Caramba + NIS	13.5	10.51	23	9	10.8	47.1
Onset + NIS	4.0	10.51	50	32	15.6	41.1
Prosaro + NIS	6.5	10.51	36	26	9.2	46.9
Caramba + NIS	17.0	10.51	39	21	9.3	43.6
Toledo + NIS	4.0	10.51	40	27	10.9	39.7
Teagro + Prosaro	5.2	10.51	40	28	11.3	40.7
Monsoon + NIS	4.0	10.51	46	32	14.8	38.3
Trial Mean			42	30	13.5	40.9
C.V. %			39.6	29.3	52.1	9.2
LSD 5%			17.1	12.4	10.0	5.4

All treatments were applied with NIS @ 0.125% v/v.

Acknowledgements: This trial was funded by Andrew Friskop through USWB Scab Initiative.

EFFECT OF A HOMOGENEOUS BLEND OF UREA + AMMONIUM SULFATE VERSUS TWO PHYSICAL BLENDS AND 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 out of the thirteen essential plant nutrients, which plant roots absorb from the soil. Nitrogen is not only an integral component of all proteins, but is also taken up by the plants in large quantities. Its deficiency often results in stunted and slow growth 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 lbs of nitrogen and 10 to 15 lbs of sulfur in sulfate form (SO_4^-)/acre even at high soil $\text{SO}_4\text{-S}$ results for a yield potential of 2000 lbs 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. One option could be a homogeneous mix of urea and ammonium sulfate (AS) fertilizers having the required composition of nitrogen and sulfur.

Objectives

Considering the high nitrogen and sulfur requirements of canola versus most crops, a fertilizer study was started in 2014 on behalf of Yara North America, Inc. 2015 was the continuation of the same study. The objective of the study was to compare the effects of “Amidas”; a homogeneous blend of urea + ammonium sulfate, on the yield and quality of canola seed versus straight fertilizers and two physical blends of urea + ammonium sulfate and Agrotain treated urea + ammonium sulfate.

Trial Location

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

Treatments and Replications

Based on the soil analysis report, T1 (control) did not receive any fertilizer. T2, T3 and T4 received 80, 100 and 120 lbs of N/acre through urea with no sulfur. T5 to T7 received same rates of N + 11, 13.75 and 16.5 lbs of $\text{SO}_4\text{-S}$ /acre through the physical blend of urea + ammonium sulfate. T8 to T10 received 80, 100 and 120 lbs of N + 11, 13.75 and 16.5 lbs of $\text{SO}_4\text{-S}$ /acre through the homogeneous blend of Amidas. T11 to T13 received 80, 100 and 120 lbs of N + 11, 13.75 and 16.5 lbs of $\text{SO}_4\text{-S}$ /acre through the physical blend of Agrotain treated urea + ammonium sulfate. Overall there were thirteen 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.

Treatment	Fertilizer/Blend	Nitrogen (lb/acre)	SO ₄ -Sulfur (lb/acre)	Phosphorus (lb/acre)	Potassium (lb/acre)
T1	Control	0	0	0	0
T2	Urea	80	0	0	0
T3	Urea	100	0	0	0
T4	Urea	120	0	0	0
T5	Urea + AS blend	80	11	0	0
T6	Urea + AS blend	100	13.75	0	0
T7	Urea + AS blend	120	16.5	0	0
T8	Amidas	80	11	0	0
T9	Amidas	100	13.75	0	0
T10	Amidas	120	16.5	0	0
T11	Agrotain treated Urea + AS blend	80	11	0	0
T12	Agrotain treated Urea + AS blend	100	13.75	0	0
T13	Agrotain treated Urea + AS blend	120	16.5	0	0

Note: No fall-nitrogen was applied. Full rates of nitrogen and sulfur were broadcasted by hand in spring 2015 and harrowed in before planting on the morning of May 22nd, 2015.

Design and Plot Size

Trial was planted in a randomized complete block design. Each plot was 13 X 25 feet.

Planting Data

Location	Variety	Planting Date	Seed Rate (lbs./acre)	Drilling Space
Langdon REC	DKL72-40 Canola	May 22, 2015	7	7" with 1" depth

Harvesting Data

Plots were swathed on September 2nd and combined on September 14th, 2015.

Results and Discussion

Data was analyzed using SAS statistical package 9.4.

For yield in lbs/acre, T1 (control) was found significantly lower than T2, T3, T4, T5, T7, T9 and T12 at 90% confidence interval. At the same confidence interval, T7 was significantly higher than T8, whereas, T2, T3, T4, T5, T6, T9, T10, T11, T12 and T13 were numerically higher than T8. At 95% confidence interval, T1 was significantly lower than T2, T3, T7 and T12, whereas, T8 was numerically lower than rest of the treatments except T1. T7 had the highest, whereas, T1 had the lowest yield/acre.

For test weight, T3, T4, T7 and T12 were significantly higher than T10 at 90% confidence interval. At the same confidence interval, T3 and T7 were significantly higher than T9. At 95% confidence interval, T7 was significantly higher than T10. T7 had the highest, whereas, T10 had the lowest test weight.

For 1000 kernel weight at 90% confidence interval, T5 and T7 were significantly higher than T10. At 95% confidence interval, only T5 was significantly higher than T10. Overall, T10 had the lowest weight and T5 had the highest weight for 1000 seeds.

For seed/pound at 90% confidence interval, T8, T9, T10 and T11 were significantly higher than T5. At 95% confidence interval, T8 and T10 were significantly higher than T5. T5 had the lowest weight, whereas, T10 had the highest weight for seed/pound.

For oil % at 90% confidence interval, T1 was significantly higher than T10. At 95% confidence interval, there was no significant difference between any of the treatments. Overall, T10 had the lowest and T1 had the highest oil percentages.

Statistical data is given in the below table.

Treatments	Yield/acre (lbs)	Test Weight (lbs/bushel)	1000 Seed Weight (grams)	Seed / Pound	Oil (Percentage)
1	2705	50.4	3.28	138,171	50.7
2	3385	50.7	3.36	135,043	49.2
3	3410	50.8	3.27	138,804	49.8
4	3196	50.8	3.31	137,420	48.4
5	3245	50.3	3.48	130,586	48.5
6	3185	50.4	3.26	139,283	49.5
7	3463	51.2	3.40	133,233	48.4
8	2927	50.2	3.21	141,415	49.1
9	3199	50.2	3.26	139,589	48.5
10	2998	50.0	3.20	141,533	48.2
11	2951	50.7	3.24	141,044	49.0
12	3372	50.7	3.32	136,971	48.5
13	3141	50.4	3.32	136,934	49.6
HIGH MEAN	3463	51.2	3.48	141,533	50.7
LOW MEAN	2705	50.0	3.20	130,586	48.2
EXP MEAN	3167	50.5	3.30	137,694	49.0
C.V.	12.91	1.29	5.13	5.37	4.25
LSD (α 0.1)	487	0.7	0.20	8823	2.4
LSD (α 0.05)	585	0.9	0.24	10592	2.9
No. OF REPS	4	4	4	4	4
F-VALUE	1.18	0.96	0.83	0.77	0.48

Note: Plot 311 bag had a small spill.

Summary

Highest canola seed yield/acre (3463.40 lbs/acre) was recorded at 120 lbs of N and 16.5 lbs of SO₄-S by applying the physical blend of Urea + AS (T7). T7 resulted in the highest yield/acre in 2014 too. Next best yield results were obtained at 100 lbs of N/acre with no S (T3), at 80 lbs of N/acre with no S (T2), and at 100 lbs of N and 13.75 lbs of SO₄-S (T12) by applying Urea and the physical blend of Agrotain treated Urea + AS.

Highest test weight (51.23 lbs/bushel) was also recorded for T7, at 120 lbs of N and 16.5 lbs of SO₄-S by applying the physical blend of Urea + AS.

Highest weight for 1000 kernels (3.48 grams) was recorded for T5 at 80 lbs of N + 11 lbs of SO₄-S by applying the physical blend of Urea + AS.

Highest seed/pound (141533) was recorded for T10 at 120 lbs of N + 16.5 lbs of SO₄-S through Amidas.

Like 2014, in 2015 T1 (control) recorded the highest oil % (50.75) with no fertilizer application.

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)

I. INTRODUCTION:

Soil salinity and sodicity are two major soil health issues facing North Dakota producers throughout the State. Brennan J. and M. Ulmer reported 5.8 million saline acres in North Dakota (Salinity in the Northern Great Plains, Natural Resources Conservation Service, Bismarck, N.D. 2010). Some studies even suggest about 90% of the soils are affected by high salt and sodium levels. Reported history of saline and sodic soils in North Dakota goes back to 1960s. NDSU Extension Bulletin No. 2 reported more than one million acres affected by high salt levels, whereas, more than two million acres were to have excessive levels of sodium (Salt Affected Problem Soils in North Dakota, Their Properties and Management by Gordon A. Johnsgard, reprinted in 1974). That 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 water-table levels and resulting capillary rise of soil water then leads to the accumulation of excessive salts and sodium within the plant root zone or at the soil surface.

Saline soils will have excessive soluble salts in the soil solution high enough to limit the ability of plant roots to absorb soil water even under wet conditions, causing drought like symptoms (“osmotic effect”).

Salts, however, result in higher amounts of positively charged ions like calcium (Ca^{++}) and magnesium (Mg^{++}) that promote flocculation (opposite of dispersion) by moving in close to the negatively charged particles, thereby reducing their tendency to disintegrate or disperse from each other (The Nature and Properties of Soils, Nyle C. Brady and Ray R. Weil, 14th Edition, Revised). Flocculation of soil particles keeps soil structure in good physical condition resulting in better soil porosity and creating conditions conducive for improved soil water infiltration and drainage. Being mobile in soil water, soluble salts can be leached out of the plant root zone by lowering the water-table level.

In contrast to saline soils, sodic soils have excessive levels of sodium ions (Na^+) adsorbed at the soil cation exchange sites. Soil sodicity causes degradation of soil structure. That process is called “soil dispersion”.

Soil sodicity is an excessive Na^+ issue and not an excessive salt problem. A typical salt will be a combination of a positively charged ion attracted to a negatively charged ion, for example Na^+Cl^- . In sodic soils, excessive Na^+ is attracted to the negative charges of soil particles, mainly clay. Forces that hold clay particles together are greatly weakened when excessive Na^+ is adsorbed at the negative charges of soil clay particles, forming Na^+ -clay particles (Seelig, 2000). When wet, Na^+ -clay particles get easily disintegrated or dispersed from the larger soil aggregates. Also, due to the larger hydrated size of Na^+ molecules, Na^+ -clay particles clog the soil pores (especially macro-pores) and settle down in dense layers (The Nature and Properties of Soils, 14th Edition, revised).

Poor physical structure then results in soils difficult to till, poor seed germination and restricted plant root growth. Due to the poor structure, sodic soils are also susceptible to wind and water erosion compared to saline soils. Soil dispersion effect will be more severe on expanding-type of clays as their degree of swelling increases, causing further shrinking of the larger soil pores. Once that happens, it severely impedes the soil drainage thus making it even more difficult to manage than soil salinity.

Remediation of soil sodicity requires an extra step of applying amendments that supply Ca^{++} directly or indirectly followed by salinity remediation practices of improving soil drainage and lowering the water-table level. Ca^{++} 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. Common soil amendments include gypsum, elemental sulfur, sulfuric acid, calcium chloride, calcium nitrate and calcium carbonate or lime (for acidic soils).

II. PURPOSE:

Salts and sodium can only be leached downward into the soils with rainfall or irrigation. That will require lowering the water-table level. One way is to install a subsurface drainage system like tile drainage which is gaining popularity due to the ongoing wet-weather cycle.

Basic purpose of a drainage system is to drain the excess soil water out of the plant root zone as quickly as possible depending upon the soil type. In order to achieve that objective, soils should be analyzed for soluble salts (Electrical Conductivity) and sodium (Sodium Adsorption Ratio or Exchangeable Sodium Percentage) levels prior to tiling. Generally tiling companies analyze soils for textural analysis in order to determine the tile size, depth and spacing between them. Analyzing soils for sodium is especially important as it can lead to the sealing of soil layers above or around the tiles, thus making the drainage system ineffective. Soils high for salts and sodium may not initially show the dispersion effects as salts will counter the dispersive nature of sodium, however, once a tile drainage system is in place, it may lead to the leaching of soluble salts, making the sodium problem worse.

The depth of sampling should also exceed the deepest depth of tiles in one foot increments. For detailed information please refer to the NDSU Publication: SF-1617; "Evaluation of Soils for Suitability for Tile Drainage Performance". Question for producers considering tiling could be:

Can they successfully improve soil drainage by tiling their sodic or saline-sodic soils before remediating sodicity?

The Langdon REC has a saline-sodic site well suited for the research of this question and other soil and water management issues. In order to replicate field conditions, it was decided to tile the project site prior to starting sodicity remediation by applying soil amendments that are suitable and easily available to northeast North Dakota growers. After several meetings between NDSU Ag. Engineers, tile drainage design engineer, tiling company, local extension agents and Langdon REC staff, project layout was finalized to achieve research and extension objectives. Area growers quickly endorsed and supported this project and within a six month period over \$80,000 was donated for the project. Installation of the tiles began on July 17th, 2015.

Layout includes dedicated plots for research trials and extension demonstrations. Research area includes four treatments (plots) in each replication with three replications. Treatment size is 325' x 80'. Each treatment has four, 4" laterals, placed 4' deep along with a water control structure. To minimize the subsoil flow from the neighboring treatments, each treatment was surrounded by a 10-12 mm thick, 5' deep plastic barrier. Extension area includes four plots of 150' x 150'. Each plots has four, 4" laterals, placed 3.5' deep with a water control structure.

III. REMEDIAL OBJECTIVES:

- First objective is to find out whether tiling can be successful on sodic or saline-sodic soils prior to sodicity remediation.
- Second objective is to compare the relationship between varying water table levels and resulting salt and sodium levels.
- Third objective is to analyze water samples from lift station, upstream and downstream for human and livestock health.

IV. SITE DESCRIPTION AND HISTORY:

As per web soil survey, project site is comprised of Cavour-Cresbard and Hamerly-Cresbard loams.

V. METHODOLOGY:

Soil Chemical Analysis:

Four feet deep soil samples in 12" increments from each treatment were collected in September 2014. For each sample, two to three cores were taken from the middle of tiles. Samples were analyzed for the following chemical properties.

- 0-12": N, P, K, O.M., SO₄, Cl, CCE, CEC, Ca, Mg, Na, saturated paste package (EC, SAR, pH, saturation %), alkalinity (CO₃ and HCO₃) and particle size fractions.
- 12-24": all of the above tests, excluding CEC.
- 24-36": all of the above tests, excluding P, O.M. and CEC.
- 36-48": all of the above tests, excluding P, O.M. and CEC.

Soil Physical Analysis:

In June 2015, 18" deep soil compaction measurements in 1" increment were taken with penetrometer. Gravimetric water content was measured for 12" depth in 6" increments and bulk density was measured for the top 10" in 5" increments. Penetrometer readings were taken through the Field Scout SC 900 meter, gravimetric water was measured by taking soil samples with standard soil auger and bulk density through undisturbed soil cores.

Weekly Water Table Level Measurements:

Water table levels were measured on a weekly basis from May-October along with EC and temperature through the observation wells in each plot with Solinst TLC 107 water level meter.

Water Sample Analysis:

Water samples were taken from lift station, upstream and downstream (100 to 200 feet from the pump station) in fall 2015 and were analyzed for the following.

- Group 2 complete mineral chemistry: bicarbonate, calcium, carbonate, conductivity, iron, magnesium, silica, nitrate, percent sodium, pH, potassium, sodium, sodium absorption ratio, hydroxide, total alkalinity, hardness, total hardness, total dissolved solids, turbidity, chloride, sulfate and fluoride.
- Group 7 trace metals: chromium, copper, zinc, arsenic, selenium, cadmium, barium, lead, manganese, iron, aluminum, boron, antimony, beryllium, nickel, silver, thallium and molybdenum.
- Group 30 nutrients: ammonia, total phosphate, dissolved phosphorus, nitrate/nitrite and total nitrogen.

Note: Soil and water analysis will be done for four more years starting from 2016 by following the same protocols.

Calculation of Soil Amendment Rates:

Soil amendment rates were calculated to bring the SAR (SAR-final) numbers to an acceptable level of 3 in the 1st foot. That was done by deducting 3 from the actual SAR numbers (SAR-initial). In order to calculate soil amendments rates, SAR-final values were converted into ESP by using the following formula:

$$ESP = \frac{(100(-0.0126+(0.01475*SAR)))}{(1+(-0.0126+(0.01475*SAR)))}$$

(Diagnosis and Improvement of Saline and Alkali Soils, Agriculture Handbook No. 60, P-26 1954. United States Salinity Laboratory Staff).

Furthermore, ESP and CEC values of the 1st foot were used to calculate the milliequivalent of exchangeable Na/100 grams of soil by using this formula. That number was multiplied by 1.7 to get tons of 100 pure gypsum/acre feet:

$$Exchaneable\ Na\ Meq\ per\ 100\ grams\ of\ soil = \frac{CEC * Ex. Na\%}{100}$$

(Diagnosis and Improvement of Saline and Alkali Soils, Agriculture Handbook No. 60, P-49 1954. United States Salinity Laboratory Staff).

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.

The following formula was used to compensate for gypsum and elemental sulfur products that were less than 100% pure.

$$\frac{100}{\text{purity}\%} * \text{tons equivalent to 1 ton of pure gypsum}$$

(Reclaiming Sodic and Saline/Sodic Soils. Drought Tips Number 92-33, University of California Cooperative Extension, 1993).

Trial Location:

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

Design and Plot Size:

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

Treatments and Replications:

Following treatments were applied with a total of 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 (S⁰) to lower the soil SAR-final levels to 3.

Amendment Rates:

Treatment number	99.5% Gypsum tons/plot	90% Elemental Sulfur tons/plot	VersaLime tons/plot
101	0	0	0
102	4.47	0	0
103	0	0	8.74
104	0	2.10	0
201	0	0	0
202	7.25	0	0
203	0	0	30.45
204	0	0.61	0
301	0	0	0
302	10.67	0	0
303	0	0	22.93
304	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. All of the amendments were then rototilled into the soil. Control plots were also rototilled for replication purposes. Control structures for all of the treatment were fully opened in order to achieve maximum leaching conditions.

Grass Planting:

In order to establish a vegetative cover, an equal mix of Tall, Slender, Intermediate and Green wheatgrasses and Russian Wildrye were hand broadcasted and harrowed in on August 28th at the rate of 7 lb/acre.

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. 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 2016 growing season are listed below:

HRSW – Glenn, Faller, Prosper, Elgin-ND

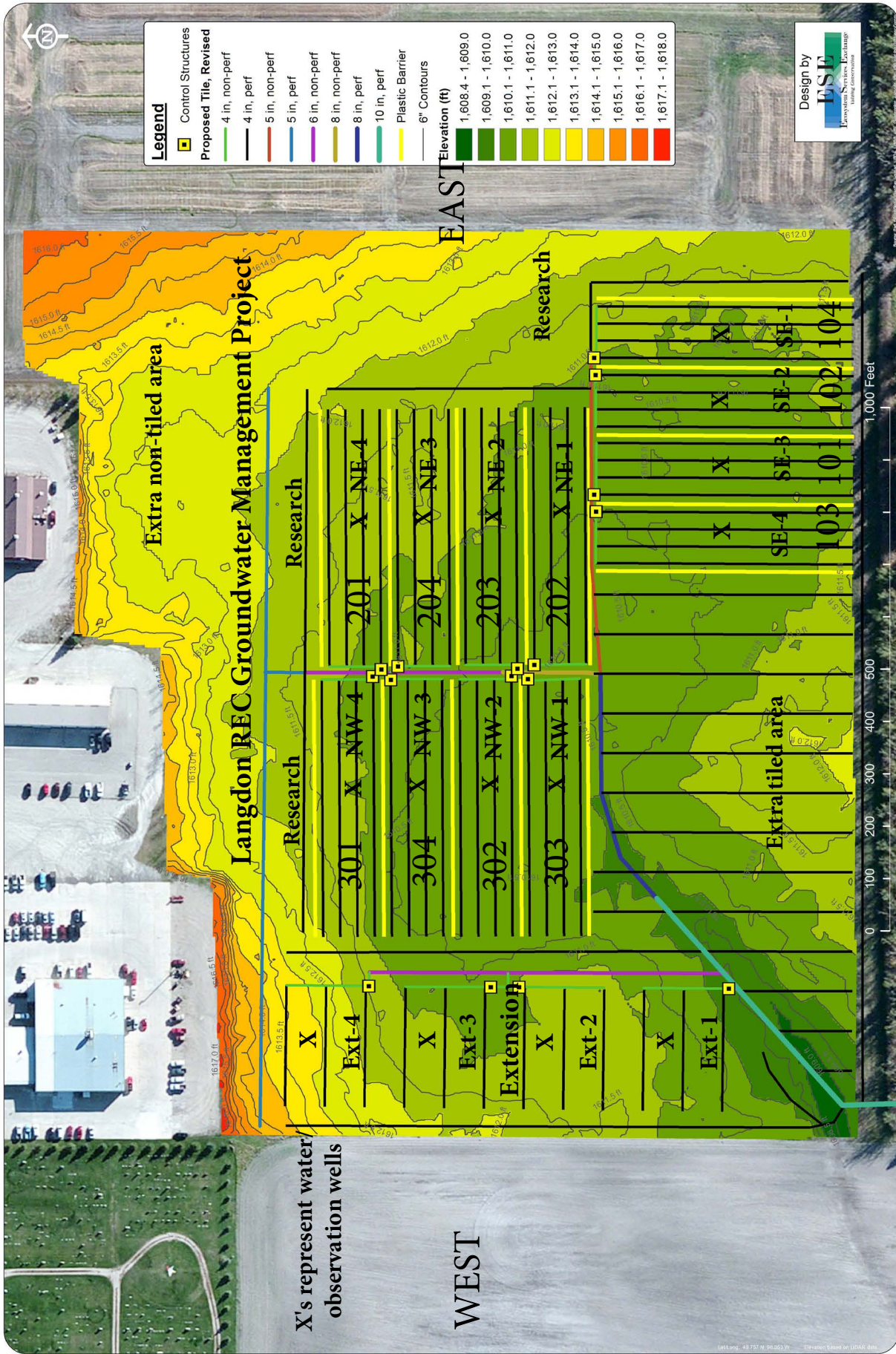
Barley – Lacey

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/

DISCLAIMER. The information given herein is for educational purposes only. Any reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement is implied by the NDSU Langdon Research Extension Center faculty and staff.

This publication will be made available in alternative formats for people with disabilities upon request. North Dakota State University is an equal opportunity institution.





NDSU Langdon
Research Extension Center
9280 107th Ave. N.E.
Langdon, ND 58249
(701) 256-2582
fax (701) 256-2580
Website: www.ag.ndsu.edu/langdonrec
Email: NDSU.Langdon.REC@ndsu.edu



NDSU NORTH DAKOTA AGRICULTURAL
EXPERIMENT STATION

NDSU EXTENSION
SERVICE

North Dakota State University does not discriminate on the basis of age, color, disability, gender expression/identity, genetic information, marital status, national origin, public assistance status, race, religion, sex, sexual orientation, or status as a U.S. veteran. Direct inquiries to: Vice Provost for Faculty and Equity, Old Main 201, 701-231-7708 or Title IX/ADA Coordinator, Old Main 102, 701-231-6409. This publication will be made available in alternative formats for people with disabilities upon request. (701) 231-7881.