2023

NORTH AMERICAN BARLEY SCAB EVALUATION NURSERY (NABSEN) REPORT

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INTRODUCTION

Elite barley lines are planted each year from university cooperators and industry partners. Five misted nurseries comprising North American Barley Scab Evaluation Nursery (NABSEN) are located in the state of North Dakota, Minnesota, and the Canadian province of Manitoba providing a broad range of barley growing regions. The 2023 NABSEN was grown at Fargo, Casselton, Osnabrock and Langdon, ND; St. Paul and Crookston MN, and Brandon, Manitoba. Nurseries either were misted or non-misted (dryland). Dryland nurseries provide conditions similar to those found in commercial fields. Disease in misted fields was more severe than growers would observe in most years and entries with only moderate FHB resistance may have higher disease levels. Dryland nurseries allow discrimination of entries with moderate to low levels of FHB resistance. Each nursery included a set of common checks. The checks were Chevron, and Quest (resistant six-row checks), Explorer and AAC Synergy (new for NABSEN since 2022), Stander (susceptible six-row checks), and Conlon (resistant two-row check). At all locations, the percentage severity of FHB was determined around the middle dough stage by determining the ratio of infected kernels to total kernels on 10-20 spikes per entry, and then multiplying by 100.

RESULTS

There was no DON, FHB disease severity, and incidence taken at Casselton, also no FHB disease severity and incidence taken at Osnabrock dryland nursery. FHB disease severity levels were high at St Paul, Crookston, and Langdon, and moderate at Fargo, and Brandon (Table 2). DON levels were highest in Langdon, followed by Brandon and Fargo, and moderate at Crookston, and St Paul. DON levels were high in misted fields and very low at Osnabrock dryland location (Table 4). S2M192, and 2ND40373 had the lowest DON levels, these were equal to or less than the resistant 2-rowed variety ‘Conlon’ in the majority of misted trials. Temperatures were below the 30-year average (Table 6), for July at most of the locations. Precipitation was below the 30-year average at all locations for May. All locations had near normal precipitation or were below for August (Table 7).

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Site details are as follows:

Fargo, & Langdon ND – Thomas Baldwin and Abraham Hangamaisho

- Misted
- Inoculated by grain spawn method
- 3 Replicates
- Disease severity - percentage of infected kernels
- Disease incidence - percentage of infected heads

- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates
- Days to heading counted from date planted to 50% of heads emerged 50%

Osnabrock, ND – Richard Horsley

- Dryland
- Inoculated by grain spawn method
- 3 Replicates
- Disease incidence or severity – none taken
- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates

Casselton, ND – Max Fraser

- Dryland
- 3 replicates
- Disease incidence, severity, and DON content (ppm) - none taken (total loss)

ST. PAUL & CROOKSTON, MN– Kevin Smith and Ruth Dill-Macky

- Misted (Crookston and St. Paul)
- 3 replicates
- Inoculated by grain spawn method.
- Disease severity - percentage of infected kernels
- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates
- Days to heading counted from date planted to 50% of heads emerged 50%

BRANDON, MANITOBA – Ana Badea and James Tucker

- Misted
- 4 replicates RCB design
- Disease severity - percentage of infected kernels
- Disease incidence - percentage of infected heads
- Days to heading counted from date planted to 50% of heads emerged.
- DON content (ppm) measured by ELISA technique at ECORC, Ottawa on a composite sample of 4 replicates.

List of Tables

Table 1. Mean FHB severity, incidence, heading date, and DON of entries grown in the 2023 NABSEN Nursery at six locations.

	Manitoba, Canada				Langdon				Fargo				Osnabrock [a]	Crookston		St Paul		
Line	HD	Severity (%)	Incidence (%)	DON(%)	HD(Avg)	Severity(%)	Incidence(%)	DON(%)	HD(Avg)	Severity(%)	Incidence(%)	DON(%)	DON(%)	Severity	DON(%)	HD(Avg)	Severity(%)	DON(%)
2IK18-4680	54.8	7.5	80.0	21.3	52.7	19.8	100.0	31.0	58.7	14.6	96.7	26.4	0.0	23.33	13.0	49	35.33	6.3
2IK19-5748	53.5	5.3	70.0	26.6	59.0	9.6	93.3	24.3	60.0	9.7	83.3	31.9	0.0	19.74	9.2	50.67	18	8.0
2IK19-5867	54.5	8.0	77.5	14.6	58.3	8.2	100.0	16.6	58.0	8.7	90.0	20.1	0.0	17.56	10.5	49.67	37	7.5
2IK19-5877	54.3	8.6	82.5	18.6	59.0	10.7	80.0	26.9	58.3	15.1	96.7	25.8	0.0	25.68	11.0	49.33	33.33	7.9
2ND36638	53.5	11.2	82.5	20.0	55.7	9.1	93.3	13.9	61.7	6.3	66.7	19.5	0.0	23.04	17.1	47.33	22.33	8.5
2ND39010	53.0	11.7	82.5	20.5	65.0	9.7	96.7	18.4	58.0	16.1	93.3	31.5	0.2	19.02	12.9	46.67	21.67	6.0
2ND40316	53.5	6.0	70.0	14.2	55.3	14.4	90.0	25.2	57.3	10.0	76.7	20.7	0.0	27.58	17.3	47.33	15.33	9.2
2ND40324	52.0	7.6	75.0	14.6	54.7	15.1	100.0	26.4	56.0	10.0	73.3	17.4	0.1	21.43	16.1	46.33	31.5	18.0
2ND40351	51.8	5.2	70.0	17.3	60.7	7.5	86.7	18.9	58.0	9.7	76.7	23.9	0.0	15.91	12.8	46	23.17	12.4
2ND40363	53.3	5.0	52.5	10.6	57.3	17.2	100.0	19.5	63.0	12.9	76.7	23.4	0.0	33.48	14.2	45.67	26.67	13.6
2ND40373	52.3	2.3	47.5	8.8	61.0	6.9	76.7	15.8	56.3	6.7	73.3	15.9	0.0	20.79	8.9	45.33	19.83	8.8
AAC Synergy	55.0	4.1	57.5	32.7	63.0	5.0	80.0	11.9	60.3	6.7	90.0	40.4	0.0	8.46	17.6	51.67	25.67	5.7
BM1618-231	55.0	2.4	42.5	11.6	63.0	7.5	80.0	16.0	60.3	15.2	90.0	19.0	0.0	7.14	10.0	51.33	23.83	5.8
Chevron	55.0	1.0	32.5	14.6	61.3	2.3	70.0	8.2	63.7	0.8	33.3	8.7	0.0	7.04	7.7	53.33	4	2.2
Conlon	52.5	10.3	67.5	13.6	52.3	14.6	90.0	18.0	55.3	9.3	83.3	9.3	0.0	20.5	7.6	45	21	7.1
Explorer	53.3	20.1	92.5	13.2	56.3	19.1	100.0	26.3	60.3	14.3	86.7	22.9	0.0	10.97	14.5	49.33	18.67	10.8
F15137016	53.8	11.2	90.0	11.1	62.7	19.1	100.0	33.0	59.3	18.6	93.3	28.5	0.0	13.19	17.2	50.33	18	9.6
F16220020	54.8	7.5	70.0	24.0	62.3	9.7	93.3	17.5	61.7	10.9	90.0	26.4	0.0	8.16	12.4	51	13.83	7.6
FB22108	54.5	8.3	72.5	20.0	55.3	11.1	100.0	13.5	58.0	15.8	90.0	23.6	0.0	11.79	14.0	49.33	12.5	11.7
FB22109	54.0	7.9	70.0	18.2	57.7	10.1	100.0	22.5	57.7	12.8	93.3	21.7	0.1	16.98	14.3	48	25.17	9.8
FB22612	53.3	8.1	82.5	9.6	55.3	14.3	96.7	19.2	55.3	11.2	90.0	15.5	0.0	26.53	13.6	47.33	23	4.2
J17044002	54.5	5.9	77.5	24.8	61.7	5.2	63.3	14.6	60.7	12.7	96.7	34.7	0.0	18.13	16.6	50.67	22.5	12.2
ND Genesis	52.8	5.8	80.0	17.3	59.0	13.0	73.3	15.0	60.0	10.2	80.0	22.8	0.0	22.78	11.3	49	17.17	4.8
QUEST	54.3	4.4	67.5	13.1	53.7	10.7	93.3	22.5	57.3	4.9	86.7	13.9	0.0	20.63	11.8	46	25.67	9.0
S2M191	53.8	5.3	60.0	9.4	56.0	11.5	96.7	23.7	57.7	11.8	76.7	18.8	0.0	26.32	16.3	46.33	12.17	9.8
S2M192	53.5	13.2	85.0	12.1	54.7	21.1	100.0	23.5	56.7	12.6	70.0	11.1	0.0	56.67	10.6	45.67	15.17	8.4
S2M193	53.3	8.0	80.0	12.2	52.0	19.4	96.7	18.1	54.0	16.9	95.0	8.7	0.0	45	8.2	44	40	11.3
S2M195	53.8	3.7	57.5	14.8	58.0	13.9	96.7	30.2	57.0	19.9	100.0	25.7	0.0	32.22	14.0	49	30.67	7.7
S2M196	54.5	11.6	92.5	30.2	55.3	10.9	86.7	22.5	59.0	19.9	90.0	24.1	0.0	33.83	30.0	46.67	45.5	15.4
S2M198 (2MS19_3389-004)	53.8	23.9	100.0	24.2	51.0	30.1	100.0	47.5	57.0	18.3	86.7	24.6	0.0	68.57	13.6	46	33	18.3

S2M199 (2MS20_3310-018)	54.0	9.5	80.0	20.7	55.0	22.3	96.7	34.7	55.7	5.0	63.3	19.2	0.0	52.67	10.7	47	29	3.5
S2M200 (TM18.056-043)	53.3	16.5	92.5	17.5	52.7	13.6	96.7	21.1	54.7	10.2	76.7	14.9	0.1	57.3	11.9	46.67	21.5	11.9
S2M201 (TM18.140-002)	53.3	9.5	95.0	17.5	55.0	15.6	100.0	38.6	56.3	19.0	90.0	26.8	0.2	36.92	22.6	48.33	22.33	7.2
S2M202 (TM18.211-018)	53.8	6.9	72.5	10.4	53.3	18.5	100.0	28.4	55.0	14.9	93.3	16.8	0.0	48.18	12.5	46	21.17	10.7
Stander	54.8	19.4	100.0	28.2	58.0	37.1	100.0	44.6	56.3	31.2	93.3	55.3	0.1	39.47	17.6	45.33	25.5	19.8
TR21187	53.5	7.9	75.0	18.5	54.0	22.0	100.0	20.2	57.7	7.6	90.0	19.9	0.0	12.92	9.4	47.67	11.83	6.3
TR22192	55.3	6.6	65.0	23.7	60.3	5.0	63.3	18.7	61.3	13.0	93.3	31.3	0.1	16.41	15.9	50	21.33	8.1
TR23287	55.0	3.6	52.5	14.1	62.0	8.3	86.7	20.2	61.3	8.9	86.7	26.4	0.0	9.23	9.9	50.67	19	2.7
TR23289	54.5	3.9	62.5	23.5	66.7	3.3	65.0	20.1	61.7	9.3	86.7	32.2	0.0	7.69	15.0	51.67	14	5.1
TR23290	55.0	2.0	45.0	13.6	66.3	6.5	83.3	11.6	61.3	7.8	93.3	23.6	0.1	4.84	15.3	51.33	20.16	8.4

[a] Not mist irrigated (dry land)
HD (Avg) = Average heading date

Table 2. Mean FHB severity of entries grown in the 2023 NABSEN Nursery at five locations.

Line	Manitoba, Canada	Langdon	Fargo	Crookston	St Paul
2IK18-4680	7.5	19.8	14.6	23.33	35.33
2IK19-5748	5.3	9.6	9.7	19.74	18
2IK19-5867	8.0	8.2	8.7	17.56	37
2IK19-5877	8.6	10.7	15.1	25.68	33.33
2ND36638	11.2	9.1	6.3	23.04	22.33
2ND39010	11.7	9.7	16.1	19.02	21.67
2ND40316	6.0	14.4	10.0	27.58	15.33
2ND40324	7.6	15.1	10.0	21.43	31.5
2ND40351	5.2	7.5	9.7	15.91	23.17
2ND40363	5.0	17.2	12.9	33.48	26.67
2ND40373	2.3	6.9	6.7	20.79	19.83
AAC Synergy	4.1	5.0	6.7	8.46	25.67
BM1618-231	2.4	7.5	15.2	7.14	23.83
Chevron	1.0	2.3	0.8	7.04	4
Conlon	10.3	14.6	9.3	20.5	21
Explorer	20.1	19.1	14.3	10.97	18.67
F15137016	11.2	19.1	18.6	13.19	18
F16220020	7.5	9.7	10.9	8.16	13.83
FB22108	8.3	11.1	15.8	11.79	12.5
FB22109	7.9	10.1	12.8	16.98	25.17
FB22612	8.1	14.3	11.2	26.53	23
J17044002	5.9	5.2	12.7	18.13	22.5
ND Genesis	5.8	13.0	10.2	22.78	17.17
QUEST	4.4	10.7	4.9	20.63	25.67

S2M191	5.3	11.5	11.8	26.32	12.17
S2M192	13.2	21.1	12.6	56.67	15.17
S2M193	8.0	19.4	16.9	45	40
S2M195	3.7	13.9	19.9	32.22	30.67
S2M196	11.6	10.9	19.9	33.83	45.5
S2M198 (2MS19_3389-004)	23.9	30.1	18.3	68.57	33
S2M199 (2MS20_3310-018)	9.5	22.3	5.0	52.67	29
S2M200 (TM18.056-043)	16.5	13.6	10.2	57.3	21.5
S2M201 (TM18.140-002)	9.5	15.6	19.0	36.92	22.33
S2M202 (TM18.211-018)	6.9	18.5	14.9	48.18	21.17
Stander	19.4	37.1	31.2	39.47	25.5
TR21187	7.9	22.0	7.6	12.92	11.83
TR22192	6.6	5.0	13.0	16.41	21.33
TR23287	3.6	8.3	8.9	9.23	19
TR23289	3.9	3.3	9.3	7.69	14
TR23290	2.0	6.5	7.8	4.84	20.16

Table 3. Mean disease incidence of entries grown in the 2023 NABSEN Nursery at three locations.

Line	Manitoba, Canada	Langdon	Fargo
2IK18-4680	80.0	100.0	96.7
2IK19-5748	70.0	93.3	83.3
2IK19-5867	77.5	100.0	90.0
2IK19-5877	82.5	80.0	96.7
2ND36638	82.5	93.3	66.7
2ND39010	82.5	96.7	93.3
2ND40316	70.0	90.0	76.7
2ND40324	75.0	100.0	73.3
2ND40351	70.0	86.7	76.7
2ND40363	52.5	100.0	76.7
2ND40373	47.5	76.7	73.3
AAC Synergy	57.5	80.0	90.0
BM1618-231	42.5	80.0	90.0
Chevron	32.5	70.0	33.3
Conlon	67.5	90.0	83.3
Explorer	92.5	100.0	86.7
F15137016	90.0	100.0	93.3
F16220020	70.0	93.3	90.0
FB22108	72.5	100.0	90.0
FB22109	70.0	100.0	93.3

FB22612	82.5	96.7	90.0
J17044002	77.5	63.3	96.7
ND Genesis	80.0	73.3	80.0
QUEST	67.5	93.3	86.7
S2M191	60.0	96.7	76.7
S2M192	85.0	100.0	70.0
S2M193	80.0	96.7	95.0
S2M195	57.5	96.7	100.0
S2M196	92.5	86.7	90.0
S2M198 (2MS19_3389-004)	100.0	100.0	86.7
S2M199 (2MS20_3310-018)	80.0	96.7	63.3
S2M200 (TM18.056-043)	92.5	96.7	76.7
S2M201 (TM18.140-002)	95.0	100.0	90.0
S2M202 (TM18.211-018)	72.5	100.0	93.3
Stander	100.0	100.0	93.3
TR21187	75.0	100.0	90.0
TR22192	65.0	63.3	93.3
TR23287	52.5	86.7	86.7
TR23289	62.5	65.0	86.7
TR23290	45.0	83.3	93.3

Table 4. Mean for DON (ppm) entries grown in 2023 NABSEN Nursery at six locations

Line	Manitoba, Canada	Langdon	Fargo	Osnabrock	Crookston	St Paul
2IK18-4680	21.3	31.0	26.4	0.0	13.0	6.3
2IK19-5748	26.6	24.3	31.9	0.0	9.2	8.0
2IK19-5867	14.6	16.6	20.1	0.0	10.5	7.5
2IK19-5877	18.6	26.9	25.8	0.0	11.0	7.9
2ND36638	20.0	13.9	19.5	0.0	17.1	8.5
2ND39010	20.5	18.4	31.5	0.2	12.9	6.0
2ND40316	14.2	25.2	20.7	0.0	17.3	9.2
2ND40324	14.6	26.4	17.4	0.1	16.1	18.0
2ND40351	17.3	18.9	23.9	0.0	12.8	12.4
2ND40363	10.6	19.5	23.4	0.0	14.2	13.6
2ND40373	8.8	15.8	15.9	0.0	8.9	8.8
AAC Synergy	32.7	11.9	40.4	0.0	17.6	5.7
BM1618-231	11.6	16.0	19.0	0.0	10.0	5.8
Chevron	14.6	8.2	8.7	0.0	7.7	2.2

Conlon	13.6	18.0	9.3	0.0	7.6	7.1
Explorer	13.2	26.3	22.9	0.0	14.5	10.8
F15137016	11.1	33.0	28.5	0.0	17.2	9.6
F16220020	24.0	17.5	26.4	0.0	12.4	7.6
FB22108	20.0	13.5	23.6	0.0	14.0	11.7
FB22109	18.2	22.5	21.7	0.1	14.3	9.8
FB22612	9.6	19.2	15.5	0.0	13.6	4.2
J17044002	24.8	14.6	34.7	0.0	16.6	12.2
ND Genesis	17.3	15.0	22.8	0.0	11.3	4.8
QUEST	13.1	22.5	13.9	0.0	11.8	9.0
S2M191	9.4	23.7	18.8	0.0	16.3	9.8
S2M192	12.1	23.5	11.1	0.0	10.6	8.4
S2M193	12.2	18.1	8.7	0.0	8.2	11.3
S2M195	14.8	30.2	25.7	0.0	14.0	7.7
S2M196	30.2	22.5	24.1	0.0	30.0	15.4
S2M198 (2MS19_3389-004)	24.2	47.5	24.6	0.0	13.6	18.3
S2M199 (2MS20_3310-018)	20.7	34.7	19.2	0.0	10.7	3.5
S2M200 (TM18.056-043)	17.5	21.1	14.9	0.1	11.9	11.9
S2M201 (TM18.140-002)	17.5	38.6	26.8	0.2	22.6	7.2
S2M202 (TM18.211-018)	10.4	28.4	16.8	0.0	12.5	10.7
Stander	28.2	44.6	55.3	0.1	17.6	19.8
TR21187	18.5	20.2	19.9	0.0	9.4	6.3
TR22192	23.7	18.7	31.3	0.1	15.9	8.1
TR23287	14.1	20.2	26.4	0.0	9.9	2.7
TR23289	23.5	20.1	32.2	0.0	15.0	5.1
TR23290	13.6	11.6	23.6	0.1	15.3	8.4

[a] Not mist irrigated (dry land)

Table 5. Mean days to heading after planting of entries grown in 2023 NABSEN Nursery at four locations.

Line	Manitoba, Canada	Langdon	Fargo	St Paul
2IK18-4680	54.8	52.7	58.7	49
2IK19-5748	53.5	59.0	60.0	50.67
2IK19-5867	54.5	58.3	58.0	49.67
2IK19-5877	54.3	59.0	58.3	49.33
2ND36638	53.5	55.7	61.7	47.33
2ND39010	53.0	65.0	58.0	46.67
2ND40316	53.5	55.3	57.3	47.33
2ND40324	52.0	54.7	56.0	46.33

2ND40351	51.8	60.7	58.0	46
2ND40363	53.3	57.3	63.0	45.67
2ND40373	52.3	61.0	56.3	45.33
AAC Synergy	55.0	63.0	60.3	51.67
BM1618-231	55.0	63.0	60.3	51.33
Chevron	55.0	61.3	63.7	53.33
Conlon	52.5	52.3	55.3	45
Explorer	53.3	56.3	60.3	49.33
F15137016	53.8	62.7	59.3	50.33
F16220020	54.8	62.3	61.7	51
FB22108	54.5	55.3	58.0	49.33
FB22109	54.0	57.7	57.7	48
FB22612	53.3	55.3	55.3	47.33
J17044002	54.5	61.7	60.7	50.67
ND Genesis	52.8	59.0	60.0	49
QUEST	54.3	53.7	57.3	46
S2M191	53.8	56.0	57.7	46.33
S2M192	53.5	54.7	56.7	45.67
S2M193	53.3	52.0	54.0	44
S2M195	53.8	58.0	57.0	49
S2M196	54.5	55.3	59.0	46.67
S2M198 (2MS19_3389-004)	53.8	51.0	57.0	46
S2M199 (2MS20_3310-018)	54.0	55.0	55.7	47
S2M200 (TM18.056-043)	53.3	52.7	54.7	46.67
S2M201 (TM18.140-002)	53.3	55.0	56.3	48.33
S2M202 (TM18.211-018)	53.8	53.3	55.0	46
Stander	54.8	58.0	56.3	45.33
TR21187	53.5	54.0	57.7	47.67
TR22192	55.3	60.3	61.3	50
TR23287	55.0	62.0	61.3	50.67
TR23289	54.5	66.7	61.7	51.67
TR23290	55.0	66.3	61.3	51.33

[1] Day to heading counted from date planted to 50% of heads emerged 50%

Table 6. Temperature (ºF) compared to the 30-year average 2023.

Location	May	June	July	August
Fargo, ND	7	6	-2	1
Langdon, ND	7	6	-3	0
St. Paul, MN	2.61	2.95	0.11	1.61
Crookston, MN	7	5	-4	0
Manitoba	28.08	22.17	7.95	9.25

Table 7. Rainfall (in.) compared to the 30-year average 2023.

Location	May	June	July	August
Fargo, ND	-0.24	-0.68	-2.29	2.04
Langdon, ND	-2.78	-2.05	-2.80	-1.04
St. Paul, MN	-3.86	-4.55	-3.98	-4.27
Crookston, MN	-2.01	-1.87	-3.11	-0.25
Manitoba	-0.97	0.17	0.03	0.04

Table 8. Pedigree and source of breeding lines tested for FHB resistance in 2023.

Entry	Line	Alias	Pedigree*	Row Type	Source
1	2ND36638		2ND31815/2ND31899	2	North Dakota State University
2	2ND39010		2ND32658/2ND32824	2	North Dakota State University
3	2ND40316		2ND32657/2ND34960	2	North Dakota State University
4	2ND40324		2ND32657/2ND34960	2	North Dakota State University
5	2ND40351		2ND32657/2ND34960	2	North Dakota State University

6	2ND40363		2ND32657/2ND34960	2	North Dakota State University
7	2ND40373		2ND32657/2ND33821	2	North Dakota State University
8	ND Genesis			2	North Dakota State University
9	S2M191		S2M179 (TM15.002-12) / 2ND32829	2	Crk'22
10	S2M192		TM14.013-27 / S2M180 (TM15.002-19)	2	Crk'22
11	S2M193		TM14.013-27 / S2M180 (TM15.002-19)	2	Crk'22
12	S2M195		TM17.073-01/ND Genesis//TM16.241-01/TM16.137-06	2	Crk'22
13	S2M196		TM16.108-16/S2M182 (TM15.162-27)	2	Crk'22
14	S2M198 (2MS19_3389-004)		TM16.340-007 / TM16.242-003	2	Crk'22
15	S2M199 (2MS20_3310-018)		2MS16_4130-136 / TM16.263-003	2	Crk'22
16	S2M200 (TM18.056-043)		TM16.241-01/TM16.242-01//TM15.162-27	2	Crk'22
17	S2M201 (TM18.140-002)		TM15.162-27//TM16.001-07/TM16.241-01	2	Crk'22
18	S2M202 (TM18.211-018)		TM15.162-27-1/TM16.261-020	2	Crk'22
19	TR23287	BM1616-085	TR15151/TR15246	2	Brandon Research and Development Centre, Agriculture & Agri-Food Canada
20	TR23290	BM1530-269	TR14146/TR15246	2	Brandon Research and Development Centre, Agriculture & Agri-Food Canada

21	BM1618-231	BM1618-231	TR15155/TR15246	2	Brandon Research and Development Centre, Agriculture & Agri-Food Canada
22	TR23289	BM1403-174	TR12135/TR13235	2	Brandon Research and Development Centre, Agriculture & Agri-Food Canada
23	FB22108	SB190223	Altorado/SB130536	2	Crop Development Centre, University of Saskatchewan
24	FB22109	SB190710	RGT Planet/TR16162	2	Crop Development Centre, University of Saskatchewan
25	TR21187	SM181902	TR15151/Explorer	2	Crop Development Centre, University of Saskatchewan
26	TR22192	SM193054	CDC Fraser/CDC Copper	2	Crop Development Centre, University of Saskatchewan
27	F15137016	F15137016	GRACE/TR14928	2	Field Crop Development Centre, Olds College
28	F16220020	F16220020	TR14146/TR14150	2	Field Crop Development Centre, Olds College
29	J17044002	J17044002	CDC AUSTENSON/TR16162	2	Field Crop Development Centre, Olds College
30	FB22612	J17050006	CLAYMORE/TR16161	2	Field Crop Development Centre, Olds College
31	2IK18-4680		2B13-6723/2B13-7314	2	Busch Ag, AB-InBev
32	2IK19-5748		2B12-5496/2B12-5760	2	Busch Ag, AB-InBev
33	2IK19-5867		2B10-4378/2B12-5678	2	Busch Ag, AB-InBev

34	2IK19-5877		2B12-5459/2DT12-6312	2	Busch Ag, AB-InBev
35	QUEST	Check	FEG18-20/M110	6	
36	Conlon	Check		2	
37	Explorer	Check	Beatrix/Marnie	2	
38	AAC Synergy	Check	TR02267/Newdale	2	
39	Chevron	Check		6	
40	Stander	Check		6	