

2021

**NORTH AMERICAN BARLEY SCAB EVALUATION NURSERY
(NABSEN) REPORT**

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INTRODUCTION

The 2021 North American Barley Scab Evaluation Nursery (NABSEN) was grown at Fargo, Langdon, Osnabrock and Casselton, 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, Quest (resistant six-row checks), and Stander (susceptible six-row checks), Explorer and AAC Synergy (new for Nabsen 2021) and Conlon (resistant two-row checks). At all locations percent 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

Temperatures were at record highs and precipitation record lows for most of the growing season. FHB severity and DON levels reflect this climate conditions except at Langdon. Langdon field was kept wet with misters, and it had a 6-inch rainfall event in July which exploded the FHB disease. FHB disease severity was not taken at Casselton or Osnabrock dryland nurseries and at ST.Paul and Crookston because disease levels were low. FHB disease severity levels were low at Fargo and moderate at Brandon, MB and high Langdon, ND. **In the two dryland nurseries DON levels were so low so the data will not be shown on this report.** DON levels were high at Langdon and all other locations were moderate to low. The lowest DON levels were in these lines 2ND37568, 2IK16-1184, FB511 and FB514

Temperatures were near average or above the 30-year average (Table. 6), for May-August for all locations except for St. Paul in May, July and August and in Langdon in August (Table 6).

Precipitation were below the 30-year average at all locations in May thru July. Langdon and St. Paul had above precipitation in August and Fargo and Casselton were near normal (Table 7).

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Site details are as follows:

Fargo, & Langdon ND – Thomas Baldwin and Patrick Gross

- 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 P. Schwarz, NDSU on a composite sample of 3 replicates
- Day to heading counted from date planted to 50% of heads emerged 50%

Osnabrock, ND – Richard Horsley

- Dryland
- 3 Replicates
- Disease incidence or severity – none taken
- DON content (ppm) measured by GC/ECD by P. Schwarz, NDSU on a composite sample of 3 replicates

Casselton, ND – Marie Timmerman and Austin Case

- Dryland
- 3 replicates
- Disease incidence or severity – none taken
- DON content (ppm) measured by GC/ECD by P. Schwarz, NDSU on a composite sample of 3 replicates

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

- Misted (Crookston and St. Paul))
- Inoculated by grain spawn method
- Disease severity - percentage of infected kernels
- DON content (ppm) measured by GC/ECD by P. Schwarz, NDSU on a composite sample of 3 replicates (no DON data for St. Paul)
- Day 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
- Day to heading counted from date planted to 80% of heads emerged 50%
- DON content (ppm) measured by ELISA technique at ECORC, Ottawa on a composite sample of 4 replicates

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Table 1. Mean FHB severity of entries grown in the 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon	Mean
2ND32529	4.2	46.7	7.5	19.5
2ND32657	4.3	36.5	8.0	16.3
2ND36638	4.9	29.8	7.3	14.0

2ND36642	12.1	30.8	5.9	16.3
2ND37111	5.5	29.3	16.0	16.9
2ND37130	7.8	32.6	7.6	16.0
2ND37568	5.6	31.1	5.5	14.1
2ND39010	9.6	37.2	6.5	17.8
S2M182	15.8	35.7	11.3	20.9
S2M184	10.4	45.7	11.1	22.4
S2M185	12.5	42.5	10.9	22.0
S2M186	19.6	47.5	15.0	27.4
S2M187	7.1	46.6	11.3	21.6
S2M188	11.7	49.0	11.3	24.0
S2M189	12.7	34.3	13.9	20.3
TM16.383-006	12.2	50.6	15.2	26.0
2MS17_3456-039	14.7	44.3	17.4	25.5
2MS17_3461-007	6.9	38.8	11.2	19.0
2IK15-9655	10.8	41.1	14.2	22.0
2IK16-1184	4.4	20.7	6.9	10.7
2IK17-3003	8.1	31.4	3.5	14.4
2IK17-3009	8.6	31.3	15.5	18.5
2IK17-3049	14.7	35.7	11.1	20.5
2IK17-3051	9.4	45.6	19.5	24.8

Table 1. cont.: Mean FHB severity of entries grown in the 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon	Mean
2IK17-3157	8.1	31.1	7.2	15.4
2IM14-8212	8.7	35.4	9.9	18.0
ABI CARDINAL	8.8	38.1	26.4	24.4
FB21200	4.2	31.0	6.5	13.9

FB21201	4.9	30.1	4.8	13.3
TR21275	6.3	31.6	1.7	13.2
TR21277	6.0	40.4	7.5	17.9
TR20180	9.2	41.6	5.0	18.6
TR20181	7.6	38.1	4.4	16.7
TR20183	3.6	31.0	6.4	13.7
TR20185	9.6	31.9	3.2	14.9
TR20660	7.0	40.2	10.1	19.1
TR20661	3.6	37.7	6.9	16.1
FB511	6.4	25.3	5.4	12.4
FB514	11.4	40.8	3.0	18.4
QUEST	8.2	42.5	10.4	20.4
Conlon	11.5	41.8	3.7	19.0
Explorer	7.1	46.0	11.6	21.6
AAC Synergy	5.2	37.6	2.7	15.2
Chevron	2.8	34.7	1.9	13.1
Stander	18.3	52.2	21.6	30.7

Table 2. Mean disease incidence of entries grown in the 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon	Mean
2ND32529	66.7	100.0	45.0	70.6
2ND32657	66.7	100.0	62.5	76.4
2ND36638	66.7	100.0	70.0	78.9
2ND36642	80.0	100.0	55.0	78.3

2ND37111	73.3	100.0	65.0	79.4
2ND37130	80.0	100.0	47.5	75.8
2ND37568	83.3	100.0	37.5	73.6
2ND39010	93.3	100.0	57.5	83.6
S2M182	100.0	100.0	67.5	89.2
S2M184	93.3	100.0	72.5	88.6
S2M185	93.3	100.0	65.0	86.1
S2M186	100.0	100.0	80.0	93.3
S2M187	83.3	100.0	62.5	81.9
S2M188	93.3	100.0	55.0	82.8
S2M189	96.7	100.0	65.0	87.2
TM16.383-006	93.3	100.0	80.0	91.1
2MS17_3456-039	96.7	100.0	72.5	89.7
2MS17_3461-007	76.7	100.0	60.0	78.9
2IK15-9655	93.3	100.0	77.5	90.3
2IK16-1184	73.3	100.0	47.5	73.6
2IK17-3003	86.7	100.0	37.5	74.7
2IK17-3009	80.0	100.0	77.5	85.8
2IK17-3049	100.0	100.0	57.5	85.8
2IK17-3051	90.0	100.0	80.0	90.0

Table 2. cont.: Mean disease incidence of entries grown in the 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon	Mean
2IK17-3157	83.3	100.0	62.5	81.9
2IM14-8212	90.0	100.0	65.0	85.0
ABI CARDINAL	83.3	100.0	87.5	90.3
FB21200	60.0	100.0	55.0	71.7
FB21201	76.7	100.0	45.0	73.9

TR21275	86.7	100.0	25.0	70.6
TR21277	70.0	100.0	45.0	71.7
TR20180	90.0	100.0	37.5	75.8
TR20181	83.3	100.0	37.5	73.6
TR20183	63.3	100.0	37.5	66.9
TR20185	90.0	100.0	40.0	76.7
TR20660	86.7	100.0	55.0	80.6
TR20661	63.3	100.0	45.0	69.4
FB511	76.7	100.0	55.0	77.2
FB514	90.0	100.0	40.0	76.7
QUEST	76.7	100.0	62.5	79.7
Conlon	96.7	100.0	45.0	80.6
Explorer	86.7	100.0	72.5	86.4
AAC Synergy	70.0	100.0	37.5	69.2
Chevron	66.7	100.0	32.5	66.4
Stander	100.0	100.0	92.5	97.5

Table 3. Mean days to heading after planting of entries grown in 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon ¹	Mean
2ND32529	56.0	55.7	47.0	52.9
2ND32657	53.7	54.3	48.0	52.0
2ND36638	54.3	57.3	47.0	52.9
2ND36642	55.3	56.0	47.5	52.9
2ND37111	58.7	56.3	50.0	55.0
2ND37130	56.0	58.0	49.5	54.5

2ND37568	55.7	58.3	49.5	54.5
2ND39010	56.7	56.0	48.5	53.7
S2M182	57.3	56.0	48.5	53.9
S2M184	54.0	54.7	48.0	52.2
S2M185	53.7	57.3	47.0	52.7
S2M186	55.7	57.3	49.0	54.0
S2M187	53.7	55.7	48.5	52.6
S2M188	57.7	57.7	46.5	53.9
S2M189	56.7	59.0	48.5	54.7
TM16.383-006	53.0	54.3	45.8	51.0
2MS17_3456-039	58.0	58.7	50.5	55.7
2MS17_3461-007	56.3	57.3	46.5	53.4
2IK15-9655	56.0	56.7	47.0	53.2
2IK16-1184	57.7	59.0	48.0	54.9
2IK17-3003	58.3	58.0	50.0	55.4
2IK17-3009	55.3	57.0	46.5	52.9
2IK17-3049	59.0	60.3	50.0	56.4
2IK17-3051	56.7	58.0	46.5	53.7

¹Day to heading counted from date planted to 80% of heads emerged 50%; other locations 50% heads emerged 50%

Table 3. cont.: Mean days to heading after planting of entries grown in 2021 NABSEN Nursery at three locations.

Line	Fargo	Langdon	Brandon ¹	Mean
2IK17-3157	56.3	54.3	46.5	52.4
2IM14-8212	55.0	56.7	46.5	52.7
ABI CARDINAL	58.3	58.0	48.5	54.9
FB21200	55.3	57.3	48.5	53.7
FB21201	62.3	59.7	52.8	58.3

TR21275	60.0	59.0	50.0	56.3
TR21277	58.3	58.0	52.0	56.1
TR20180	58.7	58.0	48.5	55.1
TR20181	59.7	60.3	51.8	57.3
TR20183	60.0	59.7	49.0	56.2
TR20185	58.7	58.7	50.0	55.8
TR20660	57.7	58.0	50.0	55.2
TR20661	58.7	57.7	50.0	55.4
FB511	59.3	60.0	51.8	57.0
FB514	57.7	58.0	49.5	55.1
QUEST	55.3	56.7	47.0	53.0
Conlon	51.3	51.7	45.3	49.4
Explorer	58.3	56.3	48.0	54.2
AAC Synergy	60.7	60.3	50.0	57.0
Chevron	60.3	60.7	50.0	57.0
Stander	56.3	58.3	46.0	53.6

¹Day to heading counted from date planted to 80% of heads emerged 50%; other locations 50% heads emerged 50%

Table 4. Means for DON (ppm) entries grown in 2021 NABSEN Nursery at five locations.

Line	Fargo	Langdon	Brandon	Crookston	St. Paul	Means
2ND32529	1.0	39.4	13.3	1.9	3.2	11.7
2ND32657	0.9	49.7	9.6	4.1	7.8	14.4
2ND36638	0.9	34.2	10.8	4.9	3.0	10.8
2ND36642	1.3	47.0	9.3	2.5	2.4	12.5
2ND37111	1.5	32.1	13.9	4.9	6.9	11.9
2ND37130	1.0	41.0	12.8	4.7	2.5	12.4
2ND37568	0.8	22.0	5.0	2.3	4.6	6.9
2ND39010	1.8	52.1	14.9	3.6	1.3	14.8

S2M182	1.6	43.8	15.7	2.6	4.9	13.7
S2M184	4.4	45.7	12.8	3.4	3.4	13.9
S2M185	4.4	42.9	11.6	2.9	3.9	13.1
S2M186	6.1	63.5	15.5	7.5	0.8	18.7
S2M187	4.2	44.9	11.4	3.9	1.9	13.3
S2M188	5.1	59.2	19.9	4.9	2.1	18.2
S2M189	3.3	46.4	14.2	4.4	2.0	14.1
TM16.383-006	3.0	88.8	14.2	1.7	3.5	22.2
2MS17_3456-039	1.1	40.1	16.0	4.1	1.1	12.5
2MS17_3461-007	1.1	34.4	11.8	4.2	0.7	10.4
2IK15-9655	0.5	37.1	14.3	5.3	6.3	12.7
2IK16-1184	0.8	14.7	9.1	3.0	3.4	6.2
2IK17-3003	1.3	23.6	5.8	3.8	6.8	8.2
2IK17-3009	1.3	51.7	14.1	6.6	1.2	15.0
2IK17-3049	0.6	41.9	9.7	1.9	2.6	11.3
2IK17-3051	0.2	36.2	18.3	3.3	2.8	12.2

Table 4. cont., Means for DON (ppm) entries grown in 2021 NABSEN Nursery at five locations.

Line	Fargo	Langdon	Brandon	Crookston	St. Paul	Means
2IK17-3157	0.8	51.8	12.4	3.7	1.7	14.1
2IM14-8212	1.2	51.7	12.3	6.8	4.2	15.2
ABI CARDINAL	1.6	43.1	19.5	2.3	1.8	13.7
FB21200	1.0	33.7	8.2	2.2	2.3	9.5
FB21201	1.4	27.7	6.9	2.3	2.8	8.2
TR21275	0.9	30.7	5.3	2.3	2.5	8.3
TR21277	2.5	29.3	4.8	2.1	1.2	8.0
TR20180	1.7	26.9	9.4	0.6	2.3	8.2
TR20181	2.0	40.0	8.3	4.8	3.9	11.8

TR20183	1.9	25.4	7.0	2.7	3.1	8.0
TR20185	1.9	37.8	11.5	1.3	2.4	11.0
TR20660	1.6	48.5	9.3	4.0	1.4	13.0
TR20661	0.5	25.2	5.4	3.1	2.9	7.4
FB511	0.5	11.0	5.8	1.2	0.9	3.9
FB514	0.5	31.6	5.3	0.8	1.1	7.9
QUEST	1.4	40.3	13.6	3.9	1.5	12.1
Conlon	2.2	39.5	5.5	0.9	5.1	10.6
Explorer	2.4	59.9	9.4	4.6	3.0	15.9
AAC Synergy	2.1	27.2	6.8	2.7	2.9	8.3
Chevron	1.8	34.1	4.5	1.0	0.6	8.4
Stander	2.9	77.6	27.0	6.5	9.6	24.7

Table 5. Average means of Heading date, FHB Incidence, FHB severity and DON content.

Line	Day to Head¹	FHB²	FHB³	DON Misted⁴
2ND32529	52.9	70.6	19.5	11.7
2ND32657	52.0	76.4	16.3	14.4
2ND36638	52.9	78.9	14.0	10.8
2ND36642	52.9	78.3	16.3	12.5
2ND37111	55.0	79.4	16.9	11.9
2ND37130	54.5	75.8	16.0	12.4
2ND37568	54.5	73.6	14.1	6.9
2ND39010	53.7	83.6	17.8	14.8
S2M182	53.9	89.2	20.9	13.7
S2M184	52.2	88.6	22.4	13.9

S2M185	52.7	86.1	22.0	13.1
S2M186	54.0	93.3	27.4	18.7
S2M187	52.6	81.9	21.6	13.3
S2M188	53.9	82.8	24.0	18.2
S2M189	54.7	87.2	20.3	14.1
TM16.383-006	51.0	91.1	26.0	22.2
2MS17 3456-039	55.7	89.7	25.5	12.5
2MS17 3461-007	53.4	78.9	19.0	10.4
2IK15-9655	53.2	90.3	22.0	12.7
2IK16-1184	54.9	73.6	10.7	6.2
2IK17-3003	55.4	74.7	14.4	8.2
2IK17-3009	52.9	85.8	18.5	15.0
2IK17-3049	56.4	85.8	20.5	11.3
2IK17-3051	53.7	90.0	24.8	12.2

¹Date from planting when 50% of heads 50% emerged at three locations.

²FHB incidence means at three locations.

³FHB severity means at three locations.

⁴DON content means at five misted locations.

Table 5. cont.: Average means of Heading date, FHB Incidence, FHB severity and DON content.

Line	Day to Head¹	FHB²	FHB³	DON Misted⁴
2IK17-3157	52.4	81.9	15.4	14.1
2IM14-8212	52.7	85.0	18.0	15.2
ABI CARDINAL	54.9	90.3	24.4	13.7
FB21200	53.7	71.7	13.9	9.5
FB21201	58.3	73.9	13.3	8.2
TR21275	56.3	70.6	13.2	8.3
TR21277	56.1	71.7	17.9	8.0
TR20180	55.1	75.8	18.6	8.2
TR20181	57.3	73.6	16.7	11.8

TR20183	56.2	66.9	13.7	8.0
TR20185	55.8	76.7	14.9	11.0
TR20660	55.2	80.6	19.1	13.0
TR20661	55.4	69.4	16.1	7.4
FB511	57.0	77.2	12.4	3.9
FB514	55.1	76.7	18.4	7.9
QUEST	53.0	79.7	20.4	12.1
Conlon	49.4	80.6	19.0	10.6
Explorer	54.2	86.4	21.6	15.9
AAC Synergy	57.0	69.2	15.2	8.3
Chevron	57.0	66.4	13.1	8.4
Stander	53.6	97.5	30.7	24.7

¹Date from planting when 50% of heads 50% emerged at three locations.

²FHB incidence means at three locations.

³FHB severity means at three locations.

⁴DON content means at five misted locations.

Table 6. Temperature (°F) compared to the 30-year average 2021

Location	May	June	July	August
Fargo, ND	+1	+6	+2	+2
Langdon, ND	+2	+6	+4	-1
Casselton, ND	0	+5	+4	+1
St. Paul, MN	-1	+4	-.5	-.5
Crookston, MN	+3	+2.5	0	0

Table 7. Rainfall (in.) compared to the 30-year average 2021.

Location	May	June	July	August
Fargo, ND	-2.5	-.4	-3.1	-.4
Langdon, ND	-0.8	-1.6	-0.8	+4
Casselton, ND	-1.7	-0.8	-2.4	-.45
St. Paul, MN	-.2	-2.4	-3.0	+2.0
Crookston, MN	-1.8	-1.6	-2.8	No data

Table 8. Pedigree and source of breeding lines tested for FHB resistance in 2021

Name	Pedigree	row type	source
2ND32529	2ND27705/2ND27560	2	North Dakota State University
2ND32657	2ND28086/2ND27705	2	North Dakota State University
2ND36638	2ND31815/2ND31899	2	North Dakota State University
2ND36642	2ND31815/2ND31899	2	North Dakota State University
2ND37111	2ND31899/2ND31914	2	North Dakota State University
2ND37130	2ND31899/2ND31914	2	North Dakota State University
2ND37568	2ND31899/2ND32838	2	North Dakota State University
2ND39010	2ND32658/2ND32824	2	North Dakota State University
S2M182	ND-Genesis/3/Bowman*7//Sen 'S'/ND10270/4/ND24388	2	University of Minnesota
S2M184	ND-Genesis/3/Bowman*7//Sen 'S'/ND10270/4/ND24388	2	University of Minnesota
S2M185	TM15.016-12 / TM14.013-41	2	University of Minnesota
S2M186	TM14.013-27/TM14.030-07	2	University of Minnesota

S2M187	TM15.002-19/TM14.030-07*	2	University of Minnesota
S2M188	TM14.013-42/TM16.028-01	2	University of Minnesota
S2M189	TM15.011-09//ND17293-1/ND-Genesis 4of8VtV	2	University of Minnesota
TM16.383-006	TM16.068-01/TM16.015-01 A=VtVt B=VtV	2	University of Minnesota
2MS17_3456-039	TM14.013-27 / TM15.016-12	2	University of Minnesota
2MS17_3461-007	S2M180(TM15.002-19) / TM14.013-52	2	University of Minnesota
2IK15-9655	2I08-3578/MERIT 57	2	Anheuser-Busch InBev
2IK16-1184	CONCHITA/LA11-0413	2	Anheuser-Busch InBev
2IK17-3003	2B11-4941/2B11-5144	2	Anheuser-Busch InBev
2IK17-3009	2B11-4941/2B11-5144	2	Anheuser-Busch InBev
2IK17-3049	2B11-5144/CDC MEREDITH	2	Anheuser-Busch InBev
2IK17-3051	2B11-5144/CDC MEREDITH	2	Anheuser-Busch InBev

Table 8 cont: Pedigree and source of breeding lines tested for FHB resistance in 2021

Line	Pedigree	Row type		Source
2IK17-3157	2B10-4672/AUDREY	2		Anheuser-Busch InBev
2IM14-8212	2B09-3408/2B09-3944	2		Anheuser-Busch InBev
ABI CARDINAL	2B09-3778/2B09-3943	2		Anheuser-Busch InBev
FB21200	BM0421-060/Major	2	GP	Brandon Research and Development Centre, Agriculture and Agri-Food Canada
FB21201	TR14240/TR14146	2	GP	Brandon Research and Development Centre, Agriculture and Agri-Food Canada
TR21275	TR13231/TR10214	2	Malt	Brandon Research and Development Centre, Agriculture and Agri-Food Canada
TR21277	2ND29827/TR13236	2	Malt	Brandon Research and Development Centre, Agriculture and Agri-Food Canada
TR20180	SM120992//CDC Fraser/Claymore	2	Malt	Crop Development Centre, University of Saskatchewan

TR20181	TR14146//CDC Bow/CDC Fraser	2	Malt	Crop Development Centre, University of Saskatchewan
TR20183	BM0354-302/CDC Bow//BM0547-38	2	Malt	Crop Development Centre, University of Saskatchewan
TR20185	TR13234/TR13144	2	Malt	Crop Development Centre, University of Saskatchewan
TR20660	AAC Synergy/Major	2	Malt	Field Crop Development Centre, Olds College
TR20661	Merit 57/Major	2	Malt	Field Crop Development Centre, Olds College
FB511	I07270/Busby	2	Feed	Field Crop Development Centre, Olds College
FB514	J00038006/Xena	2	Feed	Field Crop Development Centre, Olds College
QUEST	FEG18-20 / M110	6	Check	
Conlon	BOWMAN*2/DWS1008/ND10232	2	Check	
Explorer	Beatrix /Marine	2	Check	
AAC Synergy	TR02267/Newdale	2	Check	
Chevron	UNKNOWN	6	Check	
Stander	ROBUST*2/3/CREE/BONANZA//	6	Check	
	MANKER/4/ROBST/BUMBER			