2004

NORTH AMERICAN BARLEY SCAB EVALUATION NURSERY (NABSEN) INTERIM REPORT

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INTRODUCTION

The 2004 North American Barley Scab Evaluation Nursery (NABSEN) was grown at Fargo, Langdon, Osnabrock and Casselton, ND; St. Paul and Crookston MN, Brandon, Manitoba and Toluca Mexico. Nurseries were either irrigated or unirrigated (dryland). Dryland nurseries provide conditions similar to those found in commercial fields. Disease in irrigated fields are more severe than growers would observe in most years and entries with only moderate FHB resistance have high disease levels. Only entries with higher levels of resistance similar to Chevron or CIho 4196 are scored as resistant in the irrigated nurseries. 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 CIho 4196 (resistant two-row check), Chevron (resistant six-row check), Robust and Stander (susceptible six-row checks), MNBrite (moderately resistant six-row check), and Conlon (moderately resistant two-row check).

At all locations percent severity of FHB was determined at the soft dough stage by determining the ratio of infected kernels to total kernels on 10-20 spikes per entry, and then multiplying by 100.

COMMENTS ON THE SEASON

In Toluca Mexico seasonal conditions caused problems in the nursery, so the data is not reliable but is included to make the data set complete. There was much higher than average rainfall and the nursery was hit by hail a couple of times, causing spike breakage and severe lodging in several plots, thus the na entries in the tables.

In Fargo, temperatures from May to August averaged 4.3 ^{o}F below the 30 yr average. Rainfall was above the 30 yr average for May (+3.12 in.) and Jul (+0.93 in.) and below for Jun (-2.59 in.) and Aug. (-0.74 in.). Similar trends were experienced at Casselton, Langdon and Osnabrock. As a result of the low temperatures and close to average rainfall from flowering to maturity, soils remained cold and wet and conditions were not conducive for high levels of disease development.

Not all sites had comprehensive weather data. Blank columns indicate that the information was not available.

Site details are as follows;

FARGO, ND – Stephen Neate, Pat Gross and Sun Yongliang

- Irrigated
- Inoculated by grain spawn method using a barley and corn mixture
- 3 Replicates
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

LANGDON, ND - – Stephen Neate, Pat Gross and Sun Yongliang

- Irrigated
- Inoculated by grain spawn method using a barley and corn mixture
- 3 Replicates
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

OSNABROCK, ND – Richard Horsley

- Dryland
- Inoculated by grain spawn method using a barley and corn mixture
- 3 Replicates
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

CASSELTON, ND - Linnea Skoglund

- Dryland
- Inoculated by grain spawn method
- 3 replicates
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

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

- Irrigated
- 3 Replicates
- Inoculated by spore spray method
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

CROOKSTON, MN – Kevin Smith and Ruth Dill-Macky

- Separate Irrigated and Dryland trails
- 3 replicates
- Inoculated by spore spray method
- DON content (ppm) measured by GC/ECD by P Schwarz, NDSU on a composite sample of 3 replicates

BRANDON, MANITOBA - Bill Legge and James Tucker

- Irrigated
- 4 replicates RCB design
- DON content (ppm) measured by ELISA technique at ECORC, Ottawa on a composite sample of 4 replicates

TOLUCA, MEXICO – Flavio Capettini

- Irrigated
- 2 replicates
- Type I inoculation by sprayed spore suspension. Type II by point inoculation and head bagging.
- DON content (ppm) measured by ELISA -Fluoroquant DON system Romer Labs Inc 0.5µg/g detection limit, linear to 0.5-50 µg/g.

Table 1 Mean FHB severity of entries grown in the 2004 NABSEN Nursery at eight locations

				Toluca	Toluca*		Crookston			Mean		
Entry	Fargo	Langdon	Brandon	Type I	Type II	St. Paul	irrigated	dryland	Casselton	All loc	irrigated	dryland
BM9856D-200	3.8	16.1	4.0	4.1	6.0	20.0	6.3	4.0	9.0	8.3	9.0	6.5
BM9756-120	3.1	9.3	5.7	na	na	15.2	8.3	1.6	5.2	7.2	8.3	3.4
EX645-3-6	4.2	4.0	3.9	3.1	12.3	12.8	4.7	0.1	2.7	4.7	5.5	1.4
EX680-7-12	4.1	16.1	2.3	4.0	na	33.5	6.8	0.9	3.0	9.6	11.1	1.9
SH01690	2.8	4.0	4.1	na	na	14.0	4.0	0.2	7.0	4.8	5.8	3.6
SB00106	7.9	7.6	6.9	5.8	8.8	16.7	4.1	2.5	4.8	7.3	8.1	3.7
TR02185	2.5	6.3	4.3	na	na	11.5	3.3	0.4	4.0	4.7	5.6	2.2
BT497	4.5	8.3	3.8	na	na	11.6	7.5	0.9	8.5	6.1	7.2	4.7
ND20365	3.9	9.4	2.9	4.9	11.8	21.5	7.5	1.1	3.5	7.3	8.4	2.3
ND20481	3.4	7.1	2.0	4.9	8.9	15.3	10.1	2.0	4.5	6.4	7.1	3.3
ND20493	3.8	14.6	1.8	3.1	7.2	18.7	8.8	2.5	4.0	7.6	8.5	3.3
ND20508	5.4	12.1	4.9	4.6	6.3	35.5	6.5	1.8	6.0	10.1	11.5	3.9
ND20542	6.6	8.8	3.3	3.6	9.0	20.8	9.3	1.1	2.2	7.6	8.7	1.6
ND20546	6.9	11.6	2.7	3.0	6.5	13.3	12.8	1.9	2.7	7.5	8.4	2.3
ND20547	6.7	16.7	4.9	2.6	12.9	18.3	12.3	2.5	4.3	9.1	10.2	3.4
ND20550	11.1	11.3	3.4	4.5	10.9	18.3	12.2	3.1	4.0	9.1	10.1	3.6
Shenmai 3	7.3	10.8	7.8	9.2	17.7	16.0	6.0	2.2	5.0	8.5	9.5	3.6
2ND19119	4.2	17.5	10.0	5.4	12.2	17.5	8.2	2.9	9.5	9.4	10.5	6.2
2ND19854	6.5	14.5	5.1	5.5	13.5	36.7	8.3	5.7	7.5	11.8	12.8	6.6
2ND20794	5.4	19.7	5.9	5.1	10.2	18.2	5.4	4.0	6.5	9.1	9.9	5.3
2ND21043	9.2	14.3	3.2	2.1	5.9	25.8	4.7	1.3	5.0	8.6	9.9	3.1
2ND21863	8.5	14.6	6.5	6.3	9.0	18.5	3.8	2.7	6.9	8.7	9.7	4.8
2ND21976	5.3	22.4	2.8	4.7	9.5	18.2	10.8	3.3	7.7	9.7	10.7	5.5
2ND22185	4.8	14.5	4.6	na	na	16.2	12.8	6.3	6.5	9.9	10.6	6.4
6B00-1323	9.1	11.4	6.7	na	na	21.1	5.1	1.5	3.5	9.2	10.7	2.5
6B00-1328	2.7	7.5	3.6	4.4	10.5	27.5	6.2	1.5	5.5	7.6	8.7	3.5
6B00-1361	7.6	14.9	2.8	2.2	16.2	26.2	4.4	1.3	4.5	8.5	9.7	2.9
6B00-1421	4.9	16.3	11.2	1.9	10.7	15.3	9.7	2.0	4.7	8.7	9.9	3.3

Table 1 cont. Mean FHB severity of entries grown in the 2004 NABSEN Nursery at eight locations

				Toluca	Toluca *		Crookston			Mean		
Entry	Fargo	Langdon	Brandon	Type I	Type II	St. Paul	irrigated	dryland	Casselton	All loc	irrigated	dryland
6B00-1499	5.1	10.5	6.9	2.6	6.3	21.4	4.5	1.6	5.2	7.5	8.5	3.4
6B01-2442	4.9	13.4	2.1	4.3	6.7	25.0	9.0	2.7	5.7	8.8	9.8	4.2
6B01-2163	4.3	9.6	5.4	na	na	19.9	10.4	0.7	3.8	8.4	9.9	2.3
6B03-4452	6.4	16.5	5.6	6.3	8.1	19.3	7.5	4.5	4.4	9.4	10.3	4.4
(04IC-1)	6.4	13.3	11.5	4.2	7.3	21.8	5.0	3.2	1.3	9.3	10.4	2.3
(04IC-2)	11.5	27.7	5.3	na	na	25.8	21.0	9.1	12.7	16.7	18.3	10.9
(04IC-3)	9.3	8.0	8.1	5.4	4.9	12.5	6.5	0.1	2.8	7.1	8.3	1.5
(04IC-4)	8.6	42.8	11.0	5.5	7.6	23.7	6.9	2.4	6.8	14.4	16.4	4.6
(04IC-5)	7.7	18.0	10.3	4.5	12.7	20.7	10.3	3.9	4.5	10.8	11.9	4.2
(04IC-6)	3.2	8.3	14.7	4.6	8.9	15.0	4.2	1.4	10.5	7.3	8.3	5.9
(04IC-7)	5.4	12.4	8.0	na	na	15.4	3.5	0.9	9.2	7.6	8.9	5.0
(04IC-8)	4.5	5.5	1.7	0.8	5.2	11.0	0.7	0.3	3.7	3.5	4.0	2.0
FEG55-14	5.4	7.7	3.2	1.5	15.7	21.0	4.1	1.7	5.5	6.4	7.2	3.6
FEG60-27	5.7	9.3	7.8	4.7	9.8	18.3	5.6	3.2	6.0	7.8	8.6	4.6
FEG65-02	2.9	6.6	1.7	2.7	7.5	21.3	4.8	1.1	2.6	5.9	6.7	1.8
FEG66-31	4.6	14.9	3.2	2.9	9.3	19.5	2.6	1.7	3.9	7.1	8.0	2.8
FEG73-13	6.4	9.9	5.0	3.7	14.6	18.3	5.8	1.8	5.4	7.3	8.2	3.6
FEG82-19	4.5	17.1	3.4	4.2	9.4	19.2	6.5	1.6	7.1	8.1	9.1	4.4
FEG90-11	3.7	17.4	2.2	2.6	14.8	23.2	5.9	1.2	4.4	8.0	9.2	2.8
FEG96-07	3.2	12.0	2.8	2.1	11.3	14.4	3.7	1.2	2.0	5.6	6.3	1.6
MnBrite	7.8	16.2	3.3	2.2	12.1	13.4	5.8	3.3	5.8	7.4	8.1	4.5
Conlon	6.0	15.6	6.1	3.9	6.7	15.0	10.8	8.8	12.2	9.4	9.6	10.5
Robust	4.9	13.5	6.1	4.3	6.7	22.7	5.8	5.0	8.2	8.9	9.6	6.6
CIHO 4196	2.0	4.6	2.8	na	na	17.5	13.4	0.5	1.7	6.8	8.1	1.1
Chevron	0.3	1.8	1.9	6.7	8.7	9.3	4.7	0.3	1.8	3.6	4.1	1.1
Stander	6.9	20.5	13.6	na	na	25.9	12.1	3.8	6.0	13.8	15.8	4.9

* Toluca data for Type II resistance screening not included in means
na no plants

Table 2. Mean disease incidence of entries grown in the 2004 NABSEN Nursery at five locations.

Entry	Fargo	Langdon	Brandon	Osnabrock	Casselton	Mean
BM9856D-200	46.7	100.0	55.0	16.7	60.0	55.7
BM9756-120	50.0	90.0	70.0	13.3	67.0	58.1
EX645-3-6	66.7	73.3	72.5	3.3	33.0	49.8
EX680-7-12	66.7	93.3	62.5	16.7	47.0	57.2
SH01690	63.3	66.7	72.5	3.3	67.0	54.6
SB00106	83.3	83.3	75.0	30.0	57.0	65.7
TR02185	53.3	80.0	60.0	10.0	47.0	50.1
BT497	90.0	100.0	72.5	36.7	67.0	73.2
ND20365	66.7	96.7	65.0	13.3	50.0	58.3
ND20481	76.7	100.0	52.5	13.3	50.0	58.5
ND20493	76.7	100.0	60.0	10.0	47.0	58.7
ND20508	93.3	100.0	83.3	53.3	70.0	80.0
ND20542	83.3	93.3	75.0	13.3	30.0	59.0
ND20546	86.7	100.0	80.0	33.3	50.0	70.0
ND20547	80.0	100.0	82.5	20.0	63.0	69.1
ND20550	100.0	100.0	72.5	10.0	43.0	65.1
Shenmai 3	70.0	96.7	87.5	3.0	33.0	58.0
2ND19119	53.3	93.3	85.0	6.7	70.0	61.7
2ND19854	83.3	93.3	72.5	26.7	67.0	68.6
2ND20794	70.0	100.0	83.3	3.3	60.0	63.3
2ND21043	93.3	86.7	52.5	6.7	57.0	59.2
2ND21863	73.3	93.3	80.0	20.0	63.0	65.9
2ND21976	66.7	96.7	50.0	16.7	57.0	57.4
2ND22185	70.0	93.3	70.0	6.7	60.0	60.0
6B00-1323	96.7	100.0	92.5	40.0	47.0	75.2
6B00-1328	73.3	96.7	82.5	30.0	60.0	68.5
6B00-1361	80.0	96.7	67.5	26.7	57.0	65.6
6B00-1421	90.0	96.7	100.0	40.0	63.0	77.9

Table 2. cont. Mean disease incidence of entries grown in the 2004 NABSEN Nursery at five locations.

Entry	Fargo	Langdon	Brandon	Osnabrock	Casselton	Mean
6B00-1499	93.3	100.0	92.5	30.0	60.0	75.2
6B01-2442	86.7	100.0	55.0	23.3	73.0	67.6
6B01-2163	90.0	100.0	87.5	23.3	50.0	70.2
6B03-4452	86.7	100.0	87.5	26.7	43.0	68.8
(04IC-1)	76.7	96.7	85.0	7.7	17.0	56.6
(04IC-2)	90.0	100.0	72.5	10.0	50.0	64.5
(04IC-3)	90.0	86.7	80.0	10.0	30.0	59.3
(04IC-4)	83.3	90.0	85.0	6.7	70.0	67.0
(04IC-5)	76.7	100.0	97.5	36.7	53.0	72.8
(04IC-6)	86.7	96.7	100.0	20.0	73.0	75.3
(04IC-7)	90.0	100.0	95.0	33.3	80.0	79.7
(04IC-8)	70.0	70.0	40.0	10.0	40.0	46.0
FEG55-14	80.0	90.0	75.0	16.7	57.0	63.7
FEG60-27	96.7	100.0	80.0	36.7	67.0	76.1
FEG65-02	63.3	86.7	47.5	10.0	40.0	49.5
FEG66-31	76.7	100.0	80.0	20.0	37.0	62.7
FEG73-13	93.3	96.7	67.5	30.0	70.0	71.5
FEG82-19	80.0	100.0	70.0	13.3	73.0	67.3
FEG90-11	76.7	93.3	65.0	13.3	63.0	62.3
FEG96-07	76.7	96.7	70.0	30.0	33.0	61.3
MnBrite	83.3	100.0	70.0	20.0	67.0	68.1
Conlon	76.7	100.0	67.5	13.3	67.0	64.9
Robust	90.0	100.0	85.0	50.0	67.0	78.4
CIHO 4196	43.3	66.7	55.0	0.0	23.0	37.6
Chevron	13.3	73.3	52.5	0.0	17.0	31.2
Stander	80.0	100.0	97.5	36.7	70.0	76.8

Table 3. Mean days to heading after planting of entries grown in 2004 NABSEN Nursery at five locations.

Entry	Fargo	Langdon	Brandon	St. Paul	Crookston irrigated	Mean
BM9856D-200	67	66	51	57	65	61
BM9756-120	71	69	52	63	68	65
EX645-3-6	70	69	53	64	68	65
EX680-7-12	67	66	51	59	66	62
SH01690	73	70	54	65	69	66
SB00106	70	68	52	59	67	63
TR02185	72	70	55	64	67	66
BT497	69	68	52	61	67	63
ND20365	67	66	49	55	62	60
ND20481	67	66	49	56	61	60
ND20493	65	65	48	57	60	59
ND20508	69	67	50	58	63	61
ND20542	70	66	50	56	61	61
ND20546	71	68	51	60	61	62
ND20547	69	66	50	58	61	61
ND20550	69	66	49	58	60	60
Shenmai 3	59	59	46	55	58	55
2ND19119	65	65	51	56	60	59
2ND19854	65	64	50	55	61	59
2ND20794	67	65	51	58	64	61
2ND21043	67	66	51	58	62	61
2ND21863	65	65	52	59	64	61
2ND21976	64	62	45	55	59	57
2ND22185	69	66	52	60	63	62
6B00-1323	69	66	52	58	66	62
6B00-1328	67	66	52	57	62	61
6B00-1361	64	68	50	57	61	60

Table 3. cont. Mean days to heading after planting of entries grown in 2004 NABSEN Nursery at five locations.

Entry	Fargo	Langdon	Brandon	St. Paul	Crookston irrigated	Mean
6B00-1421	66	65	50	57	63	60
6B00-1499	66	67	51	58	64	61
6B01-2442	68	67	50	58	62	61
6B01-2163	68	67	52	58	62	61
6B03-4452	67	66	50	57	62	60
(04IC-1	63	65	45	55	60	58
(04IC-2)	63	62	46	54	58	57
(04IC-3)	72	68	53	65	67	65
(04IC-4)	67	65	52	58	62	61
(04IC-5)	71	68	52	61	66	64
(04IC-6)	72	71	55	66	69	67
(04IC-7)	72	70	53	66	69	66
(04IC-8)	72	71	57	65	70	67
FEG55-14	67	66	52	58	65	62
FEG60-27	63	67	50	56	62	60
FEG65-02	66	67	52	57	62	61
FEG66-31	66	68	52	57	65	61
FEG73-13	66	67	50	57	63	60
FEG82-19	66	67	50	57	65	61
FEG90-11	65	67	52	57	62	61
FEG96-07	64	66	51	58	69	62
Conlon	65	63	52	57	62	60
MnBrite	67	67	45	54	63	59
Robust	68	66	50	57	64	61
CIHO 4196	73	69	53	67	67	66
Chevron	72	70	54	66	68	66
Stander	67	67	52	57	62	61

Table 4. Mean DON content (ppm) of entries grown in the 2004 NABSEN Nursery at seven locations.

					Crookston			Mean		
Entry	Fargo	Langdon	Casselton	Osnabrock	dryland	St. Paul	Brandon	all locs	irrigated	dryland
BM9856D-200	5.7	6.5	7.6	0.3	0.4	3.6	27.7	7.4	10.9	2.8
BM9756-120	8.4	4.1	13.3	0.3	0.2	3	36.2	9.4	12.9	4.6
EX645-3-6	1.8	1.6	3.2	0.1	0	0.4*	22.9	4.9	6.7	1.1
EX680-7-12	8.6	9.8	17.1	0.3	0.7	9.1	42.4	12.6	17.5	6.0
SH01690	1.1	1.4	5.4	0.0	0	1.2	11.6	3.0	3.8	1.8
SB00106	3.7	3.6	7.8	0.1	0.1	1.7	23.3	5.8	8.1	2.7
TR02185	5.8	2.7	3.6	0.1	0.4	1.6	22.4	5.2	8.1	1.4
BT497	9.1	6.7	11.8	0.3	0.3	6.1	23.2	8.2	11.3	4.1
ND20365	6.8	6.7	12.4	0.8	0.7	4.3	24.0	8.0	10.5	4.6
ND20481	8.7	6.3	8.6	0.6	0.6	5.1	21.0	7.3	10.3	3.3
ND20493	7.2	8.2	1.7	0.2	0.6	3.6	11.7	4.7	7.7	0.8
ND20508	11.9	11.6	5.8	0.2	1	12	30.0	10.4	16.4	2.3
ND20542	8.2	8.9	6.9	0.0	0.3	5.2	18.2	6.8	10.1	2.4
ND20546	13.6	8.6	6.3	0.2	0.5	5.9	24.1	8.5	13.1	2.3
ND20547	12.6	14.1	6.6	0.1	0.7	7.2	25.8	9.6	14.9	2.5
ND20550	11.8	18.1	6.1	0.2	0.8	5.2	13.8	8.0	12.2	2.4
Shenmai 3	5.4	4.8	4.8	0.1	0.3	4.4	14.3	4.9	7.2	1.7
2ND19119	10.8	6.4	3.8	0.1	0.3	3.6	31.7	8.1	13.1	1.4
2ND19854	8.4	5.7	9.2	0.5	0.5	4.5	42.1	10.1	15.2	3.4
2ND20794	3.2	6.5	4.9	0.1	0.3	3.6	25.3	6.3	9.7	1.8
2ND21043	7.6	15.4	7	0.5	0.3	9.9	32.1	10.4	16.3	2.6
2ND21863	7.5	6.9	8.1	0.3	0.3	2.2	50.5	10.8	16.8	2.9
2ND21976	7	4.2	5.8	0.2	0.3	2.3	31.5	7.3	11.3	2.1
2ND22185	4.6	4.2	7.5	0.1	0.3	4.4	33.5	7.8	11.7	2.6
6B00-1323	19	6.3	14.2	0.2	0.8	11.9	29.2	11.7	16.6	5.1
6B00-1328	13	5.8	6	0.5	0.4	13.1	28.1	9.6	15.0	2.3
6B00-1361	31	11.4	24	0.3	1.1	14	40.5	17.5	24.2	8.5
6B00-1421	33.8	12.9	10.2	0.4	1.5	3.4	38.1	14.3	22.1	4.0
6B00-1499	15.6	8.7	11.8	0.1	1.1	7.1	26.2	10.1	14.4	4.3
6B01-2442	26.3	11.6	15.3	0.3	1.5	9.2	27.6	13.1	18.7	5.7
6B01-2163	27.9	10.2	9.1	0.2	0.2	8.9	33.2	12.8	20.1	3.2
6B03-4452	27.4	17.8	9.9	0.1	1.4	4.1	34.9	13.7	21.1	3.8
(04IC-1)	2.5	5.2	8.7	0.3	0.2	11.9	18.5	6.8	9.5	3.1
(04IC-2)	11.8	8.4	6.6	0.5	0.6	4.1	32.2	9.2	14.1	2.6
(04IC-3)	15.3	5.9	8.5	0.1	0.3	4.1	47.4	11.7	18.2	3.0
(04IC-4)	15.4	5.7	12.8	0.1	0.3	10.1	47.8	13.2	19.8	4.4
(04IC-5)	11.1	9.2	9.1	0.3	0.3	3.8	25.9	8.5	12.5	3.2
(04IC-6)	22.4	9.5	28.9	0.4	0.9	4.1*	60.8	20.5	24.2	10.1
(04IC-7)	7.5	9.6	43.6	1.1	0.3	4.1*	34.2	16.1	13.8	15.0
(04IC-8)	6.7	4.5	5.9	0.1	0.1	2.9	27.0	6.7	10.3	2.0
FEG55-14	12.8	4.4	7.7	0.2	0.3	5.2	20.5	7.3	10.7	2.7
FEG60-27	14.1	10.5	13.9	0.5	0.7	9.1	27.8	10.9	15.4	5.0
FEG65-02	6.2	6.3	3.1	0.5	0.4	5.9	20.3	6.1	9.7	1.3
FEG66-31	7.1	10	7.8	0.3	0.4	5.6	36.4	9.7	14.8	2.8
FEG73-13	16.1	9.8	4.8	0.2	0.6	5.2	23.4	8.6	13.6	1.9

Table 4. cont. Mean DON content (ppm) of entries grown in the 2004 NABSEN Nursery at seven locations

					Crookston			Mean		
Entry	Fargo	Langdon	Casselton	Osnabrock	dryland	St. Paul	Brandon	all locs	irrigated	dryland
FEG82-19	17.5	14.5	8.3	0.4	0.5	5.9	23.8	10.1	15.4	3.1
FEG90-11	6.3	8.7	6.3	0.3	0.4	7.9	17.9	6.8	10.2	2.3
FEG96-07	13.5	9.3	6.4	0.4	0.3	3	21.3	7.7	11.8	2.4
MnBrite	4.2	8.8	15	0.5	0.6	6	23.9	8.4	10.7	5.4
Conlon	16.6	16.6	4.2	0.2	0.6	6.7	16.2	8.7	14.0	1.7
Robust	9.2	10.5	18.4	0.5	0.9	8.1	31.0	11.2	14.7	6.6
CIHO 4196	2.9	9.1	7.1	0.2	0.1	3.9	28.1	7.3	11.0	2.5
Chevron	0.7	2.3	9.6	0.1	0.1	2.6	20.6	5.1	6.6	3.3
Stander	20.5	18.4	11.6	0.9	1.1	11.9	43.0	15.3	23.5	4.5

* some reps missing

Table 5. Correlation among locations for FHB severity in 2004

						Crookston		
	Fargo	Langdon	Brandon	Toluca	St. Paul	irrigated	dryland	Casselton
Fargo	1.00	0.50*	0.15	-0.01	0.24	0.43*	0.26	0.12
Langdon	0.50*	1.00	0.26	-0.02	0.27	0.35*	0.22	0.31*
Brandon	0.15	0.26	1.00	0.06	-0.13	-0.04	0.17	0.32*
Toluca	-0.01	-0.02	0.06	1.00	-0.45*	-0.39*	0.67**	0.16
St. Paul	0.24	0.27	-0.13	-0.45*	1.00	0.36*	-0.33*	-0.02
Crookston-irrigated	0.43*	0.35*	-0.04	-0.39*	0.36*	1.00	-0.03	0.12
Crookston-dryland	0.26	0.22	0.17	0.67**	-0.33*	-0.03	1.00	0.52*
Casselton	0.12	0.31*	0.32*	0.16	-0.02	0.12	0.52*	1.00

*,** r-values significantly different from 0.0 at P<0.05 and P<0.01, respectively

Table 6. Correlation among locations for FHB incidence in 2004

	Fargo	Langdon	Brandon	Osnabrock	Casselton
Fargo	1.00	0.56**	0.46*	0.56**	0.35*
Langdon	0.56**	1.00	0.43*	0.52**	0.39*
Brandon	0.46*	0.43*	1.00	0.48*	0.26
Osnabrock	0.56**	0.52**	0.48*	1.00	0.43*
Casselton	0.35*	0.39*	0.26	0.43*	1.00

*,** r-values significantly different from 0.0 at P<0.05 and P<0.01, respectively

Table 7. Correlation among locations for DON in 2004

					Crookston		
	Fargo	Langdon	Casselton	Osnabrock	dryland	St. Paul	Brandon
Fargo	1.00	0.58**	0.28*	0.09	0.73*	0.41**	0.41*
Langdon	0.58**	1.00	0.16	0.29*	0.64**	0.38*	0.13
Casselton	0.28*	0.16	1.00	0.55**	0.28*	0.47*	0.48*
Osnabrock	0.09	0.29**	0.55**	1.00	0.23	0.31*	0.22
Crookston-dryland	0.73**	0.64*	0.28*	0.23	1.00	0.39*	0.25
St. Paul	0.41*	0.38*	0.31*	0.31*	0.39*	1.00	0.21
Brandon	0.41*	0.13	0.48*	0.22	0.25	0.21	1.00

*,** r-values significantly different from 0.0 at P<0.05 and P<0.01, respectively

Table 8. Pedigree and source of breeding lines tested for FHB resistance in 2004

Label	Pedigree	Source
BM9856D-200	Harbin/TR253//TR253	AAFC-Brandon/ Legge
BM9756-120	Morrison/AC Metcalfe	AAFC-Brandon/ Legge
EX645-3-6	Br. CC 053//B1602/Bt213/806F7/Conquest/Minn. M82/BT946/Gainer	AAFC-Brandon/ Therrien
EX680-7-12	Br. CC 053/B1602/Br. 806F6/Argyle/Lacombe/Minn. M81/ BT946//Sisler/BT379	AAFC-Brandon/ Therrien
SH01690	HB328/TR244	U of SK/ CDC / Rossnagel & Zatorski
SB00106	TR339/TR252	U of SK/ CDC / Rossnagel & Zatorski
TR02185	SM95152/BM9014-10	U of SK/ CDC / Harvey & Lefol
BT497	SM96137/SM96003	U of SK/ CDC / Harvey & Lefol
ND20365	ND16918/C98-62-3	North Dakota State Univ./Horsley
ND20481	ND16918*2/CIho 7163	North Dakota State Univ./Horsley
ND20493	ND16918*2/CIho 6611	North Dakota State Univ./Horsley
ND20508	ND16918*2/CIho 6610	North Dakota State Univ./Horsley
ND20542	ND16918*2/CIho 5809	North Dakota State Univ./Horsley
ND20546	ND16918*2/CIho 5809	North Dakota State Univ./Horsley
ND20547	ND16918*2/CIho 5809	North Dakota State Univ./Horsley
ND20550	ND16918*2/CIho 5809	North Dakota State Univ./Horsley
Shenmai 3	Gobernadora/Humai 10	North Dakota State Univ./Franckowiak
2ND19119	ND15403-3/ND15368//ND16453	North Dakota State Univ./Franckowiak
2ND19854	ND15403-3/ND16462	North Dakota State Univ./Franckowiak
2ND20794	ND16092-1/ND17266	North Dakota State Univ./Franckowiak
2ND21043	ND116586/ND18172	North Dakota State Univ./Franckowiak
2ND21863	ND18172/ND19130	North Dakota State Univ./Franckowiak
2ND21976	ND18337/4/nd17401/3/ND15403//ND16453/A64	North Dakota State Univ./Franckowiak
2ND22185	ND18427/3/MOKKEI 93-78/ND15462//ND16723/4/ND19088	North Dakota State Univ./Franckowiak
6B00-1323	6B94-8126 // LEGACY / 6B95-6311	Busch Ag. Resources Inc.
6B00-1328	6B94-8126 // LEGACY / 6B95-6311	Busch Ag. Resources Inc.
6B00-1361	6B94-8126 // LEGACY / 6B95-6311	Busch Ag. Resources Inc.
6B00-1421	6B94-8253 / 6B94-7416	Busch Ag. Resources Inc.
6B00-1499	6B94-7378 // LEGACY / 6B94-7416	Busch Ag. Resources Inc.
6B01-2442	6B94-7378 // LEGACY / 6B94-8126	Busch Ag. Resources Inc.
6B01-2163	LEGACY // LEGACY / MNBRITE	Busch Ag. Resources Inc.
6B03-4452	6B97-2232//LEGACY/6B97-2245	Busch Ag. Resources Inc.

Table 8. cont. Pedigree and source of breeding lines tested for FHB resistance in 2004

Label	Pedigree	Source
(04IC-1)	GOB96DH/3/ARUPO/K8755/MORA/PRTL	ICARDA/CIMMYT
(04IC-2)	GOB16DH/MSEL/3/ARUPO/K8755//MORA	ICARDA/CIMMYT
(04IC-3)	G0B96DH/STIRLING/3/ARUPO/K8755//MORA	ICARDA/CIMMYT
(04IC-4)	HLLA/GOB//HLLA/3/CABUYA/4/GOB89DH/3/ARUPO/K8755//MORA	ICARDA/CIMMYT
(04IC-5)	GOB/HUMA110//GOB91DH/3/MSEL	ICARDA/CIMMYT
(04IC-6)	CHAMICO/CHEVRON-BAR//CIRU	ICARDA/CIMMYT
(04IC-7)	MINN DESC3//CEN-B/2*CALI92/3/TOCTE/4/CHAMICO	ICARDA/CIMMYT
(041C-8)	H93125/SEEBE	ICARDA/CIMMYT
FEG55-14	FEG2-26/MnBrite	University of Minnesota
FEG60-27	BT463/Lacey	University of Minnesota
FEG65-02	FEG18-20/M110	University of Minnesota
FEG66-31	FEG18-20/M96-64	University of Minnesota
FEG73-13	FEG39-03/Lacey	University of Minnesota
FEG82-19	FEG20-18/M109	University of Minnesota
FEG90-11	FEG18-40/FEG26-50	University of Minnesota
FEG96-07	FEG59-09/M110	University of Minnesota
MnBrite	M90-89/M69	check
Conlon	BOWMAN*2/DWS1008/ND10232	check
Robust	MOREX/MANKER	check
CIHO 4196	UNKNOWN	check
Chevron	UNKNOWN	check
Stander	ROBUST*2/3/CREE/BONANZA//MANKER/4/ROBUST/BUMBER	check

Table 9. Climate conditions 7 days either side of heading period at Fargo, ND (NDAWN data)

Date	Days after planting	Max Air Temp (°C)	Min Air Temp (°C)	Mean Air Temp (°C)	Avg Wind Spd (m/s)	Max Wind Spd (m/s)	Total Rainfall (mm)	Avg Dew Pt (°C)
6/29/2004	56	29.7	14.1	21.9	3	7	0	11
6/30/2004	57	30	17.2	23.6	3.6	9	0	13
7/1/2004	58	28.9	13.6	21.3	2.8	7	0	12
7/2/2004	59	30.9	19.9	25.4	3.9	11	1.5	17
7/3/2004	60	28.6	16.9	22.8	3.2	17	7.4	19
7/4/2004	61	17.8	12.5	15.2	4.9	10	0	13
7/5/2004	62	15.6	12.1	13.9	3.2	7	10.4	13
7/6/2004	63	13.4	9.4	11.4	3.6	9	25.4	11
7/7/2004	64	20.2	6.8	13.5	1.4	5	0	11
7/8/2004	65	23.3	11.1	17.2	3.2	8	0	13
7/9/2004	66	26.8	16.2	21.5	2	6	0	15
7/10/2004	67	29.3	18.4	23.9	4.7	17	25.4	20
7/11/2004	68	28.8	16.1	22.5	2.2	7	0.8	19
7/12/2004	69	29.5	17.6	23.6	3.8	16	10.4	19
7/13/2004	70	25.5	15.7	20.6	3.6	9	0	15
7/14/2004	71	27.6	13.7	20.7	1.3	5	0	16
7/15/2004	72	29.9	18.9	24.4	2.6	8	0	19
7/16/2004	73	25.5	16.9	21.2	3.4	9	0	17
7/17/2004	74	26.7	14.1	20.4	2	6	0	16
7/18/2004	75	30.1	16.9	23.5	3.8	10	0	19
7/19/2004	76	30.8	16.9	23.9	2.2	8	0	20
7/20/2004	77	31.4	20.5	26.0	2.3	9	0.3	20
7/21/2004	78	31.5	16.4	24.0	3.7	11	0	18
7/22/2004	79	20.4	10.4	15.4	3.3	8	0	12
Averages:		26.3	15.1	20.7	3.1	9.1		15.8
Totals:							82	
Max:		32	21	26	5	17	25	20
Min:		13	7	11	1	5	0	11
Std. Dev:		5	3	4	1			3

Table 10. Climate conditions 7 days either side of heading period at Langdon, ND (NDAWN data)

Date	Days after planting	Max Air Temp (°C)	Min Air Temp (°C)	Mean Air Temp (°C)	Avg Wind Spd (m/s)	Max Wind Spd (m/s)	Total Rainfall (mm)	Avg Dew Pt (°C)
7/1/2004	55	23.9	7.5	15.7	2.8	7	0	10
7/2/2004	56	25.5	13.9	19.7	3.8	9	11.7	16
7/3/2004	57	25.9	11.9	18.9	3.8	11	2	17
7/4/2004	58	23.9	7.5	15.7	2.8	7	0	10
7/5/2004	59	13.9	10.2	12.1	2.8	6	0	10
7/6/2004	60	20.1	11.4	15.8	2.3	7	0	9
7/7/2004	61	21.2	8.7	15.0	2.8	9	13.5	12
7/8/2004	62	17	9.2	13.1	3.1	9	0	14
7/9/2004	63	24.4	12.7	18.6	3.6	8	0	17
7/10/2004	64	28	16.3	22.2	2.6	7	0	15
7/11/2004	65	28.4	13.3	20.9	1.8	5	7.9	16
7/12/2004	66	26.6	15.8	21.2	5.7	17	0	14
7/13/2004	67	23.9	13.6	18.8	3.6	9	0	15
7/14/2004	68	26.5	11.4	19.0	1.7	6	0	17
7/15/2004	69	26.4	16.6	21.5	2.6	8	0	14
7/16/2004	70	22.8	13.2	18.0	2.4	8	0	13
7/17/2004	71	25.7	10.1	17.9	1.8	9	1.5	19
7/18/2004	72	30.7	16.2	23.5	2.6	8	0	19
7/19/2004	73	29.1	17.3	23.2	2.3	6	0	20
7/20/2004	74	26.9	19.4	23.2	2.5	7	0	15
7/21/2004	75	26.7	11.3	19.0	4.7	14	7.4	11
7/22/2004	76	17.5	10.3	13.9	2.2	7	0	8
7/23/2004	77	20.3	7.1	13.7	1.9	7	0	11
Averages:		24.1	12.4	18.3	2.9	8.3		14.0
Totals:							44	
Max:		31	19	23	6	17	14	20
Min:		14	7	12	2	5	0	8
Std. Dev:		4	3	3	1			3

Table 11. Climate conditions 7 days either side of heading period at Brandon, Manitoba (Environment Canada climate data)

Date	Days after planting	Max Air Temp (°C)	Min Air Temp (°C)	Mean Air Temp (°C)	Avg Wind Spd (m/s)	Max Wind Spd (m/s)	Total Rainfall (mm)	Avg Dew Pt (°C)
7/13/2004	39	25	11.4	18.2			0	
7/14/2004	40	27.7	11.3	19.5			0	
7/15/2004	41	27.3	16.6	22			7	
7/16/2004	42	24.5	12.2	18.4			0	
7/17/2004	43	27.2	10.5	18.9			0	
7/18/2004	44	31.3	17.8	24.6			2	
7/19/2004	45	30.2	15.9	23.1			0	
7/20/2004	46	28.8	20.7	24.8			0	
7/21/2004	47	23.2	15.5	19.4			3	
7/22/2004	48	20.5	11.7	16.1			12	
7/23/2004	49	22.5	5.1	13.8			0	
7/24/2004	50	26.8	10.2	18.5			0	
7/25/2004	51	28.4	10.8	19.6			0	
7/26/2004	52	29.4	10.2	19.8			0	
7/27/2004	53	24.8	14.4	19.6			0	
7/28/2004	54	19.6	11.9	15.8			0	
7/29/2004	55	15.8	11.3	13.6			0	
7/30/2004	56	20.9	10.2	15.6			0	
7/31/2004	57	27.9	7.5	17.7			0	
8/1/2004	58	24.5	10.9	17.7			1	
8/2/2004	59	24	7.8	15.9			0	
8/3/2004	60	25.8	7.9	16.9			0	
8/4/2004	61	23.8	9	16.4			0	
8/5/2004	62	26.1	6.5	16.3			0	
8/6/2004	63	21	15.2	18.1			0	
Averages:		25.1	11.7	18.4				
Totals:							25	
Max:		30	21	25			12	
Min:		16	5	14			0	
Std. Dev:		4	4	3				

Table 12. Climate conditions 7 days either side of heading period at St. Paul, Minnesota (UM Dept soil, Water& Climate data)

Date	Days after planting	Max Air Temp (^{o}C)	Min Air Temp (^{o}C)	Mean Air Temp (^{o}C)	Avg Wind Spd (m/s)	Max Wind Spd (m/s)	Total Rainfall (mm)	Avg Dew Pt (^{o}C)
6/28/2004	50.0	25.6	11.1	18.3	3.4	8.0	0.0	
6/29/2004	51.0	28.9	15.0	22.2	3.2	7.1	0.0	
6/30/2004	52.0	30.0	18.3	24.4	3.8	9.8	0.0	
7/1/2004	53.0	30.6	18.9	25.0	3.0	5.8	0.0	
7/2/2004	54.0	31.1	18.9	25.0	4.5	8.0	0.0	
7/3/2004	55.0	27.2	19.4	23.3	3.0	5.8	14.2	
7/4/2004	56.0	27.8	18.3	23.3	4.1	7.6	0.0	
7/5/2004	57.0	22.8	16.7	20.0	5.0	7.1	0.3	
7/6/2004	58.0	17.2	13.9	15.6	3.3	6.7	22.9	
7/7/2004	59.0	20.6	12.2	16.7	3.4	6.3	0.0	
7/8/2004	60.0	25.0	11.7	18.3	3.2	7.6	0.0	
7/9/2004	61.0	26.7	17.8	22.2	3.4	6.3	0.0	
7/10/2004	62.0	28.3	16.7	22.8	4.3	7.1	0.0	
7/11/2004	63.0	27.8	20.6	24.4	3.8	7.6	24.1	
7/12/2004	64.0	30.0	19.4	25.0	2.0	6.3	0.0	
7/13/2004	65.0	27.2	20.6	23.9	5.4	11.2	0.0	
7/14/2004	66.0	28.9	17.8	23.3	3.8	6.7	0.0	
7/15/2004	67.0	28.3	18.9	23.9	2.0	5.4	0.0	
7/16/2004	68.0	27.8	20.6	24.4	4.5	10.3	0.0	
7/17/2004	69.0	26.1	16.7	21.7	2.5	6.3	0.0	
7/18/2004	70.0	27.8	16.7	22.2	2.1	6.3	0.0	
7/19/2004	71.0	31.1	20.6	26.1	2.3	6.7	0.0	
7/20/2004	72.0	32.8	23.3	28.3	2.7	7.1	0.0	
7/21/2004	73.0	35.0	21.7	28.3	4.1	9.4	1.3	
7/22/2004	74.0	27.8	17.8	22.8	4.3	8.9	0.0	
Average		28	18	23	3	7		
Total							63	
Max		35.0	22	28	5.0	11	24	
Min		17	11	16	2.0	5.0	0	
Std. Dev		4	3	3	1	1		

Table 13. Climate conditions 7 days either side of heading period at Crookston (Eldred the closest NDAWN site)

Date	Days after planting	Max Air Temp (°C)	Min Air Temp (°C)	Mean Air Temp (°C)	Avg Wind Spd (m/s)	Max Wind Spd (m/s)	Total Rainfall (mm)	Avg Dew Pt (C)
7/3/2004	52.0	29.7	18.0	23.9	2.8	10.0	1.5	4.9
7/4/2004	53.0	18.7	11.9	15.3	5.4	11.0	0.0	2.5
7/5/2004	54.0	16.2	12.1	14.2	3.1	6.0	6.6	1.5
7/6/2004	55.0	15.0	8.0	11.5	2.8	8.0	12.7	1.0
7/7/2004	56.0	21.2	4.9	13.1	1.5	5.0	0.0	4.1
7/8/2004	57.0	22.3	8.7	15.5	2.6	7.0	4.6	2.5
7/9/2004	58.0	26.3	14.9	20.6	2.1	5.0	0.0	6.4
7/10/2004	59.0	29.9	14.0	22.0	3.2	10.0	8.6	5.0
7/11/2004	60.0	29.0	15.1	22.1	1.9	6.0	0.0	5.9
7/12/2004	61.0	29.8	17.1	23.5	4.3	16.0	3.3	7.7
7/13/2004	62.0	25.9	14.4	20.2	3.7	9.0	0.0	6.5
7/14/2004	63.0	27.8	13.9	20.9	1.7	4.0	0.0	5.5
7/15/2004	64.0	29.5	17.4	23.5	2.5	8.0	0.0	5.0
7/16/2004	65.0	25.9	14.4	20.2	2.9	7.0	0.0	5.2
7/17/2004	66.0	27.1	11.6	19.4	1.7	5.0	0.0	5.0
7/18/2004	67.0	30.7	16.1	23.4	3.5	10.0	0.0	5.1
7/19/2004	68.0	30.6	15.9	23.3	2.3	7.0	0.0	6.0
7/20/2004	69.0	30.1	18.6	24.4	1.9	6.0	0.0	4.0
7/21/2004	70.0	30.5	13.9	22.2	4.4	12.0	0.0	8.6
7/22/2004	71.0	20.2	9.9	15.1	2.6	8.0	0.0	3.0
7/23/2004	72.0	20.9	6.5	13.7	1.8	6.0	0.0	5.2
7/24/2004	73.0	26.7	6.9	16.8	2.7	9.0	0.0	6.6
7/25/2004	74.0	27.8	10.0	18.9	2.8	7.0	0.0	7.1
7/26/2004	75.0	27.6	11.0	19.3	4.4	11.0	0.0	8.4
7/27/2004	76.0	28.9	15.9	22.4	5.3	12.0	0.0	7.2
Average:		26	13	19	3	8		5
Total:							37	
Max:		31	19	24	5	16	13	8
Min:		15	7	12	2	5	0	1
Std. Dev		5	4	4	1	3		2