

**2002 NORTH AMERICAN BARLEY SCAB
EVALUATION NURSERY (NABSEN) – FINAL REPORT**

JANUARY 2003

INTRODUCTION

This report contains information from the 2002 North American Barley Scab Evaluation Nursery (NABSEN) grown at St. Paul and Crookston MN; Fargo, Langdon, and Park River, ND; and Brandon, Manitoba. Two nurseries were grown at Crookston. One of the nurseries at Crookston, and the nurseries at St. Paul, Fargo, Langdon, and Brandon were irrigated. One nursery at Crookston and the nursery at Park River were not irrigated and are referred to as “dryland” nurseries. Dryland nurseries were added in 2000 to provide conditions that growers would observe in their fields. Conditions in the irrigated field generally are more severe than growers would observe in most years and result in entries with moderate FHB resistance being overwhelmed and appearing susceptible. Only entries with levels of resistance similar to Chevron or CIho 4196 are scored as resistant in the irrigated nurseries. Dryland nurseries are needed to identify entries with moderate levels of FHB resistance. The nurseries at Crookston, Fargo, Langdon, and Park River were inoculated with *Fusarium graminearum* using the grain spawn method. The nursery at St. Paul was inoculated with macroconidia. All entries in the nurseries were replicated a minimum of three times.

Drs. Kevin Smith and staff on his project oversaw the nurseries in Minnesota. Dr. Stephen Neate and staff on his project oversaw nurseries in Fargo and Langdon; Dr. Linnea Skoglund and her staff oversaw the nursery at Park River; and Dr. Bill Legge and his staff oversaw the nursery at Brandon, Manitoba. Disease levels at the Osnabrock, ND dryland nursery were low and non-uniform, so FHB severity data were not collected.

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 but Brandon, Manitoba, 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. At Brandon a 0-5 scale was used with 0=no disease and 5=severe disease.

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Table 1. Mean days to heading after 31 May of entries grown in the 2002 NABSEN Nursery at four locations.

Genotype	Brandon	Crookston-Irr.	Langdon	St. Paul	Average
Chevron	51.3	39.3	43.0	27.0	40.2
CIho4196	58.3	--	44.7	--	--
Conlon	46.0	32.0	36.0	20.0	33.5
MNBrite	46.2	35.7	40.3	21.7	36.0
Robust	47.5	35.3	39.0	23.3	36.3
Stander	47.2	34.0	38.3	24.0	35.9
ND19198	46.5	35.0	37.0	23.3	35.5
ND19201	45.5	34.0	36.3	22.0	34.5
ND19203	45.3	33.7	35.7	20.7	33.8
ND19227	47.2	38.7	41.3	25.0	38.0
ND19238	49.3	37.7	41.7	25.7	38.6
FEG26-93(M114)	48.2	34.7	39.0	22.3	36.1
FEG27-56	47.0	35.7	39.0	22.0	35.9
FEG33-89	45.3	33.7	35.0	21.7	33.9
FEG38-12	45.7	36.0	38.3	21.3	35.3
FEG39-05	47.3	37.3	39.3	22.0	36.5
FEG39-66	45.7	38.3	39.3	26.0	37.3
FEG53-16	50.0	36.0	42.3	24.3	38.2
FEG55-14	49.8	36.3	41.7	23.3	37.8
6B00-1100	47.2	35.3	36.3	22.7	35.4
6B00-1323	46.8	34.3	36.7	24.0	35.5
6B00-1348	48.7	37.3	37.0	25.3	37.1
6B00-1509	45.7	34.0	36.0	21.3	34.3
6B98-9105	45.7	33.0	37.0	21.3	34.3
6B98-9170	46.3	34.0	38.3	15.3	33.5
6B98-9339	47.5	35.3	38.3	24.0	36.3
6B95-2482	46.2	34.7	35.0	23.3	34.8
2ND18365	45.3	32.0	33.7	20.7	32.9
2ND19858	47.5	33.7	41.7	23.3	36.6
2ND19926	49.0	40.0	36.3	23.3	37.2
2ND20040	44.3	32.0	36.0	20.0	33.1
2ND20049	50.5	36.3	39.0	24.7	37.6
2ND20213	45.0	32.7	35.3	21.0	33.5
AC Metcalfe	50.3	40.0	37.3	27.3	38.7
Newdale	51.8	39.0	38.3	26.0	38.8
AC Hawkeye	49.0	38.3	39.3	26.3	38.2
EX699-5-4	53.5	43.7	44.0	30.7	43.0
CDC Freedom	51.0	40.3	45.7	26.3	40.8
TR361	52.0	40.3	39.0	29.7	40.2
CDC Copeland	51.7	40.7	38.7	27.0	39.5
CDC Select	50.2	39.7	38.7	26.7	38.8

Table 2. Mean FHB severity of entries grown in the 2002 NABSEN Nursery at seven locations.

Label	C Crookston							Average‡		
	Brandon	Dryland	Irrigated	Fargo	Langdon	Park River	St. Paul	All locs	Irrigated	Dryland
	0-5 scale†	% infected kernels								
Chevron	2.1	0.4	1.8	2.1	0.2	0.0	5.9	1.7	2.5	0.2
Clho4196	2.6	3.0	--	1.5	0.2	5.3	--	--	--	4.2
Conlon	2.2	2.3	5.0	10.8	7.1	23.3	7.7	9.3	7.6	12.8
MNBrite	1.8	4.6	4.5	7.9	1.2	28.3	4.4	8.5	4.5	16.5
Robust	3.8	10.6	10.8	16.7	2.2	25.0	6.9	12.0	9.1	17.8
Stander	3.7	4.2	18.2	12.8	2.8	31.7	22.2	15.3	14.0	17.9
ND19198	2.6	2.6	8.3	11.5	7.2	31.7	5.9	11.2	8.2	17.1
ND19201	2.8	5.0	19.2	14.5	2.6	23.3	5.2	11.6	10.4	14.2
ND19203	2.7	4.1	11.5	14.5	2.6	30.0	4.6	11.2	8.3	17.0
ND19227	4.0	3.7	12.2	11.9	3.3	28.3	17.5	12.8	11.2	16.0
ND19238	3.4	2.1	3.1	8.0	3.6	15.3	11.2	7.2	6.5	8.7
FEG26-93(M114)	3.3	6.9	10.5	11.7	1.1	16.7	10.4	9.5	8.4	11.8
FEG27-56	2.9	2.9	9.2	12.5	1.1	28.3	4.6	9.8	6.8	15.6
FEG33-89	2.3	5.7	7.7	12.3	2.0	11.7	4.1	7.2	6.5	8.7
FEG38-12	3.0	4.1	21.8	17.4	5.0	21.7	3.2	12.2	11.8	12.9
FEG39-05	3.1	1.6	8.0	13.8	1.2	16.7	2.3	7.2	6.3	9.1
FEG39-66	1.8	2.9	7.5	12.2	1.8	16.7	2.2	7.2	5.9	9.8
FEG53-16	3.5	0.7	5.1	11.6	0.5	8.3	43.0	11.5	15.1	4.5
FEG55-14	3.2	1.2	3.6	7.9	1.2	18.3	8.5	6.8	5.3	9.7
6B00-1100	3.5	2.0	7.6	15.7	2.7	21.7	3.4	8.8	7.3	11.8
6B00-1323	3.4	5.3	13.1	12.7	1.7	13.3	26.0	12.0	13.4	9.3
6B00-1348	3.5	0.8	4.2	11.4	2.7	0.3	10.4	5.0	7.2	0.5
6B00-1509	2.8	3.6	21.2	16.4	5.0	21.7	4.1	12.0	11.7	12.6
6B98-9105	3.1	3.9	14.7	15.3	6.1	15.0	7.1	10.4	10.8	9.5
6B98-9170	3.3	13.8	24.7	15.2	3.5	27.3	11.4	16.0	13.7	20.6
6B98-9339	4.3	3.6	10.3	20.7	3.5	23.3	13.5	12.5	12.0	13.5
6B95-2482	3.3	12.6	8.8	10.8	5.7	33.3	10.1	13.5	8.8	22.9
2ND18365	1.8	5.6	5.7	7.4	2.7	16.7	5.3	7.2	5.3	11.1
2ND19858	2.0	2.0	4.3	12.5	1.9	20.0	7.8	8.1	6.6	11.0
2ND19926	2.2	2.3	1.3	4.4	2.7	21.7	4.0	6.1	3.1	12.0
2ND20040	2.3	11.0	7.5	17.1	5.3	15.0	8.8	10.8	9.7	13.0
2ND20049	4.1	5.0	3.5	9.7	2.5	26.7	9.2	9.4	6.2	15.8
2ND20213	2.0	3.5	4.0	8.0	4.9	40.0	2.5	10.5	4.9	21.8
AC Mectcafe	2.4	1.3	3.3	6.9	4.8	12.0	20.5	8.1	8.9	6.6
Newdale	2.4	2.5	4.0	11.7	2.1	8.7	18.8	8.0	9.1	5.6
AC Hawkeye	3.2	1.9	6.8	11.0	0.6	31.7	19.3	11.9	9.4	16.8
EX699-5-4	2.8	0.3	1.0	3.5	0.6	5.0	15.5	4.3	5.1	2.6
CDC Freedom	2.1	1.5	4.0	5.5	3.4	11.7	11.5	6.3	6.1	6.6
TR361	2.6	1.0	4.7	5.3	1.8	5.7	13.2	5.3	6.3	3.3
CDC Copeland	2.9	3.8	3.7	11.4	2.7	13.3	17.8	8.8	8.9	8.5
CDC Select	2.8	2.8	2.8	5.7	2.9	13.3	15.7	7.2	6.8	8.0

†FHB rating description; 0=no infection; 1=incidence low, up to 5% of spikes; severity low, 1 or 2 kernels per spike affected (up to 7%) of head; 2=incidence low to moderate, 5 to 15% of spikes infected; severity low to moderate, 1 to 4 kernels (up to 15% of head); 3=incidence moderate, 15 to 30% of head; severity moderate, 2 to 8 kernels (up to 25% of head); 4=incidence moderate to high, 30 to 50% of spikes infected; severity moderate to high, 4 to 12 kernels (up to 40% of head); 5=incidence high, 50% or more of spikes affected; severity high, 5 to 15+ kernels (up to 50%+ of head diseased).

‡Averages exclude results from Brandon since a disease score was used to determine FHB severity.

Table 3. Mean DON content (ppm) of entries grown in the 2002 NABSEN Nursery at seven locations.

Label	Crookston							Average		
	Brandon	Dryland	Irrigated	Fargo	Langdon	Park River	St. Paul	All locs.	Irrigated	Dryland
Chevron	7.1	0.2	0.7	0.7	11.2	0.2	3.8	3.4	4.7	0.2
Clho4196	17.1	--	--	1.7	7.1	0.0	--	6.5	8.6	0.0
Conlon	3.7	0.2	0.9	2.4	13.4	1.2	4.8	3.8	5.1	0.7
MNBrite	11.9	0.3	2.1	6.7	30.7	0.7	4.1	8.1	11.1	0.5
Robust	16.1	1.7	3.7	9.2	23.2	1.5	4.6	8.6	11.3	1.6
Stander	23.7	1.5	5.1	17.4	31.8	3.6	15.4	14.1	18.7	2.5
ND19198	11.5	0.8	2.6	4.8	17.9	0.9	8.5	6.7	9.1	0.8
ND19201	14.6	2.8	6.2	11.0	28.9	3.7	10.4	11.1	14.2	3.2
ND19203	11.9	2.1	4.6	10.0	28.4	2.5	6.7	9.5	12.3	2.3
ND19227	15.4	1.1	4.4	5.0	16.9	1.6	15.1	8.5	11.4	1.4
ND19238	14.5	0.5	1.9	4.8	16.4	0.4	12.8	7.3	10.1	0.4
FEG26-93(M114)	14.4	1.3	3.7	7.8	22.1	3.1	11.2	9.1	11.8	2.2
FEG27-56	9.2	0.4	2.0	9.7	16.1	2.0	3.6	6.1	8.1	1.2
FEG33-89	10.1	0.5	2.7	4.4	19.6	0.7	3.7	6.0	8.1	0.6
FEG38-12	10.0	1.9	3.3	2.6	17.5	2.1	3.4	5.8	7.4	2.0
FEG39-05	9.9	1.9	5.0	4.5	27.0	1.9	5.9	8.0	10.5	1.9
FEG39-66	13.2	1.3	3.1	11.0	24.4	1.2	6.2	8.6	11.6	1.3
FEG53-16	15.8	1.3	3.7	6.9	29.9	0.2	14.7	10.3	14.2	0.7
FEG55-14	11.2	0.4	2.0	5.2	38.9	0.8	6.1	9.2	12.7	0.6
6B00-1100	11.0	1.2	3.9	6.8	23.1	0.5	7.5	7.7	10.5	0.9
6B00-1323	13.9	1.5	4.6	14.4	27.0	1.5	10.8	10.5	14.1	1.5
6B00-1348	16.9	0.9	6.0	11.7	27.8	1.5	15.6	11.5	15.6	1.2
6B00-1509	10.0	1.2	4.6	10.0	20.4	2.5	6.3	7.8	10.2	1.8
6B98-9105	12.4	1.1	3.9	7.9	27.2	3.3	8.0	9.1	11.9	2.2
6B98-9170	16.9	1.3	5.6	6.1	31.2	2.9	9.7	10.5	13.9	2.1
6B98-9339	17.6	0.9	4.5	10.4	24.1	1.4	11.2	10.0	13.6	1.1
6B95-2482	12.3	1.3	4.5	7.1	23.2	2.7	13.8	9.3	12.2	2.0
2ND18365	9.5	0.6	1.4	2.2	19.4	1.1	3.9	5.4	7.3	0.9
2ND19858	14.6	0.7	1.5	3.9	17.6	0.6	4.6	6.2	8.4	0.6
2ND19926	16.0	0.2	1.2	1.4	14.4	0.7	7.2	5.9	8.0	0.4
2ND20040	8.3	0.8	1.2	4.2	10.9	0.8	3.4	4.2	5.6	0.8
2ND20049	8.0	0.6	1.0	1.6	11.6	0.2	6.4	4.2	5.7	0.4
2ND20213	14.4	0.5	1.0	4.1	17.6	1.0	5.6	6.3	8.5	0.7
AC Metcalfe	13.1	0.2	0.7	3.4	35.9	0.1	15.9	9.9	13.8	0.1
Newdale	13.4	0.3	1.2	4.9	13.4	0.4	5.8	5.6	7.7	0.4
AC Hawkeye	9.6	0.1	0.8	4.6	16.4	0.9	4.4	5.3	7.2	0.5
EX699-5-4	13.2	0.0	0.3	1.5	15.4	0.1	16.7	6.7	9.4	0.0
CDC Freedom	10.0	0.2	0.4	1.7	4.7	0.0	7.5	3.5	4.9	0.1
TR361	12.2	0.3	1.0	2.2	14.7	0.1	15.5	6.6	9.1	0.2
CDC Copeland	19.8	0.3	1.5	3.4	18.4	0.4	17.1	8.7	12.0	0.3
CDC Select	14.1	0.4	1.8	6.0	33.6	0.1	14.6	10.1	14.0	0.2

Table 4. Mean heading date (days after 31 May), percent FHB severity, and DON content (ppm) of entries grown in the 2002 NABSEN nursery, averaged across locations.

Label	Heading date ¹	FHB ²	DON ³
Chevron	40.2	1.7	3.4
CIho4196	--	--	--
Conlon	33.5	9.3	3.8
MNBrite	36.0	8.5	8.1
Robust	36.3	12.0	8.6
Stander	35.9	15.3	14.1
ND19198	35.5	11.2	6.7
ND19201	34.5	11.6	11.1
ND19203	33.8	11.2	9.5
ND19227	38.0	12.8	8.5
ND19238	38.6	7.2	7.3
FEG26-93(M114)	36.1	9.5	9.1
FEG27-56	35.9	9.8	6.1
FEG33-89	33.9	7.2	6.0
FEG38-12	35.3	12.2	5.8
FEG39-05	36.5	7.2	8.0
FEG39-66	37.3	7.2	8.6
FEG53-16	38.2	11.5	10.3
FEG55-14	37.8	6.8	9.2
6B00-1100	35.4	8.8	7.7
6B00-1323	35.5	12.0	10.5
6B00-1348	37.1	5.0	11.5
6B00-1509	34.3	12.0	7.8
6B98-9105	34.3	10.4	9.1
6B98-9170	33.5	16.0	10.5
6B98-9339	36.3	12.5	10.0
6B95-2482	34.8	13.5	9.3
2ND18365	32.9	7.2	5.4
2ND19858	36.6	8.1	6.2
2ND19926	37.2	6.1	5.9
2ND20040	33.1	10.8	4.2
2ND20049	37.6	9.4	4.2
2ND20213	33.5	10.5	6.3
AC Metcalfe	38.7	8.1	9.9
Newdale	38.8	8.0	5.6
AC Hawkeye	38.2	11.9	5.3
EX699-5-4	43.0	4.3	6.7
CDC Freedom	40.8	6.3	3.5
TR361	40.2	5.3	6.6
CDC Copeland	39.5	8.8	8.7
CDC Select	38.8	7.2	10.1

¹Averaged across 4 locations, Brandon, Crookston (Irrigated), Langdon, and St. Paul.

²Averaged across 6 locations Crookston (irrigated and dryland), Fargo, Langdon, Park River, and St. Paul.

³Averaged across 7 locations Brandon, Crookston (irrigated and dryland), Fargo, Langdon, Park River, and St. Paul.

Table 5. Correlation among locations for FHB severity.

	Crookston		Fargo	Langdon	Park River	St. Paul
	dryland	irrigated				
Crookston - dryland	1.00	0.49 **	0.42 **	0.27	0.39 **	-0.14
Crookston - irrigated	0.49 **	1.00	0.69 **	0.27	0.37 *	-0.09
Fargo	0.42 **	0.69	1.00	0.33 *	0.39 **	-0.09
Langdon	0.27	0.27	0.33 *	1.00	0.38 *	-0.23
Park River	0.39 **	0.37	0.39 **	0.38 *	1.00	-0.27
St. Paul	-0.14	-0.09	-0.09	-0.23	-0.27	1.00

*, ** r-values significantly different from 0.0 at $P \leq 0.05$ and $P \leq 0.01$, respectively.

Table 6. Correlation among locations for DON content.

	Brandon	Crookston		Fargo	Langdon	Park River	St. Paul
		dryland	irrigated				
Brandon	1.00	0.24	0.42 **	0.45 **	0.34 *	0.20	0.63 **
Crookston-dryland	0.24	1.00	0.83 **	0.59 **	0.40 **	0.73 **	0.00
Crookston-irrigated	0.42	0.83 **	1.00	0.74 **	0.55 **	0.76 **	0.22
Fargo	0.45 **	0.59 **	0.74 **	1.00	0.57 **	0.64 **	0.20
Langdon	0.34 *	0.40 *	0.55 **	0.57 **	1.00	0.39 **	0.31 *
Park River	0.20	0.73 **	0.76 **	0.64 **	0.39 **	1.00	0.00
St. Paul	0.63 **	0.00	0.22	0.20	0.31 *	0.00	1.00

*, ** r-values significantly different from 0.0 at $P \leq 0.05$ and $P \leq 0.01$, respectively.

Table 7. Pedigree and origin of entries grown in the 2002 NABSEN nursery.

Label	Pedigree	Origin
Chevron	Unknown	Switzerland
Clho4196	Unknown	China
Conlon	BOWMAN*2/DWS1008/ND10232	North Dakota State Univ.
MNBrite	M90-89/M69	Univ. of Minnesota
Robust	Morex/Manker	Univ. of Minnesota
Stander	Robust*2/3/Cree/Bonanza//Manker/4/Robust/Bumper	Univ. of Minnesota
ND19198	ND15483*2/C98-2002(BARI)	North Dakota State Univ.
ND19201	ND15483*2/C98-2002(BARI)	North Dakota State Univ.
ND19203	ND15483*2/Clho 220	North Dakota State Univ.
ND19227	ND15483/C97-21-38	North Dakota State Univ.
ND19238	ND15483/C97-21-38	North Dakota State Univ.
FEG26-93(M114)	FEG4-67/Lacey	Univ. of Minnesota
FEG27-56	MAS2-02/Lacey	Univ. of Minnesota
FEG33-89	BT941/Lacey	Univ. of Minnesota
FEG38-12	Symko/2*Lacey	Univ. of Minnesota
FEG39-05	Hor211/2*Lacey	Univ. of Minnesota
FEG39-66	Hor211/2*Lacey	Univ. of Minnesota
FEG53-16	FEG16-30/M103	Univ. of Minnesota
FEG55-14	FEG2-26/MNBrite	Univ. of Minnesota
6B00-1100	6B94-7378//Legacy/6B94-7544	Busch Ag. Resources Inc.
6B00-1323	6B94-8126//Legacy/6B95-6311	Busch Ag. Resources Inc.
6B00-1348	6B94-7378//6B92-7166/6B94-7862	Busch Ag. Resources Inc.
6B00-1509	6B94-7378//6B92-7166/6B94-7416	Busch Ag. Resources Inc.
6B98-9105	6B93-3192/M82	Busch Ag. Resources Inc.
6B98-9170	6B92-7098//6B92-7098/M75	Busch Ag. Resources Inc.
6B98-9339	B1614//B1614/M75	Busch Ag. Resources Inc.
6B95-2482	6B89-2126/ND10981	Busch Ag. Resources Inc.
2ND18365	MERIT/ND15403	North Dakota State Univ.
2ND19858	ND15403//IMPERIAL/ND15468	North Dakota State Univ.
2ND19926	TR258/ND17437	North Dakota State Univ.
2ND20040	ND15403-4//ND16453/A64	North Dakota State Univ.
2ND20049	ND16461-1/ND17431	North Dakota State Univ.
2ND20213	A134/ND17437//ND17322/ND17461	North Dakota State Univ.
AC Metcalfe	AC Oxbow/Manley	Ag. Canada - Brandon
Newdale	CDC Stratus//TR236/WM862-6	Ag. Canada – Brandon
AC Hawkeye	Norbert/CI9973	Ag. Canada – Brandon
EX699-5-4	Brandon Male Sterile Comp	Ag. Canada - Brandon
CDC Freedom	AC Oxbow/SB88579	Univ. of Saskatchewan
TR361	TR333/TR246	Univ. of Saskatchewan
CDC Copeland	TR231/TR118	Univ. of Saskatchewan
CDC Select	AC Metcalfe/TR118	Univ. of Saskatchewan