Report of the 2010 Uniform Regional Scab Nursery for Spring Wheat Parents

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The Uniform Regional Scab Nursery for Spring Wheat Parents (URSN) was grown for the 16th year in 2010. Five mist-irrigated locations at Brookings, SD, St. Paul and Crookston, MN, Langdon, ND, and Glenlea, Manitoba, Canada were planted.

A total of 37 entries were included in the 2010 URSN, including the resistant checks 2375, BacUp, and ND2710, and the susceptible checks Wheaton and Oslo. The other entries were contributed by 7 university, government, and industry breeding programs.

A core set of traits evaluated provided from most locations included FHB incidence, FHB severity, disease index (incidence x severity), and visual scabby kernel ratings (VSK ≅ tombstone ≅ FDK). Additional trait data such as grain deoxynivalenol content, plot yield, and heading date, are presented in individual location summary tables. Overall means for traits over locations are presented, as are relative rankings for incidence, severity, disease index, VSK and DON. Correlation coefficients are provided between incidence, severity, disease index, and VSK. Further, molecular marker genotypes for a set of FHB resistance QTLs and 13 other traits are provided for entries.

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Table 1. Entries for the Uniform Regional Scab Nursery for Spring Wheat Parents, 2010.

Entry No.	Name	Pedigree	Year First Entered	Source
1	2375	CHECK		
2	Wheaton	CHECK		
3	Bacup	CHECK		
4	Oslo	CHECK		
5	ND2710	CHECK		
6	FN09-17017	SD4011/GLENN	2010	SDSU
7	FN09-17210	SD3746/SD3776//SD4032	2010	SDSU
8	FN09-17213	SD3851/GRANGER//SD4018	2010	SDSU
9	FN09-17270	SD3618/ND744	2010	SDSU
10	FN09-17275	PI67392/SD3618//ND750	2010	SDSU
11	MT09SCAB3	MT0550/CHOTEAU//3*CHOTEAU	2010	MSU
12	MT09SCAB5	MT0550/CHOTEAU//3*CHOTEAU	2010	MSU
13	MT09SCAB9	MT0550/CHOTEAU//3*CHOTEAU	2010	MSU
14	MT09SCAB16	MT0550/MT0249//3*MT0249	2010	MSU
15	ND09/URSN-1	ND2902/Reeder//ND716-21	2009	NDSU
16	ND09/URSN-2	Frontana/W9207//Alsen/3/Glenn/4/ND752	2009	NDSU
17	ND09/URSN-3	ND2831//Parshall/ND706/3/ND752	2009	NDSU
18	ND09/URSN-4	Alsen/Walworth//ND744	2009	NDSU
19	ND09/URSN-5	ND721//SD8070/ND674/3/Alsen	2009	NDSU
20	NDSW0714	PI 634196/Alsen//*2Alsen	2007	NDSU
21	NDSW0715	PI 634196/Alsen//*2Alsen	2007	NDSU
22	BW 928	BW799/ND721//Alsen	2010	SPARC-AAFC
23	BW871	Alsen/AC Elsa//AC Barrie	2009	SPARC-AAFC
24	03S0211-3	Norpro/99S0051-3-1	2010	Syngenta Cereals
25	04S0196-1	Kelby/4/Oxen/3/Sumai3/Dalen//N96-0160	2010	Syngenta Cereals
26	04S0202-1	Kuntz//Knudson/Alsen	2010	Syngenta Cereals
27	04S0209-4	HJ98//Sumai3/Dalen/3/Freyr	2010	Syngenta Cereals
28	04S0301-3	Knudson/Kelby//Freyr	2010	Syngenta Cereals
29	MN06216-6-2-4	MN99112-10/FA900-720//Alsen-1	2010	UMN
30	MN07049-7-3	MN99322-5(Fuijan 5114-/ MN2538(BacUp'S')) /84-5-5-1-2(Parshall/MN97589)	2010	UMN
31	MN07183-3	MN01261-8-1(Ada/Parshall)/MN00261-4	2010	UMN
32	MN08124	Ulen sel*7/Fhb1 source//MN02207-1/MN97695-LrW	2010	UMN
33	MN08145-2-3	MN01333-A-1/MN03048-2	2010	UMN
34	04V51*A0498	BW264//BW315/ND744	2010	AAFC_AAC
35	SH1	BW205	2010	AAFC_AAC
36	SH2	BW205	2010	AAFC_AAC
37	SH3	BW205	2010	AAFC_AAC

Table 2. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents, Brookings, SD.

Line	Incidence %	Severity %	Disease Index	Tombstone %	DON ppm
2375	96.7	40.8	39.9	45.0	3.5
Wheaton	100.0	47.5	47.5	76.7	5.0
Bacup	93.3	25.0	23.8	28.3	4.4
Brick[§]	73.3	13.0	9.7	23.3	2.4
ND2710	95.0	27.7	26.4	31.7	1.8
FN09-17017	85.0	17.3	14.7	35.0	2.7
FN09-17210	78.3	17.7	14.2	10.0	1.5
FN09-17213	71.7	12.0	8.7	18.3	2.2
FN09-17270	68.3	12.7	8.6	30.0	1.4
FN09-17275	71.7	11.0	7.9	8.3	1.5
MT09SCAB3	96.7	46.0	44.6	65.0	4.0
MT09SCAB5	98.3	46.0	45.2	65.0	4.7
MT09SCAB9	100.0	56.5	56.5	73.3	4.8
MT09SCAB16	96.7	40.5	39.6	61.7	2.0
ND09/URSN-1	90.0	22.8	20.6	31.7	3.2
ND09/URSN-2	86.7	24.0	21.9	26.7	2.9
ND09/URSN-3	81.7	16.3	13.7	18.3	1.6
ND09/URSN-4	96.7	26.0	25.4	15.0	3.7
ND09/URSN-5	88.3	19.3	17.2	36.7	4.6
NDSW0714	88.3	24.0	21.7	31.7	4.8
NDSW0715	96.7	28.8	28.1	21.7	3.4
BW 928	96.7	30.8	29.8	38.3	1.9
Brick[§]	75.0	15.2	11.9	23.3	2.2
03S0211-3	93.3	28.8	27.3	45.0	2.6
04S0196-1	91.7	20.7	19.0	46.7	1.3
04S0202-1	86.7	23.8	20.7	48.3	1.2
04S0209-4	95.0	32.0	30.5	43.3	4.1
04S0301-3	90.0	26.5	24.8	46.7	4.3
MN06216-6-2-4	100.0	46.3	46.3	8.3	3.1
MN07049-7-3	81.7	16.0	13.1	38.3	2.3
MN07183-3	100.0	35.8	35.8	21.7	3.6
MN08124	100.0	46.0	46.0	46.7	1.5
MN08145-2-3	90.0	22.7	20.4	23.3	3.2
04V51*A0498	96.7	29.8	28.7	21.7	2.3
SH1	100.0	41.3	41.3	46.7	7.9
SH2	90.0	33.3	30.2	73.3	7.6
SH3	98.3	41.7	41.0	75.0	5.5
Mean	90.2	28.8	27.1	37.8	3.3
LSD	13.6	11.1	12.4	17.5	1.8
CV	10.3	41.7	48.1	51.4	49.9

[§] Seed of Oslo and BW871 not available at planting time.

Table 3. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents, Crookston, MN.

Line	Incidence %	Severity %	Disease Index	VSK %	DON ppm	Heading d from 6-1	30 SSW[1] g	Micro TWT[2] g
2375	100.0	40.3	40.3	28.3	12.0	33	18.9	10.2
Wheaton	100.0	75.0	75.0	52.5	15.9	36	6.5	–
Bacup	98.0	10.0	10.0	23.0	8.3	29	15.7	10.7
Oslo	100.0	66.9	66.9	31.7	14.9	34	8.1	9.2
ND2710	90.0	10.4	9.4	14.0	8.2	33	23.8	11.1
FN09-17017	90.0	9.8	8.8	11.3	9.5	29	21.6	11.0
FN09-17210	75.0	9.3	7.0	7.3	4.5	29	22.0	11.3
FN09-17213	100.0	7.5	7.5	9.3	7.2	30	20.9	11.5
FN09-17270	60.0	6.0	3.6	8.0	3.9	29	22.5	11.3
FN09-17275	50.0	7.0	3.5	5.3	3.8	29	22.0	11.8
MT09SCAB3	100.0	44.9	44.9	17.5	6.2	33	12.6	10.7
MT09SCAB5	100.0	37.3	37.3	21.7	9.6	33	11.2	10.2
MT09SCAB9	100.0	42.2	42.2	30.0	8.4	33	9.8	9.7
MT09SCAB16	100.0	75.5	75.5	25.0	9.5	31	10.7	10.5
ND09/URSN-1	100.0	28.6	28.6	12.0	6.2	34	17.2	11.8
ND09/URSN-2	95.0	9.7	9.2	16.0	8.5	31	14.7	11.3
ND09/URSN-3	100.0	23.7	23.7	11.0	7.6	32	17.4	11.1
ND09/URSN-4	100.0	7.5	7.5	9.3	4.8	33	18.7	12.0
ND09/URSN-5	95.0	11.2	10.6	18.3	9.1	31	18.1	11.1
NDSW0714	100.0	14.0	14.0	10.7	6.6	34	15.0	11.4
NDSW0715	100.0	21.7	21.7	10.3	7.0	34	13.3	11.3
BW 928	–	–	–	–	–	–	–	–
BW871	–	–	–	–	–	–	–	–
03S0211-3	100.0	33.3	33.3	19.0	8.3	33	17.2	10.5
04S0196-1	100.0	24.7	24.7	15.0	7.0	30	16.4	10.7
04S0202-1	100.0	16.4	16.4	28.3	7.1	32	14.6	10.8
04S0209-4	100.0	28.1	28.1	20.0	10.6	33	11.9	11.2
04S0301-3	100.0	11.5	11.5	13.0	8.0	33	14.3	11.1
MN06216-6-2-4	90.0	8.8	7.9	6.7	3.7	38	17.4	11.4
MN07049-7-3	90.0	9.9	8.9	11.0	4.3	33	23.7	11.7
MN07183-3	100.0	15.0	15.0	11.3	5.4	36	18.2	11.6
MN08124	100.0	30.5	30.5	13.3	5.6	36	12.2	10.9
MN08145-2-3	100.0	34.8	34.8	9.0	6.9	32	15.5	10.9
04V51*A0498	100.0	9.0	9.0	9.3	5.0	33	16.4	11.3
SH1	100.0	29.2	29.2	13.0	6.8	38	13.0	10.4
SH2	100.0	27.5	27.5	31.7	11.2	33	19.0	9.7
SH3	100.0	14.8	14.8	28.3	7.5	32	14.3	9.8
Alsen (MR check)	100.0	24.1	24.1	12.3	8.1	33	16.3	11.4
Roblin (S check)	100.0	84.0	84.0	60.0	10.9	31	11.7	9.6
MN00269 (S check)	100.0	80.8	80.8	24.7	11.4	37	5.4	–
Mean	95.6	27.4	27.0	19.5	7.9	32.8	15.5	10.9
LSD				12.7		1.30	3.8	0.5
CV				40.1		2.4	14.9	3.1

[1] 30 SSW = 30 spike seed weight. This is the sample used to determine VSK.

[2] Weight of the VSK sample that fits in a 15.7 mL copper vessel measuring 20 mm in diameter and 50 mm in height

Table 4. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents, St. Paul, MN.

Line	Incidence %	Severity %	Disease Index	VSK %	DON ppm	Heading d from 6-1	30 SSW[1] g	Micro TWT[2] g
2375	75.0	15.8	11.9	8.0	4.0	24	21.3	11.0
Wheaton	95.0	42.3	40.2	35.0	11.2	24	8.4	–
Bacup	87.5	39.5	34.7	7.0	3.8	24	17.7	11.7
Oslo	95.0	41.5	39.4	17.0	6.6	24	12.1	9.8
ND2710	70.0	17.2	12.0	4.0	1.2	24	28.4	12.1
FN09-17017	65.0	22.5	14.6	2.0	1.5	24	25.4	11.8
FN09-17210	90.0	32.1	28.9	10.0	4.1	24	19.6	11.8
FN09-17213	90.0	39.7	35.7	8.0	9.6	21	12.1	11.5
FN09-17270	95.0	38.4	36.5	20.0	6.7	21	17.8	11.2
FN09-17275	90.0	21.2	19.1	2.0	0.7	24	21.1	12.3
MT09SCAB3	95.0	35.4	33.6	15.0	6.1	24	17.2	11.1
MT09SCAB5	85.0	26.1	22.2	25.0	5.9	24	11.5	10.3
MT09SCAB9	80.0	30.4	24.3	8.0	2.7	24	11.2	10.9
MT09SCAB16	100.0	36.0	36.0	8.0	2.7	24	15.2	10.8
ND09/URSN-1	65.0	13.6	8.8	6.0	1.7	24	16.9	11.6
ND09/URSN-2	90.0	23.3	21.0	6.0	1.5	24	15.6	12.2
ND09/URSN-3	85.0	17.5	14.9	6.0	1.8	24	17.0	12.0
ND09/URSN-4	90.0	19.6	17.6	6.0	1.7	24	13.8	12.1
ND09/URSN-5	95.0	30.3	28.8	10.0	2.1	24	13.8	11.7
NDSW0714	70.0	34.0	23.8	8.0	2.4	28	16.4	11.9
NDSW0715	70.0	30.2	21.1	4.0	1.3	28	13.7	11.5
BW 928	85.0	34.1	29.0	6.0	2.6	28	18.7	11.1
BW871	85.0	56.3	47.9	6.0	2.5	28	18.8	11.5
03S0211-3	95.0	27.2	25.8	12.0	4.0	24	12.6	10.7
04S0196-1	100.0	67.0	67.0	20.0	11.0	21	7.6	-
04S0202-1	95.0	33.8	32.1	20.0	4.9	24	15.7	11.8
04S0209-4	90.0	28.2	25.4	15.0	8.0	24	11.0	-
04S0301-3	100.0	27.1	27.1	8.0	2.1	24	19.7	11.6
MN06216-6-2-4	85.0	23.2	19.7	2.0	0.9	28	12.5	11.3
MN07049-7-3	80.0	26.9	21.5	4.0	1.4	24	22.9	12.1
MN07183-3	100.0	28.9	28.9	6.0	2.8	28	16.3	12.0
MN08124	65.0	25.5	16.6	4.0	1.1	28	18.4	11.7
MN08145-2-3	60.0	12.6	7.6	6.0	2.4	24	16.6	11.2
04V51*A0498	95.0	30.6	29.1	2.0	2.1	28	11.4	-
SH1	90.0	58.7	52.8	10.0	4.6	31	11.9	10.1
SH2	70.0	61.5	43.1	12.0	5.4	28	20.5	10.7
SH3	100.0	42.4	42.4	15.0	5.3	24	10.9	10.2
Alsen (MR check)	75.0	13.3	10.0	6.0	3.5	24	14.2	11.6
MN00269 (S check)	100.0	63.3	63.3	7.0	5.8	28	7.1	-
Roblin (S check)	100.0	73.9	73.9	30.0	8.3	21	6.2	-
Mean	86.2	33.5	29.7	10.2	3.9	24.9	15.5	11.4

[1] 30 SSW = 30 spike seed weight. This is the sample used to determine VSK.

[2] Weight of the VSK sample that fits in a 15.7 mL copper vessel measuring 20 mm in diameter and 50 mm in height

Table 5. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents, Langdon, ND.

Line	Incidence %	Severity %	Disease Index	DON ppm	Heading d from 6-1
2375	95.0	20.1	19.5	7.0	41
Wheaton	100.0	26.2	26.2	16.1	43
Bacup	95.0	14.2	13.4	4.0	38
Oslo	100.0	32.8	32.8	8.6	41
ND2710	65.0	9.3	5.9	2.3	39
FN09-17017	65.0	8.3	5.5	2.1	38
FN09-17210	62.5	11.5	8.0	2.6	37
FN09-17213	60.0	9.5	6.3	3.8	40
FN09-17270	45.0	9.7	4.7	2.6	36
FN09-17275	42.5	6.7	2.9	2.4	38
MT09SCAB3	100.0	22.4	22.4	10.7	42
MT09SCAB5	97.5	24.5	24.0	10.5	41
MT09SCAB9	100.0	21.7	21.7	12.0	41
MT09SCAB16	100.0	25.4	25.4	6.2	41
ND09/URSN-1	85.0	12.9	11.1	3.3	42
ND09/URSN-2	62.5	9.6	6.1	2.9	40
ND09/URSN-3	97.5	12.0	11.8	4.4	40
ND09/URSN-4	97.5	15.6	15.3	3.6	42
ND09/URSN-5	87.5	15.3	13.4	7.4	41
NDSW0714	87.5	11.5	10.2	6.3	42
NDSW0715	95.0	14.8	14.2	6.1	42
BW 928	100.0	16.8	16.8	4.0	41
BW871	82.5	10.8	8.9	3.7	42
03S0211-3	100.0	24.6	24.6	7.2	42
04S0196-1	95.0	14.7	14.2	3.6	40
04S0202-1	97.5	19.8	19.3	7.4	42
04S0209-4	100.0	22.3	22.3	7.8	43
04S0301-3	95.0	15.3	14.8	5.8	42
MN06216-6-2-4	97.5	17.3	16.9	4.0	46
MN07049-7-3	87.5	10.5	9.5	3.2	42
MN07183-3	100.0	19.7	19.7	4.2	44
MN08124	95.0	25.0	23.9	4.8	43
MN08145-2-3	67.5	14.4	12.3	4.3	41
04V51*A0498	92.5	21.3	19.8	2.5	41
SH1	96.7	19.9	19.5	14.3	46
SH2	92.5	17.1	16.1	7.7	43
SH3	100.0	22.0	22.0	6.1	40
Mean	87.5	16.9	15.7	5.8	41.0
LSD	17.3	8.2	7.9	3.1	1.6
CV	10.4	14.1	37.2	33.4	37.4

Table 6. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents, Glenlea, MB.

Line	Incidence %	Severity %	Disease Index	FDK %	DON %	DISK*
04S0301-3	5.5	1.3	6.4	12.0	11.6	8.4
04S0209-4	6.4	2.1	14.3	12.4	16.7	10.4
04S0202-1	6.3	1.6	9.8	7.5	13.8	8.0
04S0196-1	5.1	1.3	7.0	4.2	10.2	5.6
03S0211-3	7.9	1.9	14.4	7.1	11.0	7.4
ND09/URSN-1	5.8	1.5	8.1	10.0	14.4	8.8
ND09/URSN-2	5.0	0.9	3.9	5.2	11.3	6.1
ND09/URSN-3	5.5	1.3	6.3	4.5	11.1	6.0
ND09/URSN-4	5.5	1.0	4.8	4.6	11.2	6.0
ND09/URSN-5	5.8	1.3	7.3	7.4	19.2	9.4
NDSW0714	6.4	1.5	9.4	8.6	14.2	8.4
NDSW0715	5.1	2.3	13.3	7.1	11.7	7.1
BW871	4.3	1.8	6.5	4.9	6.4	4.6
MN07183-3	6.3	2.1	14.5	4.6	6.9	5.1
MN08124	8.0	2.5	20.8	5.9	10.7	7.1
MN06216-6-2-4	5.5	2.3	12.4	3.9	5.7	4.4
MN07049-7-3	4.0	0.8	2.5	1.6	4.0	2.6
MN08145	5.5	1.0	5.0	3.1	15.1	6.7
FN09-17210	4.0	1.6	6.8	1.7	3.5	2.7
FN09-17213	2.4	0.8	1.9	4.4	13.0	5.9
FN09-17270	4.5	1.4	6.2	2.3	6.4	3.8
FN09-17017	4.3	1.5	6.7	2.0	6.2	3.6
FN09-17275	3.1	1.5	5.2	0.9	4.1	2.4
Mean	5.30	1.52	8.40	5.47	10.37	6.11
CV	36.9	43.7	66.6	45.1	33.4	27.8
LSD	5.2	1.8	14.9	6.6	9.2	4.5

* DISK =(0.2*Incidence)+(0.2*Severity)+(0.3*FDK)+(0.4*DON) for a given entry.

Note: An incomplete set of entries was planted at Glenlea this year.

Table 7. 2010 Uniform Regional Scab Nursery for Spring Wheat Parents - Summary of Means.

Line	Incidence %	Incidence Rank	Severity %	Severity Rank	Disease Index	Disease Index Rank	VSK %	VSK Rank	DON ppm	DON Rank
No. of Locations	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**3**	**4**	**4**
2375	91.7	18	29.3	25	27.9	25	27.1	28	6.6	29
Wheaton	98.8	34	47.8	37	47.2	37	54.7	37	12.0	37
Bacup	93.5	20	22.2	16	20.5	16	19.4	19	5.1	20
Oslo	98.3[α]	33	47.1[α]	36	46.4[α]	36	24.3[§]	25	10.0[α]	36
ND2710	80.0	6	16.1	4	13.4	4	16.6	14	3.4	9
FN09-17017	76.3	3	14.5	2	10.9	2	16.1	12	4.0	15
FN09-17210	76.5	4	17.6	10	14.5	6	9.1	4	3.2	7
FN09-17213	80.4	7	17.2	7	14.6	8	11.9	8	5.7	25
FN09-17270	67.1	2	16.7	5	13.4	4	19.3	18	3.6	11
FN09-17275	63.5	1	11.5	1	8.4	1	5.2	1	2.1	1
MT09SCAB3	97.9	32	37.2	32	36.4	34	32.5	32	6.8	30
MT09SCAB5	95.2	24	33.5	29	32.2	31	37.2	34	7.7	33
MT09SCAB9	95.0	23	37.7	34	36.2	33	37.1	33	7.0	31
MT09SCAB16	99.2	35	44.3	35	44.1	35	31.6	30	5.1	20
ND09/URSN-1	85.0	11	19.5	12	17.3	11	16.6	14	3.6	11
ND09/URSN-2	83.5	8	16.7	5	14.5	6	16.2	13	3.9	13
ND09/URSN-3	91.0	16	17.4	9	16.0	9	11.8	7	3.9	13
ND09/URSN-4	96.0	25	17.2	7	16.4	10	10.1	5	3.5	10
ND09/URSN-5	91.5	17	19.0	11	17.5	13	21.7	21	5.8	27
NDSW0714	86.5	12	20.9	14	17.4	12	16.8	16	5.0	19
NDSW0715	90.4	15	23.9	19	21.3	17	12.0	9	4.4	18
BW 928	93.9[α]	21	27.3[α]	22	25.2[α]	22	22.2[§]	22	2.8[α]	2
BW871	83.8[§]	9	33.5[§]	29	28.4[§]	26	6.0[¥]	3	3.1[§]	6
03S0211-3	97.1	31	28.5	24	27.8	24	25.3	26	5.5	24
04S0196-1	96.7	29	31.8	27	31.2	30	27.2	29	5.7	25
04S0202-1	94.8	22	23.5	18	22.1	19	32.2	31	5.2	23
04S0209-4	96.3	27	27.7	23	26.6	23	26.1	27	7.6	32
04S0301-3	96.3	27	20.1	13	19.5	15	22.6	23	5.1	20
MN06216-6-2-4	93.1	19	23.9	19	22.7	20	5.7	2	2.9	4
MN07049-7-3	84.8	10	15.8	3	13.2	3	17.8	17	2.8	2
MN07183-3	100.0	37	24.9	21	24.9	21	13.0	11	4.0	15
MN08124	90.0	14	31.8	27	29.3	28	21.3	20	3.3	8
MN08145-2-3	79.4	5	21.1	15	18.8	14	12.8	10	4.2	17
04V51*A0498	96.0	25	22.7	17	21.6	18	11.0	6	3.0	5
SH1	96.7	29	37.3	33	35.7	32	23.2	24	8.4	35
SH2	88.1	13	34.9	31	29.2	27	39.0	35	8.0	34
SH3	99.6	36	30.2	26	30.1	29	39.4	36	6.1	28
Mean	89.8		26.0		24.1		21.4		5.1	

[¥] - Based on data from one location.

[§] - Based on data from two locations.

[α] - Based on data from three locations.

Note: Glenlea was not included in summary due to incomplete data.

Table 8. Correlation coefficients among traits on a per-location basis.

Correlation Between	Brookings	Crookston	St. Paul	Langdon
Incidence & Severity	0.85	0.37	0.37	0.73
Incidence & Disease Index	0.87	0.41	0.59	0.81
Incidence & Tombstone/VSK	0.47	0.38	0.41	
Incidence & DON	0.45	0.42	0.42	0.53
Severity & Disease Index	1.00	1.00	0.96	0.99
Severity & Tombstone/VSK	0.65	0.69	0.41	
Severity & DON	0.49	0.68	0.58	0.66
Disease Index & Tombstone/VSK	0.63	0.70	0.49	
Disease Index & DON	0.48	0.69	0.65	0.67
Tombstone/VSK & DON	0.51	0.83	0.82	

Table 9. Correlation coefficients among traits.

	Incidence %	Severity %	Disease Index	VSK %	DON ppm
Incidence %					
Severity %	0.64				
Disease Index	0.70	0.99			
VSK %	0.51	0.69	0.70		
DON ppm	0.50	0.74	0.74	0.78	

Note: Correlation coefficients were calculated with means across locations.

Table 10. Allele Sizes of Molecular Markers Associated with Selected Traits/Genes. From S. Chao (USDA-ARS, Fargo, ND)

Trait / Gene	Scab / Fhb1	Scab / Fhb_5A	Tan Spot / tsn1	Grain Protein Content / GPC	HMW Glutenins/Glu	HMW Glutenins/Glu-1Dx	HMW Glutenins /Glu-1Dy	Leaf Rust / Lr21	Leaf Rust / Lr34	Stem Rust / Sr25			Photoperiod/ Ppd-D1a (insen)	Photoperiod/ Ppd-D1b (sen)	Height/Rht-B1a (wild type)	Height/Rht-B1b (dwarf)	Height/Rht-D1a (wild type)	Height/Rht-D1b (dwarf)
Marker	umn10	barc180	fcp394	uhw89	umn19	umn25	umn26	Lr21	csLV34	Sr25			Ppd-D1a	Ppd-D1b	Rht-B1a	Rht-B1b	Rht-D1a	Rht-D1b
Chromosome	3B	5A	5B	6B	1A	1D	1D	1D	7D	7D			2D	2D	4B	4B	4D	4D
2375	238	194	328	125	***341***	***278***	***391***	303	***156***	183	204	210	284		+	+	+	-
Wheaton	238	190	***377***	125	***341***	***278***	***391***	303	***156***	183	204	210	284		+	+	+	+
Bacup	238	197	328	125	359	***278***	***391***	303	237	183	***200***	204	284		+	+	+	-
Oslo	238	190	328	125	359	278/295	391/408	303	156/237	183	***200***	204	284		-	+	+	-
ND2710	***241***	***203***	328	125	359	***278***	***391***	303	***156***	183	204	210		414	+	+	+	-
FN09-17017	238	190	328	125	***341***	***278***	***391***	286	237	183	204	210		414	+	-	+	-
FN09-17210	***241***	190	328	125	***341***	***278***	***391***	303	***156***	204	210	232	284		+	+	+	-
FN09-17213		190	328	125	***341***	***278***	***391***	303	237	183	204	210	284		-	+	+	-
FN09-17270	***241***	190	328	125	***341***	***278***	***391***	***196***	156/237	183	204	210	284	414	+	+	+	-
FN09-17275	***241***	***203***	***377***	125	***341***	***278***	***391***	***196***	***156***	183	204	210		414	+	+	+	-
MT09SCAB3	***241***	190	370	125	359	***278***	***391***	***196***	237	183	204	210		414	-	+	+	-
MT09SCAB5	***241***	190	370	125	359	***278***	***391***	***196***	237	183	204	210		414	-	+	+	-
MT09SCAB9	***241***	190	370	125	359	***278***	***391***	***196***	237	183	204	210		414	-	+	+	-
MT09SCAB16	***241***	194	***377***	125	***341***	***278***	***391***	286	237	183	204	210		414	-	+	+	-
BW928	***241***	197	328	125	***341***	***278***	***391***	303	***156***	183	204	210		414	-	+	+	-
BW871	***241***	197	328	125	***341***	***278***	***391***	286	***156***	183	204	210		414	+	+	+	-
03S0211-3	238	200	328	125	***341***	***278***	***391***	286	***156***	204	210	232		414	+	+	+	no data
04S0196-1	***241***	190	328	125	***341***	***278***	***391***	303	***156***	204	210	232	284		+	+	+	+
04S0202-1	***241***	***203***	328	125	***341***	***278***	***391***	286	***156***	204	210	232	284		-	+	+	-
04S0209-4	238	200	***377***	125	***341***	***278***	***391***	286	***156***	204	210	232	284		+	-	+	+
04S0301-3	238	***203***	***377***	125	***341***	***278***	***391***	286	***156***	204	210	232		414	+	-	+	+
MN06216-6-2-4	***241***	***203***	328	125	***341***	***278***	***391***	303	***156***	183	204	210		414	-	+	+	-
MN07049-7-3	***241***	200	328	125	359	***278***	***391***	303	***156***	183	***200***	204	284		+	+	+	-
MN07183-3	238	194	***377***	125	***341***	***278***	***391***	286	***156***	183	204	210		414	+	+	+	+
MN08124	***241***	***203***	328	125	***341***	***278***	***391***	***196***	237	183	204	210		414	+	+	+	+
MN08145-2-3	238	190	328	125	359	***278***	***391***	303	237	183	204	210		414	+	+	+	-
04V51*A0498	***241***	190	328	125	***341***	***278***	***391***	***196***	***156***	183	204	210		414	+	+	+	-
SH1	238	190	328	125	***341***	***278***	***391***	***196***	237	183	204	210		414	-	+	+	-
SH2	238	190	328	125	***341***	***278***	***391***	286	237	183	204	210		414	+	+	+	-
SH3	238	190	328	125	***341***	***278***	***391***	303	***156***	183	204	210		414	+	+	+	-

Numbers in bold are associated with gene/QTL. Please see next page for more details on marker allele/gene associations.

Note: Marker data for entries ND09/URSN-1, ND09/URSN-2, ND09/URSN-3, ND09/URSN-4, ND09/URSN-5, NDSW0714, NDSW0715, was omitted at the request of the submitter.

Table 10 continued.

Trait	Marker	Gene	Chromosome	Size (base)
scab	umn10	Fhb1	3B	Resistance=241
scab	barc180	Fhb_5A	5A	Resistance=203
Tan Spot	fcp394	tsn1	5B	Resistance=377
grain protein content	uhw89	GPC	6B	H=121, L=125
HMW Glutenins	umn19	Glu	1A	Ax2*=341, Ax1=359
HMW Glutenins	umn25	Glu-1Dx	1D	Dx5=278, Dx2=295
HMW Glutenins	umn26	Glu-1Dy	1D	Dy10=391, Dy12=408
Leaf rust	Lr21	Lr21	1D	Resistance=196
Leaf rust	csLV34	Lr34	7D	Resistance=156
Stem rust	Sr25	Sr25	7D	Resistance = 200
photoperiod	Ppd-D1a	Ppd-D1a (insensitive)	2D	284
photoperiod	Ppd-D1b	Ppd-D1b (sensitive)	2D	414
plant height	Rht-B1a	Rht-B1a (wild type)	4B	360 = +
plant height	Rht-B1b	Rht-B1b (dwarf)	4B	366 = +
plant height	Rht-D1a	Rht-D1a (wild type)	4D	250 = +
plant height	Rht-D1b	Rht-D1b (Dwarf)	4D	252 = +