Report of the 2013 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 18th year in 2013. Three locations (Brookings, SD, and St. Paul and Crookston, MN) were planted.

A total of 23 entries were included in the 2013 URSN, in addition the resistant checks 2375, BacUp, and ND2710, and the susceptible checks Wheaton and Oslo. The entries were contributed by 5 university and industry breeding programs.

A core set of traits evaluated provided from locations included Fusarium head blight (FHB) incidence, FHB severity, disease index (incidence x severity), visual scabby kernel ratings (VSK ≅ tombstone) and grain deoxynivalenol content. Yield and heading dates are presented in individual location summary tables for locations where they were measured. 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. Molecular marker genotypes for a set of FHB resistance QTLs and other traits are provided for entries. Adult plant leaf and stem rust reactions are also presented.

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Cooperators for the 2013 Uniform Regional Scab Nursery for Spring Wheat Parents

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Table 1. Entries for the Uniform Regional Scab Nursery for Spring Wheat Parents, 2013.

Entry No.	Name	Pedigree	Year First Entered	Source
1	2375	CHECK		
2	Wheaton	CHECK		
3	Bacup	CHECK		
4	Oslo	CHECK		
5	ND2710	CHECK		
6	MN09157	MN03308-4*2//MN99220-4-1	2013	UMN
7	MN10055	Sabin/Kelby	2013	UMN
8	MN10285	MN03160-4/Sabin	2013	UMN
9	MN10362	MN00187-3-1/Sabin	2013	UMN
10	MN10368	MN03160-4/Sabin	2013	UMN
11	SD4487	SD4156/SD4187	2013	SDSU
12	SD4518	SD4011/SD4181	2013	SDSU
13	SD4536	SD4186/SD4178	2013	SDSU
14	SD4541	SD4189/SD4181	2013	SDSU
15	SD4544	SD4178/KELBY	2013	SDSU
16	07S0018-2	Alsen//Knudson/BW297/3/02S0239-1	2013	Syngenta
17	07S0027-3	HJ98/BC97ROM-52//Freyr/3/01S0236-6	2013	Syngenta
18	07S0184-11	Faller/Brennan	2013	Syngenta
19	07S0203-9	SY Soren 'S'/02S0178-1	2013	Syngenta
20	07S0209-29	02S0066-13/SY Soren 'S'	2013	Syngenta
21	LNR10-0176	RB07/SD3641	2013	Limagrain
22	LNR10-0177	RB07/SD3641	2013	Limagrain
23	LNR10-0493	ALSEN/ND800	2013	Limagrain
24	12-14-81	PI157593/Parshall//Alsen	2013	NDSU
25	12-14-97	Frontana/W9207//2*Alsen/3/2*ND752	2013	NDSU
26	12-14-147	Velva/Bigg Red	2013	NDSU
27	12-14-158	Arsenal//Kormorran/Rohau72-839/3/Parshall/4/ND706	2013	NDSU
28	12-14-172	Tokai66/Parshall//Alsen	2013	NDSU

Table 2. 2013 Uniform Regional Scab Nursery for Spring Wheat Parents, Brookings, SD.

Line	Incidence %	Severity %	Disease Index	Tombstone %	DON ppm
2375	65.0	18.2	15.9	26.7	8.7
Wheaton	83.3	33.8	31.2	71.7	10.6
Bacup	63.3	19.4	16.0	45.0	13.4
Brick	52.5	10.8	8.8	23.3	4.7
ND2710	60.8	12.4	9.3	23.3	5.7
MN09157	68.3	18.9	16.3	10.0	4.6
MN10055	73.3	19.7	16.5	18.3	7.6
MN10285	71.7	17.0	14.7	15.0	4.9
MN10362	73.3	16.9	14.1	21.7	3.7
MN10368	66.7	16.9	14.1	20.0	6.3
SD4487	69.2	20.8	18.9	36.7	8.7
SD4518	76.7	21.3	19.2	21.7	7.5
SD4536	72.5	21.3	18.7	40.0	5.5
SD4541	60.8	17.4	15.0	28.3	7.7
SD4544	66.7	18.8	16.6	40.0	6.8
07S0018-2	57.5	13.9	11.6	30.0	9.2
07S0027-3	70.0	22.7	20.6	36.7	5.1
07S0184-11	73.3	23.3	21.4	38.3	9.5
07S0203-9	90.0	34.9	32.9	35.0	7.9
07S0209-29	70.0	18.7	16.5	33.3	7.4
LNR10-0176	59.2	14.0	11.6	38.3	5.5
LNR10-0177	76.7	22.0	19.5	21.7	6.7
LNR10-0493	80.0	21.8	19.5	38.3	9.8
12-14-81	74.2	20.2	17.8	30.0	8.0
12-14-97	76.7	23.3	20.8	31.7	7.6
12-14-147	66.7	16.3	13.5	26.7	5.9
12-14-158	81.7	21.7	18.9	20.0	11.3
12-14-172	57.5	13.6	11.9	36.7	8.2
Mean	69.9	19.6	17.2	30.7	7.5
LSD	11.2	6.0	5.9	13.2	3.1
CV	12.4	27.1	31.2	38.8	29.9

Note: Brick used in place of Oslo

Table 3. 2013 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	38.4	38.4	21.0	11.5	36	16.5	10.5
Wheaton	98.8	74.8	73.9	67.5	46.8	38	3.1	–
Bacup	95.0	19.1	18.3	21.8	11.7	33	13.0	10.8
Oslo	100.0	80.9	80.9	65.0	19.3	36	3.2	–
ND2710	75.0	8.7	6.5	11.0	3.1	37	25.6	11.8
MN09157	70.0	12.6	8.4	5.0	2.5	40	22.8	12.1
MN10055	82.5	11.3	9.2	9.0	3.9	37	19.8	11.5
MN10285	67.5	7.2	4.8	6.0	2.9	41	19.2	12.0
MN10362	57.5	6.0	3.5	5.0	2.1	37	28.1	12.0
MN10368	97.5	19.1	18.6	5.0	5.0	37	11.5	11.0
SD4487	95.0	39.9	37.9	27.5	13.7	36	11.1	10.5
SD4518	100.0	40.1	40.1	18.5	9.7	36	12.9	10.8
SD4536	95.0	45.7	43.7	18.5	9.5	36	13.3	10.8
SD4541	100.0	35.9	35.9	15.0	9.8	36	10.8	11.3
SD4544	100.0	38.9	38.9	37.5	15.2	34	10.4	10.0
07S0018-2	95.0	31.8	30.4	18.5	14.6	35	13.8	11.2
07S0027-3	97.5	19.9	19.6	13.5	7.8	37	20.0	11.0
07S0184-11	97.5	53.3	52.4	15.0	14.8	37	13.4	11.0
07S0203-9	100.0	62.0	62.0	28.5	14.4	36	5.8	–
07S0209-29	100.0	22.0	22.0	13.5	5.9	36	15.3	11.2
LNR10-0176	60.0	7.6	4.6	27.5	7.6	34	16.8	11.1
LNR10-0177	97.5	25.0	24.5	18.5	9.9	35	12.4	10.8
LNR10-0493	100.0	28.6	28.6	25.0	13.5	37	13.5	10.9
12-14-81	90.0	10.1	9.4	7.0	6.3	39	22.2	11.9
12-14-97	87.5	24.2	20.2	12.0	7.2	37	14.3	11.1
12-14-147	90.0	17.9	16.2	15.0	6.5	38	19.9	11.4
12-14-158	100.0	28.5	28.5	13.5	8.1	38	15.7	11.4
12-14-172	100.0	22.8	22.8	17.5	12.1	35	11.7	10.6
Alsen (MR check)	97.5	26.3	25.8	12.5	8.2	37	13.0	11.1
Roblin (S check)	100.0	81.2	81.2	75.0	18.7	33	5.8	–
MN00269 (S check)	100.0	63.7	63.7	45.0	13.7	41	6.3	–
Mean	92.1	33.2	32.2	23.9	10.8	36.5	13.8	11.1
LSD	14.3	17.9	17.9	13.5		1.4	2.7	0.6
CV	7.6	26.4	27.3	27.6		2.4	9.6	2.6

[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. 2013 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	83.3	22.6	20.0	12.5	5.5	35	19.5	11.1
Wheaton	95.0	66.2	62.9	70.0	22.5	40	7.7	9.3
Bacup	33.3	12.0	4.3	2.5	2.0	35	19.7	12.1
Oslo	96.7	71.9	69.4	50.0	15.2	38	8.7	8.8
ND2710	41.7	11.9	5.4	4.0	1.6	36	28.4	12.1
MN09157	45.0	21.8	9.8	2.0	1.6	41	24.4	12.1
MN10055	88.3	19.9	18.6	5.0	2.5	38	21.0	11.4
MN10285	43.3	15.1	6.7	2.0	1.2	41	22.2	11.6
MN10362	25.0	15.0	3.9	3.0	0.3	38	34.6	12.5
MN10368	76.7	20.8	15.7	3.0	2.2	39	17.7	11.7
SD4487	100.0	50.4	50.4	12.5	8.7	38	13.2	10.3
SD4518	71.7	21.1	15.5	12.5	2.3	35	16.7	11.1
SD4536	55.0	18.1	10.3	6.0	4.4	35	22.1	11.8
SD4541	83.3	29.1	25.7	8.0	2.3	35	15.6	11.2
SD4544	70.0	20.7	15.5	14.0	5.1	35	21.4	11.2
07S0018-2	65.0	12.9	8.4	8.0	3.9	36	16.9	11.2
07S0027-3	83.3	28.8	26.1	9.0	6.6	38	13.7	9.8
07S0184-11	86.7	43.6	40.4	14.5	13.3	38	11.2	10.7
07S0203-9	98.3	57.8	56.8	13.5	8.3	38	9.5	9.3
07S0209-29	76.7	21.6	17.3	8.0	4.7	38	17.4	11.2
LNR10-0176	63.3	15.1	11.1	11.0	5.2	35	13.7	10.2
LNR10-0177	81.7	25.8	21.9	11.0	5.8	35	10.7	9.8
LNR10-0493	73.3	20.3	14.7	16.0	7.6	38	18.2	10.9
12-14-81	90.0	30.3	26.9	8.0	8.9	38	18.8	11.8
12-14-97	81.7	45.4	37.7	12.0	5.6	38	10.2	11.0
12-14-147	75.0	19.2	14.6	10.0	4.2	35	24.9	11.6
12-14-158	90.0	21.6	19.4	4.0	3.3	38	20.5	11.9
12-14-172	56.7	9.2	5.6	10.0	3.3	35	14.7	11.1
Alsen (MR check)	88.3	25.7	23.5	6.0	3.4	38	16.1	11.1
Roblin (S check)	96.7	49.2	47.7	22.5	8.2	35	11.9	10.1
MN00269 (S check)	98.3	61.7	61.0	27.5	12.2	41	7.6	–
Mean	74	11.9	25.3	14.3	5.9	37.2	16.8	11.2
LSD	23	49.2	17.1	20.5		1.1	20.5	0.7
CV	18	50.4	40.5	71.9		1.8	61.0	3.0

[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. 2013 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	**3**		**3**		**3**		**3**		**3**	
2375	82.8	17	26.4	19	24.8	20	20.1	17	8.6	19
Wheaton	92.4	26	58.3	27	56.0	27	69.7	28	26.6	28
Bacup	63.9	6	16.8	6	12.8	6	23.1	21	9.0	20
Olso *	98.3	28	76.4	28	75.2	28	57.5	27	17.3	27
ND2710	59.2	2	11.0	1	7.1	1	12.8	7	3.5	4
MN09157	61.1	5	17.8	8	11.5	5	5.7	1	2.9	2
MN10055	81.4	13	17.0	7	14.8	8	10.8	5	4.7	6
MN10285	60.8	3	13.1	4	8.7	3	7.7	2	3.0	3
MN10362	51.9	1	12.6	3	7.2	2	9.9	4	2.0	1
MN10368	80.3	12	18.9	10	16.1	10	9.3	3	4.5	5
SD4487	88.1	24	37.0	24	35.7	24	25.6	22	10.4	25
SD4518	82.8	17	27.5	20	24.9	21	17.6	12	6.5	10
SD4536	74.2	9	28.4	22	24.2	19	21.5	19	6.5	10
SD4541	81.4	13	27.5	20	25.6	22	17.1	9	6.6	13
SD4544	78.9	11	26.1	18	23.7	18	30.5	26	9.0	20
07S0018-2	72.5	8	19.5	11	16.8	11	18.8	15	9.2	22
07S0027-3	83.6	19	23.8	15	22.1	16	19.7	16	6.5	10
07S0184-11	85.8	23	40.1	25	38.1	25	22.6	20	12.5	26
07S0203-9	96.1	27	51.6	26	50.6	26	25.7	24	10.2	23
07S0209-29	82.2	16	20.7	13	18.6	13	18.3	13	6.0	8
LNR10-0176	60.8	3	12.2	2	9.1	4	25.6	22	6.1	9
LNR10-0177	85.3	22	24.3	17	21.9	15	17.1	9	7.5	15
LNR10-0493	84.4	20	23.5	14	20.9	14	26.4	25	10.3	24
12-14-81	84.7	21	20.2	12	18.0	12	15.0	8	7.7	17
12-14-97	81.9	15	31.0	23	26.2	23	18.6	14	6.8	14
12-14-147	77.2	10	17.8	8	14.8	8	17.2	11	5.5	7
12-14-158	90.6	25	23.9	16	22.3	17	12.5	6	7.6	16
12-14-172	71.4	7	15.2	5	13.4	7	21.4	18	7.9	18
Mean	78.4		26.4		23.6		21.3		8.0	

* Mean of two locations for all summary data.

Table 6. Correlation coefficients among traits on a per-location basis.

Correlation Between	Brookings	Crookston	St. Paul
Incidence & Severity	0.85	0.61	0.69
Incidence & Disease Index	0.84	0.64	0.77
Incidence & Tombstone/VSK	0.13	0.36	0.46
Incidence & DON	0.16	0.45	0.62
Severity & Disease Index	1.00	1.00	0.99
Severity & Tombstone/VSK	0.48	0.80	0.75
Severity & DON	0.32	0.78	0.83
Disease Index & Tombstone/VSK	0.49	0.80	0.74
Disease Index & DON	0.31	0.77	0.83
Tombstone/VSK & DON	0.48	0.86	0.89

Table 7. Correlation coefficients among traits, using means across locations.

	Incidence %	Severity %	Disease Index	VSK %
Severity %	0.74			
Disease Index	0.78	1.00		
VSK %*	0.50	0.80	0.80	
DON ppm	0.61	0.80	0.81	0.94

*For calculation, VSK and tombstone considered to be equivalent.

Table 8. Leaf and stem rust reactions in inoculated field nurseries, 2013 Uniform Regional Scab Nursery for Spring Wheat Parents, St. Paul, MN. (J. Kolmer and Y. Jin, USDA-ARS, St. Paul, MN)

Line	Leaf Rust	Stem Rust
2375	30MR-MS	10MR
Wheaton	20MR-MS	–
Bacup	40MS	–
Oslo	30MS	–
ND2710	50MS	–
MN09157	40MR-MS	–
MN10055	10R-MR	–
MN10285	10R-MR	20MR
MN10362	30MR-MS	40MS
MN10368	10R-MR	–
SD4487	5R-MR	–
SD4518	50MS-S	30MR
SD4536	20R-MR	30MR
SD4541	10R-MR	40MR-MS
SD4544	10R-MR	30MR
07S0018-2	20R-MR	–
07S0027-3	40MR-MS	20MR
07S0184-11	30MR-MS	–
07S0203-9	10R-MR	70MS-S
07S0209-29	5R	20MR
LNR10-0176	30MS	40MR
LNR10-0177	20R-MR	–
LNR10-0493	40MR	–
12-14-81	30MS	50MR
12-14-97	60MS-S	50MR-MS
12-14-147	30MR-MS	20MR
12-14-158	10R-MR	–
12-14-172	40MR-MS	–

Table 9. Allele Sizes of Molecular Markers Associated with Selected Traits/Genes (S. Chao, USDA-ARS, Fargo, ND)

Trait / Gene	HMW Glutenins / Glu-1A	HMW Glutenins / Glu-1Dx	HMW Glutenins / Glu-1Dy	Leaf Rust / Lr34	Leaf Rust / Lr21	Stem Rust / Sr2	Scab / Fhb1	Scab / Fhb 5A		Tan Spot / tsn1	Grain Protein Content / GPC	Photoperiod / Ppd-D1a (insen)	Photoperiod / Ppd-D1b (sen)	Height / Rht-B1	Height / Rht-D1
Marker	**umn19**	**umn25**	**umn26**	**l4**	**Lr21**	**gwm533**	**Fhb1**	**barc180**	**barc186**	**fcp397**	**Gpc-B1**	**Ppd-D1a**	**Ppd-D1b**	**Rht-B1**	**Rht-D1**
Chromosome	**1A**	**1D**	**1D**	**7D**	**1D**	**3B**	**3B**	**5A**		**5B**	**6B**	**2D**	**2D**	**4B**	**4D**
2375	**341**	**278**	**391**	**T**	304	**116**	C	194	**211**	253	A	284		+	+
Wheaton	**341**	**278**	**391**	**T**	304	**116**	C	190	201	**226**	A	284		+	-
Bacup	359	**278**	**391**	**T**	304	**116**	C	197	**211**	253	A	284		+	+
Oslo	359	295	408	A	304	**116**	C	190	201	229	A	284		-	+
ND2710	359	**278**	**391**	**T**	304	143	**T**	**203**	**211**	253	A		414	+	+
MN09157	359	**278**	**391**	A	304/307	118	**T**	194	**211**	253	A	284		+	+
MN10055	359	**278**	**391**	**T**	304	143	**T**	200	201	253	A	284		+	+
MN10285	359	**278**	**391**	A	304	143	**T**	200	201	253	A		414	+	+
MN10362	**341**	**278**	**391**	**T**	304	143	**T**	**203**	**211**	253	A	284		+	+
MN10368	**341**	**278**	**391**	A	304	141	**T**	194	213	253	A		414	-	+
SD4487	**341**	**278**	**391**	**T**	**196**	118	C	194	201	**226**	A	284		+	-
SD4518	359	**278**	**391**	A	304	143	**T**	190	201	253	A		414	+	+
SD4536	**341**	**278**	**391**	A	**196**	**116**	C	190	201	**226**	A	284		+	+
SD4541	**341**	**278**	**391**	A	304	143	**T**	187	201	253	A		414	+	+
SD4544	**341**	**278**	**391**	**T**	304	**116**	C	190	201	**226**	A	284		+	+
07S0018-2	**341**	**278**	**391**	**T**	286	118	C	**203**	**211**	253	A	284		+	-
07S0027-3	**341**	**278**	**391**	**T**	286	143	**T**	190	201	**226**	A		414	+	-
07S0184-11	**341**	**278**	**391**	A	**196**	**116**	**T**	**203**	**211**	**226**	A		414	+	-
07S0203-9	**341**	**278**	**391**	**T**	**196**	143	**T**	190	201	253	A	284		-	+
07S0209-29	**341**	**278**	**391**	**T**	286	143	**T**	200	201	**226**	A	284		+	-
LNR10-0176	**341**	**278**	**391**	A	**196**	**116**	C	190	**211**	253	A		414	-	+
LNR10-0177	**341**	**278**	**391**	A	**196**	**116**	C	190	201	253	A		414	-	+
LNR10-0493	**341**	**278**	**391**	A	304	143	C	**203**	**211**	253	A		414	-	+
12-14-81	359	**278**	**391**	A	**196**	118	C	190	201	253	A		414	-	+
12-14-97	359	**278**	**391**	A	**196**	118	C	197	201	229	A		414	-	+
12-14-147	**341**	**278**	**391**	A	304	143	**T**	194	**211**	229	A		414	+	+
12-14-158	**341**	**278**	**391**	A	**196**	141	C	190	201	229	A		414	+	+
12-14-172	**341**	**278**	**391**	A	**196**	**116**	C	**203**	**211**	253	A		414	-	+

Numbers in bold are associated with resistance gene/QTL.

Please see next page for more details on marker allele/gene associations.

Table 9 continued.

Trait	Marker	Gene	Chromosome	Size (base)
HMW Glutenins	umn19	Glu-1A	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	I4	Lr34	7D	Resistance=T
Leaf rust	Lr21	Lr21	1D	Resistance=196
Stem rust	gwm533	Sr2	3B	R=116*
Scab	Fhb1	Fhb1	3B	Resistance=T
Scab	barc180	Fhb 5A	5A	Resistance=203
Scab	barc186	Fhb 5A	5A	Resistance=211
Tan Spot	fcp397	tsn1	5B	Resistance=226
Grain protein content	Gpc-B1	GPC	6B	High=T
Photoperiod	Ppd-D1a	Ppd-D1a (insensitive)	2D	284
Photoperiod	Ppd-D1b	Ppd-D1b (sensitive)	2D	414
Plant height	Rht-B1	Rht-B1	4B	wild type = +, dwarf = -
Plant height	Rht-D1	Rht-D1	4D	wild type = +, dwarf = -

* This marker may not be diagnotic, for reference only.