NRPN: location of replicated yield trials and regional production zones.

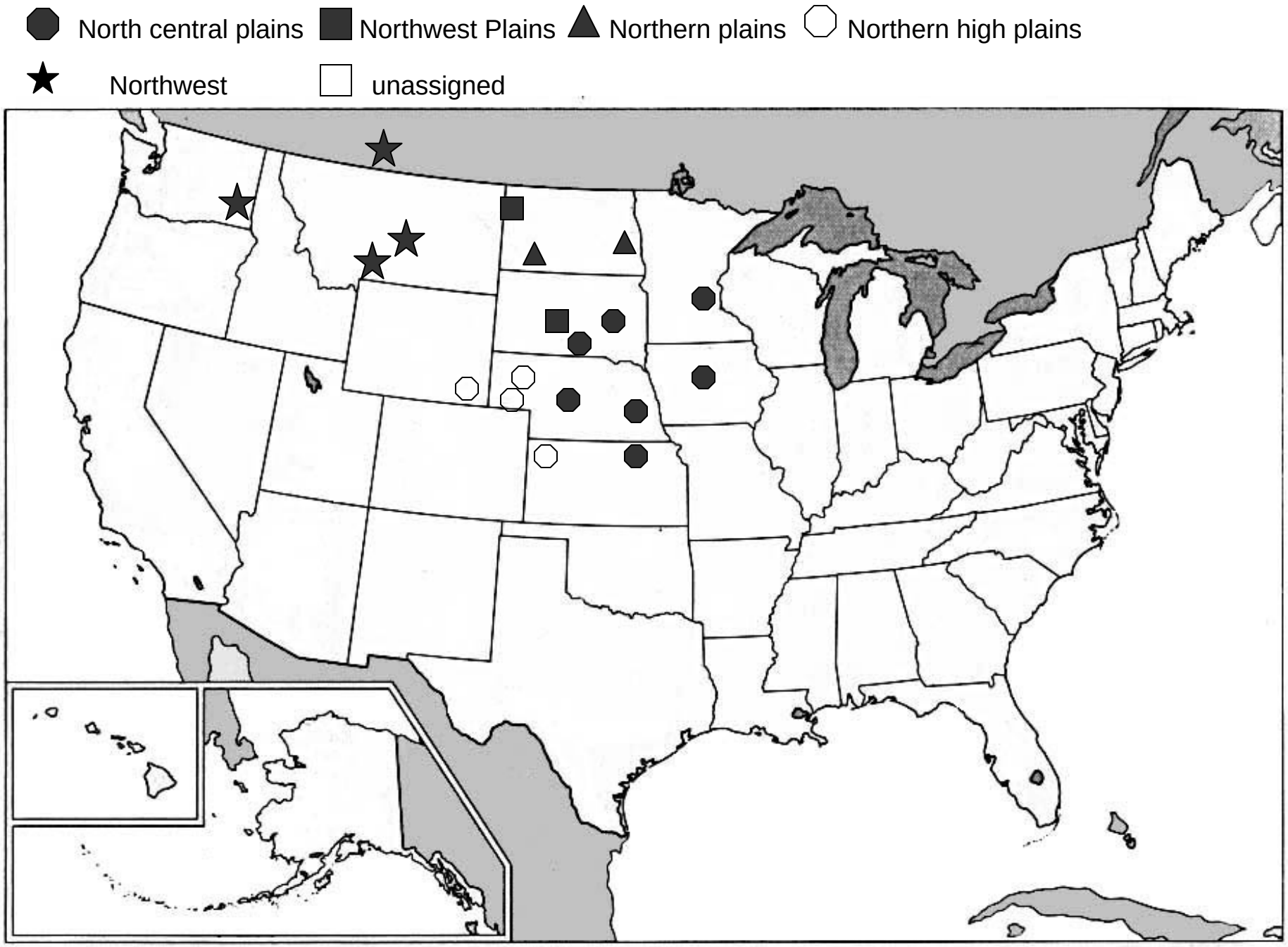

Table 1. Hard Winter Wheat Regional Nursery Program - Contributors

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Table 1. Hard Winter Wheat Regional Nursery Program - Contributors

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Table 2. 2007 Northern Regional Performance Nursery

Entry	Line/selection	Putative market class	Cultivar or pedigree	Source	Protected Traits
1	Kharkof	HRW	Kharkof	check	
2	Harding	HRW	Harding	check	
3	Nuplains	HWW	Nuplains	check	
4	Wesley	HRW	Wesley	check	
5	Jerry	HRW	Roughrider // Winoka / NB66425 /3/ Arapahoe	NDSU	
6	98x0435-15 = Hawken	HRW	W95-091/W96-427	Agripro	
7	BC98334-04-02	HWW	KS920709B-5-2/Stanof//KS920709B5-2	Agripro	
8	BC98334-10W-8W	HWW	KS920709B-5-2/Stanof//KS920709B5-2	Agripro	
9	HV9W98A-1002R	HRW	B1127/3/B1551//ROWDY/RWA 671 MONT	Westbred	
10	HV9W02-846R	HRW	474S10-1/X87807-26//HBK0736-3	Westbred	
11	Millennium-27, ALS-1	HRW	Selection from mutagenized Millennium	UNL	CL
12	NE03458	HRW	NE95544 (=MCVEY 78015/NE88521)/W91-348 X MILLENNIUM (=ARAPAHOE/ABILENE//NE86488)	UNL	
13	NE04490	HRW	NE95589/NE94632(=ABILENE/NORKAN//RAWHIDE) X NE95510(=ABILENE/ARAPAHOE)	UNL	
14	NE04537	HRW	KS92H363-2/CULVER(=NE92419/ARAPAHOE) X NE96605(=ARAPAHOE/RAWHIDE)	UNL	
15	NH03614	HRW	N95L164 X MILLENNIUM SIB//TXGH125888-120*4/FS2	UNL	CL
16	NI05711	HRW	Wesley//NE88584/KSSB-369-7 X NE88584/KSSB-369-7	UNL	
17	NI05714	HRW	KS87W822-2-1/NE88427//NE88584/KSSB-369-7 X NE88584/KSSB-369-7	UNL	
18	NI05720W	HWW	KM 602-90/NE89657//Heyne X Heyne	UNL	
19	NW03681	HWW	WI88-052/WI81-162-610W//N94L189	UNL	
20	N98L20040-44	HRW	CS/PI467024//CS/3/SXLD/4/TAM202/5/SXLD	ARS-LNK	
21	SD96240-3-1	HRWW	NE87513/USSR#67	SDSU	
22	SD98W175-1	HWWW	KS84273BB-10/KSSB110-9//KS831374-141B/YE1110/3/KS82W418/SPN	SDSU	
23	SD05W012	HWWW	NW96S016/SD98W327	SDSU	
24	SD05W018	HWWW	SD98W302/SD98W175	SDSU	
25	SD05W030	HWWW	SD98W302/NW97S186	SDSU	
26	SD05W138	HWWW	SD98416/SD98W331	SDSU	
27	SD05W140	HWWW	SD98153/WENDY	SDSU	
28	SD02804-1	HRWW	Romania42/Tandem//SD94149	SDSU	
29	SD05004	HRWW	ERYT26221/SD94149//SD98208	SDSU	
30	SD05118	HRWW	Wesley/NE93613	SDSU	
31	SD05179	HRWW	SD98224/OK95548-26	SDSU	
32	SD05210	HRWW	SD98444/SD97060	SDSU	
33	BZ9W02-2051	HRWW	Meridian/Ike	Westbred	
34	NX03Y2489	waxy	BaiHuo/Kanto107//Ike/3/KS91H184/3*RBL//N87V106	ARS-LNK	
35	NWX03Y2459	waxy	BaiHuoMai/Ike//KS91H184/3*RBL//N87V106	ARS-LNK	
36	MT0419		Erhardt/KS92H21-4//Pronghorn	MTSU	
37	MTCL0477		MT9409*2/IMIBC303-9(TAM 110's'*4/FS2)//Neeley	MTSU	CL
38	MT0495		MT9640/NB1133	MTSU	

Table 3. Agronomic summary of 38 hard winter wheats entered in the 2007 NRPN.

Entry	Line/selection	Grain yield, kg/ha		Volume weight, kg/hl	Days from 1/1 to heading	Plant height, cm
		mean	rank	mean	mean	mean
1	Kharkof	3047	38	75.1	156	104
2	Harding	3866	21	75.8	155	92
3	Nuplains	3471	34	75.8	155	80
4	Wesley	4043	14	74.7	151	76
5	Jerry	3954	17	75.4	156	93
6	98x0435-15 = Hawken	4069	11	75.6	151	74
7	BC98334-04-02	4120	9	77.3	150	75
8	BC98334-10W-8W	4103	10	76.3	150	70
9	HV9W98A-1002R	3798	25	76.9	149	72
10	HV9W02-846R	4370	1	78.9	151	81
11	Millennium-27, ALS-1	4194	7	78.6	155	84
12	NE03458	3944	18	75.2	152	75
13	NE04490	4061	12	75.5	151	83
14	NE04537	4211	4	75.7	153	84
15	NH03614	4175	8	76.4	152	78
16	NI05711	3928	19	72.8	151	80
17	NI05714	3916	20	76.0	155	83
18	NI05720W	3413	35	73.2	155	79
19	NW03681	4210	5	77.8	152	79
20	N98L20040-44	3619	31	70.8	149	79
21	SD96240-3-1	3854	23	73.7	154	80
22	SD98W175-1	3677	28	76.7	153	89
23	SD05W012	4194	6	75.0	151	82
24	SD05W018	4334	2	76.0	154	83
25	SD05W030	4233	3	76.6	154	83
26	SD05W138	4046	13	76.1	154	79
27	SD05W140	3794	26	76.1	152	90
28	SD02804-1	3591	32	73.0	155	80
29	SD05004	3865	22	76.9	156	87
30	SD05118	4001	16	75.7	150	87
31	SD05179	4008	15	76.8	151	85
32	SD05210	3734	27	76.0	155	88
33	BZ9W02-2051	3673	29	73.4	156	84
34	NX03Y2489	3623	30	71.3	154	85
35	NWX03Y2459	3146	37	71.5	152	82
36	MT0419	3810	24	74.4	156	82
37	MTCL0477	3401	36	71.6	156	86
38	MT0495	3534	33	71.4	156	84
	mean	3869		75.2	153	83
	cv (%)	11.9				
	l.s.d. (0.05)	340				
	n	55				

Table 4. Mean grain yields (kg/ha) and ranks, 2007 NRPN.

		region		Palmer, KS		Goodland, KS		Nebraska State		Lincoln, NE		North Platte, NE		Alliance, NE	
Entry	Line/selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3047	38	2087	33	2039	40	3435	38	4250	21	3407	35	3225	32
2	Harding	3866	21	2478	27	2590	35	4032	28	4523	10	4852	21	3352	30
3	Nuplains	3471	34	1937	34	2952	33	4055	26	4900	4	3428	34	3625	19
4	Wesley	4043	14	2980	12	3098	28	4338	15	4982	2	5358	8	3481	25
5	Jerry	3954	17	2460	28	2386	38	4074	25	4376	16	4410	27	3475	26
6	98x0435-15 = Hawken	4069	11	2373	30	3854	6	4479	10	4391	15	5081	14	4082	6
7	BC98334-04-02	4120	9	2910	14	4024	4	4256	19	3583	35	5618	6	3742	15
8	BC98334-10W-8W	4103	10	2676	20	3028	31	4589	9	3954	30	4996	17	4177	3
9	HV9W98A-1002R	3798	25	2442	29	3871	5	4646	3	4607	8	4811	22	4038	8
10	HV9W02-846R	4370	1	2813	17	3801	7	4833	2	3979	27	6207	1	4268	2
11	Millennium-27, ALS-1	4194	7	3368	3	3114	27	4242	21	4000	26	5082	13	3616	20
12	NE03458	3944	18	1800	37	3551	14	4614	6	4671	7	4925	20	3791	12
13	NE04490	4061	12	3597	2	3053	30	4610	8	4007	25	5881	4	3935	10
14	NE04537	4211	4	2562	24	3429	19	4638	4	4354	18	5998	3	3786	13
15	NH03614	4175	8	2988	11	2972	32	4440	11	3572	36	5463	7	3612	21
16	NI05711	3928	19	2141	32	3511	17	4250	20	4359	17	5035	15	2998	37
17	NI05714	3916	20	2621	21	3744	8	4372	13	4589	9	4662	23	3716	17
18	NI05720W	3413	35	2542	26	2266	39	3726	34	4168	22	3744	33	2933	38
19	NW03681	4210	5	3181	9	3424	20	4277	18	3898	31	5764	5	3459	28
20	N98L20040-44	3619	31	1167	40	3497	18	3886	32	3664	33	4314	29	3698	18
21	SD96240-3-1	3854	23	2936	13	3637	10	3971	29	3664	33	4956	19	3030	36
22	SD98W175-1	3677	28	2302	31	3062	29	4205	23	5021	1	4251	30	3471	27
23	SD05W012	4194	6	3224	7	4889	1	4327	16	3969	28	5121	12	3588	23
24	SD05W018	4334	2	3286	6	4254	2	5029	1	4750	6	6135	2	4125	5
25	SD05W030	4233	3	3728	1	4230	3	4611	7	4489	11	5324	9	4144	4
26	SD05W138	4046	13	2716	19	3623	12	4392	12	4923	3	4590	25	3758	14
27	SD05W140	3794	26	2746	18	3199	25	4227	22	4302	19	5219	11	3521	24
28	SD02804-1	3591	32	2547	25	3173	26	3939	30	4259	20	3175	38	4073	7
29	SD05004	3865	22	3070	10	3560	13	3673	36	2669	38	4329	28	3725	16
30	SD05118	4001	16	3287	5	3634	11	4352	14	3885	32	5241	10	3811	11
31	SD05179	4008	15	2892	16	3209	24	4618	5	4091	23	5010	16	4530	1
32	SD05210	3734	27	2904	15	2553	36	3573	37	3319	37	4991	18	3189	33
33	BZ9W02-2051	3673	29	1651	38	2890	34	4097	24	4066	24	3309	36	3977	9
34	NX03Y2489	3623	30	2593	22	3379	21	4311	17	4774	5	4462	26	3599	22
35	NWX03Y2459	3146	37	2562	23	3525	16	3865	33	3958	29	4649	24	3159	35
36	MT0419	3810	24	3193	8	3343	23	3912	31	4443	12	4187	31	3182	34
37	MTCL0477	3401	36	1573	39	2436	37	3698	35	4409	14	3191	37	3434	29
38	MT0495	3534	33	1888	36	3369	22	4041	27	4432	13	3986	32	3255	31
	mean	3869		2637		3320		4227		4217		4767		3647	
	cv (%)	11.9		10.3		23.2		14.2		20.4		9.2		9.8	
	l.s.d. (0.05)	340		458		1269		756		1405		713		586	
	n	55		3		3		12		3		3		3	

Table 4. Mean grain yields (kg/ha) and ranks, 2007 NRPN.

		region		Sidney, NE		South Dakota State		Brookings, SD		Winner, SD		Dakota Lakes, SD	
Entry	Line/selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3047	38	2856	37	2445	32	2393	36	2585	33	2356	26
2	Harding	3866	21	3403	36	3510	9	4019	8	3620	12	3061	10
3	Nuplains	3471	34	4269	21	2200	35	2434	35	2408	36	1536	37
4	Wesley	4043	14	3530	35	3425	13	3374	25	3708	10	3192	7
5	Jerry	3954	17	4036	27	3295	17	3837	13	3127	27	2922	16
6	98x0435-15 = Hawken	4069	11	4363	18	3456	11	3785	14	3810	7	2772	18
7	BC98334-04-02	4120	9	4079	24	3646	6	3696	17	3799	8	3443	3
8	BC98334-10W-8W	4103	10	5070	5	3939	2	4212	4	4092	3	3605	2
9	HV9W98A-1002R	3798	25	5128	1	2886	28	2453	34	3254	23	2981	12
10	HV9W02-846R	4370	1	4877	7	3373	15	2981	30	4269	1	3168	8
11	Millennium-27, ALS-1	4194	7	4270	20	3806	4	4235	3	3910	6	3273	5
12	NE03458	3944	18	5072	4	3013	26	3419	22	3218	25	2401	25
13	NE04490	4061	12	4616	10	3347	16	3668	19	3434	20	2939	14
14	NE04537	4211	4	4415	16	3556	8	3933	11	3724	9	3010	11
15	NH03614	4175	8	5111	2	3727	5	3964	9	3965	5	3252	6
16	NI05711	3928	19	4608	11	3047	24	3404	24	3138	26	2628	23
17	NI05714	3916	20	4521	12	3170	21	4249	2	3448	17	2173	30
18	NI05720W	3413	35	4061	26	2615	31	3156	28	2523	35	1943	31
19	NW03681	4210	5	3987	28	4048	1	4288	1	4031	4	3824	1
20	N98L20040-44	3619	31	3862	31	2693	30	2895	32	2996	28	2188	29
21	SD96240-3-1	3854	23	4232	23	3177	20	3297	27	3542	14	2692	21
22	SD98W175-1	3677	28	4074	25	2994	27	3519	20	3250	24	2212	28
23	SD05W012	4194	6	4630	9	3854	3	3950	10	4180	2	3432	4
24	SD05W018	4334	2	5108	3	3443	12	4049	7	3579	13	2700	20
25	SD05W030	4233	3	4487	14	3169	22	3428	21	3441	18	2725	19
26	SD05W138	4046	13	4298	19	3236	19	3918	12	3502	16	2288	27
27	SD05W140	3794	26	3867	30	3565	7	4154	5	3396	21	2935	15
28	SD02804-1	3591	32	4247	22	2435	33	2700	33	2725	31	1879	34
29	SD05004	3865	22	3971	29	3131	23	3333	26	3438	19	2622	24
30	SD05118	4001	16	4473	15	3495	10	4057	6	3523	15	3093	9
31	SD05179	4008	15	4840	8	3392	14	3780	15	3634	11	2892	17
32	SD05210	3734	27	2793	38	3240	18	3408	23	3357	22	2957	13
33	BZ9W02-2051	3673	29	5038	6	2351	34	2980	31	2526	34	1758	35
34	NX03Y2489	3623	30	4410	17	2821	29	3681	18	2879	29	1903	33
35	NWX03Y2459	3146	37	3697	34	1865	38	3122	29	2595	32	121	38
36	MT0419	3810	24	3835	32	3040	25	3715	16	2768	30	2638	22
37	MTCL0477	3401	36	3759	33	2101	37	2306	38	2261	37	1737	36
38	MT0495	3534	33	4493	13	2162	36	2354	37	2221	38	1912	32
	mean	3869		4273		3123		3477		3313		2610	
	cv (%)	11.9		14.4		9.5		10.0		12.6		5.9	
	l.s.d. (0.05)	340		1008		575		563		539		321	
	n	55		3		9		3		3		3	

Table 4. Mean grain yields (kg/ha) and ranks, 2007 NRPN.

		region		Ames, IA		Rosemount, MN		North Dakota State		Williston, ND		Hettinger, ND		Prosper, ND	
Entry	Line/selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3047	38	2549	23	3580	25	3546	36	3843	36	4149	11	2546	33
2	Harding	3866	21	2875	9	3773	22	4583	6	4663	17	4039	27	4910	2
3	Nuplains	3471	34	1453	37	3558	28	3624	34	4460	26	4237	3	2329	36
4	Wesley	4043	14	3268	2	4376	8	4011	28	4589	21	4004	34	3439	25
5	Jerry	3954	17	3016	7	5304	1	4623	3	4947	6	4055	25	4725	4
6	98x0435-15 = Hawken	4069	11	2747	13	3681	24	4361	12	4660	18	4134	14	4233	13
7	BC98334-04-02	4120	9	1997	33	4315	9	4493	10	4846	14	4228	4	4338	10
8	BC98334-10W-8W	4103	10	1866	35	3930	16	4328	13	4648	19	4057	24	4212	14
9	HV9W98A-1002R	3798	25	1076	38	3712	23	3475	37	4031	35	4170	9	2398	35
10	HV9W02-846R	4370	1	2687	16	4936	3	4189	18	4923	8	4185	6	3214	29
11	Millennium-27, ALS-1	4194	7	3104	5	4378	7	4702	1	4983	2	4295	1	4725	5
12	NE03458	3944	18	2128	32	3560	27	4103	22	4889	11	4091	21	3066	32
13	NE04490	4061	12	3137	4	3569	26	4102	24	4453	28	4134	15	3726	21
14	NE04537	4211	4	2532	25	4035	13	4516	8	4563	22	4107	19	4776	3
15	NH03614	4175	8	3009	8	4553	5	4304	15	4885	13	4145	12	3843	19
16	NI05711	3928	19	2179	29	4663	4	3850	30	4229	31	3916	36	3280	28
17	NI05714	3916	20	2636	18	2457	37	4206	17	4216	32	4131	16	4252	12
18	NI05720W	3413	35	2609	20	2506	36	3626	33	3586	37	3880	37	3477	23
19	NW03681	4210	5	3396	1	4119	12	4598	4	4958	4	4288	2	4471	9
20	N98L20040-44	3619	31	1678	36	4277	10	3662	31	4458	27	3820	38	2442	34
21	SD96240-3-1	3854	23	2737	14	4136	11	4148	20	4910	10	4033	29	3471	24
22	SD98W175-1	3677	28	2542	24	3555	29	4118	21	4369	29	4217	5	3792	20
23	SD05W012	4194	6	2653	17	4026	14	4506	9	4888	12	3952	35	4550	8
24	SD05W018	4334	2	2710	15	3853	18	4547	7	5062	1	4174	7	4313	11
25	SD05W030	4233	3	3157	3	4483	6	4591	5	4941	7	4145	12	4570	7
26	SD05W138	4046	13	2155	31	5252	2	4173	19	4967	3	4172	8	3378	27
27	SD05W140	3794	26	2754	12	3802	20	4384	11	4252	30	4170	9	4676	6
28	SD02804-1	3591	32	2169	30	3405	31	4102	23	4626	20	4044	26	3622	22
29	SD05004	3865	22	2633	19	3934	15	4311	14	4803	16	4064	22	4004	17
30	SD05118	4001	16	2794	10	3788	21	4066	25	4145	33	4033	28	4013	16
31	SD05179	4008	15	3053	6	3818	19	4005	29	4537	24	4102	20	3401	26
32	SD05210	3734	27	2757	11	3857	17	4639	2	4817	15	4109	18	4931	1
33	BZ9W02-2051	3673	29	2609	20	2643	35	4031	26	4955	5	4022	32	3114	31
34	NX03Y2489	3623	30	2461	26	2737	34	4019	27	4063	34	4008	33	3984	18
35	NWX03Y2459	3146	37	1896	34	1325	38	3137	38	2423	38	4120	17	3114	30
36	MT0419	3810	24	2552	22	3414	30	4240	16	4491	25	4060	23	4123	15
37	MTCL0477	3401	36	2199	28	3387	32	3546	35	4550	23	4033	29	2177	37
38	MT0495	3534	33	2283	27	3125	33	3657	32	4910	9	4031	31	2124	38
	mean	3869		2528		3785		4135		4541		4093		3730	
	cv (%)	11.9		13.8		16.8		6.9		5.4		2.6		10.6	
	l.s.d. (0.05)	340		700		1040		872		355		174		649	
	n	55		2		3		10		4		3		3	

Table 4. Mean grain yields (kg/ha) and ranks, 2007 NRPN.

		region		Montana State		Moccasin, MT		Bozeman, MT		Pine Bluff, WY		Pullman, WA		Lethbridge, Alberta (excluded from regional means due to missing data)	
Entry	Line/selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3047	38	4388	38	3419	38	5358	38	971	35	2810	38	3368	35
2	Harding	3866	21	5643	32	4277	33	7010	31	1540	11	3716	33	5578	16
3	Nuplains	3471	34	6366	17	5360	15	7373	22	1493	16	3461	35	5183	28
4	Wesley	4043	14	6709	5	5476	10	7942	5	1553	10	4193	24	5121	31
5	Jerry	3954	17	5967	27	4521	32	7413	21	984	34	4282	22	5401	22
6	98x0435-15 = Hawken	4069	11	6538	12	5736	4	7339	23	1107	33	4403	19	5392	23
7	BC98334-04-02	4120	9	6471	13	5777	2	7164	26	1614	8	3966	32	5018	33
8	BC98334-10W-8W	4103	10	5922	29	5458	12	6387	34	1540	11	4704	10	5296	26
9	HV9W98A-1002R	3798	25	6372	16	5228	19	7516	16	1636	6	4225	23	5544	18
10	HV9W02-846R	4370	1	7072	1	5784	1	8361	1	2098	1	5338	1	6905	1
11	Millennium-27, ALS-1	4194	7	6539	11	5562	7	7516	16	1215	26	4039	30		
12	NE03458	3944	18	6626	7	5387	13	7866	7	1643	5	4593	13	5823	14
13	NE04490	4061	12	6350	19	5678	5	7021	30	1258	22	4663	11	5284	27
14	NE04537	4211	4	6587	9	5382	14	7792	8	1627	7	4910	4	6234	9
15	NH03614	4175	8	6749	4	5299	17	8198	2	1249	23	4746	9	6428	3
16	NI05711	3928	19	6825	2	5761	3	7888	6	1497	15	4514	15	6054	12
17	NI05714	3916	20	6252	20	5044	22	7460	19	1143	30	4907	5	6268	7
18	NI05720W	3413	35	5482	36	3847	37	7117	27	1802	3	4441	17	6152	10
19	NW03681	4210	5	5995	26	4952	25	7039	29	1728	4	4325	20	5413	21
20	N98L20040-44	3619	31	6658	6	5566	6	7749	10	1831	2	4189	25		
21	SD96240-3-1	3854	23	6375	15	5024	23	7727	11	746	39	4011	31	5677	15
22	SD98W175-1	3677	28	5591	33	4669	29	6512	33	673	40	4050	29	5156	30
23	SD05W012	4194	6	6178	22	5176	20	7180	25	899	38	4575	14	6239	8
24	SD05W018	4334	2	6551	10	5465	11	7637	14	1421	19	4613	12	6353	6
25	SD05W030	4233	3	6165	24	4873	27	7456	20	937	37	4781	7	6675	2
26	SD05W138	4046	13	6354	18	4934	26	7774	9	962	36	4895	6	6113	11
27	SD05W140	3794	26	4944	37	4194	36	5694	37	1177	27	3150	36	4544	34
28	SD02804-1	3591	32	5873	31	4232	34	7514	18	1323	21	4091	26	5870	13
29	SD05004	3865	22	6153	25	4622	30	7684	12	1219	25	5110	3	6408	4
30	SD05118	4001	16	5916	30	4589	31	7243	24	1502	14	4480	16	5513	19
31	SD05179	4008	15	6197	21	5306	16	7088	28	1533	13	4053	28	6365	5
32	SD05210	3734	27	5497	35	4226	35	6768	32	1569	9	4055	27	5388	24
33	BZ9W02-2051	3673	29	6793	3	5526	9	8061	3	1392	20	4771	8	5562	17
34	NX03Y2489	3623	30	5499	34	4970	24	6028	36	1163	29	3474	34	5079	32
35	NWX03Y2459	3146	37	5926	28	5537	8	6315	35	1121	32	3047	37	5370	25
36	MT0419	3810	24	6172	23	4701	28	7644	13	1237	24	4311	21		
37	MTCL0477	3401	36	6406	14	5176	20	7635	15	1437	18	5137	2		
38	MT0495	3534	33	6613	8	5234	18	7992	4	1170	28	4426	18		
	mean	3869		6177		5052		7302		1342		4301		5660	
	cv (%)	11.9		7.1		7.6		6.6		31.1		9.2		10.1	
	l.s.d. (0.05)	340		885		626		790.0		680		644		928	
	n	55		6		3		3		3		3		3	

Table 5. Summary of mean yields of 30 wheats grown in the 2007 NRPN for regional production zones (Peterson, 1992, Crop Science 32: 907).

		region		North Central Plains		Northern High Plains		Northern Plains		Northwest Plains		Northwest	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3047	38	2966	31	2706	38	3348	33	3304	36	3862	38
2	Harding	3866	21	3676	16	3115	35	4537	2	4216	14	5001	34
3	Nuplains	3471	34	2881	35	3615	27	3147	35	3580	33	5398	29
4	Wesley	4043	14	3966	4	3370	32	3681	27	4211	15	5871	10
5	Jerry	3954	17	3798	11	3299	33	4438	6	4167	19	5405	28
6	98x0435-15 = Hawken	4069	11	3587	19	4100	9	4190	13	4296	12	5826	13
7	BC98334-04-02	4120	9	3734	15	3948	13	4291	9	4398	8	5636	21
8	BC98334-10W-8W	4103	10	3665	18	4190	7	4146	14	4410	7	5516	24
9	HV9W98A-1002R	3798	25	3273	27	4346	3	3157	34	3698	32	5656	20
10	HV9W02-846R	4370	1	3881	6	4315	4	3699	26	4705	1	6494	1
11	Millennium-27, ALS-1	4194	7	3961	5	3667	23	4541	1	4523	4	5706	18
12	NE03458	3944	18	3329	26	4138	8	3578	30	4173	18	5949	7
13	NE04490	4061	12	3863	8	3868	17	3901	21	4016	21	5787	16
14	NE04537	4211	4	3837	9	3877	16	4489	4	4204	16	6028	5
15	NH03614	4175	8	3870	7	3898	14	3972	20	4491	5	6248	2
16	NI05711	3928	19	3552	20	3706	21	3598	29	3865	27	6055	4
17	NI05714	3916	20	3330	25	3994	10	4201	12	3887	24	5804	15
18	NI05720W	3413	35	3024	30	3087	36	3650	28	3130	37	5135	31
19	NW03681	4210	5	4100	1	3623	26	4393	7	4561	3	5439	26
20	N98L20040-44	3619	31	2944	32	3663	24	3131	36	3831	28	5835	12
21	SD96240-3-1	3854	23	3526	21	3633	25	3712	24	4324	10	5587	22
22	SD98W175-1	3677	28	3383	24	3536	28	3974	19	3890	23	5077	32
23	SD05W012	4194	6	3824	10	4369	2	4251	11	4584	2	5777	17
24	SD05W018	4334	2	3987	2	4495	1	4253	10	4427	6	5905	8
25	SD05W030	4233	3	3969	3	4287	5	4357	8	4298	11	5704	19
26	SD05W138	4046	13	3769	13	3893	15	3718	23	4339	9	5868	11
27	SD05W140	3794	26	3792	12	3529	29	4459	5	3885	25	4346	37
28	SD02804-1	3591	32	2912	33	3831	18	3803	22	3811	29	5279	30
29	SD05004	3865	22	3257	29	3752	20	4030	16	4218	13	5806	14
30	SD05118	4001	16	3767	14	3973	11	4021	17	3878	26	5437	27
31	SD05179	4008	15	3672	17	4193	6	3702	25	4150	20	5482	25
32	SD05210	3734	27	3472	23	2845	37	4520	3	4191	17	5016	33
33	BZ9W02-2051	3673	29	2708	37	3968	12	3503	32	3914	22	6119	3
34	NX03Y2489	3623	30	3269	28	3796	19	3994	18	3556	35	4824	36
35	NWX03Y2459	3146	37	2550	38	3460	30	3545	31	2481	38	4966	35
36	MT0419	3810	24	3494	22	3454	31	4096	15	3753	31	5552	23
37	MTCL0477	3401	36	2710	36	3210	34	2972	37	3569	34	5983	6
38	MT0495	3534	33	2883	34	3706	22	2941	38	3758	30	5884	9
	mean	3869		3478		3749		3893		4018		5560	
	cv (%)	11.9		14.8		16.3		7.7		5.6		7.6	
	l.s.d. (0.05)	340		569		615		972		771		659	
	n	55		20		9		7		7		9	

Table 6. Summary of mean volume weights (kg/hl), 2007 NRPN.

Entry	Line or selection	region	Palmer, KS	Goodland, KS	North Platte, NE	Sidney, NE	Alliance, NE	Dakota Lakes, SD	Winner, SD	Brookings, SD	Prosper, ND	Williston, ND
1	Kharkof	76.3	76.5	70.3	75.3	75.3	78.2	74.0	77.4	78.3	73.8	79.4
2	Harding	76.2	74.0	76.3	72.6	74.0	77.9	71.5	76.0	79.1	75.8	78.1
3	Nuplains	76.8	73.0	74.1	71.4	78.4	79.8	66.8	72.0	74.6	73.5	80.8
4	Wesley	75.2	72.6	74.8	67.2	71.9	75.9	70.7	72.3	75.4	69.4	78.2
5	Jerry	75.9	73.3	75.3	73.6	74.0	75.2	70.0	75.0	78.6	72.6	77.5
6	98x0435-15 = Hawken	75.8	72.4	75.9	71.8	74.9	78.0	71.1	72.4	78.5	72.3	78.3
7	BC98334-04-02	77.5	74.0	75.0	73.6	75.5	76.8	69.3	76.6	79.1	71.4	78.1
8	BC98334-10W-8W	76.7	75.5	73.7	69.2	74.2	76.3	73.7	77.0	78.5	71.9	78.9
9	HV9W98A-1002R	77.9	76.9	78.1	76.3	77.3	80.3	70.1	73.9	75.9	73.4	80.9
10	HV9W02-846R	79.4	76.1	77.1	81.4	78.4	79.9	74.2	75.2	81.5	73.6	80.8
11	Millennium-27, ALS-1	79.2	78.9	77.1	71.2	77.3	78.8	75.6	78.2	81.1	75.2	80.8
12	NE03458	75.8	70.4	73.7	73.6	76.7	78.0	65.3	71.1	72.0	69.6	78.4
13	NE04490	76.2	75.1	74.5	68.7	72.8	75.7	68.1	74.9	76.9	71.9	79.6
14	NE04537	76.2	74.4	76.6	70.4	74.3	75.9	70.8	74.5	78.1	74.0	78.0
15	NH03614	77.0	74.0	72.2	72.6	76.0	77.7	69.6	75.4	77.9	72.4	79.4
16	NI05711	73.3	71.9	72.6	64.9	72.2	74.3	64.4	71.1	73.8	70.6	76.1
17	NI05714	76.7	73.3	76.3	73.1	77.1	78.9	69.6	71.5	78.1	73.3	78.5
18	NI05720W	74.0	73.0	70.6	68.4	75.5	77.3	60.2	68.3	74.4	70.1	77.7
19	NW03681	77.7	75.9	76.9	77.6	40.6	79.4	77.1	79.8	81.0	75.3	80.8
20	N98L20040-44	71.5	72.2	68.9	65.7	71.5	75.3	58.5	67.1	71.2	66.0	74.8
21	SD96240-3-1	74.1	71.6	73.1	67.4	74.3	73.2	66.7	73.1	75.6	69.6	76.9
22	SD98W175-1	77.3	75.1	78.3	74.3	76.1	80.3	72.2	72.6	78.7	75.3	80.2
23	SD05W012	75.3	73.7	77.6	72.1	73.4	75.9	74.2	75.1	75.9	72.8	76.5
24	SD05W018	76.5	75.5	75.1	74.1	75.9	77.1	71.4	72.6	78.1	74.5	79.1
25	SD05W030	77.0	75.9	76.8	68.2	77.1	78.7	68.0	73.1	76.5	72.8	80.1
26	SD05W138	76.9	75.5	79.2	69.7	78.6	79.4	73.5	75.7	79.2	71.6	79.6
27	SD05W140	77.0	76.5	79.9	82.8	78.0	78.2	74.9	74.6	80.1	75.1	79.4
28	SD02804-1	73.9	76.9	73.1	64.5	71.6	74.7	60.6	70.2	73.5	70.5	79.0
29	SD05004	77.6	77.5	78.3	70.9	77.8	77.6	69.7	74.3	76.1	71.4	79.8
30	SD05118	76.3	77.5	75.8	70.9	74.0	76.5	70.8	75.1	79.0	73.9	78.3
31	SD05179	77.4	74.7	75.0	73.3	76.6	80.4	74.6	75.0	78.8	73.9	79.8
32	SD05210	76.3	74.7	73.4	68.4	73.9	76.0	71.4	75.5	78.6	75.5	79.0
33	BZ9W02-2051	74.5	71.6	73.3	67.9	76.7	78.4	64.5	68.5	76.3	69.0	78.7
34	NX03Y2489	72.3	68.0	74.9	66.4	75.1	73.9	66.2	60.5	76.4	68.9	76.4
35	NWX03Y2459	72.2	72.2	76.6	68.7	75.7	37.0	67.9		80.0	70.5	77.5
36	MT0419	75.1	74.0	73.4	73.6	75.5	74.6	65.7	72.7	77.9	72.7	77.4
37	MTCL0477	72.6	69.4	70.7	66.2	72.8	76.9	64.1	69.8	69.6	66.4	75.3
38	MT0495	71.7	65.5	73.1	68.9	70.3	74.9	53.6	66.6	65.4	65.1	75.0
	mean	75.8	73.9	74.9	71.2	74.2	76.1	69.0	73.1	76.8	72.0	78.5

Table 6. Summary of mean volume weights (kg/hl), 2007 NRPN.

Entry	Line or selection	region	Hettinger, ND	Moccasin, MT	Bozeman, MT	Ames, IA	Rosemount, MN	Pine Bluff, WY	Pullman, WA
1	Kharkof	76.3	56.2	79.3	80.5	79.7	89.8		
2	Harding	76.2	67.9	77.5	78.9	77.3	86.0	74.2	78.7
3	Nuplains	76.8	69.5	82.4	83.0	77.9	88.8	80.4	79.2
4	Wesley	75.2	70.0	80.5	81.4	77.3	84.5	77.8	78.6
5	Jerry	75.9	71.9	76.0	78.6	77.2	86.6		78.6
6	98x0435-15 = Hawken	75.8	67.3	82.0	82.0	79.0	81.2	71.5	79.9
7	BC98334-04-02	77.5	91.6	81.2	80.6	74.9	82.8	79.9	77.4
8	BC98334-10W-8W	76.7	71.3	82.7	82.2	75.9	83.9	80.5	79.2
9	HV9W98A-1002R	77.9	68.2	83.2	82.0	79.9	87.9	79.9	80.2
10	HV9W02-846R	79.4	80.2	80.5	82.1	80.5	88.8	80.2	78.7
11	Millennium-27, ALS-1	79.2	78.5	81.3	81.7	79.1	88.3	82.9	79.9
12	NE03458	75.8	77.9	80.2	81.4	76.7	85.8	77.1	80.7
13	NE04490	76.2	67.3	81.4	82.4	79.5	82.4	83.3	81.1
14	NE04537	76.2	64.6	80.1	80.6	78.0	84.3	81.1	79.4
15	NH03614	77.0	78.5	80.8	81.2	77.9	85.8	78.6	78.8
16	NI05711	73.3	65.2	79.8	80.6	75.4	81.4	74.7	76.5
17	NI05714	76.7	68.0	81.0	81.4	77.3	85.4	80.0	80.6
18	NI05720W	74.0	63.9	79.9	80.4	76.7	83.1	80.2	78.3
19	NW03681	77.7	80.6	82.5	82.0	80.4	89.0	82.7	79.9
20	N98L20040-44	71.5	63.2	76.8	78.9	74.0	78.0	78.0	75.4
21	SD96240-3-1	74.1	72.0	78.4	79.2	76.6	82.0		76.5
22	SD98W175-1	77.3	66.9	80.9	82.6	78.6	86.0		78.4
23	SD05W012	75.3	66.0	78.0	79.3	75.8	81.8		77.2
24	SD05W018	76.5	65.0	81.0	81.9	77.1	82.4	79.7	79.7
25	SD05W030	77.0	79.9	80.8	82.0	78.0	85.8		79.0
26	SD05W138	76.9	58.7	82.6	82.4	76.2	88.3		80.2
27	SD05W140	77.0	50.0	80.6	81.1	77.7	86.9	77.0	
28	SD02804-1	73.9	65.1	79.5	81.5	76.4	83.7	77.9	78.5
29	SD05004	77.6	80.3	79.9	81.2	77.0	85.8	80.6	80.6
30	SD05118	76.3	62.5	78.9	80.9	78.8	83.7	80.9	78.9
31	SD05179	77.4	66.3	80.9	81.8	79.3	85.6	81.5	78.6
32	SD05210	76.3	72.8	79.5	79.9	77.5	84.5	76.4	79.6
33	BZ9W02-2051	74.5	59.4	79.9	82.0	75.9	85.2	79.5	79.8
34	NX03Y2489	72.3	57.1	78.4	78.8	74.3	84.5	77.7	
35	NWX03Y2459	72.2	53.3	81.8	81.5	77.1	82.4	80.9	
36	MT0419	75.1	65.0	79.3	79.7	77.0	82.4	77.7	78.8
37	MTCL0477	72.6	61.9	77.3	78.6	75.2	82.4	79.2	78.4
38	MT0495	71.7	78.4	76.5	78.2	73.1	78.4	78.8	77.6
	mean	75.8	68.5	80.1	80.9	77.3	84.6	79.0	78.9

Table 7. Summary of mean plant heights (cm) of 38 wheats grown in the 2007 NRPN.

Entry	Line or selection	region	Lincoln, NE	North Platte, NE	Sidney, NE	Alliance, NE	Williston, ND	Hettinger, ND	Moccasin, MT	Bozeman, MT	Ames, IA	Rosemount, MN	Pine Bluff, WY	Pullman, WA
1	Kharkof	102	96	119	76	81	107	118	127	131	92	101	50	122
2	Harding	92	88	112	91	69	93	95	113	113	76	95	52	101
3	Nuplains	80	91	91	99	64	76	79	104	91	63	79	46	80
4	Wesley	77	94	91	84	64	67	72	92	83	66	75	49	85
5	Jerry	92	87	114	89	74	90	100	119	116	77	94	44	105
6	98x0435-15 = Hawken	75	97	86	81	66	70	73	86	80	57	75	46	78
7	BC98334-04-02	74	96	81	79	66	69	72	91	86	54	71	47	80
8	BC98334-10W-8W	70	86	74	84	58	67	59	86	79	53	66	44	79
9	HV9W98A-1002R	73	93	86	84	64	62	69	92	83	58	62	48	77
10	HV9W02-846R	80	80	91	76	64	75	84	106	99	66	80	50	89
11	Millennium-27, ALS-1	85	91	102	94	66	82	88	103	101	73	81	47	85
12	NE03458	75	93	89	79	64	72	71	90	85	61	68	47	82
13	NE04490	83	82	99	86	71	80	85	100	98	67	77	52	98
14	NE04537	85	80	97	107	71	78	84	101	100	68	81	51	98
15	NH03614	78	95	91	94	56	75	74	97	92	58	73	47	82
16	NI05711	80	92	97	94	58	70	75	100	90	68	82	50	85
17	NI05714	83	99	99	102	56	81	81	104	96	66	74	46	93
18	NI05720W	80	77	102	89	61	75	78	98	95	72	73	50	92
19	NW03681	79	81	91	86	58	73	77	95	91	70	79	51	89
20	N98L20040-44	78	90	79	91	64	73	75	99	97	59	79	46	85
21	SD96240-3-1	80	88	99	81	61	80	80	100	93	68	81	41	88
22	SD98W175-1	88	95	97	79	74	85	92	115	109	77	90	43	97
23	SD05W012	83	100	91	97	71	75	82	95	97	68	82	45	89
24	SD05W018	83	86	97	84	74	82	81	99	99	72	84	49	91
25	SD05W030	84	88	102	89	74	79	83	100	96	74	80	47	93
26	SD05W138	79	97	94	86	61	74	73	98	87	63	76	41	93
27	SD05W140	89	94	104	86	79	86	89	108	112	72	90	52	100
28	SD02804-1	79	82	89	84	69	79	75	96	95	67	84	43	91
29	SD05004	87	97	99	91	74	82	88	105	107	73	86	44	101
30	SD05118	87	88	99	84	81	80	88	104	101	74	91	52	97
31	SD05179	85	86	99	91	74	81	83	104	104	73	85	48	95
32	SD05210	88	101	102	89	71	81	91	106	103	73	88	51	97
33	BZ9W02-2051	85	83	99	99	71	83	86	103	103	76	78	47	93
34	NX03Y2489	85	94	97	91	74	82	84	104	103	71	79	46	94
35	NWX03Y2459	81	87	94	81	71	81	84	104	97	63	75	46	92
36	MT0419	83	85	94	99	69	81	78	108	97	64	80	45	91
37	MTCL0477	86	85	102	86	66	82	93	104	103	76	86	50	98
38	MT0495	84	85	97	97	66	82	85	104	99	74	84	47	92
	mean	82	90	96	88	68	79	82	102	98	68	81	47	92

Table 8. Summary of days (from 1/1) to heading for 38 wheats grown in the 2007 NRPN.

Entry	Line or selection	region	Lincoln, NE	Brookings, SD	Winner, SD	Williston, ND	Hettinger, ND	Moccasin, MT	Bozeman, MT	Ames, IA	Rosemount, MN	Pine Bluff, WY	Pullman, WA
1	Kharkof	156	139	157	147	158	161	162	164	152	155	164	153
2	Harding	154	138	155	147	156	162	161	161	151	152	164	153
3	Nuplains	155	138	155	147	158	161	161	162	152	153	162	153
4	Wesley	151	139	150	143	153	158	156	156	148	149	159	147
5	Jerry	156	139	154	148	157	162	164	164	152	153	165	154
6	98x0435-15 = Hawken	150	139	150	144	154	158	156	155	148	150	156	146
7	BC98334-04-02	149	141	147	140	153	156	156	155	145	145	156	144
8	BC98334-10W-8W	149	139	148	142	153	158	155	157	143	145	155	143
9	HV9W98A-1002R	149	138	147	143	149	157	156	155	140	144	159	145
10	HV9W02-846R	150	136	149	143	153	157	158	158	145	145	159	146
11	Millennium-27, ALS-1	154	138	152	147	156	162	162	162	150	151	162	152
12	NE03458	151	138	146	145	154	158	158	159	147	150	161	148
13	NE04490	150	139	147	140	154	158	158	158	143	148	158	146
14	NE04537	151	136	147	140	155	161	160	160	149	149	159	148
15	NH03614	151	140	147	144	153	160	159	159	145	147	160	149
16	NI05711	150	138	147	144	153	158	157	157	147	148	159	147
17	NI05714	154	139	149	146	157	160	161	160	152	151	162	151
18	NI05720W	154	138	152	146	160	162	161	161	152	153	162	151
19	NW03681	151	139	147	145	153	157	157	158	146	150	160	149
20	N98L20040-44	149	139	147	141	149	156	156	155	148	142	155	146
21	SD96240-3-1	154	140	154	147	155	160	160	160	150	150	163	152
22	SD98W175-1	152	138	148	147	155	158	159	159	151	151	162	149
23	SD05W012	151	139	148	144	153	156	158	156	148	148	160	146
24	SD05W018	153	137	153	146	157	161	160	160	150	151	161	151
25	SD05W030	153	138	153	147	157	158	160	160	150	152	161	150
26	SD05W138	153	138	154	147	156	158	160	160	151	149	162	149
27	SD05W140	151	139	152	145	154	156	158	158	146	150	160	148
28	SD02804-1	155	137	155	147	157	160	162	162	152	154	164	153
29	SD05004	155	142	157	147	157	160	162	162	153	152	163	152
30	SD05118	150	138	149	141	152	158	159	155	144	149	154	146
31	SD05179	150	137	148	144	153	159	158	158	145	147	159	146
32	SD05210	154	139	153	146	156	159	161	161	153	151	162	153
33	BZ9W02-2051	156	137	155	148	158	161	163	163	152	157	164	154
34	NX03Y2489	154	138	151	147	156	161	160	158	153	153	163	150
35	NWX03Y2459	152	137	146		155	160	159	156	147	150	160	146
36	MT0419	155	137	153	148	159	162	160	164	155	152	164	154
37	MTCL0477	155	138	154	148	159	162	162	163	151	153	162	153
38	MT0495	155	138	154	148	156	162	165	163	151	155	164	153
	mean	152	138	151	145	155	159	159	159	149	150	161	149

Table 9. Stability analyses, grain yield and volume weights, of 38 wheats grown in the 2007 NRPN.

		grain yield			volume weight		
Entry	Line or selection	regional average (kg/ha)	regression coef. (b)	r^2	regional average (kg/hl)	regression coef. (b)	r^2
1	Kharkof	3047	0.69	0.75	76.3	1.25	0.63
2	Harding	3866	0.86	0.83	76.2	0.79	0.75
3	Nuplains	3471	1.13	0.85	76.8	1.22	0.90
4	Wesley	4043	1.02	0.90	75.2	1.04	0.91
5	Jerry	3954	1.00	0.83	75.9	0.79	0.82
6	98x0435-15 = Hawken	4069	1.04	0.96	75.8	0.87	0.72
7	BC98334-04-02	4120	0.96	0.88	77.5	0.87	0.90
8	BC98334-10W-8W	4103	0.87	0.84	76.7	0.88	0.82
9	HV9W98A-1002R	3798	1.08	0.83	77.9	1.06	0.89
10	HV9W02-846R	4370	1.12	0.88	79.4	0.57	0.48
11	Millennium-27, ALS-1	4194	0.97	0.91	79.2	0.70	0.68
12	NE03458	3944	1.16	0.94	75.8	0.90	0.59
13	NE04490	4061	0.96	0.90	76.2	1.15	0.89
14	NE04537	4211	1.07	0.94	76.2	1.04	0.91
15	NH03614	4175	1.09	0.92	77.0	0.76	0.67
16	NI05711	3928	1.15	0.94	73.3	1.14	0.93
17	NI05714	3916	1.04	0.89	76.7	1.03	0.94
18	NI05720W	3413	0.89	0.84	74.0	1.37	0.89
19	NW03681	4210	0.82	0.86	77.7	0.76	0.99
20	N98L20040-44	3619	1.14	0.87	71.5	1.23	0.85
21	SD96240-3-1	3854	1.08	0.95	74.1	0.88	0.85
22	SD98W175-1	3677	0.96	0.92	77.3	0.98	0.88
23	SD05W012	4194	0.93	0.86	75.3	0.70	0.76
24	SD05W018	4334	1.07	0.94	76.5	0.93	0.87
25	SD05W030	4233	0.99	0.91	77.0	0.84	0.61
26	SD05W138	4046	1.13	0.91	76.9	1.33	0.77
27	SD05W140	3794	0.71	0.76	77.0	1.14	0.41
28	SD02804-1	3591	1.01	0.88	73.9	1.37	0.88
29	SD05004	3865	0.98	0.86	77.6	0.73	0.58
30	SD05118	4001	0.88	0.94	76.3	1.03	0.82
31	SD05179	4008	0.92	0.94	77.4	0.95	0.85
32	SD05210	3734	0.82	0.76	76.3	0.79	0.80
33	BZ9W02-2051	3673	1.20	0.86	74.5	1.51	0.92
34	NX03Y2489	3623	0.86	0.86	72.3	1.48	0.81
35	NWX03Y2459	3146	0.99	0.67	72.2	1.43	0.27
36	MT0419	3810	0.99	0.93	75.1	0.99	0.89
37	MTCL0477	3401	1.16	0.83	72.6	1.29	0.90
38	MT0495	3534	1.22	0.89	71.7	0.99	0.39
	mean	3869			75.8		

Table 10. Reactions of wheats grown in the 2007 NRPN to various viral infections.

		BYDV, Palmer, KS	WSBM, Stillwater, OK: visual rating (1-4); 1 = resistant	
Entry	Line/selection	0-9: 0=resistant	3/9/2007	3/15/2007
1	Kharkof	6	1	1
2	Harding	2	1	1
3	Nuplains	6	1	2
4	Wesley	4	1	1
5	Jerry	5	2	2
6	98x0435-15 = Hawken	6	2	2
7	BC98334-04-02	5	1	1
8	BC98334-10W-8W	5	1	1
9	HV9W98A-1002R	5	1	1
10	HV9W02-846R	3	1	1
11	Millennium-27, ALS-1	2	1	1
12	NE03458	7	1	1
13	NE04490	4	1	2
14	NE04537	5	1	1
15	NH03614	3	1	1
16	NI05711	8	1	2
17	NI05714	2	3	2
18	NI05720W	6	1	1
19	NW03681	2	2	2
20	N98L20040-44	5	2	2
21	SD96240-3-1	2	2	2
22	SD98W175-1	7	2	2
23	SD05W012	3	2	1
24	SD05W018	3	1	1
25	SD05W030	1	1	1
26	SD05W138	6	1	1
27	SD05W140	5	2	2
28	SD02804-1	3	2	2
29	SD05004	4	3	2
30	SD05118	4	2	2
31	SD05179	5	2	2
32	SD05210	3	2	2
33	BZ9W02-2051	7	1	2
34	NX03Y2489	5	2	2
35	NWX03Y2459	5	1	2
36	MT0419	4	4	3
37	MTCL0477	8	4	4
38	MT0495	5	3	3
	mean	5	2	2

Table 11. Seedling reactions of entries in the 2007 NRPN to selected isolates of stem rust.

Entry	Line/selection	QFCS 06ND76C	QTHJ 75ND717C	RCRS 77ND82A	RKQQ 99KS76A-1	TPMK 74MN1409	TTTT 01MN84A-1-2	TTKS 04KEN156/04	TTKS repeat 04KEN156/04	TTKS w/Sr24V 06KEN19v3	Postulated gene TTKS effective	Adult plant field response St. Paul, MN
1	Kharkof	2++	S	S	S	S	S	S				T MR-MS
2	Harding	;	2	;	2+	0;	S/1.	2/S	S/2	S	24	0
3	Nuplains	2	2	1;	2	2	2	2	2	S	24	0
4	Wesley	0;	S	0;	S	;	1;/S	S	S/2	S		0
5	Jerry	;	;	;	S	0;	13-C Sr2 mosaic	S				0
6	98x0435-15 = Hawken	0;	;1-	;1/2	;1	123-C	S	S				T MR
7	BC98334-04-02	0;	0;3-	0;	0;	;13	;	S				0
8	BC98334-10W-8W	0;	;1+	0;	0;	;13	;	S	S	S		0
9	HV9W98A-1002R	2	S	0;1	S	S	0;	S	S	S		T MS
10	HV9W02-846R	S	S	S	S	S	S	S				30 S
11	Millennium-27, ALS-1	S	2	2+	S	S	S	2++ Tmp	2++	2+	Tmp	20 MS
12	NE03458	0;	2	;	1;	0;	2-;	2	2	2++	24	0
13	NE04490	;3	;3	0	;11+	22+/S	S	S/2-	S	S		T MR/30S
14	NE04537	;	;	;	2+	;	2-;	2	2/S	S	24	0
15	NH03614	2	2/S	2++	;1	2+/S	S	2+	2++	2+	Tmp	0
16	NI05711	;	;1-	;1-	S	0;	S	S				T MR
17	NI05714	0;	2	0;	1;	0;	;1	S	S	S		0
18	NI05720W	0;/2	0;	;1	;1-	S	S	S				5 MS
19	NW03681	;1	2	2	2+	2+	2	2	2	S	24	T MR
20	N98L20040-44	S	S	23-	S	S	S	S				5 MR
21	SD96240-3-1	;	2	;1-	2	0;/2	2-	2-	2	S	24	0
22	SD98W175-1	2	;1	0;	;	2+	;	2	2+	S	24	0
23	SD05W012	0;	2	;1/2	2	;	1	S				0
24	SD05W018	;	;1	0;	0;	;1-	;1-	S				0
25	SD05W030	;/S	;/2	0	;/1	;	0;	S				0
26	SD05W138	0;	2	1	2-	2-	;1	S				TR
27	SD05W140	;1	1	1;	2-	2	2-;	S				0
28	SD02804-1	;	;1	1	2-	;1/2+	2	2	2+	2	1A.1R or 24+Tmp	T MR
29	SD05004	0	1	;	2-	0;	;1	S				0
30	SD05118	;1	;/S	S/;	;3	S/2/;	;/S	S				30 MR-MS
31	SD05179	1	2	2/2++	2/;	2	2	2+	2+	2+	1A.1R or 24+Tmp	S MR
32	SD05210	2	S	2-	S/2	S	S-/2	S				20 MR
33	BZ9W02-2051	;12	S	1+;	S	0;/;3-	S	2	2	2	?	60 S
34	NX03Y2489	;1	S	0;	S	0;/S	S	2++	S	2+?	?	30 MR-MS
35	NWX03Y2459	;12	S	;1	S	0;	S	S				60 S
36	MT0419	0	0	;	S	0;	S/2	0;/;1	0;	0	36	0/5 MS
37	MTCL0477	;12	S	1+;	S	S/;1	S	S				70 S
38	MT0495	2	2++	2+3-	S	S	S/2	2+	2++	2++	?	70 S

"S" denotes susceptible, infection type (IT) 3 or 4.

"/" denotes hetergeneous, the predominant type given first.

"LIF" denotes low infection frequency (=low density of pustules)

Entries with low infection types to TTKS (or missing) were repeated, repeated entries were tested against 06KEN19v3 (TTKS+Sr24 virulence).

Postulation of 1A.1R and Sr24+ is tentative because Sr24+Tmp will yield similar ITs as 1A.1R. Users are advised to revise the gene posulation when 1A.1R data become available.

Table 12. Reactions of entries in the 2007 NRPN to leaf rust.

		Greenhouse screen, St. Paul, MN Leaf rust isolates										Field Screen Stillwater, OK	Field reactions Castroville, TX
Entry	Line/selection	MCRK	THBJ	MJBJ	TGBG	MHDS	KFBJ	TNRJ	MFPSC	MLDSB	Gene Postulation	Stakeman's rating	reaction types
1	Kharkof	3+	3+	3+	3+	3+	3+	3+	3+	3+	-	3+	20MR
2	Harding	;1-	;	3+	;	3+	;1+	;	;/2-	;1-	Lr16?	X;3-	10R
3	Nuplains	;1-	;	3+	;	;	3+	3+	3+	;	Lr24	3+	80S
4	Wesley	3+	;	3+	;	3+	;1-	3+	3+	;/2	?	3+	20MS
5	Jerry	;1+	;2-	3+	;	3+	;1-	;	1+	;1-	Lr16	X;3-	tR
6	98x0435-15 = Hawken	;1+	;	;1	;1-	3+	;2-	;	3	2	Lr17	3+	tR
7	BC98334-04-02	;2-	;1	;2+3	;1-	3+	;22+	;	3-	;2-	Lr17	3+	30MRR
8	BC98334-10W-8W	0;	0;	0;	0;	0;	0;	;	0	;2-	"+"	3	tR
9	HV9W98A-1002R	0;	3	0;	3+	0;	3+	3	0	0;	Lr2a	3+	60S
10	HV9W02-846R	0;	0;	0;	0;	0;	0;	22+	0	3+	Lr9 or Lr41	3	tR
11	Millennium-27, ALS-1	1+	2	3+	1+	2+3	1+	;	1	;	Lr16	X;3-	20R
12	NE03458	;	;	3+	;	;	3+	3+	3+	;	Lr24	3-	40S
13	NE04490	;	1+	;	3+	3	;	;	3+	3+	?	3+	tR
14	NE04537	;	;	3+	;	;	2+	3+	3+	;	Lr24	3+	tR
15	NH03614	;	3+/;1	3+	;	3	;1/3+	3+	3+	3+	?	3	40MSS
16	NI05711	3+	3+	3+	;	3+	;	3+	3+	3	Lr1, Lr14a	3	tR
17	NI05714	2+3	3+	;	;1-	3+	3+	22+	3+	22+	Lr26	X;3-	tR
18	NI05720W	;1+	2	3+	2+	2	;	;	2	;1+	Lr16?	X;3-	tR
19	NW03681	0;	;	2+3	0;	;	;1+	3+	3+	0;	?	3-	40S
20	N98L20040-44	3+	3+	3+	3+	3+	3+	3+	3+	3+	-	3+	80S
21	SD96240-3-1	;1-	;1-	;	;	;	;1-	;	3+	;	Lr17, Lr24	3	40MS
22	SD98W175-1	0;	0;	3+	0;	;	;	3+	3+	;	?	3	20MR
23	SD05W012	1+	;1+	;	;	;1-	;1-	;	1+2	;1+	"+"	X;3-	20MS
24	SD05W018	;	;	;	;1+	3/2	;	;	3	;1+	Lr17, Lr24	3-	tR
25	SD05W030	;2-	;2-	;	;1-	3+	0;	;	3+	;2	Lr17, Lr26	X;3=	10R
26	SD05W138	3+	3+	;	32+	3+	3+	;	3+	3	?	3-	10MS
27	SD05W140	33+	3+	;	;1-	3+	3+	;2	3+	23	?	X;3-	30MRMS
28	SD02804-1	1+2+	2+3	3+	3+	3+	1+	1+	;12-	;1-	Lr16	3	20MR
29	SD05004	;1+	3+2+;	;	;1+	3+	1+	1+	;22+	1+2	Lr16, Lr26	X;3	tR
30	SD05118	;1+	;2-	3+/;	;	3+	;	;	22+	;1+2	Lr16, Lr17	3	20MS
31	SD05179	0;	0;	0;	0;	0;	0;	3+	0;	3+	Lr9 or Lr41	3	10MS
32	SD05210	33+	3+	3+	3+	3+	;	3+	3+	;	?	3+	40R
33	BZ9W02-2051	3+	3+	;1-	;2-	2-/3+	3+	3+	3+	;2	Lr26?	3+	80S
34	NX03Y2489	3+	;	;2-	;	;2-	;	3+	3+	;2	Lr3ka or Lr11 or Lr30	3+	40MS
35	NWX03Y2459	3+	3+	3+	3+	22+ 3+	3+	3+	3+	3+	-	3	20MS
36	MT0419	33+	2+3	3+	3+	3+	3+	2+	23	;1-	?	3	40MR
37	MTCL0477	3+	3+	3+	3+	3+	3+	3+	3+	3+	-	3+	20MR
38	MT0495	3+	3+	3+	3+	3+	3+	3+	3+	3+	-	3+	40S

- = no resistance genes

? = unable to determine Lr gene(s)

+ = no virulent isolates tested

Seg = segregating

Table 13. Seedling and adult plant reactions to stripe rust, 2007 NPRN.

			Pullman, WA**		Mt. Vernon, WA				adult plant	
			6/22/07		4/18/07		6/1/07		Pullman, WA	Bozeman, MT
Entry	Line/selection	Manhattan, KS*	IT	%	IT	%	IT	%	severity	%
1	Kharkof	8	55	4	5	2	10	2	5	2
2	Harding	8	56	8	60	5,8	20	2,8	10	13.3
3	Nuplains	8	57	8	100	8	60	8	100	30
4	Wesley	6H4	58	5	5	5	20	2	10	1.3
5	Jerry	6	59	5	5	8	40	2	15	2.7
6	98x0435-15 = Hawken	8	60	0	0	2	10	3	20	0
7	BC98334-04-02	8	62	0	0	8	30	8	70	0.3
8	BC98334-10W-8W	8	63	8	40	8	20	8	80	3.3
9	HV9W98A-1002R	7	64	2	1	5	20	2	10	2.3
10	HV9W02-846R	1	65	0	0	2	10	2	5	0.3
11	Millennium-27, ALS-1	4	66	8	50	5	20	3	40	3.3
12	NE03458	9	67	3	10	8	50	5	30	0.7
13	NE04490	7	68	5	1	2	10	5	20	1
14	NE04537	8	69	3	1	5	30	3	30	0.7
15	NH03614	7	70	8	50	8	30	2,8	40	2
16	NI05711	5	71	5	5	5	10	2	5	1.7
17	NI05714	7	72	8	5	8	20	2	5	1
18	NI05720W	6H3	73	0	0	8	20	2	5	1
19	NW03681	6	74	2,8	1	2	10	2	5	0.7
20	N98L20040-44	8	75	8	100	8	50	8	100	3.7
21	SD96240-3-1	8	76	5	10	8	50	3	30	1.7
22	SD98W175-1	8	77	5	50	5	10	2	10	9.3
23	SD05W012	5	78	8	5	5	10	3	15	1.3
24	SD05W018	5H8	79	5	5	5	20	2	2	0
25	SD05W030	6	80	5	30	2	10	2	5	0.3
26	SD05W138	8	82	5	60	8	60	8	70	3
27	SD05W140	7	83	5	1	5	20	2	5	0.3
28	SD02804-1	7	84	5	40	5	20	8	90	1
29	SD05004	5H7	85	5	40	5	20	2	5	2
30	SD05118	7	86	8	40	5,8	20	2,8	40	3
31	SD05179	8	87	8	100	8	60	8	80	15
32	SD05210	6	88	2	1	5	10	2	10	0.7
33	BZ9W02-2051	8	89	8	70	8	20	2,8	30	3.3
34	NX03Y2489	5	90	8	90	8	20	5	40	4.3
35	NWX03Y2459	8	91	5	90	8	20	2	10	6
36	MT0419	5	92	2	10	5	20	3	20	0.7
37	MTCL0477	8	93	5	5	5	20	2	10	4.3
38	MT0495	5	94	2	1	5	10	3	10	1

*stripe rust isolate (race PST-100) read 6-12-2007 on seedlings; 0-9 scale, 0=immune and 9=highly susceptible

**Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with continuous ITs. Entries with a high IT in the first note, but a low IT in the second note may indicate that they have high-temperature, adult-plant (HTAP) resistance.

Table 14. Acid soil reactions of entries in the 2007 NRPN.

Entry	Line/selection	Acid soil tolerance, Enid, OK*	
		19-Mar	21-May
1	Kharkof	4	3
2	Harding	5	3
3	Nuplains	4	3
4	Wesley	2	2
5	Jerry	3	2
6	98x0435-15 = Hawken	2	2
7	BC98334-04-02	4	4
8	BC98334-10W-8W	4	3
9	HV9W98A-1002R	3	4
10	HV9W02-846R	4	3
11	Millennium-27, ALS-1	5	4
12	NE03458	5	5
13	NE04490	2	1
14	NE04537	3	2
15	NH03614	3	2
16	NI05711	3	3
17	NI05714	4	2
18	NI05720W	3	1
19	NW03681	3	1
20	N98L20040-44	5	5
21	SD96240-3-1	3	2
22	SD98W175-1	4	3
23	SD05W012	5	3
24	SD05W018	3	1
25	SD05W030	4	2
26	SD05W138	3	2
27	SD05W140	4	3
28	SD02804-1	4	3
29	SD05004	4	2
30	SD05118	2	1
31	SD05179	2	1
32	SD05210	4	2
33	BZ9W02-2051	3	4
34	NX03Y2489	3	1
35	NWX03Y2459	3	3
36	MT0419	4	2
37	MTCL0477	3	3
38	MT0495	3	3

*Readings taken at Enid, OK (pH = 4.6, 70 ppm Al, and Al saturation = 11%). Scale of 1 (highly tolerant) to 5 (highly susceptible), in which Jagger = 2.

Table 15. Reactions of entries in the 2007 NRPN to various insects.

Entry	Line or Selection	Russian Wheat Aphid Biotype 1	Greenbug biotype E	Hessian fly
1	Kharkof	S	S	S
2	Harding	S	S	S
3	Nuplains	S	S	S
4	Wesley	S	S	S
5	Jerry	S	S	S
6	98x0435-15 = Hawken	S	S	S
7	BC98334-04-02	S	S	S
8	BC98334-10W-8W	S	S	S
9	HV9W98A-1002R	S	S	S
10	HV9W02-846R	S	S	S
11	Millennium-27, ALS-1	S	S	H
12	NE03458	S	S	H-
13	NE04490	S	S	S
14	NE04537	S	S	H+
15	NH03614	S	S	H
16	NI05711	S	S	H-
17	NI05714	S	S	S
18	NI05720W	S	S	S
19	NW03681	S	S	S
20	N98L20040-44	S	S	S
21	SD96240-3-1	S	S	S
22	SD98W175-1	S	S	S
23	SD05W012	S	S	H
24	SD05W018	S	S	S
25	SD05W030	S	S	S
26	SD05W138	S	S	S
27	SD05W140	S	S	S
28	SD02804-1	S	S	S
29	SD05004	S	S	H-
30	SD05118	S	S	S
31	SD05179	??	Seg: 13R/2S	S
32	SD05210	S	S	S
33	BZ9W02-2051	S	S	S
34	NX03Y2489	S	S	S
35	NWX03Y2459	S	S	H
36	MT0419	S	S	S
37	MTCL0477	S	S	S
38	MT0495	S	S	S

Table 16. Field reactions to powdery mildew and Fusarium head blight.

Entry	Line/selection	Powdery mildew, Lethbridge, Alberta (0-9)	Fusarium Headblight Brookings, SD[1]		
			Incidence	Severity	Disease Index
1	Kharkof	3.7	99.6	45.1	45
2	Harding	3.0	94.8	55.9	53.2
3	Nuplains	5.7	99.6	65.5	65.5
4	Wesley	5.0	99.6	49.8	49.7
5	Jerry	3.0	87.4	39.1	35.7
6	98x0435-15 = Hawken	4.7	100.1	56.5	56.5
7	BC98334-04-02	6.0	92	66.8	63.4
8	BC98334-10W-8W	5.0	100.5	72.1	72.3
9	HV9W98A-1002R	5.0	100	68.1	68
10	HV9W02-846R	4.0	100	64.3	64.3
11	Millennium-27, ALS-1		99.6	56	55.9
12	NE03458	5.3	99.4	65	64.8
13	NE04490	3.7	99.7	63.7	63.8
14	NE04537	4.7	99.8	41	41.1
15	NH03614	5.0	95.8	48.7	46.9
16	NI05711	4.7	99.7	76.8	76.8
17	NI05714	2.7	100.4	58.7	58.8
18	NI05720W	3.7	95.8	52.8	50.4
19	NW03681	5.0	99.8	50.7	50.6
20	N98L20040-44		100	64.3	64.1
21	SD96240-3-1	3.7	99.7	49.1	49.1
22	SD98W175-1	4.0	87.3	49.5	46.2
23	SD05W012	4.0	99.7	66	66
24	SD05W018	2.3	99.9	56.8	56.7
25	SD05W030	1.7	96.4	44.8	43.2
26	SD05W138	3.3			
27	SD05W140	1.0	99.9	65.5	65.4
28	SD02804-1	1.3	90.4	60.3	55
29	SD05004	1.0	99.7	36.2	36.3
30	SD05118	4.7	100	42.6	42.6
31	SD05179	3.0	94.1	52.7	49.7
32	SD05210	5.7	99.3	51.2	50.8
33	BZ9W02-2051	5.3	100	53.8	53.8
34	NX03Y2489	3.7	99.1	45.1	45.1
35	NWX03Y2459	4.0	100	46.7	46.7
36	MT0419		95.1	63.4	61.1
37	MTCL0477		100.6	46.9	47
38	MT0495		99.8	62.1	62

[1]From Amir Ibrahim, South Dakota State, FHB ratings are based on a 0-9 scale. Incidence is the number of infected ears. Severity is the average of the scab ratings * 10. Disease Index is incidence * severity/100. L.S.D.(0.05) = 34.0.

Summary of Genotyping Data from the 2007 Regional Performance Nurseries

Hard winter wheat breeding lines from the 2007 Northern and Southern Regional Performance Nurseries were analyzed for 22 traits using 41 markers. The complete data set is included in the attached spreadsheet. The expected size (in base pairs) of each target band is included in the data set. Sizes preceded with the letter "T" are based on tailed primers and should be 18 base pairs longer than published reports. In the spreadsheet, a "+" indicates that the target band was positively identified, a "-" indicates that the target band was not present, and a "?" indicates that it was not possible to clearly determine the presence or absence of the band. The "NR" indicates that the assay was not run and is only used for excess control lines.

Except where noted, protocols used for all assays are listed on the MASWheat website (http://maswheat.ucdavis.edu/protocols/index.htm).

Fungal Resistance Traits

1. Wheat Scab (3BS QTL)
Three SSR markers (GWM493 and GWM533, TAG 2003 107:503-508; STS-3B-256, M. Pumphrey and Jim Anderson, personal communication) were used to detect the presence of a QTL on chromosome 3BS that confers resistance to wheat scab. No line contained the expected banding patterns for all three marker found in the controls Sumai 3. No line contained any two of the three markers. Two lines, 98x0435-15 and NW03681, did have the GWM493 band (211 bp) and GWM533 band (159 bp) respectively. The data suggests that none of the lines have the 3BS QTL.

2. Lr21
Newly designed primers were used for detecting the Lr21 resistance gene. This set of primers was based on the gene sequence provided by Li Huang. Known positive (WGRC07, WGRC27) and negative (WGRC02, Wichita) control lines were tested and found to be genotyped as expected using the new primers. Three entries, NE04490, 98x0338-13, and HV9W02-271W, had the band (214 bp) found in the positive controls and may have the Lr21 resistance gene. Other entries had the bands seen in the susceptible check line and may not have the Lr21 resistance gene.

3. Lr24/Sr24
Two STS markers were used to screen for Lr24/Sr24. Sr24#12 and Sr24#50 (Theor Appl Genet (2005) 111: 496–504) are both STS markers closely linked to Sr24 and typically amplify only one band. Resistant germplasm LcSr24Ag was positive for

both markers. Twenty-four lines were positive for marker Sr24#50. Sixteen lines were positive for marker Sr24#12 (512 bp). The following 16 lines were positive for both markers: CO03W054, CO03443, Jerry, NE03458, NE04537, NH03614, Nuplains, NW03681, OK03522, SD96240-3-1, SD98W175-1, TAM-107, TX02A0252, TX03A0563, TX99A0153-1, and Wesley. These 16 lines more likely have Lr24/Sr24 resistance gene.

4. Lr34/Yr18

The slow leaf rusting gene Lr34 and yellow rust resistance gene Yr18 are flanked by two markers (SSR marker SWM10, TAG 2006 113:1049–1062; STS marker csLV34-LR34, TAG 2006 114:21–30). Chinese Spring and Thatcher-Lr34 have the Lr34 resistance gene. CS7DS-4 (a deletion line of Chinese Spring) and Thatcher are both susceptible to Lr34. Chinese Spring and 20 lines have the "resistant" SWM10 206 bp band. Chinese Spring and 17 lines have the "resistant" csLV34-LR34 171 bp band. Fifteen lines were positive for both markers: 98x0338-13, CO03443, HV9W02-846R, KS980512-11-22, KS990498-3-&~2, NE04490, NWX03Y2459, NX03Y2489, OK05737W, OKBullet06ERU, TX01A7340, TX02A0252, TX03A0148, TX03A0563, and TX03M1096. These 15 entries more likely have Lr34/Yr18 resistance gene. However, Jagger also has the two resistance marker alleles and most likely does not carry the Lr34, therefore, caution needs to be taken for these materials have Jagger in their pedigrees.

5. Lr37/SR38/Yr17

These three rust resistance genes are on a chromosome segment that does not appear to recombine with bread wheat chromosomes. The STS marker (VENTRIUP-LN2) is therefore completely linked with the resistance genes. The following 62 lines were positive for the marker and likely have the alien segment: 98x0338-13, 98x0435-15, 99x0212-2, BC98331-03$-2W, BC98334-04$-02$, BC98334-10W-8W, BZ9W02-2051, CO01385-A1, CO03443, CO03W239, CO03W269, HV9W02-112W, HV9W02-271W, HV9W98A-1002R, Jerry, KS04HW47-3-4, KS970093-8-9-#1, KS980512-11-22, KS980512-2-2, KS990498-3-&~2, MT0419, MT0495, N98L20040-44, NE03458, NE04490, NE04537, NH03614, NI04420, NI05711, NI05714, NI05720W, Nuplains, NW03681, NWX03Y2459, OK02125, OK02522W, OK03305, OK05737W, OKBullet06ERU, SD02804-1, SD05004, SD05118, SD05179, SD05210, SD05W018, SD05W030, SD05W138, SD05W140, SD96240-3-1, SD98W175-1, T153, T159, TAM-107, Trego, TX01A7340, TX01V5136RC, TX02A0252, TX03A0148, TX03A0563, TX03M1096, TX04M410068, and Wesley.

6. Lr39/Lr41

These two resistance genes appear to be the same gene and are linked with SSR marker GDM35. No line had the expected 183 bp band clearly found in the positive controls WGRC02 and WGRC10. The data suggests that none of the lines

have Lr39/Lr41. The marker was run twice with DNA isolated from different plants.

7. Lr50

Lr50 is flanked by microsatellite markers GWM382 (6.7 cM) and GDM87 (9.4 cM) on wheat chromosome arm 2BL. In the resistant line WGRC36, marker GDM87 produces one distinct band of 124 bp. The following 19 lines have the GDM87 124 bp band as found in the positive control WGRC36: BZ9W02-2051, CO03W054, CO03W239, CO02W280, MT0419, MT0495, MTCL0477, NE03458, NI05711, NI05714, Nuplains, NX03Y2489, OK05737W, OKBullet06ERU, SD05118, SD05W018, SD96240-3-1, SD98W175-1, and Trego. None of the lines have the 156 bp band found in WGRC36 for marker GWM382. It is likely that none of the tested lines have the Lr50 gene. The 19 lines with the GDM87 124 bp band may have the Lr50 gene if they are from a pedigree with Lr50 gene.

8. Sr2

The Sr2 resistance gene has been effective worldwide for more than 50 years. It has recessive inheritance and is expressed primarily during the adult-plant stage. It is located on 3BS in the same region as the FHB QTL. The SSR marker, GWM533, produces a 133 bp band in resistant lines (Spielmeyer, 2003. Crop Sci. 43:333–336) and is only 1 to 2 cM away from the gene. The 133 bp band was present in all 15 Sr2 resistant lines tested from the US, Mexico, Canada, Kenya, and India and was present in all 12 Sr2 resistant lines from Australia; but was also present in 4 susceptible Australian lines (Spielmeyer, 2003. Crop Sci. 43:333–336). The 133 bp band was present in our positive controls (Eagle(USA), Sonalika) and was in the following 49 lines: 99x0212-2, BC98334-04-02, BC98334-10W-8W, BZ9W02-2051, CO02W280, CO03443, CO03W054, CO03W239, CO03W269, Harding, HV9W02-112W, HV9W02-267W, HV9W02-271W, HV9W96-1271R-1, HV9W98A-1002R, Jerry, KS980512-11-22, KS990498-3-&~2, MTCL0477, NE04424, NI04420, NI04428, NI05711, NI05714, Nuplains, NW03681, NWX03Y2459, OKBullet06ERU, Scout66, SD02804-1, SD05004, SD05210, SD05W012, SD05W018, SD05W030, SD05W140, SD96240-3-1, SD98W175-1, T153, T154, T158, T159, Trego, TX01A7340, TX01V5136RC, TX02A0252, TX03A0148, TX03A0563, and TX03M1096.

9. Sr26

One STS marker (Sr26#43) was used to screen for Sr26 (Theor Appl Genet (2005) 111: 496–504). Three Sr26 resistant lines were positive for marker Sr26#43 (6AL-Ag-TA3933, Argus-Isoline-TA4025, Eagle-Aus). None of the tested entries appears to have the Sr26 gene.

Insect Resistance Traits

10. Hessian Fly (H9)
One STS marker was used to test lines for the presence of gene H9 which confers resistance to Hessian fly biotype L. The following 10 lines had the expected 909 bp band found in the positive control 'Iris' and likely have H9 gene: BC98331-03$-2W, BC98334-04$-02$, BC98334-10W-8W, Kharkof, Millennium-27(ALS-1), MT0419, NH03614, NW03681, NWX03Y2459, and Trego.

11. Hessian Fly (H13)
Two SSR markers (GDM36 and CFD132) were used to test lines for the presence of gene H13 which also confers resistance to Hessian fly biotype L. No line contained both of the expected bands found in the positive control Molly. Only one line, HV9W96-1271R-1, has the CFD132 166 bp band. It is likely that none of the tested lines has H13 resistance gene.

12. Russian Wheat Aphid (Dn1, Dn2, Dn5, Dn6, Dnx)

Dn1, Dn2, Dn5, Dn6, Dnx, RWA genes....
We have data on GWM44 and GWM111, but since the controls for all of the RWA genes showed complex band patterns, we can not determine which band is corresponding to the resistance gene based on available information from the publication.

Viral Resistance Traits

13. Barley Yellow Dwarf Virus (Bydv2)
One SCAR marker (BYAgi) was used to detect the presence of the Bydv2 gene. No line had the expected 567 bp band clearly found in the positive control P961341. The data suggests that none of the lines have Bydv2.

14. Wheat Streak Mosaic Virus (Wsm1)
One STS marker (J15) was used to detect the chromosome segment containing the Wsm1 gene translocated from *Agropyron intermedium*. No line had the expected 431 bp band clearly found in the positive control KS93WGRC27. The data suggests that none of the lines may have Wsm1.

Quality Traits

15. 1RS Translocation
One rye SSR marker (SCM9, Euphytica 2003 132: 243–250, http://maswheat.ucdavis.edu/protocols/drought/index.htm) was used to detect the presence of the 1RS rye translocation. SCM9 amplified a 225 bp band

for the 1B/1R in check cultivar 'Aurora' and in 14 lines. SCM9 amplified a 242 bp band for the 1A/1R in check cultivar TAM107 and in 12 lines. The following 14 lines were positive for the SCM9 225bp band from rye only and likely have the 1B/1R translocation: HV9W02-846R, NW03681 SD05W012, SD05W018, SD05W030, SD05W138, SD05W140, SD05004, SD05118, OK02125, 98x0338-13, NI04420, NI04421, and NI04428. The following 12 lines were positive for the SCM9 242bp band and likely have the 1A/1R translocation: SD02804-1, SD05179, SD05210, T151, T153, T154, T158, BC98331-03S-2W, HV9W96-1271R-1, CO02W280, TX99A0153-1, and TX01V5136RC.

(Note: Five lines showed different results compared to the results from the USDA-ARS Grain, Forages and Bioenergy group at Lincoln, NE. One line, NI05714 showed 1R translocation in the Lincoln lab, but not in our report. Four lines showed 1RS translocation in our report, but not in the Lincoln lab, namely: HV9W02-846R, NWX03Y2459, BC98331-03$-2W and CO02W280. The marker was originally run in ABI3730. Because ABI sequencer is very sensitive and many samples showed false positive, the marker was rerun twice in an agarose gel using DNA isolated from different plants.)

16. High Grain Protein Content, HGPC

One STS marker (UCW89) very closely (0.1 cM) linked with the Gpc-B1 gene was used to identify the gene for HGPC. The positive control 'Glupro' produces a band of 138 bp. No line had the distinct 138 bp band. It appears that no entry has the Gpc-B1 gene.

17. High Molecular Weight Glutenins

Three STS markers (Euphytica 2003 134:51-60) were used to determine some of the alleles at the 3 loci controlling high molecular weight glutenins. Marker HMWAx2* produces one band of 1319 bp for Ax2* genotype, or no band for Ax1 genotype. HMWBx produces one band of 669 bp for Bx17 genotype, or 2 bands (630 and 766 bp) for all others (non-Bx17 genotypes). HMWDx5 will produce one 478 bp band for Dx5 genotype, or no band for all others (non-Dx5 genotypes). These three markers appear to be extremely sensitive to small changes in PCR conditions. Reproducibility of the data using these markers is low to moderate.

Twenty four lines without the HMWAx2* band likely carry Ax1 allele (98x0435-15, 99x0212-2, BC98331-03$-2W, BC98334-04$-02$, BC98334-10W-8W, CO01385-A1, CO03W239, HV9W02-846R, Jerry, KS970093-8-9-#1, KS980512-2-2, MT0495, N98L20040-44, OK02125, OK02522W, OK03522, OK05737W, OKBullet06ERU, SD05118, SD05W012, SD96240-3-1, TX01A7340, TX03A0148, TX04M410068) and the remaining entries likely carry the Ax2* allele. Fifteen lines with the HMWBx 669 bp band likely carry Bx17 allele (CO03443, CO03W054, HV9W02-112W, HV9W02-267W, KS980512-11-22, KS980512-2-2, NE04490, NWX03Y2459, OK02522W, OK05737W, OKBullet06ERU, SD05210, T154, T158, T159) and the remaining entries likely carry non-Bx17 allele. Most of the lines tested with HMWDx5 produced a band of 478 bp and carry, therefore, Dx5 allele and only 7 lines (BC98334-10W-8W, Scout66, T151, T153, T154, T158, TAM-107) amplified no band and likely carry non- Dx5 allele.

18. Grain Texture (Pina-D1, Pinb-D1)
One dominant STS marker (Pina-D1) was used to screen for the presence of wild-type (Pina-D1a), soft alleles. The positive control, 'Newana' yielded the expected band size of 348 bp which is associated with soft texture. The following five lines were missing the 348 bp band and likely have the null allele (Pina-D1b) associated with hard texture: NE04490, NI05714, SD05118, SD05W018, and TX03M1096. The rest of entries have the 348 bp band, indicating the presence of the Pina-D1a (soft) allele.

A codominant PCR-CAPs marker (Pinb-D1) was used to screen for Pinb-D1 alleles. After PCR amplification and restriction using Bsr BI, a 320 bp band indicates the soft, wild allele (Pinb-D1a). A band of 200 bp indicates the hard, mutant allele (Pinb-D1b). Eighteen lines had the 320 bp band and therefore have the soft allele Pinb-D1a (Kharkof, NE04490, NI05714, SD98W175-1, SD05118, SD05210, NX03Y2489, KS04HW47-3-4, OK02125, 99x0212-2, CO01385-A1, CO02W280, CO03W054, TX01A7340, TX01V5136RC, TX03M1096, T159, TX04M410068). The remaining lines had the 200 bp band from the hard allele Pinb-D1b.

In summary, 4 lines have soft alleles of both markers Pina-D1a and Pinb-D1a: NE04490, NI05714, SD05118, and TX03M1096. Those lines are likely soft wheat.

19. Waxy Mutants
One STS marker (Waxy4) was used to detect null mutants at all three loci controlling granule-bound starch synthase (GBSS) or waxy protein. Almost all entries had all three bands and are non-mutants or non-waxy lines. No lines were missing more than one band. No line was missing either the Wx-D1 locus (314 bp) on 7DS or the Wx-A1 locus (273 bp) on 7AS. Three lines (HV9W02-112W, Trego, TX01A7340) were missing only the 243 bp band and are partially waxy null-mutants for the Wx-B1 locus on 4AL.

Abiotic Stress and Agronomic Traits

20. Aluminum Tolerance
Two SSR markers WMC331 and ALMT1-SSR3A (Mol Breeding 2006 18:171–183) were used for screening of 4DL Al-resistance QTL. Twelve entries (98x0338-13, 99x0212-2, KS970093-8-9-#1, NE04490, NH03614, NI05720W, OK02125, SD05118, SD96240-3-1, TX01A7340, TX03M1096, and Wesley) were positive for both SSR markers are most likely have the Al tolerance QTL on chromosome 4D. Additional eight lines that were positive for only the ALMT1-SSR3A SSR marker

(98x0435-15, KS04HW47-3-4, KS990498-3-&~2, NI05714, Nuplains, NW03681, SD05W018, and T159) may also carry the Al tolerance QTL on chromosome 4D.

21. Plant Height Genes (Rht1, Rht2, Rht8)

Two gene-specific STS markers were used to detect the Rht1 and Rht2 genes (TAG 2002 105:1038-1042). One linked SSR marker (GWM261, TAG 1998 96:1104-1109) was used to detect Rht8. All but seventeen lines (BC98331-03$-2W, BZ9W02-2051, CO03W239, Harding, Jerry, Kharkof, KS970093-8-9-#1, NI05720W, Scout66, SD02804-1, SD05004, SD05118, SD05179, SD05W138, SD05W140, T159, and TX04M410068) had the 255 bp band indicating the presence of the Rht1 gene. Only three lines (BZ9W02-2051, KS970093-8-9-#1, and SD02804-1) had the 270 bp band diagnostic for the Rht2 gene. Four lines (CO01385-A1, OK03305, TX03A0148, Wesley) had the 212 bp band linked with Rht8 and may carry the Rht8 gene.

22. Vernalization (VRN-1)

Three STS primer sets (MGG 2005 273:54-65) were used to determine if deletions were present in the first intron of the VRN-1 gene in the A (Intr1/C/F & Intr1/AB/R), B (Intr1/B/F & Intr1/B/R4), and D (Intr1/D/F & Intr1/D/R4) genomes. One STS primer set (VRNAIF-VRNA1R, TAG 2004 109:1677-1686) was used to determine the presence of insertions or deletions (in/dels) in the VRN-A1 promoter. Winter genotypes have no intron deletions in the VRN-A1, VRN-B1, or VRN-D1 genes and no VRN-A1 promoter in/dels. Either an in/del in the VRN-A1 promoter or a deletion in the VRN-A1 gene itself is associated with a strong spring growth habit. A deletion in the intron of VRN-B1 or VRN-D1 indicates the dominant Vrn-B1 and Vrn-D1 alleles associated with spring growth habit. The deletions in Vrn-B1 and Vrn-D1 do not have as great an effect as the dominant Vrn-A1 alleles, and usually flower later than the Vrn-A1 spring types, but much earlier than winter types. There are other alleles associated with spring growth that are not detected by the primer sets used here, so it is possible to have no promoter mutations and no deletions in any of the VRN-1 genes yet still have a spring type.

One entry (BC98334-10W-8W) appears to have an indel in the VRN-A1 promoter and is likely strong spring types. Four entries (Harding, HV9W98A-1002R, SD05004, and Wesley) have deletions in the VRN-A1 gene contributing to spring growth habit. Seven entries (KS980512-2-2, NH03614, NI05720W, NW03681, SD05179, SD05W012, and SD05W138) appear to have indels in the VRN-B1 gene contributing to spring growth habit. Two entries, MTCL0477 and N98L20040-44, appear to have deletions in the VRN-B1 gene contributing to spring growth habit. One entry, OK02125, appear to have a deletion in the VRN-D1 gene contributing to spring growth habit.

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS, Manhattan, KS. Click here for notes

	Trait	FHB 3BS	FHB 3BS	FHB 3BS	Sr2	Lr21	Lr24/Sr24	Lr24/Sr24
	Marker	GWM533	STS-3B-256	GWM493	GWM533	Lr21-214	Sr24#12	Sr24#12
	Band Size (bp)	T159	T221	T211	T133	214	T512	T524
	Marker type	SSR	STS	SSR	SSR	STS	STS	STS
1	Kharkof	-	-	-	-	-	-	-
2	Harding	-	-	-	+	-	-	-
3	Nuplains	-	-	-	+	-	+	-
4	Wesley	-	-	-	-	-	+	-
5	Jerry	-	-	-	+	-	+	-
6	98x0435-15	-	-	+	-	-	-	-
7	BC98334-04-02	-	-	-	+	-	-	-
8	BC98334-10W-8W	-	-	-	+	-	-	-
9	HV9W98A-1002R	-	-	-	+	-	-	-
10	HV9W02-846R	-	-	-	-	-	-	-
11	Millennium-27,ALS-1	-	-	-	-	-	-	-
12	NE03458	-	-	-	-	-	+	-
13	NE04490	-	-	-	-	+	-	-
14	NE04537	-	-	-	-	-	+	-
15	NH03614	-	-	-	-	-	+	-
16	NI05711	-	-	-	+	-	-	-
17	NI05714	-	-	-	+	-	-	-
18	NI05720W	-	-	-	-	-	-	-
19	NW03681	+	-	-	+	-	+	-
20	N98L20040-44	-	-	-	-	-	-	-
21	SD96240-3-1	-	-	-	+	-	+	-
22	SD98W175-1	-	-	-	+	-	+	-
23	SD05W012	-	-	-	+	-	-	-
24	SD05W018	-	-	-	+	-	-	-

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	FHB 3BS	FHB 3BS	FHB 3BS	Sr2	Lr21	Lr24/Sr24	Lr24/Sr24
	Marker	GWM533	STS-3B-256	GWM493	GWM533	Lr21-214	Sr24#12	Sr24#12
	Band Size (bp)	T159	T221	T211	T133	214	T512	T524
	Marker type	SSR	STS	SSR	SSR	STS	STS	STS
25	SD05W030	-	-	-	+	-	-	-
26	SD05W138	-	-	-	-	-	-	-
27	SD05W140	-	-	-	+	-	-	-
28	SD02804-1	-	-	-	+	-	-	-
29	SD05004	-	-	-	+	-	-	-
30	SD05118	-	-	-	-	-	-	-
31	SD05179	-	-	-	-	-	-	-
32	SD05210	-	-	-	+	-	-	-
33	BZ9W02-2051	-	-	-	+	-	-	-
34	NX03Y2489	-	-	-	-	-	-	-
35	NWX03Y2459	-	-	-	+	-	-	-
36	MT0419	-	-	-	-	-	-	-
37	MTCL0477	-	-	-	+	-	-	-
38	MT0495	-	-	-	-	-	-	-
	Chinese Spring	-	-	+	-	-	-	-
	Yecora Rojo	-	-	-	+	-	-	-
	TAM107	-	-	-	-	-	+	-
	Clark	-	-	-	+	-	-	-
	Jagger	-	-	-	+	-	-	-
	Sumai 3	+	+	+	-	-	-	-
	Check	+	+	+	-	+	+	+
	Check	-	-	-	+	-	-	-

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	Lr24/Sr24	Lr24/Sr24	Sr26	Lr34/Yr18	Lr34/Yr18	Lr37/Sr38/Yr17
	Marker	Sr24#12	Sr24#50	Sr26#43	SWM10	csLV34-LR34	VentriupLn2
	Band Size (bp)	T525	T213	T231	T206	T171	T275
	Marker type	STS	STS	STS	SSR	STS	STS
1	Kharkof	-	-	-	-	-	-
2	Harding	-	+	-	-	-	-
3	Nuplains	-	+	-	-	-	+
4	Wesley	-	+	-	-	-	+
5	Jerry	-	+	-	-	-	+
6	98x0435-15	-	-	-	-	-	+
7	BC98334-04-02	-	-	-	-	-	+
8	BC98334-10W-8W	-	-	-	-	-	+
9	HV9W98A-1002R	-	-	-	-	-	+
10	HV9W02-846R	-	-	-	+	+	-
11	Millennium-27,ALS-1	-	-	-	-	-	-
12	NE03458	-	+	-	-	-	+
13	NE04490	-	+	-	+	+	+
14	NE04537	-	+	-	-	-	+
15	NH03614	-	+	-	-	-	+
16	NI05711	-	-	-	-	-	+
17	NI05714	-	+	-	-	-	+
18	NI05720W	-	-	-	-	-	+
19	NW03681	-	+	-	+	-	+
20	N98L20040-44	-	+	-	-	-	+
21	SD96240-3-1	-	+	-	-	-	+
22	SD98W175-1	-	+	-	-	-	+
23	SD05W012	-	-	-	-	-	-
24	SD05W018	-	-	-	-	-	+

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	Lr24/Sr24	Lr24/Sr24	Sr26	Lr34/Yr18	Lr34/Yr18	Lr37/Sr38/Yr17
	Marker	Sr24#12	Sr24#50	Sr26#43	SWM10	csLV34-LR34	VentriupLn2
	Band Size (bp)	T525	T213	T231	T206	T171	T275
	Marker type	STS	STS	STS	SSR	STS	STS
25	SD05W030	-	-	-	-	-	+
26	SD05W138	-	-	-	+	-	+
27	SD05W140	-	-	-	-	-	+
28	SD02804-1	-	-	-	-	-	+
29	SD05004	-	-	-	-	-	+
30	SD05118	-	-	-	-	-	+
31	SD05179	-	-	-	-	-	+
32	SD05210	-	-	-	-	+	+
33	BZ9W02-2051	-	-	-	-	-	+
34	NX03Y2489	-	-	-	+	+	-
35	NWX03Y2459	-	+	-	+	+	+
36	MT0419	-	-	-	-	-	+
37	MTCL0477	-	-	-	-	-	-
38	MT0495	-	-	-	-	-	+
	Chinese Spring	-	-	-	+	+	+
	Yecora Rojo	-	-	-	-	-	+
	TAM107	-	+	-	-	-	+
	Clark	-	+	-	-	-	+
	Jagger	-	-	-	+	+	+
	Sumai 3	-	-	-	+	+	+
	Check	+	+	+	+	+	+
	Check	-	-	-	-	-	-

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	Lr39/Lr41	Lr50	Lr50	Hessian Fly, H9	Hessian Fly, H13	Hessian Fly, H13
	Marker	GDM35	GWM382	GDM87	H9	CFD132	GDM36
	Band Size (bp)	T183	T156	T124	909	T166	T186
	Marker type	SSR	SSR	SSR	STS	SSR	SSR
1	Kharkof	-	-	-	+	-	-
2	Harding	-	-	-	-	-	-
3	Nuplains	-	-	+	-	-	-
4	Wesley	-	-	-	-	-	-
5	Jerry	-	-	-	-	-	-
6	98x0435-15	-	-	-	-	-	-
7	BC98334-04-02	-	-	-	+	-	-
8	BC98334-10W-8W	-	-	-	+	-	-
9	HV9W98A-1002R	-	-	-	-	-	-
10	HV9W02-846R	-	-	-	-	-	-
11	Millennium-27,ALS-1	-	-	-	+	-	-
12	NE03458	-	-	+	-	-	-
13	NE04490	-	-	-	-	-	-
14	NE04537	-	-	-	-	-	-
15	NH03614	-	-	-	+	-	-
16	NI05711	-	-	+	-	-	-
17	NI05714	-	-	+	-	-	-
18	NI05720W	-	-	-	-	-	-
19	NW03681	-	-	-	+	-	-
20	N98L20040-44	-	-	-	-	-	-
21	SD96240-3-1	-	-	+	-	-	-
22	SD98W175-1	-	-	+	-	-	-
23	SD05W012	-	-	-	-	-	-
24	SD05W018	-	-	+	-	-	-

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	Lr39/Lr41	Lr50	Lr50	Hessian Fly, H9	Hessian Fly, H13	Hessian Fly, H13
	Marker	GDM35	GWM382	GDM87	H9	CFD132	GDM36
	Band Size (bp)	T183	T156	T124	909	T166	T186
	Marker type	SSR	SSR	SSR	STS	SSR	SSR
25	SD05W030	-	-	-	-	-	-
26	SD05W138	-	-	-	-	-	-
27	SD05W140	-	-	-	-	-	-
28	SD02804-1	-	-	-	-	-	-
29	SD05004	-	-	-	-	-	-
30	SD05118	-	-	+	-	-	-
31	SD05179	-	-	-	-	-	-
32	SD05210	-	-	-	-	-	-
33	BZ9W02-2051	-	-	+	-	-	-
34	NX03Y2489	-	-	+	-	-	-
35	NWX03Y2459	-	-	-	+	-	-
36	MT0419	-	-	+	+	-	-
37	MTCL0477	-	-	+	-	-	-
38	MT0495	-	-	+	-	-	-
	Chinese Spring	-	-	-	-	-	-
	Yecora Rojo	-	-	-	-	-	-
	TAM107	-	-	-	-	-	-
	Clark	-	-	+	-	-	-
	Jagger	-	-	+	-	-	-
	Sumai 3	-	-	+	-	-	-
	Check	+	+	+	+	+	+
	Check	-	+	+	+	+	+

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	BYDV2	WSM1	1RS: ARS-LNK	1B/1R	1A/1R	Grain Texture	Grain Texture
	Marker	BYAgi	J15	(secalin proteins +	SCM0009	SCM0009	Pina-D1	Pinb-D1b
	Band Size (bp)	T567	T431	SCM PCR markers	T225	T242	T348/350	200
	Marker type	SSR	STS				STS	CAP
1	Kharkof	-	-	Non.1RS	-	-	+	-
2	Harding	-	-	Non.1RS	-	-	+	+
3	Nuplains	-	-	Non.1RS	-	-	+	+
4	Wesley	-	-	Non.1RS	-	-	+	+
5	Jerry	-	-	Non.1RS	-	-	+	+
6	98x0435-15	-	-	Non.1RS	-	-	+	+
7	BC98334-04-02	-	-	Non.1RS	-	-	+	+
8	BC98334-10W-8W	-	-	Non.1RS	-	-	+	+
9	HV9W98A-1002R	-	-	Non.1RS	-	-	+	+
10	HV9W02-846R	-	-	Non.1RS	+	-	+	+
11	Millennium-27,ALS-1	-	-	Non.1RS	-	-	+	+
12	NE03458	-	-	Non.1RS	-	-	+	+
13	NE04490	-	-	Non.1RS	-	-	-	-
14	NE04537	-	-	Non.1RS	-	-	+	+
15	NH03614	-	-	Non.1RS	-	-	+	+
16	NI05711	-	-	Non.1RS	-	-	+	+
17	NI05714	-	-	1BL.1RS	-	-	-	-
18	NI05720W	-	-	Non.1RS	-	-	+	+
19	NW03681	-	-	Non.1RS	+	-	+	+
20	N98L20040-44	-	-	Non.1RS	-	-	+	+
21	SD96240-3-1	-	-	Non.1RS	-	-	+	+
22	SD98W175-1	-	-	Non.1RS	-	-	+	-
23	SD05W012	-	-	1BL.1RS	+	-	+	+
24	SD05W018	-	-	1BL.1RS	+	-	-	+

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	BYDV2	WSM1	1RS: ARS-LNK	1B/1R	1A/1R	Grain Texture	Grain Texture
	Marker	BYAgi	J15	(secalin proteins +	SCM0009	SCM0009	Pina-D1	Pinb-D1b
	Band Size (bp)	T567	T431	SCM PCR markers	T225	T242	T348/350	200
	Marker type	SSR	STS				STS	CAP
25	SD05W030	-	-	1BL.1RS	+	-	+	+
26	SD05W138	-	-	1BL.1RS	+	-	+	+
27	SD05W140	-	-	1BL.1RS	+	-	+	+
28	SD02804-1	-	-	1AL.1RS	-	+	+	+
29	SD05004	-	-	1BL.1RS	+	-	+	+
30	SD05118	-	-	1BL.1RS	+	-	-	-
31	SD05179	-	-	1AL.1RS	-	+	+	+
32	SD05210	-	-	1AL.1RS	-	+	+	-
33	BZ9W02-2051	-	-	Non.1RS	-	-	+	+
34	NX03Y2489	-	-	Non.1RS	-	-	+	-
35	NWX03Y2459	-	-	Non.1RS	+	-	+	+
36	MT0419	-	-	Non.1RS	-	-	+	+
37	MTCL0477	-	-	Non.1RS	-	-	+	+
38	MT0495	-	-	Non.1RS	-	-	+	+
	Chinese Spring	-	-				+	-
	Yecora Rojo	-	-				+	-
	TAM107	-	-		-	+	+	+
	Clark	-	-		+	-	+	-
	Jagger	-	-		-	-	+	-
	Sumai 3	-	-		-	-	+	-
	Check	+	+		+	-	+	+
	Check	-	-		-	+	+	+

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	Grain Texture	HGPC	HMW Glutenins	HMW Glutenins	HMW Glutenins
	Marker	Pinb-Wild	UCW89	HMWA	HMWB	HMWB
	Band Size (bp)	320	T138	1319	630+766	669
	Marker type	CAP	STS	STS	STS	STS
1	Kharkof	+	-	+	+	-
2	Harding	-	-	+	+	-
3	Nuplains	-	-	+	-	-
4	Wesley	-	-	+	+	-
5	Jerry	-	-	-	+	-
6	98x0435-15	-	-	-	+	-
7	BC98334-04-02	-	-	-	+	-
8	BC98334-10W-8W	-	-	-	+	-
9	HV9W98A-1002R	-	-	+	-	-
10	HV9W02-846R	-	-	-	+	-
11	Millennium-27,ALS-1	-	-	+	+	-
12	NE03458	-	-	+	+	-
13	NE04490	+	-	+	-	+
14	NE04537	-	-	+	+	-
15	NH03614	-	-	+	+	-
16	NI05711	-	-	+	+	-
17	NI05714	+	-	+	+	-
18	NI05720W	-	-	+	+	-
19	NW03681	-	-	+	+	-
20	N98L20040-44	-	-	-	+	-
21	SD96240-3-1	-	-	-	+	-
22	SD98W175-1	+	-	+	-	-
23	SD05W012	-	-	-	+	-
24	SD05W018	-	-	+	+	-

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	Grain Texture	HGPC	HMW Glutenins	HMW Glutenins	HMW Glutenins
	Marker	Pinb-Wild	UCW89	HMWA	HMWB	HMWB
	Band Size (bp)	320	T138	1319	630+766	669
	Marker type	CAP	STS	STS	STS	STS
25	SD05W030	-	-	+	+	-
26	SD05W138	-	-	+	+	-
27	SD05W140	-	-	+	+	-
28	SD02804-1	-	-	+	+	-
29	SD05004	-	-	+	+	-
30	SD05118	+	-	-	-	-
31	SD05179	-	-	+	-	-
32	SD05210	+	-	+	-	+
33	BZ9W02-2051	-	-	+	+	-
34	NX03Y2489	+	-	+	-	-
35	NWX03Y2459	-	-	+	+	+
36	MT0419	-	-	+	+	-
37	MTCL0477	-	-	+	+	-
38	MT0495	-	-	-	+	-
	Chinese Spring	+	-	-	-	+
	Yecora Rojo	+	-	-	-	+
	TAM107	-	-	+	+	-
	Clark	+	-	-	-	-
	Jagger	+	-	-	-	-
	Sumai 3	+	-	-	+	-
	Check	-	+	+	+	-
	Check	-	-	-	-	+

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	HMW Glutenins	Waxy	Waxy	Waxy	Al Tolerance	Al Tolerance
	Marker	HMWD	Waxy4,4A	Waxy4,7A	Waxy4,7D	WMC331	ALMT1-SSR3A
	Band Size (bp)	478	T243	T273	T314	T149	T220-250
	Marker type	STS	STS	STS	STS	SSR	SSR
1	Kharkof	+	+	+	+	-	-
2	Harding	+	+	+	+	-	-
3	Nuplains	+	+	+	+	-	+
4	Wesley	+	+	+	+	+	+
5	Jerry	+	+	+	+	-	-
6	98x0435-15	+	+	+	+	-	+
7	BC98334-04-02	+	+	+	+	-	-
8	BC98334-10W-8W	+	+	+	+	-	-
9	HV9W98A-1002R	+	+	+	+	-	-
10	HV9W02-846R	+	+	+	+	-	-
11	Millennium-27,ALS-1	+	+	+	+	-	-
12	NE03458	+	+	+	+	-	-
13	NE04490	+	+	+	+	+	+
14	NE04537	+	+	+	+	-	-
15	NH03614	+	+	+	+	+	+
16	NI05711	+	+	+	+	-	-
17	NI05714	+	+	+	+	-	+
18	NI05720W	+	+	+	+	+	+
19	NW03681	+	+	+	+	-	+
20	N98L20040-44	+	+	+	+	-	-
21	SD96240-3-1	+	+	+	+	+	+
22	SD98W175-1	+	+	+	+	-	-
23	SD05W012	+	+	+	+	-	-
24	SD05W018	+	+	+	+	-	+

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	HMW Glutenins	Waxy	Waxy	Waxy	Al Tolerance	Al Tolerance
	Marker	HMWD	Waxy4,4A	Waxy4,7A	Waxy4,7D	WMC331	ALMT1-SSR3A
	Band Size (bp)	478	T243	T273	T314	T149	T220-250
	Marker type	STS	STS	STS	STS	SSR	SSR
25	SD05W030	+	+	+	+	-	-
26	SD05W138	+	+	+	+	-	-
27	SD05W140	+	+	+	+	-	-
28	SD02804-1	+	+	+	+	-	-
29	SD05004	+	+	+	+	-	-
30	SD05118	+	+	+	+	+	+
31	SD05179	+	+	+	+	-	-
32	SD05210	+	+	+	+	-	-
33	BZ9W02-2051	+	+	+	+	-	-
34	NX03Y2489	+	+	+	+	-	-
35	NWX03Y2459	+	+	+	+	-	-
36	MT0419	+	+	+	+	-	-
37	MTCL0477	+	+	+	+	-	-
38	MT0495	+	+	+	+	-	-
	Chinese Spring	+	+	+	+	-	-
	Yecora Rojo	+	+	+	+	+	+
	TAM107	-	+	+	+	-	-
	Clark	+	+	+	+	-	-
	Jagger	+	+	+	+	+	+
	Sumai 3	+	+	+	+	-	-
	Check	+	+	+	+	+	+
	Check	-	+	+	-	-	-

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	Height, Rht1	Height, Rht2	Height, Rht8	RWA
	Marker	Rht1BF-MR1	Rht2,DF-MR2	GWM261	GWM0044
	Band Size (bp)	T255	T270	T212	Tailed
	Marker type	STS	STS	SSR	SSR
1	Kharkof	-	-	-	129, 157, 179, 189
2	Harding	-	-	-	122, 129, 191
3	Nuplains	+	-	-	122
4	Wesley	+	-	+	129, 157, 201
5	Jerry	-	-	-	129, 157, 179, 189
6	98x0435-15	+	-	-	129, 157, 191
7	BC98334-04-02	-	-	-	129, 155, 193
8	BC98334-10W-8W	+	-	-	122, 129, 155, 193
9	HV9W98A-1002R	+	-	-	129, 157, 193
10	HV9W02-846R	+	-	-	129, 157, 199
11	Millennium-27,ALS-1	+	-	-	122, 193
12	NE03458	+	-	-	129, 157, 191
13	NE04490	+	-	-	129, 157, 191, 197
14	NE04537	+	-	-	129, 157, 179
15	NH03614	+	-	-	129, 157, 179, 193, 201
16	NI05711	+	-	-	129, 157, 189
17	NI05714	+	-	-	129, 155, 157, 179, 189
18	NI05720W	-	-	-	129, 155, 157, 193
19	NW03681	+	-	-	122
20	N98L20040-44	+	-	-	129, 157, 179
21	SD96240-3-1	+	-	-	129, 157, 201
22	SD98W175-1	+	-	-	122, 129, 193
23	SD05W012	+	-	-	129, 157, 193
24	SD05W018	+	-	-	129, 155, 199

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	Height, Rht1	Height, Rht2	Height, Rht8	RWA
	Marker	Rht1BF-MR1	Rht2,DF-MR2	GWM261	GWM0044
	Band Size (bp)	T255	T270	T212	Tailed
	Marker type	STS	STS	SSR	SSR
25	SD05W030	+	-	-	129, 155, 157, 199
26	SD05W138	-	-	-	122, 129, 193
27	SD05W140	-	-	-	122
28	SD02804-1	-	+	-	129, 157, 179
29	SD05004	-	-	-	129, 157, 199
30	SD05118	-	-	-	122
31	SD05179	-	-	-	129, 157, 163
32	SD05210	+	-	-	129, 157, 201
33	BZ9W02-2051	-	+	-	129, 157189,
34	NX03Y2489	+	-	-	122, 129, 195,
35	NWX03Y2459	+	-	-	122
36	MT0419	+	-	-	129, 157, 189
37	MTCL0477	+	-	-	129, 157, 199
38	MT0495	+	-	-	129, 155, 193
	Chinese Spring	-	-	+	129, 155, 197
	Yecora Rojo	+	+	-	129, 155, 199
	TAM107	+	-	-	129, 179
	Clark	+	-	-	129, 157, 189
	Jagger	+	-	-	129, 197
	Sumai 3	-	-	+	129, 157, 197
	Check	+	+	+	129, 155, 191
	Check	+	+	-	129, 155, 191

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	RWA	Vernalization	Vernalization	Vernalization
	Marker	GWM111	VRN1AProm	VRN-A1,NON-Del	VRN-B1,Del
	Band Size (bp)	Tailed	T492	1068	709
	Marker type	SSR	STS	STS	STS
1	Kharkof	**154, 155, 168, 169, 203, 227, 229**	+	+	-
2	Harding	**157, 231, 233**	+	-	-
3	Nuplains	**154, 155, 156, 202, 203**	+	+	-
4	Wesley	**154, 155, 156, 219**	+	-	-
5	Jerry	**156, 157, 229**	+	+	-
6	98x0435-15	**156, 157, 231, 233**	+	+	-
7	BC98334-04-02	**156, 157, 202, 203, 231, 233**	+	+	-
8	BC98334-10W-8W	**150, 156, 157, 232**	-	+	-
9	HV9W98A-1002R	**156, 157, 202, 203**	+	-	-
10	HV9W02-846R	**154, 155, 221, 223**	+	+	-
11	Millennium-27,ALS-1	**156, 157, 233**	+	+	-
12	NE03458	**154, 155, 169, 203**	+	+	-
13	NE04490	**156, 157, 205**	+	+	-
14	NE04537	**152, 157, 168, 169, 231**	+	+	-
15	NH03614	**152, 156, 157, 169, 203, 233**	+	+	+
16	NI05711	**150, 156, 157, 219**	+	+	-
17	NI05714	**152, 156, 157, 168, 169, 202, 203**	+	+	-
18	NI05720W	**152, 156, 157, 227**	+	+	+
19	NW03681	**153, 154, 169, 231**	+	+	+
20	N98L20040-44	**153, 154**	+	+	-
21	SD96240-3-1	**153, 154, 208**	+	+	-
22	SD98W175-1	**156, 157, 203**	+	+	-
23	SD05W012	**152, 156, 157, 205, 231**	+	+	+
24	SD05W018	**152, 156, 157, 203**	+	+	-

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	RWA	Vernalization	Vernalization	Vernalization
	Marker	GWM111	VRN1AProm	VRN-A1,NON-Del	VRN-B1,Del
	Band Size (bp)	Tailed	T492	1068	709
	Marker type	SSR	STS	STS	STS
25	SD05W030	**153, 154, 168, 169, 202, 203**	+	+	-
26	SD05W138	**156, 157, 231**	+	+	+
27	SD05W140	**153, 154, 168, 169, 233**	+	+	-
28	SD02804-1	**154, 156, 203**	+	+	-
29	SD05004	**156, 157**	+	-	-
30	SD05118	**152, 156, 157, 231**	+	+	-
31	SD05179	**154, 155, 169, 203**	+	+	+
32	SD05210	**156, 157, 202, 203**	+	+	-
33	BZ9W02-2051	**150, 156, 157, 208**	+	+	-
34	NX03Y2489	**152, 155, 156, 202, 203**	+	+	-
35	NWX03Y2459	**152, 156, 157, 202, 203**	+	+	-
36	MT0419	**153, 154, 227**	+	+	-
37	MTCL0477	**156, 157, 202, 203**	+	+	-
38	MT0495	**153, 154**	+	+	-
	Chinese Spring	**152, 155, 156, 226, 227, 228, 229**	+	+	+
	Yecora Rojo	**155, 168, 169, 230, 231, 232**	+	+	+
	TAM107	**153, 154, 168, 169, 202**	+	+	-
	Clark	**153, 154, 155, 156, 222, 223**	+	+	-
	Jagger	**154, 168, 169, 191, 204, 205**	+	+	-
	Sumai 3	**150, 156, 157, 202, 203**	+	+	-
	Check	**148, 154, 155, 168, 169, 232, 233, 234**	+	-	-
	Check	**152, 153, 168, 169, 236, 237**	+	+	-

Table 17. DNA marker analysis, 2007 NRPN.

DNA marker analysis: USDA-ARS

	Trait	Vernalization	Vernalization	Vernalization
	Marker	VRN-B1,NON-Del	VRN-D1,Del	VRN-D1,NON-Del
	Band Size (bp)	1149	1671	997
	Marker type	STS	STS	STS
1	Kharkof	+	-	+
2	Harding	+	-	+
3	Nuplains	+	-	+
4	Wesley	+	-	+
5	Jerry	+	-	+
6	98x0435-15	+	-	+
7	BC98334-04-02	+	-	+
8	BC98334-10W-8W	+	-	+
9	HV9W98A-1002R	+	-	+
10	HV9W02-846R	+	-	+
11	Millennium-27,ALS-1	+	-	+
12	NE03458	+	-	+
13	NE04490	+	-	+
14	NE04537	+	-	+
15	NH03614	+	-	+
16	NI05711	+	-	+
17	NI05714	+	-	+
18	NI05720W	+	-	+
19	NW03681	+	-	+
20	N98L20040-44	-	-	+
21	SD96240-3-1	+	-	+
22	SD98W175-1	+	-	+
23	SD05W012	+	-	+
24	SD05W018	+	-	+

Table 17. DNA marker analysis, 2007 NRPN.

	Trait	Vernalization	Vernalization	Vernalization
	Marker	VRN-B1,NON-Del	VRN-D1,Del	VRN-D1,NON-Del
	Band Size (bp)	1149	1671	997
	Marker type	STS	STS	STS
25	SD05W030	+	-	+
26	SD05W138	+	-	+
27	SD05W140	+	-	+
28	SD02804-1	+	-	+
29	SD05004	+	-	+
30	SD05118	+	-	+
31	SD05179	+	-	+
32	SD05210	+	-	+
33	BZ9W02-2051	+	-	+
34	NX03Y2489	+	-	+
35	NWX03Y2459	+	-	+
36	MT0419	+	-	+
37	MTCL0477	-	-	+
38	MT0495	+	-	+
	Chinese Spring	+	+	+
	Yecora Rojo	+	+	+
	TAM107	+	-	+
	Clark	+	-	+
	Jagger	+	-	+
	Sumai 3	+	+	+
	Check	-	+	-
	Check	+	-	+