

SWEET CORN HYBRID DISEASE NURSERY – 2000

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Common rust, northern leaf blight (NLB), Stewart's bacterial wilt, maize dwarf mosaic (MDM), and southern leaf blight (SLB) can reduce yields of susceptible and moderately susceptible sweet corn hybrids. Disease management can be improved if reactions of hybrids are known.

Resistance and susceptibility are the two extremes of a continuum of host reactions to diseases. Resistance is a measure of the ability of the host to reduce the growth, reproduction and/or disease-producing abilities of the pathogen, thus resulting in less severe symptoms of disease. Major genes for resistance, such as *Rp*, *Ht*, or *Mdm1*, can prevent or substantially limit disease development if specific virulence is not present in pathogen populations. Hybrids with major gene resistance usually are identified from specific phenotypes. Major gene resistance may be ineffective when specific virulence occurs.

In the absence of effective major gene resistance, disease reactions often range from partially resistant to susceptible. Hybrids can be grouped into broad classes such as: resistant (R), moderately resistant (MR), moderate (M), moderately susceptible (MS), and susceptible (S) based on severity of disease symptoms. This procedure produces statistically “overlapping” groups without clear-cut differences between classes (e.g., the hybrid with least severe symptoms in the MR class does not differ significantly from the hybrid with the most severe symptoms in the R class). Nevertheless, a consistent response over several trials produces a reasonable estimate of the disease reaction of a hybrid relative to the response of other hybrids. These reactions can be used to assess the potential for diseases to become severe and affect yield (2).

This report summarizes the reactions of 247 sweet corn hybrids to common rust, NLB, Stewart's wilt, MDM, and SLB based on performance in the 2000 University of Illinois sweet corn disease nursery.

Materials and Methods

Hybrids: Two-hundred-and-forty-seven hybrids were evaluated in 2000. This includes 115 *sh2* hybrids, 126 *se* or *su* hybrids and 6 *bt1* hybrid. Maturity ranged from about 60 to 110 days. Standard hybrids with relatively consistent reactions to rust, Stewart's wilt, and NLB (Table 2) were included to compare the results from the 2000 nursery to those from previous nurseries.

Experimental design and procedures: Each disease was a separate trial with three replicates of hybrids arranged in randomized complete blocks. Each trial was split into two main blocks of *sh2* and *bt1* or *su* and *se* hybrids. Each experimental unit was a single 12-ft. row with about 8 to 20 plants. Three trials (NLB, Stewart's wilt, and SLB) were planted May 15 at Champaign, IL. Four additional trials were planted in Champaign or Urbana on June 6 (common rust and Stewart's wilt), June 19 (Stewart's wilt and MDM), June 29 (Stewart's wilt and MDM), and July 6 (common rust, Stewart's wilt and MDM).

Table 1. Summary statistics for common rust, NLB, SLB, Stewart's wilt, and MDM ratings.

Disease	n	mean	std. dev.	Range	B LSD	CV (%)
Common rust - leaf area infected	244	24 %	11.6 %	2 - 57 %	6.7 %	18.9
NLB - leaf area infected	245	27 %	9.1 %	6 - 53 %	8.4 %	18.7
SLB - leaf area infected	243	3.0	1.09	1 - 8	1.38	26.4
Stewart's wilt - seedling ratings	246	3.0	0.75	1.7 - 5.4	0.94	19.4
*Stewart's wilt - incidence	244	13 %	11.3 %	0 - 56 %	10.8 %	49.5
*MDM - incidence (mostly MDMV-A)	244	30 %	18.6 %	0 - 75 %	36.9 %	65.2
*MDM - incidence (mostly SCMVM-B)	243	82 %	16.8%	17 - 100 %	20.8 %	16.1

Stewart's wilt and MDM incidence - % of naturally infected plants.

Inoculation and disease assessment: The three trials planted May 15 were inoculated with one of three pathogens: *Exserohilum turcicum* (NLB), *Erwinia stewartii* (Stewart's wilt), or *Bipolaris maydis* (SLB). A mixture of conidia of races 0 and 1 of *E. turcicum* were sprayed into plant whorls on June 13, 19, 22, 27 and 30. Plants were inoculated with *E. stewartii* on June 12, 15, and 27 by wounding leaves in the whorl and introducing bacteria into wounds. Conidial suspensions of *B. maydis* were sprayed into whorls on June 14, 21, and 28. Plants in the other four trials were infected naturally. Common rust was prevalent in the trials planted June 6 and July 6. Plants in the trials planted June 19 and 29 and July 6 were infected with MDM viruses. Stewart's wilt occurred naturally in all four late-planted trials.

Disease symptoms were rated on a row basis. The percentage of the leaf area infected by common rust was rated from 0 to 100% on August 4-5 (June 6 trial) and August 30-31 (July 6 trial). Leaf area infected by NLB was rated from 0 to 100% on July 30-31. Stewart's wilt was rated in the inoculated trial on July 10-14 (seedling wilt phase) using scale from 1 (*E. stewartii* within 2 cm of inoculation wounds) to 9 (severe systemic infection or dead plants). SLB was rated on August 1-2 using a scale from 1 (small, chlorotic lesions; little secondary spread) to 9 (large, necrotic lesions; abundant secondary spread). The number of plants with MDM symptoms was counted in the naturally-infected MDM trials on July 24-25 (June 19 trial), August 1-2 (June 29 trial) and August 2-3 (July 6 trial). The number of plants systemically infected with *E. stewartii* was counted on July 10-11 (June 6 trial); July 11-12 (June 19 trial – early seedling stage); July 20-21 (June 19 trial – 6-to 8-leaf stages); July 30-31 (June 29 trial); and August 4-5 (July 6 trial). Incidence (%) of plants with MDM or systemic Stewart's wilt symptoms was calculated as: (number of symptomatic plants / stand counts) *100.

Data analysis: Disease ratings were analyzed by ANOVA. Hybrid reactions were classified according to standard deviations from the mean (z-scores), Bayesian least significant difference (BLSD) separations (k=100), and the FASTCLUS procedure of SAS using various groupings of 4 to 12 clusters.

Results and Discussion

Hybrid reactions ranged from very little disease to severe symptoms (Table 1). Reactions of standard hybrids to rust, NLB, Stewart's wilt, SLB, and MDM were generally within expected ranges except for the occurrence of rust on hybrids with Rp-resistance (Table 2). The criteria for classifying hybrid reactions are listed in Table 3. Table 4 includes reactions and actual ratings of the 247 hybrids **based solely on the 2000** trial. This is the only data we have for some of these hybrids. For hybrids that have been evaluated in previous years, a more complete assessment of reactions is presented in another report, "Reactions of sweet corn hybrids to prevalent diseases - 2000" (1).

Table 2. Reactions of sweet corn hybrids included as standards in the 2000 disease nursery

Hybrid	Common rust			NLB			Stewart's wilt				SLB			MDM			
	Prior	00	Rating	Prior	00	Rating	Prior	00	Rating	%	Prior	00	Rating	Prior	00	MDM	SCM
Bonus	0	2	8 %	5	5	26 %	1	1	1.8	5%	7	6	4.7	1	1	2 %	31%
Day Star	6	8	41	1	2	9	3	5	2.7	22	1	2	2.0	8	9	37	85
Eliminator	0	5	15	6	6	31	2	4	2.9	2	6	6	4.3	1	1	2	46
Green Giant 27	3	3	14	3	4	23	2	2	2.2	4	5	4	3.0	6	9	16	99
Jubilee	5	6	29	8	8	37	9	9	4.9	46	5	2	2.0	9	5	35	60
Miracle	2	5	20	2	5	25	1	1	1.9	5	4	2	2.3	9	9	52	82
Phenomenal	5	7	38	5	5	30	5	5	3.5	7	5	4	3.3	9	9	21	85
Prime Plus	0	3	16	2	2	11	3	3	2.1	11	6	7	5.7	9	9	36	74
Snow White	9	9	57	7	7	32	7	9	4.4	35	3	4	3.0	4	3	2	65
Sum. Sweet 7710	6	8	40	2	2	8	2	3	2.2	14	2	2	2.3	8	9	51	93
Ultimate	6	7	39	2	3	16	2	1	2.0	4	2	2	2.0	8	9	25	90

Prior - reaction in previous years (1984-1999).

00 - reaction in 2000: 1 - resistant, 3 - moderately resistant, 5 - moderate, 7 - moderately susceptible, 9 - susceptible.

Rating - mean rating in 2000: 0 to 100% for severity of rust and NLB; 1 to 9 for Stewart's wilt (inoculated seedling) and SLB; natural incidence (0 to 100%) of systemic Stewart's wilt or MDM due to MDMV-A or SCM (MDMV-B).

Table 3. Criteria for classifying hybrid reactions to diseases in the 2000 nursery

	Classification of reaction								
	1	2	3	4	5	6	7	8	9
Common rust (%)	< 5		≤10	≤18	<26	<33	<40	<49	≥49
NLB (%)	<10	≤15	≤20	<24	<30	≤32	<38	<42	≥42
SLB (1 to 9 rating)	< 2	≤2.5	< 3	< 4		< 5	< 6	< 7	≥ 7

Classification: 1 - resistant, 3 - moderately resistant, 5 - moderate, 7 - moderately susceptible, 9 - susceptible.

Stewart's wilt classifications based on a cluster analysis of severity ratings and incidence of natural infection.

MDM classifications based on a cluster analysis of incidence due mostly to MDMV-A or SCMV (MDMV-B).

Common rust: Rust severity ranged from 2 to 57% leaf area infected with a mean of 24%. Rust pustules were observed on all hybrids including those with Rp-resistance although many Rp-resistant hybrids had fewer and smaller pustules than non-Rp hybrids. Rust severity was less than 5% for three hybrids (BSS 0977 VPA, GSS 0966 A, and GSS 0978 A) which have Rp-resistance based on the *Rp1-I* gene. Twenty of 21 hybrids with rust severity between 5 and 10% had Rp-resistance based on the *Rp1-D* gene. Apparently, *P. sorghi* biotypes with virulence against *Rp1-D* (3) comprised a relatively low percentage of the rust population thereby allowing *Rp1-D* to provide some control. Rust severity was about half as much on the *Rp1-D* version of a hybrid as on the non-Rp version of the same hybrid (e.g., 15% vs 25% for Bodacious, 15% vs 36% for Crisp n Sweet 710A, 10% vs 24% for Incredible, 16% vs 32% for Primetime/Prime Plus, and 14% vs 33% for Summer Sweet 8102). Although these differences were observed in both trials, they may not occur if *P. sorghi* biotypes with virulence against *Rp1-D* comprise a larger portion of the rust population. Sixty-four hybrids with more than 33% leaf area infected were classified as moderately susceptible to susceptible. Rust severity was greater than 40% on 17 of these hybrids.

Northern leaf blight: NLB severity ranged from 6 to 53% with a mean of 27%. For many hybrids, NLB was rated from two replicates due to flooding in the third replicate. Therefore, hybrid reactions to NLB may be less accurate than in previous nurseries. Also, about 80% of the NLB lesions were due to race 0 and about 20% were due to race 1. This resulted in less severe infection of hybrids with the *Ht1* gene (i.e., chlorotic-lesion resistance to race 0) than would have occurred if race 1 was more frequent. Severity of NLB averaged 19% for 82 hybrids with the *Ht1* or *HtN* genes and 31% for 163 hybrids without Ht-resistance. Ten hybrids with less than 10% leaf area infected were considered to be resistant. These include: BSS 8142, Crisp n Sweet 710A, Crisp n Sweet 710A-RR, Day Star, GSS 3381, Hi37 x Hi36c, HMX 8343 BS, Summer Sweet 7630, Summer Sweet 7710, and Xtra Tender 182A. Fifteen hybrids with 10 to 15% NLB infection were considered to be resistant/moderately resistant. These include: ba11 x 190, Big Time, Boreal, BSS 0977 VP A, Envy, GH 3054, Green Giant Code 62, GSS 0966 A, GSS 5771, Prime Plus, Seneca PX 8201, Seneca PX 9364169, Summer Sweet 7631, Twin Star, and Xtra Tender 282A. Nineteen of these 25 hybrids were rated resistant or moderately resistant (1 to 3) in previous nurseries; two were rated MR/M (4) previously; and four had not been evaluated before this trial. Thirty-seven hybrids with 15 to 20% leaf area infected were considered to be moderately resistant in the 2000 trial. Forty-eight of the 62 hybrids classified from resistant to moderately resistant in the 2000 trial had either the *Ht1* or *HtN* gene.

Stewart's wilt: Stewart's wilt ratings at the 6- to 8-leaf stage in the inoculated trial ranged from 1.7 to 5.4 with a mean of 3. Incidence of systemically infected plants calculated from all four naturally-infected, late-planted trials averaged 13% and ranged from 0 to 56% among hybrids. Incidence of systemic Stewart's wilt averaged 5%, 10%, 12%, 15%, and 25% from five ratings of the four trials. Severity of Stewart's wilt (seedling ratings) and incidence of systemically infected plants were correlated, $r=0.68$. Hybrids were classified for Stewart's wilt reactions based on a cluster analysis of severity and mean incidence ratings. Nine hybrids were classified as resistant based on severity rated 2 or below and incidence of 5% or below. These included: Ambrosia, Bonus, Millennium, Miracle, Seneca Nation, SVR 8492239, Ultimate, Xtra Tender 179A, and Xtra Tender 271A. Forty hybrids with ratings below 2.5 and incidence below 11% were classified as R/MR. Thirty-eight of the 49 hybrids rated resistant or R/MR had been evaluated in previous nurseries, and 35 had been classified from resistant to moderately resistant. Thirty-seven hybrids with

Stewart's wilt ratings below 2.9 and incidence of systemic infection below 16% were classified as moderately resistant. Stewart's wilt severity usually was above 4 and incidence of systemic infection was above 20% for 41 hybrids classified as moderately susceptible to susceptible.

Southern leaf blight: SLB ratings ranged from 1 to 8 with a mean of 3. Thirteen hybrids with SLB ratings below 2 were classified as resistant. These included: 217 x ba11, ba11 x 190, Climax, Crisp n Sweet 710A, Crisp n Sweet 710A-RR, EX 8410057, Millennium, Seneca PS 7404, Starship II, Summer Sweet 8100, Summer Sweet 8102, Summer Sweet 8102R, and WSS 1921. Seventy hybrids with ratings from 2 to 2.5 were classified as R/MR. Thirty-nine hybrids rated between 2.5 and 3 were classified as moderately resistant. Sixteen hybrids rated 5 and above were classified as moderately susceptible to susceptible.

Maize dwarf mosaic: Incidence of MDM-infected plants averaged 30% for the trial planted June 19 in which plants were infected predominantly by MDMV-A. Incidence averaged 82% for the two trials planted June 29 and July 6 in which plants were infected predominantly by SCMV-MB (i.e., MDMV-B). Incidence ranged from 0 to 75% among hybrids in the MDMV-A trial and from 17 to 100% in the SCMV-MB trials. Viruses other than MDMV and SCMV-MB may have caused symptoms similar to those of MDM especially in the two later-planted trials (June 29 and July 6). Thirty-one hybrids with less than 5% incidence of infected plants in the MDM trial were classified as resistant. Thirteen of these hybrids also were classified from moderately resistant to resistant in the SCM trials based on an average incidence below 50%. These include: Bonus, Eliminator, GH 3054, GH 4809, Green Giant Code 75, HMX 8343 BS, Millennium, Rustler, SVR 08705760, SVR 08705774, Topacio, ba11 x KbtL13, and ba11 x 190. Ten hybrids classified as resistant to MDM were classified as MR/M or moderate for SCM with an average incidence between 50 and 60%. These include: 217 x ba11, El Toro, GH 0934 A, GH 2783, HMX 8392 S, Morning Star, SVR 08302389, SVR 8482598, Snow White, and Twin Star. Eight hybrids with less than 5% incidence in the MDM trial were rated from M/MS to susceptible in the SCM trials based on incidence above 60%. Seven hybrids with 5 to 10% incidence in the MDM trial were classified as moderately resistant if incidence in the SCM trial was below 80%. Five hybrids with 10 to 20% incidence in the MDM trial were classified as MR/M or moderate if incidence in the SCM trials was less than 60%. Twenty-three hybrids that were classified from resistant to MR/M in the SCM trials also were classified as resistant to MR/M in the MDM trial. Four hybrids that were a moderate in the SCM trials were resistant in the MDM trial; and five that were moderate in the SMC trials were susceptible in the MDM trial. Most of the hybrids that were classified as resistant to moderate in the MDM trial probably have the *Mdm1* gene or other genes for MDM resistance. Hybrids that also were classified as resistant to moderate in the SCM trials probably have additional genes for resistance to viruses that cause MDM symptoms.

References

1. Pataky, J. K., 2000. Reactions of sweet corn hybrids to prevalent diseases – revised October 2000. In: Midwestern Vegetable Variety Trial Report for 2000. Purdue Univ. Agric. Exp. Sta. Bull. No.
2. Pataky, J. K., and D. M. Eastburn. 1993. Using hybrid disease nurseries and yield loss studies to evaluate levels of resistance in sweet corn. *Plant Disease* 77:760-765.
3. Pataky, J. K., and W. F. Tracy. 1999. Widespread occurrence of common rust, caused by *Puccinia sorghi*, on Rp-resistant sweet corn in the midwestern United States. *Plant Dis.* 83:1177.

Table 4. Reactions of sweet corn hybrids in the University of Illinois disease nursery in 2000

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic				
				Rxn Rate		Rxn Rate		Rxn Rate		Rxn Rate		Rxn Rate		A	B	A	B	
					(%)	(%)	Ht	(1-9)	(%)	(1-9)	(1-9)			(%)	(%)			
						<u>su/se trial</u>												
se	Y	Cr	Bodacious	5	25	5	26		2	2.4	6	2	2.5	9	9	44	100	
se	Y	Cr	Bodacious R	3	15	5	26		4	3	6	2	2	9	9	18	92	
su	Y	Rog	Bonus	2	8	5	26	Ht	1	1.8	5	6	4.7	1	1	2	31	
se	Y	Asg	Climax	2	8	8	37		2	2.4	10	1	1.7	9	9	71	97	
su	Y	Cr	Conquest	2	5	7	35		7	4.1	26	6	4.3	9	9	47	84	
su	Y	DM	DMC 20-38	3	16	8	39		8	4.8	24	6	4	9	9	44	72	
se	Y	Asg	EX 8414247	5	20	5	29		2	2.3	2	2	2.5	9	9	38	100	
se	Y	Asg	EX 8414907	7	37	5	30		4	2.9	5	4	3.5	9	9	65	100	
se	Y	Asg	EX 8471538	3	11	5	28		3	2.7	5	2	2	9	9	50	98	
se	Y	Asg	EX 8473488	7	33	6	31		3	2.8	8	7	5	9	9	58	86	
su	Y	Cr	Earlivee	8	41	9	45		6	3.8	16	.	.	9	9	16	81	
su	Y	Asg	El Toro	3	15	7	32		5	3.6	10	2	2.5	1	5	2	68	
su	Y	Cr	Eliminator	5	18	6	31		4	2.9	2	6	4.3	1	2	2	46	
su	Y	Asg	Esquire	2	6	8	37		6	3.3	20	2	2.5	9	5	41	61	
se	Y	HM	Esteem	5	21	7	32		5	3	15	4	3	1	7	0	69	
se	Y	Mesa	Exp 30218	5	23	4	24		4	3	3	2	2	9	9	61	90	
su	Y	HM	FMX 492	3	11	4	24	Ht	6	3.3	20	3	2.7	9	9	64	93	
su	Y	HM	FMX 516	3	10	7	36		5	2.9	15	2	2.3	9	9	52	81	
su	Y	Rog	GH 0934 A	5	23	4	23	Ht	2	1.9	8	4	3.7	1	4	0	52	
su	Y	Rog	GH 0937 A	2	7	4	22	Ht	2	1.8	8	6	4	1	7	0	64	
su	Y	Rog	GH 2384	3	13	5	30		6	3.1	20	4	3	9	9	34	82	
su	Y	Rog	GH 2693	2	9	5	28	Ht	2	1.9	7	4	3.3	9	9	47	83	
su	Y	Rog	GH 2783	5	22	5	27	Ht	2	2.2	9	4	3.3	1	4	3	51	
su	Y	Rog	GH 3054	5	25	2	11	Ht	2	1.7	9	3	2.7	1	1	0	17	
sesu	Y	Rog	GH 4809	3	14	6	31	Ht	7	4.1	28	4	3.3	1	2	0	43	
su	Y	Rog	GH 7749	6	29	6	31		4	3.2	7	3	2.7	1	9	2	78	
su	Y	GG	Green Giant Code 6	5	24	5	27		2	2.4	8	4	3	9	9	14	95	
su	Y	GG	Green Giant Code 27	3	14	4	23		2	2.2	4	4	3	9	9	16	99	
su	Y	GG	Green Giant Code 49	5	18	8	37		5	3.3	11	7	5	9	9	47	94	
su	Y	GG	Green Giant Code 58	5	18	9	44		6	3.6	15	8	6	9	9	18	92	
su	Y	GG	Green Giant Code 60	2	5	5	27		2	2.4	4	4	3	9	9	20	94	
su	Y	GG	Green Giant Code 62	2	7	2	15	Ht	3	2.7	2	4	3	9	9	48	88	
su	Y	GG	Green Giant Code 64	2	9	5	25		3	2.7	9	3	2.7	9	9	53	99	
su	Y	GG	Green Giant Code 67	3	12	5	30		2	2.1	4	6	4	9	9	60	95	

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate	Rxn	Rate	HT	Rxn	Rate	Inc	Rxn	Rate	A	B	A	B
					(%)		(%)			(1-9)	(%)		(1-9)			(%)	(%)
<u>su/se trial</u>																	
su	Y	GG	Green Giant Code 71	3	14	9	43		9	4.8	56	2	2	9	5	33	60
su	Y	GG	Green Giant Code 74	3	12	4	21		2	2.3	2	4	3	9	9	12	88
su	Y	GG	Green Giant Code 75	3	14	4	24		2	2.2	1	2	2	1	3	3	47
su	Y	GG	Green Giant Code 76	2	6	8	37		4	2.7	11	6	4	9	9	58	92
su	Y	GG	Green Giant Code 77	2	8	7	35		5	3.4	9	4	3	9	9	14	95
su	Y	GG	Green Giant Code 79	3	11	5	26		6	3.8	16	6	4	1	9	4	74
su	Y	GG	Green Giant Code 80	3	14	7	34		6	3.7	15	6	4	9	9	61	92
su	Y	GG	Green Giant Code 81	6	28	5	30		8	4.6	25	4	3.5	1	7	0	71
su	Y	GG	Green Giant Code 82	2	7	6	31		4	3	3	2	2	9	9	73	83
su	Y	HM	HMX 7384	3	15	9	45		9	5.1	50	4	3.3	1	6	0	61
su	Y	HM	HMX 8389	2	7	3	18	Ht	2	1.8	6	4	3.7	9	9	29	84
se	Y	Cr	Incredible	5	24	5	30		3	2.6	0	2	2.3	9	9	27	94
se	Y	Cr	Incredible R	3	10	6	31		3	2.8	4	2	2	9	9	24	87
se	Y	Cr	Intrigue	2	8	5	30		6	3.7	9	6	4.7	9	9	44	82
su	Y	Rog	Jubilee	6	29	8	37		9	4.9	46	2	2	9	5	35	60
se	Y	Mesa	Merlin	5	18	5	27		2	2.3	3	2	2.5	9	9	63	84
se	Y	Cr	Miracle	5	20	5	25		1	1.9	5	2	2.3	9	9	52	82
su	Y	Asg	SVR 08302389	3	15	9	43		5	2.7	31	4	3	1	5	0	70
su	Y	Asg	SVR 08705760	2	6	7	34		7	4	17	2	2.3	1	1	0	28
se	Y	Asg	SVR 8452067	3	10	8	37		4	2.4	25	6	4	9	9	37	92
su	Y	Asg	SVR 8479238	2	7	4	24		2	2.4	7	6	4	9	9	12	77
su	Y	Asg	SVR 8482598	3	16	5	28		5	3	15	6	4.7	1	4	2	52
su	Y	Asg	SVR 8492229	2	9	5	28	Ht	2	2	6	6	4	9	9	32	83
su	Y	Asg	SVR 8492239	5	25	3	17	Ht	1	2	5	4	3.3	9	9	29	71
su	Y	Asg	SVR 8492909	5	19	7	32		5	3.3	12	4	3.3	9	9	39	72
se	Y	Sen	Seneca Arrow II	7	34	4	23		2	2.2	7	2	2.5	9	9	52	94
se	Y	Sen	Seneca PX 9330109	7	33	5	29		5	3.2	13	6	4	9	9	49	75
se	Y	Cr	Sugar Buns	7	36	4	24		4	2.9	2	3	2.7	9	9	37	91
se	Y	HM	Topacio	3	12	5	26		4	2.7	13	6	4.7	1	4	0	46
se	Y	Mesa	Tuxedo	5	24	3	20		2	2.1	7	2	2	9	9	38	67
su	Y	SnRv	UY 1214ND	6	31	7	35		5	2.9	15	7	5	9	9	59	96
su	Y	SnRv	UY 1509NE	3	15	6	31		3	2.5	9	6	4	1	6	2	58
su	Y	SnRv	UY 1601NF	3	12	6	31		7	3.9	23	4	3	9	9	56	75
se	Y	Mesa	Welcome TSW	7	35	.	.		5	2.8	29	4	3.5	9	9	46	83
se	Y	Asg	XPH 3123	5	20	5	25		2	2.3	0	3	2.7	9	9	43	100

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate (%)	Rxn	Rate (%)	HT	Rxn	Rate (1-9)	Inc (%)	Rxn	Rate (1-9)	Rxn	Rxn	A	B
<u>su/se trial</u>																	
se	B	Cr	Ambrosia	6	27	4	22		1	2	3	4	3.7	9	9	31	88
se	B	Rog	BC 0801 A	3	11	5	29		9	4.6	32	2	2	9	9	31	92
se	B	Mesa	Bon Appetit TSW	7	35	5	27		4	2.7	13	3	2.7	9	9	38	86
sb	B	Cr	Bravado	6	27	5	26		3	2.8	5	3	2.7	9	9	34	100
se	B	Mesa	Buckeye	6	27	4	21		2	2.1	2	4	3	9	9	45	82
se	B	Cr	Delectable	5	20	4	24		2	2.4	1	2	2	9	9	35	89
se	B	Asg	EX 8410297	3	15	8	39		5	3.3	11	4	3.7	9	9	59	91
se	B	Asg	EX 8410307	3	17	5	29		6	3.6	18	6	4.3	9	9	63	70
se	B	Asg	EX 8410317	6	28	5	27		3	2.8	1	4	3.3	3	6	6	68
se	B	Asg	EX 8414787	6	28	5	28		5	3.5	9	7	5.3	9	9	32	73
se	B	Asg	EX 8414837	5	23	9	45		4	2.9	2	3	2.7	9	9	51	96
se	B	Asg	EX 8415097	5	24	3	19		4	3.1	0	4	3.3	9	9	48	95
se	B	Cr	Early Ambrosia	8	43	9	40		4	3.2	5	6	4	5	.	16	.
se	B	Mesa	Encore	5	22	6	31		2	2.3	7	2	2.5	9	9	58	86
se	B	Mesa	Exp 10331	7	35	7	33		5	3	11	2	2	9	9	55	86
se	B	Mesa	Exp 10332	6	31	3	20		4	2.8	15	4	3.5	9	9	41	89
se	B	Mesa	Exp 10502	6	29	3	19		2	2.3	10	2	2.3	9	9	75	89
se	B	Mesa	Exp 10503	6	32	3	20		3	2.5	2	4	3	9	9	62	98
se	B	Cr	Fleet	7	35	8	39		6	3.7	5	2	2	9	9	22	87
se	B	Mesa	Friendship	6	27	3	16		3	2.2	15	6	4	9	9	42	87
sb	B	HM	HMX 6357 BSB	7	36	5	29		2	2.4	5	4	3	1	9	0	80
sb	B	HM	HMX 7366 BES	7	39	5	27		4	3.3	3	2	2.3	9	9	51	100
su	B	Cr	Honey & Cream	7	37	5	29		6	3.6	15	7	5	9	9	55	93
se	B	Mesa	Luscious TSW	7	35	4	24		3	2	15	4	3	9	9	33	76
se	B	Cr	Mystique	7	33	3	20		4	3	8	6	4	9	9	23	92
se	B	Mesa	Precious Gem	5	25	4	22		4	2.9	3	2	2.3	9	9	52	87
su	B	Cr	Quickie	8	45	9	47		7	4.7	15	9	8	9	9	18	100
se	B	Asg	SVR 08705488	5	25	5	29		4	3.3	8	6	4.7	9	9	51	76
se	B	Asg	SVR 8471718	.	.	7	32		5	3.2	.	.	.	.	.	.	.
se	B	Asg	SVR 8471748	.	.	4	24		3	2.3	.	.	.	.	.	.	.
se	B	Sen	Seneca Nation	6	29	4	22		1	1.9	1	4	3.3	9	9	51	79
se	B	Sen	Seneca PS 6803	6	27	.	.		4	2.9	8	2	2	9	5	30	61
se	B	Sen	Seneca PS 7404	6	26	3	20		2	2.2	3	1	1.5	9	9	52	85
se	B	Sen	Seneca PX 6804	5	19	3	20		4	2.7	13	4	3.5	9	9	61	76
se	B	Sen	Seneca Spring	6	31	5	26		3	2.6	4	4	3.3	9	9	44	96

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate (%)	Rxn	Rate (%)	HT	Rxn	Rate	Inc	Rxn	Rate	Rxn	Rxn	Inc (%)	Inc (%)
<u>su/se trial</u>																	
se	B	Asg	Sensor	6	28	5	29		4	3.1	8	2	2	9	9	57	85
se	B	HS	Sir Prize	7	36	5	27		6	3.9	13	3	2.7	9	9	65	94
se	B	Asg	Sunset	5	25	8	39		6	3	24	2	2.5	9	9	54	81
se	B	Cr	Trinity	8	47	7	35		6	3.8	1	4	3	9	9	27	100
se	B	Asg	XPH 3130 BC	5	25	8	37		9	4	44	2	2	9	9	17	100
se	W	Cr	Argent	6	27	4	22		2	2.4	3	2	2	9	9	31	85
se	W	Mesa	Avalanche	8	40	4	23		5	3.4	2	4	3.5	9	9	59	100
se	W	Asg	Celebration	7	36	5	27		4	2.9	9	7	5	9	9	50	68
se	W	Mesa	Cloud Nine TSW	5	23	4	23		2	2.1	1	4	3	9	9	56	99
se	W	Asg	EX 8410337	7	34	5	29		7	3.5	26	2	2	3	6	10	62
se	W	Asg	EX 8414877	5	21	9	41		7	3.8	26	6	4.5	9	9	38	91
se	W	Asg	EX 8414887	7	38	9	47		7	3.9	17	6	4.3	9	9	28	81
se	W	Asg	EX 8414897	6	32	9	53		9	4.2	49	4	3	9	9	59	74
se	W	Asg	EX 8415187	6	31	7	32		4	3	8	4	3	9	9	37	87
se	W	Mesa	Exp 20425	6	32	4	23		3	2.7	0	4	3.5	9	9	58	93
se	W	Cr	Frosty	6	32	5	30		6	3.9	11	4	3	9	9	42	89
su	W	GG	Green Giant Code 61	3	14	4	23		9	4	44	2	2.5	9	9	35	85
se	W	Mesa	Imaculata	6	31	3	16		3	2.8	2	4	3	9	9	48	100
se	W	Sen	Seneca SEnsation	5	22	4	23		4	3	9	2	2	9	9	45	98
se	W	Rog	Silver King	3	14	5	30		5	3.1	14	2	2.3	9	9	31	100
se	W	Rog	Silver Princess	7	37	7	32		4	3.1	8	6	4	9	9	16	95
sesu	R	Asg	Sweet Scarlet	5	22	5	29		9	3.8	50	2	2	9	9	64	86
<u>sh2/bt trial</u>																	
sh2	Y	Cr	Assure	3	17	5	25	Ht	7	4.2	27	2	2	9	9	13	81
sh2	Y	Asg	Brut	6	28	5	25		6	3.2	19	2	2.3	9	9	47	78
sh2	Y	Asg	Challenger	7	37	4	21	Ht	4	2.7	11	3	2.7	9	9	55	93
sh2	Y	Cr	Crisp n Sweet 710	7	38	4	24	Ht	3	2.2	11	2	2	9	9	18	84
sh2	Y	Cr	Crisp n Sweet 710A	7	36	1	9	Ht	4	2.6	11	1	1.7	9	9	26	97
sh2	Y	Cr	Crisp n Sweet 710ARR	3	15	1	9	Ht	.	.	5	1	1	9	9	27	88
sh2	Y	Rog	Cronus	3	14	3	19	Ht	4	2.7	15	6	4.3	9	9	27	78
sh2	Y	HM	Day Star	8	41	1	9	Ht	5	2.7	22	2	2	9	9	37	85
sh2	Y	Asg	EX 8410057	5	19	3	20	Ht	3	2.3	12	1	1.7	9	9	45	89
sh2	Y	Asg	EX 8415037	.	.	3	16	Ht	5	3	.	.	.	.	.	.	.
sh2	Y	Asg	EX 8415257	5	19	4	24		6	3.6	17	4	3	9	9	22	93

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate	Rxn	Rate	Ht	Rxn	Rate	Inc	Rxn	Rate	A	B	A	B
				(%)		sh2/bt trial			(1-9)		(%)	(1-9)		(%)			
sh2	Y	Asg	Endeavor	7	34	3	19	Ht	5	3.2	14	3	2.7	9	9	34	99
sh2	Y	Agw	Envy	3	14	2	11	Ht	5	2.9	11	2	2	9	9	27	95
sh2	Y	Agw	Flagship II	5	19	3	19	Ht	6	3.1	17	2	2	9	9	44	98
sh2	Y	Rog	GSS 0966 A	1	3	2	15	Ht	6	3.1	19	7	5.7	9	9	21	67
sh2	Y	Rog	GSS 0978 A	1	2	5	26	Ht	7	3.8	21	4	3.7	9	9	20	78
sh2	Y	Rog	GSS 3381	2	7	1	9	Ht	4	2.4	20	2	2.3	9	9	38	78
sh2	Y	Rog	GSS 5771	3	11	2	10	Ht	6	3.2	18	6	4.7	9	9	18	91
sh2	Y	Rog	GSS 5786	3	14	3	16	Ht	4	2.8	13	4	3.7	9	9	20	65
sh2	Y	Rog	GSS 5865	3	14	4	23	Ht	9	4.3	42	2	2.3	9	9	17	84
sh2	Y	Rog	GSS 9379 R	6	29	5	27	Ht	3	2.8	9	4	3.7	9	9	36	78
sh2	Y	GG	Green Giant Code 39	3	11	7	32		5	2.7	17	3	2.7	9	9	33	84
sh2	Y	HM	HMX 8392 S	5	22	7	34		4	2.9	0	2	2.3	1	4	0	63
sh2	Y	SnRv	HY 944ND	9	51	9	44		9	4.2	43	8	6	9	7	14	71
sh2	Y	SnRv	HY 1034NF	7	36	5	29		5	3.3	16	4	3.7	9	9	37	87
sh2	Y	SnRv	HY 1116NF	3	15	7	34		9	4.6	38	2	2.3	5	6	18	61
sh2	Y	Cr	Marvel	5	19	5	29		7	4.1	27	2	2.3	3	9	6	73
sh2	Y	Cr	Missouri	7	37	5	25		2	2.3	3	3	2.7	9	9	23	96
sh2	Y	HM	Morning Star	5	22	3	17	Ht	7	3.6	35	2	2	1	5	2	62
sh2	Y	Rog	Prime Plus	3	16	2	11	Ht	3	2.1	11	7	5.7	9	9	36	74
sh2	Y	Rog	Primetime	6	32	3	17	Ht	2	2.3	7	7	5	9	9	17	78
sh2	Y	Asg	Punchline	7	36	3	20		3	2.6	10	3	2.7	9	9	48	89
sh2	Y	HM	Rustler	5	19	7	33	Ht	4	3	9	2	2	1	2	0	32
sh2	Y	Asg	SVR 08705752	5	22	8	37		6	3	26	3	2.7	3	7	10	69
sh2	Y	Asg	SVR 08705755	5	23	7	36		5	2.8	23	3	2.7	3	4	8	53
sh2	Y	Asg	SVR 8415217	5	20	3	16	Ht	6	3.1	19	2	2	9	9	47	98
sh2	Y	Cr	Samson	5	25	7	36		6	3.6	17	4	3	9	9	15	78
sh2	Y	Agw	Saturn	6	26	5	29	Ht	2	2.3	5	6	4.3	9	9	28	93
sh2	Y	IFS	Sch 70064	3	13	3	17	Ht	2	2.1	0	4	3.3	9	9	34	79
sh2	Y	IFS	Sch 70064 RR	3	14	4	24	Ht	3	1.9	15	2	2	9	9	31	69
sh2	Y	IFS	Sch 90570	7	35	8	38		4	2.9	2	4	3.3	9	9	32	89
sh2	Y	Asg	Shimmer	3	10	3	20	Ht	5	3	13	3	2.7	9	9	27	94
sh2	Y	Asg	Stetson	5	19	5	27		3	2.8	8	2	2	9	9	13	86
sh2	Y	AC	Summer Sweet 6800 R	6	28	5	25		7	3.9	19	2	2	9	9	31	86
sh2	Y	AC	Summer Sweet 7100	8	43	8	39		6	3.6	12	7	5	9	9	41	79
sh2	Y	AC	Summer Sweet 7630	7	36	1	7	Ht	2	2.1	8	2	2	9	9	35	91

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate (%)	Rxn	Rate (%)	HT	Rxn	Rate (1-9)	Inc (%)	Rxn	Rate (1-9)	Rxn	Rxn	A	B
<u>sh2/bt trial</u>																	
sh2	Y	AC	Summer Sweet 7710	8	40	1	8	Ht	3	2.2	14	2	2.3	9	9	51	93
sh2	Y	AC	Summer Sweet 8100	3	12	3	16	Ht	4	2.8	15	1	1	9	9	12	95
sh2	Y	Sak	Super Honey Bantam	5	19	7	33		9	4.9	31	2	2.3	9	9	14	85
sh2	Y	Rog	Supersweet Jubilee	7	33	7	34		9	5.4	50	2	2.3	9	5	24	54
sh2	Y	HM	Suregold	5	19	8	37		6	3.6	11	2	2.3	4	4	16	59
sh2	Y	HM	Sweetear	7	37	6	31		4	3.3	8	2	2.3	9	9	15	85
sh2	Y	HM	Ultimate	7	39	3	16	Ht	1	2	4	2	2	9	9	25	90
sh2	Y	Asg	XP 8414667 (Diva)	3	16	8	37		9	4.4	40	2	2.3	9	9	15	89
sh2	Y	Asg	XP 8414737	5	20	5	28		8	4.3	26	3	2.7	9	9	54	91
sh2	Y	Asg	XPH 3105	9	52	6	31		7	4	23	6	4.3	9	9	23	100
sh2	Y	IFS	Xtra Tender 171A	5	21	5	25		3	2.8	0	4	3	9	9	36	91
sh2	Y	IFS	Xtra Tender 175A	7	35	5	29	Ht	3	2.8	8	6	4.7	9	9	36	99
sh2	Y	IFS	Xtra Tender 176A	7	37	5	29		3	2.7	9	4	3.3	9	9	11	99
sh2	Y	IFS	Xtra Tender 177A	7	34	5	25		2	1.9	7	4	3	9	9	37	95
sh2	Y	IFS	Xtra Tender 178A	7	37	5	29	Ht	3	2.2	16	6	4.7	9	9	25	83
sh2	Y	IFS	Xtra Tender 179A	6	32	5	29		1	1.7	0	4	3.3	9	9	28	97
sh2	Y	IFS	Xtra Tender 182A	3	12	1	9	Ht	2	2.1	1	2	2.3	9	9	25	98
sh2	B	Rog	BSS 0977 VP A	1	2	2	14	Ht	6	3.1	24	6	4	9	9	27	72
sh2	B	Rog	BSS 8142	5	22	1	6	Ht	6	3.9	13	2	2	3	9	10	79
sh2	B	Agw	Bicolor Saturn	6	29	5	27	Ht	3	2.8	6	6	4	9	9	18	92
sh2	B	Rog	Big Time	5	21	2	13	Ht	4	2.3	21	8	6.3	9	9	50	81
sh2	B	Asg	Broadway	5	23	4	21	Ht	6	3.4	17	2	2.3	9	9	40	99
sh2	B	Asg	Cabaret	7	34	3	20	Ht	6	3.4	12	3	2.7	9	9	37	90
sh2	B	Asg	EX 8415277	5	18	6	31		5	3.6	6	3	2.7	9	9	49	98
sh2	B	SnRv	HB 1400NF	7	33	7	35		7	4	27	6	4.3	9	9	42	96
sh2	B	SnRv	HB 1435NF	3	17	5	29		8	3.9	32	4	3	9	9	35	89
sh2	B	HM	HMX 8343 BS	5	22	1	6	Ht	2	2.3	8	2	2	1	1	3	32
sh2	B	HM	HMX 8344 BS	5	22	9	41		6	3.1	20	4	3	4	4	16	51
sh2	B	Asg	Hollywood	5	22	7	36		6	4.1	15	4	3.7	9	9	42	96
sh2	B	Sak	Peter 235	9	56	9	47		9	5.1	46	9	7	9	9	32	56
sh2	B	Sak	Peter 445	7	36	3	16	Ht	5	3	12	2	2.3	9	9	15	92
sh2	B	Cr	Phenomenal	7	38	5	30		5	3.5	7	4	3.3	9	9	21	85
sh2	B	IFS	Sch 86804	7	34	3	16	Ht	5	3.1	11	4	3	9	9	35	89
sh2	B	IFS	Sch 96885	7	35	7	36		4	3.3	10	2	2.3	9	9	25	86
sh2	B	Sen	Seneca PX 8201	3	12	2	14	Ht	5	3.1	11	2	2	9	9	37	85

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate (%)	Rxn	Rate (%)	HT	Rxn	Rate (1-9)	Inc (%)	Rxn	Rate (1-9)	Rxn	Rxn	A	B
<u>sh2/bt trial</u>																	
sh2	B	Sen	Seneca PX 9364169	3	13	2	13	Ht	3	2.7	8	3	2.7	9	9	22	90
sh2	B	Agw	Starship II	3	14	3	18	Ht	5	3.2	14	1	1.3	9	9	32	89
sh2	B	AC	Summer Sweet 8102	7	33	3	16	Ht	4	2.9	8	1	1.3	9	9	15	94
sh2	B	AC	Summer Sweet 8102R	3	14	3	16	Ht	4	3	9	1	1	9	9	22	95
sh2	B	Rog	Tethys	3	17	5	26	Ht	5	2.7	19	4	3.7	9	9	34	77
sh2	B	HM	Twin Star	5	22	2	12	Ht	3	1.9	23	2	2	1	4	0	55
sh2	B	IFS	Xtra Tender 270A	9	53	9	45		6	3.7	13	4	3	9	9	14	89
sh2	B	IFS	Xtra Tender 271A	7	35	8	37		1	1.9	2	4	3	9	9	18	93
sh2	B	IFS	Xtra Tender 272A	9	57	9	46		6	4	7	3	2.7	9	9	28	87
sh2	B	IFS	Xtra Tender 273A	7	35	9	44		4	3.2	8	4	3.3	9	9	38	84
sh2	B	IFS	Xtra Tender 275A	9	49	6	31	Ht	3	2.6	8	4	3	9	9	32	94
sh2	B	IFS	Xtra Tender 276A	7	37	7	32		4	3.3	8	2	2.3	9	9	29	93
sh2	B	IFS	Xtra Tender 277A	7	37	5	30		4	3	2	3	2.7	9	9	16	94
sh2	B	IFS	Xtra Tender 278A	7	34	4	24	Ht	3	2.8	6	3	2.7	9	9	18	85
sh2	B	IFS	Xtra Tender 282A	3	15	2	12	Ht	3	2.7	4	2	2	9	9	15	95
sh2	B	Sak	Yumeno corn	3	15	3	16	Ht	7	4	19	2	2.3	9	9	24	84
sh2	W	Rog	Boreal	5	21	2	14	Ht	4	2.6	13	8	6	9	9	52	71
sh2	W	Asg	Dreamer	6	30	8	39		9	4.3	41	3	2.7	9	9	29	89
sh2	W	Asg	EX 8410177	8	47	5	28	Ht	8	3.7	34	4	3	9	9	30	82
sh2	W	Asg	EX 8410187	5	25	8	38		6	3.2	23	3	2.7	9	9	46	88
sh2	W	Cr	How Sweet It Is	8	40	7	33		5	3.1	15	4	3.7	9	9	22	91
sh2	W	Sak	Millennium	3	14	3	18		1	1.9	0	1	1.7	1	2	2	42
sh2	W	Asg	SVR 08705774	3	15	6	31		5	2.7	22	4	3.7	1	1	0	23
sh2	W	Sen	Seneca PX 9355039	5	21	5	28	Ht	2	2.3	3	4	3.7	9	9	27	96
sh2	W	HM	Snow White	9	57	7	32		9	4.4	35	4	3	1	5	2	65
sh2	W	Asg	Sugar Bowl	6	30	5	29		8	4.1	34	2	2.3	9	9	24	81
sh2	W	AC	Summer Sweet 7631	7	39	2	11	Ht	3	2.2	12	2	2.3	9	9	30	92
sh2	W	AC	Summer Sweet 781 Ultra	7	38	4	24		2	2.3	8	4	3	9	9	26	96
sh2	W	Rog	WSS 1921	5	24	3	19	Ht	4	2.6	13	1	1.7	9	9	31	96
sh2	W	Agw	White Saturn	6	30	6	31	Ht	4	2.9	6	6	4.3	9	9	8	94
sh2	W	Rog	Windham	5	21	9	41		7	4	22	3	2.7	9	9	21	96
sh2	W	IFS	Xtra Tender 372A	8	46	7	33		4	2.8	11	3	2.7	9	9	37	99
sh2	W	IFS	Xtra Tender 374A	7	38	7	35		7	3.8	20	3	2.7	9	9	26	99
sh2	W	IFS	Xtra Tender 376A	7	39	7	35		6	3.8	16	4	3.3	9	9	20	99

Endo	KC	SdCo	Hybrid	Common rust		Northern leaf blight			Stewart's wilt			Southern leaf blight		Maize dwarf mosaic			
				Rxn	Rate (%)	Rxn	Rate (%)	HT	Rxn	Rate	Inc	Rxn	Rate	A	B	A	B
						sh2/bt trial											
bt1	Y	UHA	217 x ball	3	13	3	17		4	3.1	2	1	1.7	1	4	0	55
bt1	Y	UHA	Hi37c x Hi36c	3	11	1	8	Ht	3	2.8	6	2	2	3	3	6	47
bt1	Y	UHA	ball x KbtL13	3	15	3	20		3	2.8	0	2	2	1	2	0	39
bt1	Y	UHA	ball x 190	3	11	2	15		4	2.9	0	1	1.5	1	2	0	31
bt1	B	UHA	KSS x Hi38y	5	18	3	20	Ht	2	2.1	5	2	2	4	2	15	41
bt1	W	UHA	Hawaii #9 Silver	2	6	3	18		4	3	6	4	3	9	9	53	98

Endo = endosperm type: su = sugary, se = sugary enhancer, sesu = heterozygous sugary enhancer, sb = sweet breed, sh2 = shrunken-2, bt1 = brittle.

KC = kernel color: B = bicolor, W = white, Y = yellow, R = red

SdCo = seed source: AC = Abbott & Cobb, Agw = Agway (Seedway), Asg = Asgrow (Seminis), Cr = Crookham, DM = Del Monte, GG = Green Giant, HM = Harris Moran, HS = Harris Seeds, IFS = Illinois Foundation Seeds, Mesa = Mesa Maize, Rog = Rogers Novartis, Sak = Sakata, Sen = Seneca Hybrids/Peto Brand (Seminis), SnRv = Snowy River, UHA = University of Hawaii

Rate = Disease rating: 0 to 100% leaf area infected (common rust, NLB), 0 to 100% systemically infected plants (Stewart's wilt incidence, MDM), 1 to 9 (Stewart's wilt severity, and SLB leaf symptoms)

Rxn = classification of hybrid disease reaction: 1 - resistant

3 - moderately resistant

5 - moderate

7 - moderately susceptible

9 - susceptible

Ht - Ht1 chlorotic-lesion reaction to race 0 of *E. turcicum*