

REPORT TO THE OREGON PROCESSED VEGETABLE COMMISSION
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Title: Identification of Sweet Corn Hybrids Resistant to Root/Stalk Rot

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Funding was used to establish, evaluate, and analyze data from sweet corn field plots established on the Jim Belden farm near Stayton. Twenty hybrids with *se* or *su* endosperm were evaluated for resistance to root/crown rot. Ears were also evaluated for processing quality.

Objectives: Characterize *su* and *se* sweet corn hybrids for reaction to root/crown rot.

Report of Progress:

For the past several years a "stalk rot" disease has been afflicting commercial sweet corn fields grown in the Willamette Valley. The disease seems to have a pathogenic basis, but the exact causal agent is unknown. For growers with this disease, yield and quality are reduced, and increased lodging makes harvesting more difficult. While the disease can be found in fields around the Willamette Valley, greatest severity occurs in the Stayton area where rotation times and choices are minimal.

Little is currently known about the control of this disease. Fungicide trials are underway. Fungicide trials should be supplemented with variety trials to determine what hybrids may have resistance to this disease. A variety trial was conducted in 1995. We wanted to confirm prior results, to determine the level of resistance of the hybrids currently used by processors, and to identify additional hybrids with resistance.

Materials and Methods:

Major U.S. seed companies were contacted in early spring to request sweet corn hybrids with potential for resistance to root/crown rot. Seventeen entries were received. We also included 'Jubilee' and 'Reward' as susceptible checks, and 'Bonus' as a resistant check (Table 1). A plot for the trial was identified on Belden's Farm on Brick Rd.

One row plots 30 ft. in length and replicated six times were established by planting with hand pushed belt planters. Plots were over-planted, then thinned to approximately two plants per foot. Seed companies applied standard fungicide treatments to the seed. The grower applied preemergent insecticide and herbicide, and irrigated and performed other cultural procedures (fertilizer application) in conjunction

with care of the surrounding sweet corn crop.

Disease severity was rated using a 0-5 scale where 0=no symptoms; 1=leaf at first node necrotic; 2=leaf at first and second node necrotic; 3=leaves at first three nodes necrotic; 4=leaves at first 4 nodes necrotic; and 5=leaves to the ear or first 5 nodes necrotic. Ten plants per plot were rated. The same plants were also evaluated for lodging. At flowering, silking date was estimated, and used to separate the varieties into "early", "middle" and "late" maturity groups. At harvest, plots were visited 15 Sep., 22 Sep., 30 Sep., and 7 Oct. to observe disease severity. Early maturing varieties were evaluated on the first two dates, all varieties were evaluated on 30 Sep., and late maturing varieties only were evaluated on 7 Oct. Ears were collected for quality evaluation from all varieties except Chase and Reward on 22 Sep.

Results and Discussion:

Differences were observed for disease severity across varieties (Table 2). The early maturity group consisted of three varieties. Of these, Chase had significantly worse symptoms than did Reward or GH 1861 (Table 2). GH 1861 also showed considerably less lodging than the other two varieties (Table 3). In the middle maturity group, several lines had significantly lower disease severity than Jubilee. These included GH 5702, GH 7419, and XP8410377 (Table 2). In general, lodging scores did not correlate with disease severity (Table 3). In the late maturity group, GH 2547, Bonus, and GH 2783 had significantly lower disease severity and less lodging than the other two entries in this group (Tables 2 & 3).

Disease severity increased as varieties passed through harvest maturity. For example, Reward showed relatively little disease severity at the two earliest evaluation dates. (Higher disease severity scores at the first date compared to the second date probably reflect experimental error; primarily, different individuals evaluated the hybrids on the different dates.) By the third evaluation, disease severity was quite high (Table 4). We felt that it was important to evaluate disease at the harvest maturity of each hybrid. The problem with this approach is that disease severity may change over the course of the season, and the true potential of a hybrid may not be revealed. This may be true for the earliest readings because these hybrids as a group rank low for disease severity among all hybrids (Table 5).

Eight hybrids had overall ear quality that equaled or exceeded Jubilee (Table 6). Of these, Bonus, GH 2783, GH 5702, GH 7419, GH 7445, and XP8410377 had significant levels of crown/root rot resistance as well. As in the 1995 trial, Bonus performed well, but may not be acceptable to processors because it has a tough pericarp that becomes more apparent as ears go past optimum harvest time. Many of the hybrids tested in this trial have not been evaluated previously in OSU variety trials (Table 1).

Summary: Six of the twenty entries had better levels of resistance to crown/root rot compared to Jubilee. These are GH 1861 (early maturity group), GH 5702, GH 7419, XP 8410377 (middle maturity group), Bonus, and GH 2783 (late maturity group). Excluding GH 1861, these hybrids equaled or exceeded Jubilee in ear quality as indicated by overall score.

Table 1. Sweet corn hybrids grown in 1998 in a crown/root rot trial on the Belden farm, Stayton, OR.

Entry	Company	Endosperm Type	Year Tested in OSU Variety Trial									
			1998	1997	1996	1995	1994	1993	1992	1991	1990	
Bonus (ck)	Novartis	<i>susu</i>										
Chase	Seminis	<i>sese susu</i>	x	x	x							
Eliminator	Crookham	<i>susu</i>		x*	x		x	x	x	x		
GH 1861	Novartis	<i>susu</i>	x*		x	x	x	x				
GH 1887	Novartis	<i>Sese susu</i>	x	x	x	x						
GH 2509	Novartis	<i>susu</i>										
GH 2547	Novartis	<i>susu</i>										
GH 2684	Novartis	<i>Sese susu</i>	x	x	x	x	x	x	x	x	x	
GH 2783	Novartis	<i>susu</i>										
GH 4819	Novartis	<i>Sese susu</i>										
GH 5702	Novartis	<i>susu</i>										
GH 7419	Novartis	<i>susu</i>										
GH 7445	Novartis	<i>Sese susu</i>										
Jubilee (ck)	Novartis	<i>susu</i>	x	x	x	x	x	x			x	x
Reward (ck)	Novartis	<i>susu</i>										
Sequel	Seminis	<i>susu</i>	x*		x							
XP8410347	Seminis	<i>sese susu</i>	x									
XP8410357	Seminis	<i>sese susu</i>	x									
XP8410367	Seminis	<i>sese susu</i>	x*									
XP8410377	Seminis	<i>susu</i>	x*									

*Observation trial only.

Table 2. Disease severity for sweet corn hybrids grown in a crown/root rot trial in 1998.

Hybrid	Mean Disease Mean Separation	
	Severity ¹	(LSD) ²
Early Maturity Group (22 Sep)		
Chase	2.0	A
Reward	1.4	B
GH 1861	1.1	B
Middle Maturity Group (30 Sep)		
XP8410367	3.3	A
GH 2684	2.6	B
GH 1887	2.6	BC
Jubilee	2.3	BCD
Eliminator	2.2	BCDE
GH 2509	2.1	BCDEF
XP8410357	2.0	CDEF
GH 7445	1.9	DEF
XP8410347	1.9	DEF
GH 7419	1.7	EF
GH 5702	1.6	F
XP8410377	1.6	F
Late Maturity Group (07 Oct)		
Sequel	4.4	A
GH 4819	3.4	B
GH 2547	2.3	C
Bonus	2.0	C
GH 2783	1.8	C

¹Scale of 0=no symptoms to 5=necrotic leaves at five nodes or to ear. ²Means within maturity group followed by the same letter are not significantly different at $\alpha=0.05$ probability level.

Table 3. Mean lodging for sweet corn hybrids grown in a crown/root rot trial in 1998.

Hybrid	Mean Lodging ¹	Mean Separation (LSD) ²
	Early Maturity Group (22 Sep)	
Chase	6.37	A
Reward	2.83	AB
GH 1861	1.67	B
Middle Maturity Group (30 Sep)		
XP8410367	4.50	A
GH 2509	3.00	AB
GH 1887	2.17	BC
GH 7445	1.33	BCD
XP8410377	1.17	BCD
GH 5702	1.17	BCD
Jubilee	0.33	CD
GH 7419	0.17	D
Eliminator	0.17	D
XP8410357	0.17	D
XP8410347	0.17	D
GH 2684	0.17	D
Late Maturity Group (07 Oct)		
Sequel	2.83	A
GH 4819	1.50	AB
GH 2783	0.17	B
Bonus	0.17	B
GH 2547	0.00	B

¹Mean number of plants lodged where 0=none lodged to 10=all lodged. ²Means within maturity group followed by the same letter are not significantly different at $\alpha=0.05$ probability level.

Table 4. Change in disease severity over time for three sweet corn hybrids grown on crown/root rot infested ground in 1998.

Hybrid	Evaluation Date		
	15 Sep	22 Sep (optimum harvest date)	30 Sep
Chase	2.4	2.0	3.8
Reward	2.1	1.4	4.5
GH 1861	1.0	1.0	2.1

¹Scale of 0=no disease to 5=firing up five nodes or to the ear.

Table 5. Ear quality evaluations for sweet corn hybrids grown in a crown/root rot trial in 1998.

Entry	Ear Ln (in)	Ear Dia (in)	Kernel Depth (mm)	Flag Leaves ¹	Kernel refinement ¹	Row straightness ¹	Ear Shape ¹	Tip fill ¹	Row No.	Overall Score ¹	Notes
Bonus	7.7	2.0	12.0	3.0	4.5	4.0	4.5	3.5	18-20	4.0	Slight variation for maturity
Chase											Not evaluated
Eliminator	7.5	2.0	10.0	2-4	3.5	4.0	4.0	3.0	16-20	2.5	Variable flag leaves, highly variable ears for type and maturity
GH 1861	8.3	2.0	13.0	4.0	2.5	3.0	3.5	4.5	16	3.0	One ear with no flag leaves, some curved
GH 1887	7.5	1.8	10.0	4.0	4.5	4.0	3.5	1.5	16-20	3.0	Small ears, tip kernels undeveloped & shriveling 1/4 of ear
GH 2509	7.5	2.0	12.0	5.0	4.0	3.0	3.5	2.5	18-20	3.5	
GH 2547	7.6	2.0	10.0	3.0	3?	4.0	3.0	2.5	16-18	?	Picked 6-7 days early
GH 2684	7.9	1.8	11.0	2.0	3.0	4.0	3.5	2.5	16	3.0	Variable shape - some curved
GH 2783	7.7	2.0	13.0	3.0	4.0	3.5	3.5	3.0	18-20	3.5	
GH 4819	7.2	1.8	10.0	1.0	3.5	3.5	3.0	2.0	14-20	3.0	Variable for type & maturity, very poor tip fill and undeveloped rows near tip
GH 5702	7.6	2.0	12.0	2-4	3.0	3.0	4.0	5.0	18-22	3.5	Variable flag leaves
GH 7419	7.3	1.9	13.0	5.0	4.5	3.5	4.5	5.0	18-20	4.0	Small ears, some kernel shriveling
GH 7445	7.9	1.9	11.0	1.5-4	3.5	4.5	4.0	3.5	14-20	3.5	One ear slightly curved - many shriveled kernels
Jubilee	7.8	1.9	11.0	2-4	4.0	4.0	4.0	2.0	18	3.5	Shriveled kernels at base-1/4 way up & necrosis at base of husk on 1 ear - 2 ears slight curve
Reward											Not evaluated

Table 5. (continued)

Entry	Ear Ln (in)	Ear Dia (in)	Kernel Depth (mm)	Flag Leaves ¹	Kernel refinement ¹	Row straight-ness ¹	Ear Shape ¹	Tip fill ¹	Row No.	Overall Score ¹	Notes
Sequel	7.7	2.1	13.0	1.5	3.0	4.5	4.0	3.5	16-20	3.5	Variable - nice ears but 1 curved, 1 skinny, 1 very fat
XP8410347	7.4	2.1	11.0	1.5	3.0	4.0	3.0	2.5	18-20	3.0	Slightly curved ears
XP8410357	6.4	2.1	11.0	3.5	3.0	4.0	3.5	2.5	16-20	2.5	Short ears, pale color
XP8410367	7.7	2.1	12.0	2.0	3.5	4.0	4.0	2.5	16-18	3.5	
XP8410377	7.6	2.0	12.0	1.5	4.0	4.0	4.5	4.0	18	4.0	

¹Scale of 1 to 5 where 1=worst (least) and 5=best (greatest) condition of that character.