

Report to the OSU Agricultural Research Foundation
for the
Oregon Processed Vegetable Commission

Title: 2009 Cultivar Evaluation for Control of Common Smut in Sweet Corn in the Columbia Basin.

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Materials & methods

Twenty-three sweet corn cultivars were evaluated for resistance to natural infection by common smut (Table 1). Six cultivars (Jubilee, Crisp n Sweet 710, Krispy King, Summer Sweet 500, Summer Sweet 610, and Supersweet Jubilee) have been included in all 11 years of these evaluations to gauge the relative severity of smut pressure over that time. Summer Sweet 500 seed is no longer available, and due to poor germination of saved seed in the first planting, Summer Sweet 500 was replaced with Magnum in the later Jun 12 planting, and will be dropped as a "Check" cultivar in future trials. Plots were seeded to ~27,000 plants/acre on May 9 and Jun 12 on the Hermiston Agricultural Research and Extension Center on Adkins fine sandy loam (pH 6.8, 0.8 organic matter). The four 30 ft rows/plot were spaced 30 inches apart. The experimental design was a randomized complete block, with four replications. Normal commercial production practices were followed.

At ear maturity, plant stand was recorded, and the number and location (at base, between base and ear, on ear, between ear and tassel, on tassel) of smut galls were noted for each plant. Some plants had more than one infection location. Data were analyzed with the SAS GLM procedure following arcsine transformation. Duncans multiple range test was used for mean separation. The relative disease pressure over the 11 years of the trials is displayed in Figure 1 and Table 2; the most susceptible and resistant cultivars are presented in Table 6. Results of the 2009 trial are presented in Tables 3-5.

Table 1. Sweet corn cultivars evaluated for common smut resistance, Hermiston, OR. 2009.

Cultivar	Source
<u><i>su</i>:</u>	
Evita	Crookham
GH 1703	Syngenta
GH 2690	Syngenta
GH 6377	Syngenta
GH 6462	Syngenta
Jubilee ¹	Syngenta
Tamarack	Crookham
<u><i>sh₂</i>:</u>	
ACX 4032W	Abbott & Cobb
ACX 5137Y	Abbott & Cobb
ACX SS 7078W	Abbott & Cobb
Constellation	Abbott & Cobb
Crisp n Sweet 710 ¹	Crookham
DMC218	Del Monte
DMC2285	Del Monte
Fortitude (CSHYP3-99)	Crookham
GSS 1477	Syngenta
GSS 2259	Syngenta
Krispy King ¹	Syngenta
Magnum ²	Syngenta
Marvel	Crookham
Summer Sweet 500 ^{1,3}	Abbott & Cobb
Summer Sweet 610 ¹	Abbott & Cobb
Supersweet Jubilee ¹	Syngenta

¹ Six cultivars in trial 1999-2009.

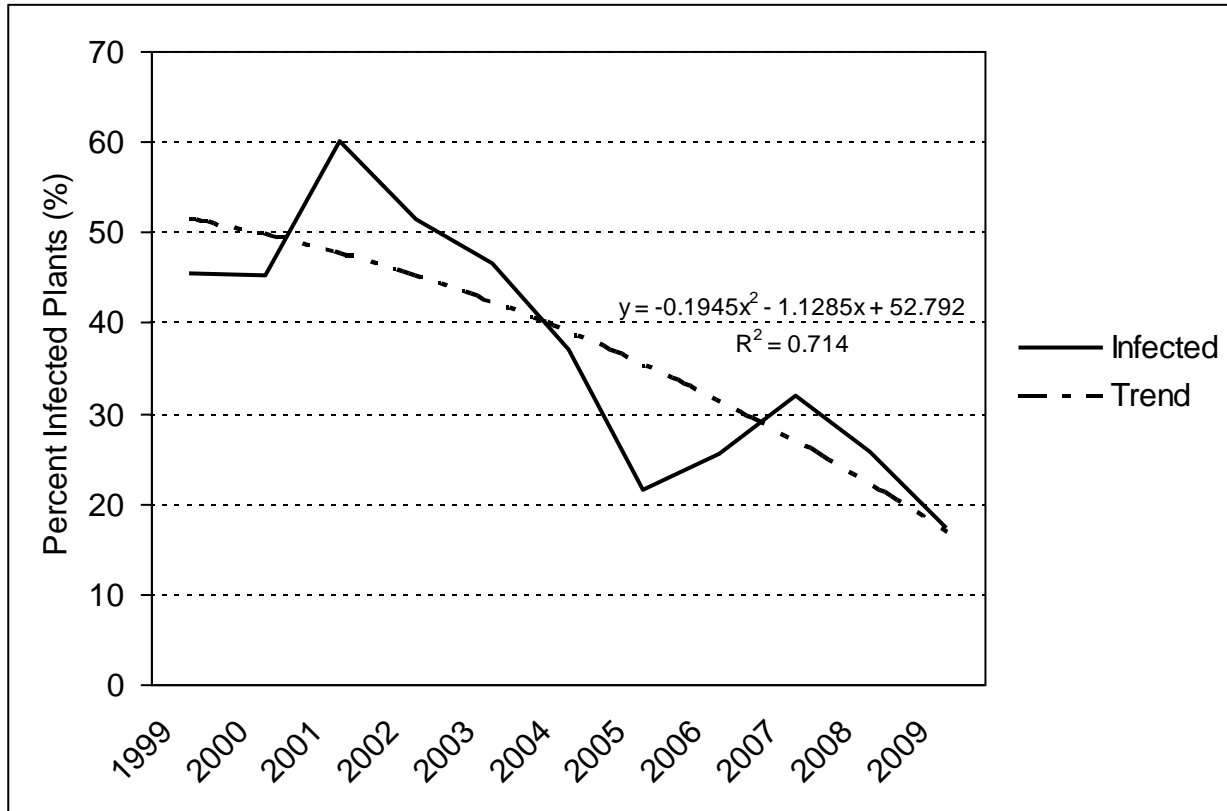
² Second (Jun 12) planting only.

³ Early (May 9) planting only.

Results

Disease pressure. Using the data from the six cultivars evaluated in all 11 years of these trials, the percent plants with galls has decreased over time (Fig. 1, Table 2), possibly due to changes in cultivars grown in the Columbia basin. Two cultivars identified as extremely susceptible to common smut (Jubilee and Supersweet Jubilee) accounted for more than 70% of the planted acreage in 1999, but less than 10% in 2009, probably reducing the spore load and subsequent disease pressure. Also over the 11 years of this trial, the percentage of plants with smut infections at the different plant locations increased from the early to later planting (Table 2).

Figure 1. Average percent plants infected with common corn smut, six check cultivars, Hermiston, Ore. 1999-2009.



2009 trial: cultivars. As in past years, the different cultivars responded somewhat differently, depending on planting date. At the earlier planting date, Krispy King, Supersweet Jubilee and GSS 2259 had significantly more galls on the base than the other cultivars (Table 3). Jubilee and Supersweet Jubilee, followed by DMC2285, Krispy King and GSS 2259, had the highest percent galls on the lower stalk. And Constellation, Summer Sweet 500 and Super Sweet Jubilee had more infected ears than the other cultivars. Supersweet Jubilee, Rana and Krispy King had the most galls on the upper stalk. Fortitude and Rana had the highest percent galls on the tassels. When ranked for overall effect of gall and location on ear yield (reduction in fresh weight), SuperSweet Jubilee had the most impact, followed by Summer Sweet 500, Constellation, and Krispy King.

Table 2. Effect of year and planting date on development of common smut in six sweet corn cultivars trialed from 1999-2009, Hermiston, OR.

Cultivar	Gall location				
	Base	Lower stalk	Ear	Upper stalk	Tassel
<u>Year</u>	<i>Percent plants w/gall (%)</i>				
1999	6.3 c	4.2 e	15.3a	10.5a	24.7 b
2000	9.1 b	21.0ab	6.7 bcde	8.3 b	20.1 cd
2001	11.2a	23.4a	7.6 bcd	6.6 bc	40.4a
2002	7.5 bc	22.7a	9.5 b	6.7 bc	21.5 bc
2003	5.9 c	23.6a	4.6 ef	5.8 c	13.8 ef
2004	3.1 d	18.0 b	6.1 cdef	4.9 cd	17.6 de
2005	1.6 d	7.6 de	7.2 bcde	2.1 e	3.2 h
2006	3.4 d	8.0 d	3.6 f	5.3 cd	7.0 g
2007	1.8 d	14.3 c	8.5 bc	5.1 cd	2.2 h
2008	1.4 d	9.3 d	5.8 cdef	3.6 de	10.8 f
2009	2.0 d	4.0 e	5.1 def	5.8 c	1.5 h
	****	****	****	****	****
<u>Planting date 1999-2009</u>					
Apr/May	2.3	8.5	6.9	5.3	7.4
May/Jun	7.5	20.2	7.7	6.5	22.8
	****	****	x	***	****

NS, x, ***, **** Effect of year or planting date not significant or significant at $P \leq 0.10$, $P \leq 0.001$ or $P \leq 0.0001$, respectively. Means followed by different letters significantly different at $P=0.01$ (Duncans multiple range test).

With the later June 12 planting date, Tamarack and GH 6377 had significantly more galls on the base than the other varieties (Table 4). DMC2285 and Jubilee had the most galls on the lower stalk, followed by Krispy King. The highest percent infected ears was found in Super Sweet Jubilee and Crisp n Sweet 710, followed by Summer Sweet 610 and Magnum. Upper stalk infection was greatest with Krispy King and Supersweet Jubilee. Fortitude had the highest tassel infection rating, followed by Rana, then Constellation and Magnum. When ranked for overall effect of gall and location on ear yield (reduction in fresh weight), SuperSweet Jubilee again had the greatest reduction in ear weight, followed by Crisp n Sweet 710, Summer Sweet 610, and Krispy King.

Table 3. Susceptibility of sweet corn cultivars to natural common smut infection, May 9 planting, Hermiston, OR., 2009.

Cultivar	Gall location									
	Base		Lower stalk		Ear		Upper stalk		Tassel	
	<i>su:</i>									
	<i>Percent plants w/gall (%)</i>									
Evita	0.2	d	2.1	cdef	0.8	d	0	d	1.0	c
GH 1703	1.2	d	1.4	def	1.2	c	0.1	d	1.3	c
GH 2690	0.9	d	0.7	ef	0.2	d	0	d	0	c
GH 6377	0	d	0.9	def	0.5	d	0	d	0	c
GH 6462	0	d	0.6	ef	0	d	0.1	d	0	c
Jubilee	0.8	d	10.3a		2.5abcd		0.4	d	0.3	c
Tamarack	1.1	d	2.1	cdef	0	d	0.5	d	1.6	c
	<i>sh₂:</i>									
ACX 4032W	0.7	d	1.7	cdef	1.9	bcd	4.4	cd	1.0	c
ACX 5137Y	0.2	d	0.3	ef	0.6	d	0.5	d	1.1	c
ACX SS7078W	3.0	bcd	1.5	def	2.7abcd		0.4	d	2.0	c
Constellation	0.2	d	0.2	ef	5.1a		0	d	1.5	c
Crisp n Sweet 710	2.1	cd	4.3	bcde	0.5	d	1.8	d	0.8	c
DMC2184	0.2	d	3.9	cdef	0.8	d	0.8	d	0.4	c
DMC2285	1.7	d	7.1ab		0.8	d	2.6	d	1.7	c
Fortitude	0.2	d	1.9	cdef	1.5	cd	1.3	d	5.4a	
GSS 1477	2.5	bcd	3.1	cdef	0.2	d	1.3	d	0	c
GSS 2259	5.0	bc	4.8	bcd	0	d	0	d	0	c
Krispy King	8.1a		5.6	bc	1.6	cd	6.9	bc	0.7	c
Marvel	0.6	d	0	f	0	d	0.5	d	0.4	c
Rana	2.8	bcd	1.7	cdef	0.8	d	9.0	b	4.8ab	
Summer Sweet #500	0	d	1.3	def	4.9ab		3.7	cd	2.6	bc
Summer Sweet #610	1.3	d	1.9	cdef	0.7	d	3.2	cd	2.3	bc
Supersweet Jubilee	5.4ab		10.0a		4.1abc		15.5a		0.2	c
	****		****		**		****		***	
average (\bar{x})	1.7		2.9		1.3		2.3		1.3	

** , *** , **** Cultivar effect significant at $P \leq 0.01$, $P \leq 0.001$, or $P \leq 0.0001$, respectively.

Means followed by different letters significantly different at $P=0.01$ (Duncans multiple range test).

2009 trial: planting date. Contrary to previous years' results, the percent plants with galls on the base and lower stalk decreased slightly but significantly from the early to later planting (Table 5). The percent plants with galls on the ear or tassel increased, but the percent with galls on the upper stalk

was not affected by planting date.

Table 4. Susceptibility of sweet corn cultivars to natural common smut infection, Jun 12 planting, Hermiston, OR., 2009.

Cultivar	Gall location					
	Base	Lower stalk	Ear	Upper stalk	Tassel	
	<i>su:</i>					
	<i>Percent plants w/gall (%)</i>					
Evita	0.9 c	0.4 bc	0.5 e	0.4 b	1.4 cd	
GH 1703	1.8abc	1.0abc	2.3 cde	0 b	1.6 cd	
GH 2690	1.2 bc	2.3abc	0.3 e	1.9 b	1.0 d	
GH 6377	3.1ab	1.7abc	0.9 de	1.4 b	0.8 d	
GH 6462	2.0abc	0.4 bc	2.5 cde	0 b	1.7 cd	
Jubilee	0.7 c	3.2a	1.1 de	1.3 b	1.1 d	
Tamarack	3.4a	1.6abc	0.9 de	2.1 b	2.7 bcd	
	<i>sh₂:</i>					
ACX 4032W	0 c	0.3 bc	2.7 cde	1.0 b	3.4 bcd	
ACX 5137Y	0.2 c	0.3 bc	2.4 cde	0.3 b	4.0 bcd	
ACX SS7078W	0.6 c	0.2 c	0.8 e	0.6 b	1.7 cd	
Constellation	0.1 c	0.2 c	4.5 bcd	0.4 b	4.8 bc	
Crisp n Sweet 710	0.2 c	2.3abc	13.3a	0.4 b	1.4 cd	
DMC2184	1.0 c	0.9abc	1.6 cde	0.6 b	0.9 d	
DMC2285	0.4 c	3.4a	0.8 cde	2.6 b	3.5 bcd	
Fortitude	2.0abc	2.1abc	1.2 de	0.2 b	10.7a	
GSS 1477	0.3 c	1.4abc	0.3 e	1.5 b	0.6 d	
GSS 2259	0.8 c	2.2abc	0 e	0.2 b	0.8 d	
Krispy King	1.3 bc	2.8ab	3.5 cde	14.4a	2.6 cd	
Marvel	0.3 c	0.3 c	0.4 d	0.5 b	0.4 d	
Magnum	0 c	2.5abc	4.9 bc	0.2 b	4.8 bc	
Rana	0.7 c	0.3 c	1.0 de	2.3 b	6.1 b	
Summer Sweet #610	0.9 c	0.4 bc	7.3 b	1.5 b	1.8 cd	
Supersweet Jubilee	0.3 c	1.8abc	13.6a	13.1a	2.8 bcd	
	**	*	****	****	****	
average (\bar{x})	1.0	1.4	2.9	2.0	2.6	

*, **, **** Cultivar effect significant at $P \leq 0.05$, $P \leq 0.01$, or $P \leq 0.0001$, respectively.

Means followed by different letters significantly different at $P=0.05$ (Duncans multiple range test).

Table 5. Effect of planting date on development of common smut in sweet corn, Hermiston, OR, 2009.

Planting Date	Gall location				
	Base	Lower stalk	Ear	Upper stalk	Tassel
	<i>Percent plants w/gall (%)</i>				
May 9	1.7	2.9	1.3	2.3	1.3
Jun 12	1.0	1.4	2.9	2.0	2.6
	**	****	****	NS	****

NS, **, **** Planting date effect not significant or significant at $P \leq 0.01$, or $P \leq 0.0001$, respectively.

Table 6 summarizes the most and least susceptible varieties for natural infection of the ear of the 39 varieties included in at least 3 of the 11 years this trial has been conducted.

Table 6. Susceptibility of sweet corn cultivars^z to natural common smut infection of the ear, Hermiston, OR., 1999-2009.

Cultivar	Ears infected	Years tested	Source
	(%)	(No.)	
<u>Most susceptible</u>			
1861	16.1	3	Rogers
2684	12.5	3	Rogers
Jubilee	12.3	11	Rogers
Challenger	11.0	3	Seminis
Supersweet Jubilee	8.9	11	Rogers
Summer Sweet 8100	7.3	5	Abbott & Cobb
Summer Sweet 500	7.0	10	Abbott & Cobb
ACX429	7.0	3	Abbott & Cobb
Krispy King	6.6	11	Rogers
Crisp n Sweet 710	6.4	11	Crookham
<u>Least susceptible</u>			
Conquest	0.6	3	Crookham
Marvel	0.7	10	Crookham
Sockeye	0.9	7	Harris Moran
GH2547	0.9	7	Syngenta
Eliminator	0.9	3	Crookham
GH6462	0.9	5	Syngenta
Intrigue	1.0	3	Crookham
Tamarack	1.0	3	Crookham
ACX232	1.1	5	Abbott & Cobb
Cinch	1.2	5	Seminis

^z Of 40 cultivars evaluated in at least 3 of 11 trial years.