Report to Oregon Processed Vegetable Commission
1986

Title: Screening for sources of resistance to head smut in corn

Project Leader: J. R. Baggett, Horticulture

Project Status: Continuing, 2-4 years

Project Funding: $3,000
Funds were used to pay research farm assessment; for labor and supplies to prepare inoculum; labor to plant, thin, clip, and maintain plots and take smut infection counts in the fall.

Objectives:

1. Test Plant Introduction lines and other germplasm sources for high field resistance to head smut.

2. Determine if immunity or true seedling resistance exists in germplasm sources.

3. Test commercial F_1 hybrids and inbreds for head smut resistance.

Report of Progress:

Single plots of 100 Plant Introduction lines of corn were planted with head smut inoculum June 10, and thinned on emergence to about 25-30 plants in 20 feet of row. At the 4-5 leaf stage, they were clipped to about 1/2 inch to increase infection potential. About 20% of the plants in each plot were left unclipped. Infection incidence was high with nearly 50% infection in 'Jubilee', 89% in 'Earliglow', and 95% in another susceptible control variety. Differences between the clipped and unclipped plants were quite variable among varieties, probably because of the small sample size of the unclipped treatment, but clipped plots were more infected in general. Combined, the 2 sublines of Nebraska 6 dent corn, our resistant control, had 0.4 % infection (1 plant in 253). There were 5 P.I. lines with 0% infection, in addition to 5 which had less than 5%. Of the 5 which were not infected, 3 were flour corn, 1 was sweet and dent mixed, and 1 was popcorn. The 100 lines tested (see table) included a diversity of sources and types, but very few were sweet corn. To determine if any of the 5 uninfected lines have resistance higher than previously available, they will be screened again in 1981 with larger numbers of plants and if they remain uninfected, they will be tested in the greenhouse by injection, which should eventually determine if they could carry immunity.

Thirty-six hybrids and inbred lines from seed companies were tested in 4 replications, 2 clipped, 2 unclipped. In the clipped plots infection ranged from 0 to 93% with an average of 35%. Non-clipped plots ranged from 0 to 83% with an average of 19%. Although some entries were uninfected in clipped or unclipped, these were no lines uninfected in all 4 replications. 'Jubilee' control plots were 40% infected in clipped and 18% in unclipped plots. In these plots, the resistant dent corn lines N6 and N7 averaged

about 1% infection. Although there are usually some commercial sweet corn hybrids with 0% infection each year, we have not thus far been able to identify sweet corn hybrids which will consistently show this much resistance because seed companies do not often repeat their entries.

It is possible that there is no corn germ plasm more resistant to head smut than the most resistant sweet corn lines or hybrids now available in commercial breeding programs. Screening a portion of the Plant Introduction may provide some indication if this is true.

Summary:

Screening of 100 Plant Introduction lines of corn for resistance to head smut identified 5 lines which were uninfected and have the possibility of being proven highly resistant or immune when retested. Screening of 36 lines and hybrids of sweet corn from seed companies indicated several are highly resistant even though none were totally free from infection. Identifying resistant hybrids and lines in commercial breeding programs will facilitate selection of resistant lines which may eventually become hybrid varieties for Oregon. If a higher level of resistance can be found in Plant Introduction lines, it may be possible to breed more resistant sweet corn than is possible with presently available commercial germ plasm.

Signatures:

Redacted for Privacy

Project Leader _____

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Department Head _____

JRB/td

Head Smut Infection in Corn Plant Introductions Lines
Corvallis, Oregon, 1986[1]

OSU #	PI #	Cultivar	Source	Type[2]	Plant[3] Height (DM)	Unclipped		Clipped[4]	
						Total Plants	% Infection	Total Plants	% Infection
P1	40262		Spain	DT	13	3	67	20	80
P2	163558		Guatemala	FT	27	5	0	30	7
P3	163597		Guatemala	DT FT	24-30	4	25	20	20
P4	198641	Atkinson	Ohio	ST	18-23	4	50	18	44
P5	213697	Lancaster Sure Crop	Pennsylvania	DT	24-28	4	0	23	13
P6	213713	Yellow Dent	Missouri	DT	22-32			19	16
P7	213714	Papago Flour	Arizona	FR	21-27	3	0	27	0
P8	213717	Krug Yellow Dent	Illinois	DT	21-27	4	0	28	4
P9	213728	Apache White	Arizona	DT FT	16-21	4	0	25	12
P10	213730	Apache Tribe	Arizona	FR	15	3	0	18	0
P11	213741	Wallapi Tribe	Arizona	FR	15	4	0	27	19
P12	213742	Arikara Tribe	Oklahoma	FT DT	19-21	4	100	27	78
P13	213743	Cherokee Tribe	Oklahoma	FR	18-24	4	25	31	39
P14	213745	Cherokee Tribe	Oklahoma	FR	21	2	0	18	17
P15	213749	Cheyenne Tribe	Oklahoma	FR	19	2	0	24	4
P16	213759	Blackfeet Tribe	North Dakota	FR	12-14	3	0	25	56
P17	213764	Rhee Flint Blackfeet Tribe	North Dakota	FT DT	10	4	0	20	30
P18	213771	Winnebago Tribe	Nebraska	FR	12-14	3	0	19	11
P19	213772	Winnebago Tribe	Nebraska	FR	16-17	3	33	19	26
P20	213774	Winnebago Tribe	Nebraska	FR FT	13	4	0	23	26
P21	213777	Golden Jewel	South Dakota	DT	15	4	0	21	52
P22	213794	Mandan Yellow Flour	North Dakota	FR	9	4	0	28	21
P23	213809	Polish Bydgolgaskaya	North Dakota	FT DT	8-15	4	50	21	19
P24	213810	Bezen Kchon Skaya Siberian Flint	North Dakota	FT	7-16	5	20	29	69
P25	214188	Compton's Early	Canada	FT	19	6	17	27	22
P26	214194	Howe's Alberta Flint	Canada	FT	5-11	5	80	22	86
P27	214273	Northwestern Dent	Canada	DT	16-22	6	0	26	15
P28	214295	Pride of Saline	Kansas	DT	23-30	4	0	20	15
P29	217407	Ladyfinger	Iowa	PP	15	6	17	27	30
P30	217409	Maiz Chapolote	Iowa	PP	27-32	5	40	23	17
P31	217410	Papago Flour Corn	Arizona	FR	21-27	4	0	19	0
P32	217411	Tama Flint	Iowa	FT	15-21	4	25	27	19
P33	217413	Zapalote Chico	Iowa	DT FT	21	3	0	23	43
P34	217477	Red Robin	New York	DT	18-24	3	67	16	31
P35	217479	Red Field	Colorado	DT	21-24	3	0	18	28
P36	217482	Amber Flint	Colorado	FT	15	3	33	26	4
P37	218130		New Mexico	FR	27	5	0	35	3
P38	218131		New Mexico	FR FT	21-28	4	0	31	16
P39	218134		New Mexico	ST FT	21-26	3	0	26	19
P40	218137		New Mexico	FR FT	17-30			21	5
P41	218140		New Mexico	RP PP	20-29	2	0	13	31
P42	218144		New Mexico	DT FR	24-33	3	0	27	4
P43	218148		New Mexico	FR	27-32	4	25	20	15

Head Smut Infection in Corn Plant Introductions Lines
Corvallis, Oregon, 1986[1]

OSU #	PI #	Cultivar	Source	Type[2]	Plant[3] Height (DM)	Unclipped		Clipped[4]	
						Total Plants	% Infection	Total Plants	% Infection
P44	218150		New Mexico	FR	21-27	3	0	24	8
P45	218156		New Mexico	FR	24	7	14	24	17
P46	218159		New Mexico	FR	17-31	4	25	25	16
P47	218168		New Mexico	FR FT	18-24	5	40	28	18
P48	218188		Arizona	FT	27	4	0	26	27
P49	221734		Tennessee	FT DT	13-18	5	100	19	100
P50	221739		Tennessee	FT	14-16	3	0	20	10
P51	221794		South Africa	FT	13-18			14	100
P52	221843	Sahara	Tennessee	DT	20-33	4	50	24	21
P53	221845	Homedale	South Africa	DT		3	0	24	17
P54	221846	Natal Yellow Horsetooth	Tennessee	DT FT	27-32	4	50	25	40
P55	221853	Hotnot	South Africa	FT		4	25	20	40
P56	221854	Natal 8-Row	Tennessee	FT DT	22-31	5	60	21	76
P57	222310	Cattle Corn	Nebraska	DT		5	0	26	27
P58	222319	Red Meadowbrook - Reid	Nebraska	DT		3	33	21	14
P59	222615	Midland	Kansas	DT		6	33	25	52
P60	222619	Freed White	Kansas	DT		5	40	18	33
P61	231298	Howling Mob	Minnesota	ST FT	15	6	33	20	25
P62	231299	Oregon Evergreen	Minnesota	ST FT	18	4	25	28	21
P63	231300	Whipple's White	Minnesota	ST FT	15	8	25	27	33
P64	231302	Golden Giant	Minnesota	ST FT	15	8	13	22	14
P65	245130	Rhode Island Sweet	Rhode Island	ST FT	15	7	43	26	19
P66	255974	Extra Early Russian Flint	Massachusetts	FT ST DT	13-18	6	17	32	47
P67	255975	West Brookefield White Sweet	Massachusetts	ST FT	11-14	9	56	26	35
P68	279024	Gallego Race	Spain	FT	15	4	25	17	76
P69	286382		Missouri	PD	15	7	57	27	59
P70	286383		Kansas	PD	21	5	0	25	28
P71	291386		China	FT DT	21	5	40	23	39
P72	291389		China	FT DT	16-22	5	0	21	62
P73	291391		China	ST FT	12	5	0	20	0
P74	303850		Chile	PP	18	3	0	26	8
P75	303912	Turkistan White Flint	Japan	FT	15-21	3	0	16	50
P76	306329		Hungary	DT	15-18	5	0	22	36
P78	317331		Guatemala	FR	29-37	5	20	22	14
P79	317677		Arizona	FR	19	5	0	15	13
P80	317680	Black Beauty	South Dakota	PP	9	5	80	25	36
P81	340835		Iowa	RP	15-17	5	0	21	5
P82	340837		Iowa	RP	12-19	9	0	21	0
P83	340859		Iowa	PP	10-14	5	80	22	100
P84	358525		Illinois	ST FT	14-19	6	0	17	12
P85	358529		Illinois	ST	13-17	5	60	21	33
P86	358550	Enano Norteno	Illinois	FT	12-18	6	50	20	70
P87	358552	Cuna	Spain	FT	12-20	7	14	20	65

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Corvallis, Oregon, 1986[1]

OSU #	PI #	Cultivar	Source	Type[2]	Plant[3] Height (DM)	Unclipped		Clipped[4]	
						Total Plants	% Infection	Total Plants	% Infection
P88	390833		Peru	FR	24-33	9	11	20	10
P89	390837		Peru	DT	21-27	4	25	22	36
P90	390841		Peru		26-35	6	0	23	35
P91	401754	Gaspe Flint	Nebraska	FT		4	25	22	82
P92	401762	Bravo Padella White	Texas			2	0	21	14
P93	409026	Chaumatou	France	PP FT	16-22	5	60	29	52
P94	414176	Little Briton	Illinois	DT	16-23	4	0	26	12
P95	414180	Rio Padella	Texas	DT FT	23-29	7	0	21	38
P96	414183	Gourd Seed	Texas	DT	22-27	4	0	15	27
P97	414184	Strawberry Dent	Texas	DT	23-26	5	40	20	65
P98	420244		Arizona	PP	22-31	8	25	23	26
P99	433656		Italy	PP		6	83	21	90
P100	452060	Cow Corn	Tennessee	DT		7	0	21	43
N6						17	0	111	1
N7						21	0	104	0
Jubilee						20	20	104	47
Earliglow						14	71	107	89
Control						10	90	42	95

[1]Planted June 10; rows 3 feet apart; plots 20 feet long. Values shown for N6, N7, Jubilee, and Earliglow are totals of 4 plots; for control, totals of 2 plots.

[2]Seed type, shown in order of their predominance in the seed samples: DT = dent, FT = flint, FR = flour, ST = sweet, RP = rice pop, PP = pearl pop, PD = pod, SH = shrunken, and WX = waxy.

[3]Listed catalogue height.

[4]Seedlings clipped to increase % infection.

Head Smut Infection in Sweet Corn Inbreds and Hybrids, Corvallis, Oregon, 1986[1]

Code no.		Clipped					Not clipped					Overall % AV infection
		Total plants		% Infection			Total plants		% Infection			
		Rep 1	Rep 3	Rep 1	Rep 3	AV	Rep 2	Rep 4	Rep 2	Rep 4	AV	
1		27	32	48	16	32	24	30	0	0	0	16
2		30	26	57	38	48	26	21	23	33	28	38
3		25	29	32	21	26	24	23	4	0	2	14
4		24	23	38	65	51	23	22	9	18	13	32
5		25	27	32	41	36	21	27	14	30	22	29
6		24	22	29	41	35	23	23	22	52	37	36
7		25	22	80	96	88	27	26	89	77	83	85
8		16	19	62	68	66	26	18	38	22	30	48
9		28	23	0	0	0	22	27	0	4	2	1
10		26	27	54	48	51	26	34	0	6	3	27
11		30	28	7	7	7	33	35	6	0	3	5
12		26	30	23	10	16	25	28	12	39	26	21
13		26	33	4	12	8	27	29	0	0	0	4
14		22	21	4	5	5	20	24	5	4	5	5
15		25	24	0	0	0	32	24	6	0	3	2
16		23	18	39	17	28	19	30	0	10	5	16
17		27	33	11	18	15	25	26	4	8	6	10
18		26	29	8	0	4	26	28	0	0	0	2
19		29	29	3	3	3	24	27	0	0	0	2
20		27	20	7	0	4	19	28	0	0	0	2
21		20	25	90	96	93	30	25	83	48	66	79
22		32	25	66	76	71	30	27	80	52	66	68
23		31	27	84	100	92	24	31	83	52	68	80
24		22	20	36	40	38	27	26	22	23	23	30
25		25	30	28	60	44	31	26	42	35	38	41
26		23	31	4	6	5	32	32	9	9	9	7
27		23	21	26	24	25	21	26	0	4	2	13
28		27	23	22	39	31	24	25	12	8	10	21
29		30	23	53	52	53	22	22	18	18	18	36
30		29	26	28	23	25	18	26	11	0	6	15
31		22	26	82	65	74	23	24	13	38	25	49
32		21	24	62	71	66	24	25	29	24	27	46
33		19	18	10	22	16	27	22	11	4	8	12
34		21	26	48	65	56	29	25	28	16	22	39
35		25	25	40	32	36	26	23	15	9	12	24
36		23	26	26	8	17	22	27	4	7	6	11
37	Jubilee	30	22	30	50	40	30	34	23	12	18	29
38	Earliglow	25	27	76	89	82	29	26	93	77	85	84
39	N6	26	32	0	0	0	32	30	0	0	0	0
40	N7	33	31	0	3	2	31	31	0	3	2	2

[1] Planted June 9; rows 3 feet apart; plots 20 feet long. Mean infection for all varieties: clipped 35%, not clipped 19%. LSD at 5%: for overall variety means, 17%; for comparison of varieties within clipping or non-clipping, 19%; for comparison of clipping and non-clipping, all varieties combined, 3%. Interaction between clipping and varieties was significant at 1%.