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OREGON PROCESSED VEGETABLE COMMISSION REPORTS

Submitted to the

Oregon Processed Vegetable Commission

By the Agricultural Research Foundation

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Report to the Oregon Processed Vegetable Commission 1991-1992

1. <u>Title</u>: Green bean breeding

2. Project Leaders: J. R. Baggett, Horticulture

D. M. Barrett, Food Science and Technology

3. Project Status: Terminating June 30, 1992

4. Project Funding: \$39,000 breeding

\$25,000 breeding supplementary technical support

\$14,355 processing

Breeding funds were used for a major portion of the support of two vegetable breeding technicians, student labor, supplies, and research farm expenses. Processing funds were used for processing samples of experimental beans, laboratory analysis, and panel evaluations.

- 5. Objectives: Breed bush green beans for the western Oregon processing industry with:
 - a) Improved potential for high yields at favorable sieve sizes and dependability.
 - b) Improved straightness, texture, and other quality factors.
 - c) Develop easy picking and small pod strains of Blue Lake type.
 - d) Resistance to white mold and root rot.

6. Report of Progress:

evaluation of a limited number of very promising new green bean lines received major emphasis. OSU 5402, 5403, 5416, and 5421 are lines which are under preliminary seed increase by seed companies and were subjected to intensive testing in yield and processing trials in 1990, in comparison with Oregon 91G. Additional lines of similar parentage were also included in the trials. Further evaluations were made of OSU 5256, a line that has been of interest and which has been increased for several years. Results of five replicated plot trials are summarized in Tables 1 and 2. An additional

trial was planted in May, but it was not harvested because of poor soil conditions which resulted in very poor stand and growth. Trials 1 and 3 included 17 OSU lines, of which three were discarded, four commercial wax varieties, and two small sieve commercial varieties. OSU 5163, a line carried for many years and which has good yield potential, was included only in trials 1 and 3 because of declining interest by OSU and processors.

Tables 1 and 2 show that the 5400 series of lines tend to yield more than Oregon 91G. This has likewise been demonstrated during the past two years. In 1991, 5418 was included for the first time and this line was one of the highest yielding. However, statistical analysis indicates that the yields of the 5400 series were essentially the same when experimental variation is considered. The 5400 series lines are considered to be in the same general sieve size class as 91G. OSU 5256, considered to be smaller in sieve size, produced yields which were close to those of 91G, as usual. In Tables 4-6 and Figure 1, the dollar value/A of 5256 was again favorable compared to 91G for the whole season. Seasonal average dollars/A for all of the 5400 lines was distinctly higher than that of 91G. No statistical analysis was available for value per acre because it is not practical for us to keep the replications separate when the harvested beans are graded. For this reason, Tables 4-6 and Figure 1 include as many trials and harvests as possible to offset some of the plot to plot and trial to trial variation. Table 7, which gives yields and dollar return for 1984-1991 for 5256 and 91G, and 1989-1991 for 5402, is also included to show long-term trends. This table shows the usual higher production of 5402 and 5403. (Yields of 5403, a close sister line of 5402, can be considered to support the yield values for 5402.)

Of the newer lines included in the trials, 5520 is an easy picking line which did quite well in trial 2 (June 1) and poorly in trial 1 (April 23). It will be retested along with some similar lines in 1992. OSU 5445, an early line with smooth, straight pods, was quite interesting in pod and plant type and yields, and will be included in 1992.

Several OSU lines of the small sieve (whole-bean) type were compared with Rogers 76-110 and Teseo. The best of them were OSU 5497, with very smooth pods which are too light to be considered Blue Lake, and OSU 5446. OSU 5446 has excellent dark green pod color and very smooth, fiber-free pods which are unusually uniform but only 10-11 cm at full processing maturity. OSU 5446 produces mostly 3-sieve pods and gave very favorable returns/acre, exceeding 76-110 by a good margin. 76-110 yielded poorly in 1991 and did not compete with Teseo, which approached 5446 in return. It should be noted in considering Table 4 and Figures 2 and 3 that 76-110 was considered to be completely overmature (seedy and getting thin-walled) on the last picking date shown in each case. OSU 5446 was getting seedy on the last date shown, but was still considered usable. It will be thoroughly tested in 1992.

The wax beans were difficult to compare because they mostly remained in the small sizes and it was not possible to effectively use grades in making yield comparisons. Generally, Goldrush appeared to be the most promising for yield and quality together, but tends to have green 3-sieve pods and becomes seedy in 5-sieve pods. Goldie was generally bumpy with pollywogs. 506-10 is a larger sieve bean and develops wax color early, with some problem of green 3-sieve grade. Slenderwax was smooth and refined, but usually had much green in 3-sieve pods. The wax beans tended to yield poorly in the early (April 23) trial because of poor pod set compared to the green bean lines.

- OSU 5402 Increase of seed and plans for release. Because OSU 5402 is considered the best of the new lines being currently tested, seed increase goals in 1991 were to produce the maximum possible amounts. After the 1990 season, the total amount of stock grown by seed companies was 2,135 lbs. Of this, 100 lbs. was sent to Chile by Rogers-NK for an extra increase. The return from this, 1,800 lbs., was planted along with 1,200 lbs. produced by Ferry Morse in 1990. The total return from 1991 production was about 65,000 lbs. OSU plans are to release 5402 early in 1992. Seed will be allocated to both seed and processing companies. It is estimated that supplies after 1992 could total about 400,000-500,000 lbs. if the industry wishes increases to proceed that rapidly. Advantages of OSU 5402 include smoother pods, straighter pods, longer and more uniform small pods (3-sieve), and higher return. Disadvantages might include a two-day later maturity and possibly increased white mold susceptibility.
- Samples were canned and/or frozen from four of the five yield trials harvested in 1991. For trials 4 and 5 (planting dates June 12 and June 24), samples were processed on three harvest dates, usually on alternate days. Because there has been no evaluation of samples at the time of this writing, details of the processing procedures and panel results will be included in a supplementary report.
- Root rot scores of the 24 lines and varieties included in the yield trials, along with miscellaneous controls and lines derived from resistance crosses, are shown in Table 8. Because of hot dry weather during the maturity of the white mold trial, infection was slight and overall reading of the plots was not attempted. We did, however, take some counts on OSU 5402 and Oregon 91G in the white mold trial and in the last trial (July 1). OSU 5403 was also evaluated in the last trial, and all data obtained are included in Table 9. Table 9 indicates that 5402 was more susceptible to white mold in 1991, which agrees with some previous observations, but not with scores obtained in 1990.
- e) Evaluation of newer lines developed from easy picking, small sieve, and OSU line x OSU line crosses continued. Thus far, few interesting lines have resulted from OSU line x small sieve variety crosses, but new material has been generated from additional crosses. Many easy picking lines are

truly easy to pick but most have pods which are not as smooth and straight as those of Oregon 91G.

f) Sublines of OSU advanced lines, including OSU 5256 and OSU 5163, were evaluated. They will be used as stockseed progeny lines and also to make bulk lots which will be evaluated for build-up of flat pod mutants.

7. <u>Summary</u>:

Intensive evaluation of advanced OSU breeding lines indicates that OSU 5402 and some similar lines should yield more in tons/acre and dollars/acre than Oregon 91G. Adjusted tons/acre and dollars/acre, based on 1990 prices, appeared to be similar in showing varietal yield differences. The quality of OSU 5402, OSU 5403, and related lines has been acceptable and close to that of OSU 91G, while pod straightness and smoothness have consistently been better. OSU 5402 will be released early in 1992. About 65,000 lbs. of seed of OSU 5402 have been commercially produced.

1991 trials confirmed previous indications that OSU 5402 will yield more and return more \$/A to growers than Oregon 91G. Favorable 1991 seed increases and favorable evaluations indicate that OSU 5402 should be released early in 1992. OSU 5256 continued to approximately equal Oregon 91G in production and \$ return, and probably will be continued. Trials of small sieve (whole pack) type beans indicated that OSU 5446, a small bean with good color, should be further tested.

8. <u>Signatures</u>:

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Project Leader Date

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Department Head

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Table 1. Green bean yields, April 23 planting, Corvallis, 1991.

			Ha	rvest 1			Ha	rvest 2			Har	vest 3		Ava
Line	Av. Stand	Days	% 1-4	T/A	Adj. T/A	Days	% 1-4	T/A	Adj. T/A	Days	% 1-4	T/A	Adj. T/A	Avg. Adj. T/A
91G	140	90	82	7.9	10.4	92	39	9.2	8.2*				T	9.3
5163	140	90	85	7.3	9.3	92	49	8.6	8.1	94	53	9.8	9.6*	9.0
5256	140	90	94	6.6	8.9	92	46	8.2	7.6*			2.0	7.0	8.3
5402	140	93	60	9.6	10.5	94	57	9.9	10.6*					10.5
5403	140	93	57	8.4	9.0	94	49	10.1	10.0*					9.5
5416	140	92	65	9.4	10.8	94	48	9.8	9.6*					10.2
5418	140	93	68	8.8	10.4	94	62	9.5	10.6*					10.5
5420	140	93	61	9.1	10.1	94	47	10.2	9.9*		·			10.0
5421	140	93	51	9.3	9.4*	94	47	9.8	9.5		·····			9.5
5440	140	90	91	7.4	7.4*									7.4
5445	139	86	65	5.9	6.8	88	62	6.5	7.2	90	55	7.4	7.8*	7.3
5446	140	88	100	5.6		90	99	6.0*		92	95	7.2	7.0	6.3
5497	138	90	100	3.8		93	100	5.8*		94	100	5.9		5.2
5520	139	92	34	7.5	6.3*									6.3
76-110	136	88	100	3.6		90	99	4.0*						3.8
BE506-10-1	140	90	75	4.4*		93	43	5.5						5.0
Goldrush	136	88	95	3.0		90	93	4.5*						3.8
Slenderwax	127	88	95	3.4		90	97	4.4*						3.9
Goldie	140	88	95	3.6		90	93	4.9*						4.3
Teseo	140	92	98	5.4		94	94	6.0*						5.7

¹ Mean of 4 replications; subplots of 5' were harvested from 20' plots on each harvest date; rows 36" apart; days = days from planting; % = percent 1-4 sieve grades; adj. T/A = tons per acre adjusted to 50% 1-4 sieve, except 5256 and 5163, which were adjusted to 55% 1-4 sieve. 5446, 5497, 76-110, and Teseo are small sieve, whole pack varieties and were not adjusted. BE506-10-1, Goldrush, Slenderwax, and Goldie are wax beans and were not adjusted. Analysis of variance calculated using the harvest closest to 50% 1-4 sieve for each line (55% for 5256 and 5163), marked with *. LSD for comparing * means was 1.8 tons/A at 5% significance.

Table 2. Green bean yield, June 1 planting, Corvallis, Oregon, 1991.

	ASI		Harv	est 1			Har	vest 2			Har	vest 3		Avg
Line	AV Stand	days	% 1-4	T/A	adj. T/A	days	% 1-4	T/A	adj. T/A	days	% 1-4	T/A	adj. T/A	Avg. Adj. T/A
91G	136	68	73	6.6	8.1	70	52	6.4	6.5*	44,6	T T	T./Λ	<u> 1/Ω</u>	7.3
5163	134	68	86	4.4	5.6	72	56	7.1	7.2*			 		6.4
5256	138	68	94	4.4	6.0	70	79	5.4	6.6*			-		6.3
5402	140	72	47	6.8	6.6*			1	0.0				 	6.6
5403	140	68	83	5.8	7.7	72	41	7.5	6.8*				 	1
5416	140	72	59	6.6	7.2*			1 "-	0.0			 		7.3
5418	140	72	66	8.0	9.3*			1				 		7.2
5420	138	72	63	7.0	7.9*							 		9.3
5421	130	72	52	5.8	5.9*							 		7.9
5440	123	72	42	6.0	5.5*			 				 		5.9
5445	125	72	61	6.2	6.9*									5.5
5446	136	66	99	5.5		68	99	6.0*						6.9
5497	140	66	100	3.1*		68	100	4.0						5.8
5520	133	66	82	5.8	7.7	68	64	7.4	8.4	70	41	8.0	7.3*	3.5 7.8
76-110	133	68	100	2.9		70	100	3.3*	<u> </u>		- 71	0.0	1.5	
BE 506-10-1	138	66	95	4.0		68	85	5.2*						3.1
Goldrush	135	68	95	5.0		70	95	5.3*						4.6
Slenderwax	133	66	98	4.4		68	96	5.4*			-			5.1
Goldie	136	66	97	4.0		. 68	87	4.4*						4.9
Teseo	138	66	100	3.9		68	100	5.4*						<u>4.2</u> 4.7

Mean of 4 replications; subplots of 5' were harvested from 20' plots on each harvest date; rows 36" apart; days = days from planting; % = percent 1-4 sieve grades; adj. T/A = tons per acre adjusted to 50% 1-4 sieve, except 5256 and 5163 which were adjusted to 55% 1-4 sieve. 5446, 5497, 76-110, and Teseo are small sieve, whole pack varieties and were not adjusted. BE 506-10-1, Goldrush, Slenderwax, and Goldie are wax beans and were not adjusted. Analysis of variance calculated using the harvest closest to 50% 1-4 sieve for each line (55% for 5256 and 5263), marked with *. LSD to compare the * values for each variety was 1.7 T/A at 5% significance.

Table 3. Yields of selected OSU bean lines at three planting dates, Corvallis, Oregon, 1991.

osu				vest 1				vest 2			Har	vest 3		1	Har	vest 4		Av.	LSD ²
Line	Av. Stand	Days	% 1-4	T/A	Adj. T/A	Days	% 1-4	T/A	Adj. T/A	Days	% 1-4	T/A	Adj. T/A	Days	% 1-4	T/A	Adj. T/A	Adj.	Adj.
91G		62	59	5.8	6.3	64	46	7.4	7.1*	65	45	7.9	7.5	Days	T	T .//	1 1/2	T/A	T/A
5256		62	76	4.6	5.5	64	64	6.5	7.0	65	60	7.1	7.5*	 	 	 	┼	7.0	1,5
5402		65	63	8.4	9.5*	68	34	10.2	8.6			 '''	"-	 		 	 	6.7	
5403		65	67	6.6	7.8*	68	29	9.2	7.3				 		 	 	 	9.1	
5416		65	65	6.3	7.3*	68	32	10.2	8.4			 -	 	ļ	 		 	7.5	ļ
5418		65	65	7.8	9.0*	68	35	10.3	8.8			 				 		7.9	
5420		62	77	6.8	8.7	64	58	6.5	7.0	65	53	60	7.1				ļ	8.9	
5421		63	71	7.4	8.9	65	50	8.8	8.8*	68		6.9	7.1*	68	29	8.8	7.0	7.5	
91G	139	61	53								28	10.7	· 8.3					8.7	
	 			9.9	10.2*	62	47	10.3	10.0	63	32	10.0	8.2	65	29	10.0	7.9	9.1	1,4
5256	140	61	81	7.4	9.1	62	75	7.1	8.4	63	55	8.0	8.0*	65	48	8.3	7.7	8.3	
5402	140	61	72	9.0	10.9	62	67	9.3	10.9	63	49	8.8	8.6*	65	36	9.4	8.1	9.6	
5403	140	61	73	8.3	10.2	62	69	8.0	9.5	63	49	9.9	9.8*	65	44	11.1	10.5	10.0	
5416	139	61	71	8.6	10.4	62	59	9.7	10.5	63	47	9.6	9.3*	65	44	10.6	10.0	10.0	
5418	119	61	74	9.4	11.6	62	70	9.7	11.6	63	50	9.4	9.4*	65	48	9.9			
5421	139	61	70	8.2	9.8	62	59	10.2	11.1	63	58	9,4	10.1	65	43	10.3	9.7	10.6	
Easy Harvest	140	61	86	6.3	7.3	62	86	6.5	7.6	63	56	7.6	7.1*	65	50	9.3	9.6* 8.2	7.5	· · · · · · · · · · · · · · · · · · ·

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Table 3. Yields of selected OSU bean lines at three planting dates, Corvallis, Oregon, 1991 (cont.).

osu	Av.		Han %	est 1	Adj.		Harv %	est 2	Adj.		Har %	vest 3	Adj.		Han %	vest 4	Adj.	Av. Adj.	LSD ²
Line	Stand	Days	1-4	T/A	T/A	Days	1-4	T/A	T/A	Days	1-4	T/A	T/A	Days	1-4	T/A	T/A	T/A	Adj. T/A
91G	140	70	31	9.9	8.0*													8.0	1.8
5256	140	70	65	9.1	9.9*													9.9	
5402	140	70	51	9.5	9.6*					·								9.6	
5403	140	70	45	9.9	9.4*													9.4	
5416	139	70	56	9.6	10.2*						~~~					1		10.2	
5418	140	70	61	9.3	10.3*													10.3	
5421	139	70	51	10.8	10.9*						~~~							10.9	
Easy Harvest	140	70	82	7.1	8.0*													8.0	

¹Means of 4 replicates; subplots of 5 were harvested from double 20' plots on each harvest date; rows 36" apart; days = days from planting; % = percent 1-4 sieve grades; adj. T/A = tons/acre adjusted to 50% 1-4 sieve, except 5256, which was adjusted to 55% 1-4 sieve, and Easy Harvest, which was adjusted to 65% 1-4 sieve.

²Analysis of variance calculated using the harvest marked *; LSD was calculated at 0.05 significance to compare values marked *.

Table 4. Yield and value of green bean lines and varieties included in the April 23 and June 1 plantings, Corvallis, Oregon, 1991.

	Harv.		April 23			June 1	
Variety ²	No.	T/A	% 1-4	\$/A	T/A	% 1-4	\$/A
91G	1 2	7.4 8.5	82 39	1848 1568	4.8 4.5	73 53	1124 1034
5163	1 2	6.8 9.4	85 53	1726 1920	6.0 6.5	86 56	1534 1372
5256	1 2	6.1 7.7	94 46	1613 1504	4.2 5.2	94 79	1120 1276
5402	1 2	8.9 9.4	60 57	1924 1985	6.7	47	1316
5440	1 2				5.6	42	1064
5445	1 2	8.5 6.7	65 55	1905 1395	5.9	61	1279
5446 (small)	1 2	5.4 6.8	100 95	1487 1818	3.8 5.6	99 99	1033 1537
5497 (small)	1 2	3.6 5.6	100 100	978 1547	2.9 3.4	100 100	789 928
5520	1 2	6.9	. 34	1225	7.2 6.9	64 41	1600 1300
76-110 (small)	1 2	3.3 3.8	100 99	918 1042	2.6 3.1	100 100	729 832
506-10 (wax)	1 2	4.0 4.8	75 43	948 905	3.7 5.0	95 85	991 1274
Goldrush (wax)	1 2	3.0 4.1	95 93	797 1095	4.7 4.8	95 95	1250 1290
Slenderwax (wax)	1 2	3.0 4.1	95 97	797 1102	4.2 5.0	98 96	1147 1345
Goldie (wax)	1 2	3.6 4.4	95 93	971 1170	3.7 4.2	97 87	1012 1077
Teseo (small)	1 2	5.0 5.6	98 94	1371 1499	3.6 4.9	100 100	988 1348

¹Dollars/acre based on prices of \$275/ton for 1-4 sieve, \$127/ton for 5 and 6 sieve. All data are from four combined replications comprised of five feet of row each.

²Small = small sieve, whole pack type variety.

Table 5. Yield and value of Oregon State University green bean lines included in five harvested trials, Corvallis, Oregon, 1991.

	Uor.		A!1	03	T									7		
Variety ²	Harv. No.	T/A	April % 1-4	23 \$/A	T/A	June 1 % 1-4	\$/A	T/A	June 12 % 1-4	2 \$/A	T/A	June 24 % 1-4	\$/A	T/A	July 1 % 1-4	\$/A
91G	1 2 3 4	7.4 8.5	82 39	1848 1568	4.8 4.5	73 52	1124 1034	6.0 7.0 7.4	59 46 45	1277 1360 1445	9.5 10.0 9.5 9.3	53 47 32 29	1950 1961 1658 1579	9.4	31	1619
5256	1 2 3 4	6.1 7.7	94 46	1613 1504	4.2 5.2	94 79	1120 1276	4.4 6.0 6.9	76 64 60	1062 1335 1498	6.9 6.9 7.8 7.9	81 75 55 48	1708 1649 1621 1564	8.7	65	1949
5402	1 2 3 4	8.9 9.4	60 57	1924 1985	6.7	47	1316	7.8 9.6	63 34	1732 1705	8.7 8.9 8.3 8.4	72 67 49 36	2040 2005 1663 1516	8.9	51	1806
5403	1 2 3 4	7.8 9.7	57 49	1647 1940	5.3 7.0	83 41	1333 1320	6.1 9.1	67 29	1381 1539	8.1 7.6 8.7 10.6	73 69 49 44	1904 1727 1740 2035	9.5	45	1847
5416	1 2 3 4	9.1 9.4	65 48	2037 1861	6.4	59	1365	6.0 9.9	65 32	1345 1731	8.1 9.3 9.3 10.3	71 59 47 44	1892 1997 1815 1971	9.1	56	1905
5418	1 2 3 4	8.3 9.0	68 62	1888 1902	7.6	66	1715	7.5 9.7	65 35	1664 1736	9.0 9.3 8.7 9.4	74 70 50 48	2122 2137 1756 1856	8.9	61	1930
5420	1 2 3 4	8.6 9.5	61 47	1850 1889	6.6	63	1451	6.4 6.0 6.4 8.1	77 58 53 29	1552 1286 1311 1382	7. T	70	10,70			
5421	1 2 3 4	8.8 9.4	51 47	1781 1849	5.5	52	1115	6.8 8.5 10.2	71 50 28	1581 1717 1720	7.6 9.8 8.5 9.8	70 59 58 43	1778 2089 1814 1873	10.3	51	2078

Dollars/acre based on prices of \$275/ton for 1-4 sieve, \$127/ton for 5 and 6 sieve. All data are from four combined replications comprised of five feet of row each.

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Line		,	Tons/acre	, not adji Frial	ısted ¹					rs/acre ²		
	1	2	3	4	5	Mean	1	2	<u>T</u>	rial 4	5	Mean
91G	8.0	4.6	6.8	9.6	9.4	7.7	1708	1079	1360	1787	1619	1511
5256	6.9	4.7	5.8	7.4	8.7	6.7	1559	1198	1298	1635	1949	1528
5402	9.1	6.7	8.7	8.6	8.9	8.4	1954	1316	1718	1806	1806	1720
5403	8.7	6.2	7.6	8.7	9.5	8.1	1793	1326	1460	1851	1847	1655
5416	9.3	6.4	8.0	9.2	9.0	8.4	1949	1365	1538	1919	1905	1735
5418	8.6	7.6	8.6	9.1	8.9	8.6	1895	1715	1700	1968	1930	1841
5421	9.1	5.5	8.5	8.9	10.3	8.5	1815	1115	1673	1889	2078	1714

Tons/acre derived from four five-foot replications combined for grading for each harvest. One to four harvests per trial. Trial planting dates were: April 23, June 1, June 12, June 24, and July 1.

²Dollars/acre based on prices of \$275/ton for 1-4 sieve beans, \$127/ton for 5 and 6 sieve beans. Grades were from four replications per harvest, combined for grading, and 2-4 harvests/trial.

Table 7. Summary of average yields of selected Oregon State University bean lines, 1984-1991.

				Adjus	sted Tons/A	ı			
Y	1984-1986	1989	1990			1991 Plantin	g		1991
Line	AV	AV	AV	4/23	6/1	6/12	6/24	7/1	AV
91G	8.6	8.9	8.1	8.2	6.5	7.1	10.2	8.1	8.0
5256	9.1	9.0	8.0	7.6	6.6	7.5	8.0	9.9	7.9
5402		10.3	9.2	10.6	6.6	9.5	8.6	9.5	9.0
5403			9.3	10.0	6.8	7.8	9.8	9.4	8.8
	·			Do	llars/Acre ^y		<u></u>	<u> </u>	
91G		1768	1536	1708	1079	1360	1787	1619	1511
5256		1767	1563	1559	1198	1298	1635	1949	1528
5402		1939	1707	1954	1316	1718	1806	1806	1720
5403				1793	1326	1460	1851	1847	1655

²Adjusted to 50% 1-4 sieve except for 5256, which was adjusted to 55% 1-4.

-

^yDollar value based on prices of \$275/ton for 1-4 sieve, \$127/ton for 5 and 6 sieve.

Table 8. Fusarium root rot infection, Corvallis, Oregon, 1991.

		Score ¹		
Line	Rep 1	Rep 2	Avg.	Notes
91G ²	4.0	3.3	3.7	
5163	4.5	4.0	4.3	
5256	3.0	4.5	3.7	
5402	2.0	3.5	2.7	
5403	2.0	3.5	2.7	
5404	4.5	2.5	3.5	
5405	3.0	4.5	3.7	
5416	3.0	4.0	3.5	
5418	2.0	2.5	2.3	
5420	3.0	3.0	3.0	
5421	4.0	4.5	4.3	
5440	2.0	3.0	2.5	
5445	2.0	4.0	3.0	
5446	4.0	4.0	4.0	
5485	2.0	2.5	2.3	
5497	3.0	4.0	3.5	
5520	3.0	4.5	3.7	
B7030-24	3.5	2.5	3.0	
B7030-40	2.0	2.5	2.3	
B7126-1-1-1	1.5	2.0	1.8	
B7126-33-1-2	2.0	4.5	3.3	
B7126-33-2-1	2.0	1.5	1.7	
B7126-54-2-1	3.5	3.0	3.3	
B7237-1-1	3.0	3.5	3.3	
B7237-1-2	4.0	4.0	4.0	
B7237-1-3	4.0	4.5	4.3	

Table 8. Fusarium root rot infection, Corvallis, Oregon, 1991 (cont.).

		Score ¹		
Line	Rep 1	Rep 2	Avg.	Notes
B7237-1-4	4.5	3.5	4.0	
B7237-13	3.0	4.0	3.5	stiff upright plant
B7237-14-1	3.0	4.5	3.7	
B7237-14-2	4.5	4.5	4.5	
B7237-14-3	4.5	5.0	4.7	
B7237-14-4	4.0	4.5	4.3	
B7238-10	3.0	2.0	2.5	
B7238-11	3.5	4.5	3.5	white seeds
B7238-11	3.5	3.5	4.0	black seeds
B7238-14	4.5	3.5	4.0	
B7238-15	3.0	4.0	3.5	white seeds
B7238-15	4.5	4.0	4.3	colored seeds
B7238-22	2.0	1.5	1.7	
B7239-1	4.5	4.5	4.5	
B7239-4	4.5	4.5	4.5	
B7239-5-1	3.0	4.5	3.7	
B7239-5-2	3.0	3.0	3.0	
B7239-5-3	3.0	3.0	3.0	
B7239-5-4	3.0	4.5	3.7	
B7239-10	3.5	2.5	3.0	
B7239-11-1	4.0	4.0	4.0	
B7239-11-2	3.5	4.5	4.0	
B7239-11-3	4.0	3.5	3.7	
B7239-11-4	4.0	3.0	3.5	
B7239-12	1.0	3.0	2.0	
B7239-13	2.0	3.5	2.7	

Table 8. Fusarium root rot infection, Corvallis, Oregon, 1991 (cont.).

		Score ¹		
Line	Rep 1	Rep 2	Avg.	Notes
B7240-2	1.5	3.5	2.5	
B7243-8	2.0	4.5	3.3	
DM6NY1	0.5	2.0	1.3	
DM4NY6	3.5	2.0	2.8	
DM3NY1	1.5	2.5	2.0	
Goldrush	2.5	4.5	3.5	
Slenderwax	2.0	4.5	3.3	
Teseo	1.5	1.5	1.5	
BE506-10-1	3.0	3.5	3.3	
Goldie	3.5	2.0	2.7	
76-110	4.5	4.5	4.5	
S&G 6192	2.0	2.5	2.3	
RR 6950 ²	0.8	0.8	0.8	
RR 4270	2.0	1.0	1.5	
Wis 46 RR	2.5	3.5	3.0	
Wis 83 RR	2.5	4.5	3.5	

¹ Scores: 1-5 scale, 1 = none or very slight, 5 = roots mostly dead.

²Each value is an average of 3 plots.

Table 9. White mold infection in disease nursery and yield trial, Corvallis, Oregon, 1991.

	Disease Nursery rep 1 rep 2 rep 3 rep 4 Avg								July 1 Planting														
	total		total i		rep		rep		Avg.	<u>rep</u>		_rep	2	<u>rep</u>	3	_rep	4	rep	5	rep	6	Avg.	Over-
Line	plants	•	plants		plants		total a		Inf.	total # plants	% inf.	total # plants	% inf.	total # plants	% inf.	total #	% inf.	total #	% inf.	total #	% inf.	% Inf.	all Avg.
91G	57	5	60	5	58	0	67	0	2.5	140	11	280	1	140	1	140	1	140	0	140	1	2.5	2.5
5402	65	9	75	9	62	0	61	0	4.5	140	3	280	10	140	4	140	10	140	4	140	2	5.5	4.0
5403										140	4	140	1	140	1	140	9	140	4	140	1	3.3	3.3

 $^{^{1}\}mathrm{The}$ white mold disease nursery was planted June 27.

BEAN YIELD 1991

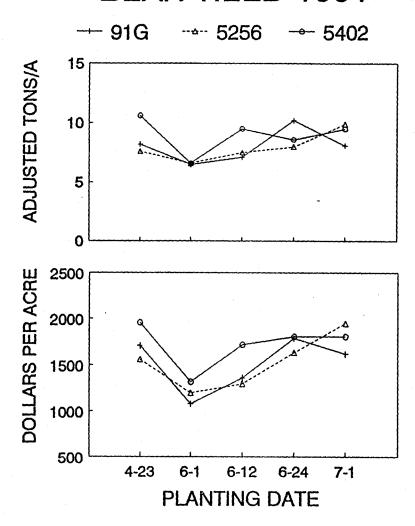


Figure 1. Yield and value per acre of OSU green bean lines.

GREEN BEAN YIELD

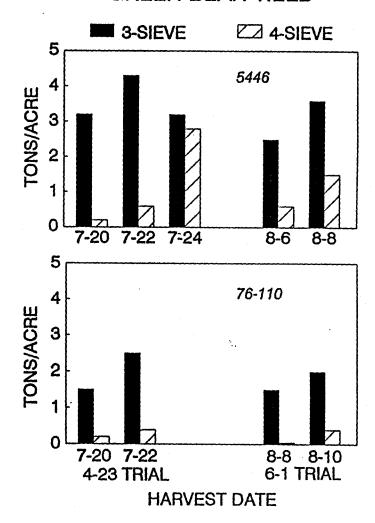


Figure 2. Yield of 3- and 4-sieve pods of OSU 5446 and Rogers-NK 76-110, 1991.



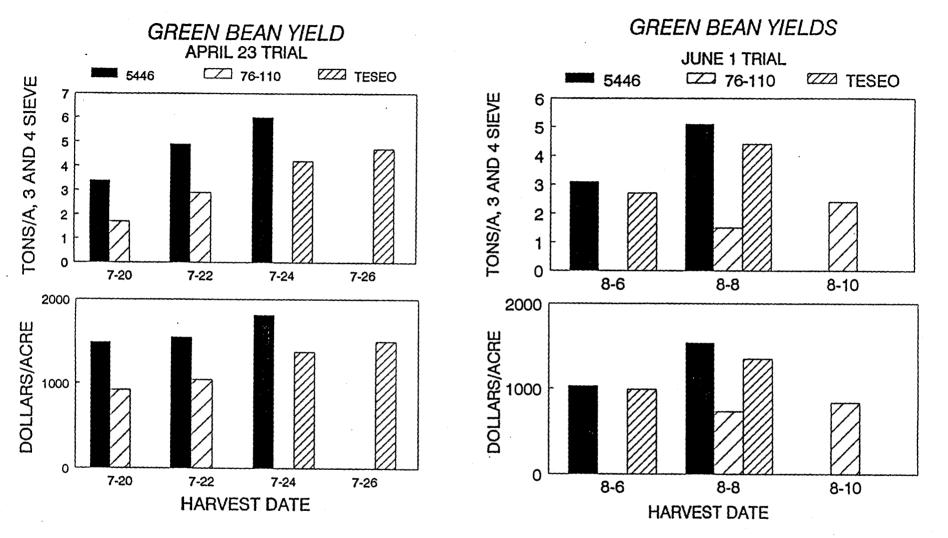


Figure 3. Yield and value per acre of OSU 5446 and Rogers-NK 76-110, 1991.

Research Report To Oregon Processed Vegetable Commission (for the year 1991)

Title: Genetic Mapping of Beans via Restriction Fragment Length Polymorphism of DNA.

Project Leaders: David Mok and Machteld Mok, Horticulture

Project Status: Continuing to 1992.

Project Funding for this Period: \$9,000

Funds were used to support a doctoral student working on the project. Other sources supporting the principal investigators include competitive grants from the National Science Foundation.

Objectives:

- 1. To utilize direct DNA mapping techniques to generate a linkage map of beans.
- 2. To associate particular DNA fragments with quantitative traits of economic importance in order to assist targeted selection in plant improvement.

Progress:

The long term objective of the project is to construct a genetic map (not available at present) of beans using DNA markers. This approach eliminates the effects of the environment (and other non-biological factors) on the expression of characters which interfere with classical gene mapping. Ultimately, the information will be used to correlate specific DNA markers with economically important traits to assist breeding. Some of the potential applications include identification of desirable individuals in early generations, and association of qualitative traits and disease resistance with specific DNA fragments. Methods of generating interspecific hybrids (between common beans and runner beans), extracting plant DNA and generating DNA probes that are polymorphic (different and can be distinguished between genotypes) have been described previously.

In the past year, 60 polymorphic probes have been identified. Over 170 F₂ progeny have been screened. A partial linkage map consisting of eight linkage groups has been generated. Additional markers are being added to the map continuously. In addition, DNA markers associated with maternal transmission have been identified. For example, a probe (395) has been identified as the histone gene which is transmitted only via the female parent in interspecific crosses. Therefore, the RFLP markers can also be utilized in gene cloning.

Future work will continue the mapping of markers into separate linkage groups (there are at least 11 linkage groups in beans, equal to the pairs of chromosomes), followed by determining the order and map distance of markers within each linkage group. When the genetic map is completed, breeding populations of the common bean will be examined and existing data on their performance will be correlated with the segregation of particular DNA markers.

Summary:

The construction of a genetic map based on DNA markers and correlating specific markers with performance will facilitate variety improvement by providing a means to directly assess the genetic composition of breeding lines and to predict their potentials.

Signatures:

Redacted for Privacy

David W. S. Mok

Professor

Redacted for Privacy

Project Leaders:

Date

Machteld C. Mok Date

Professor

Redacted for Privacy

P. J. Breen, Interim Head Date

TITLE: Fungicide resistance in <u>Botrytis</u> <u>cinerea</u> in snap beans, and chemical and biological control of gray and white mold of snap beans

PROJECT LEADERS: Mary L. Powelson and Kenneth B. Johnson Department of Botany and Plant Pathology

PROJECT STATUS: Final Report

FUNDING HISTORY: 1990-1992

Funding from Processed Vegetable Commission: \$18,000

OBJECTIVES:

- 1. Determine the distribution and frequency of benomyl and vinclozolin/iprodione resistance in the <u>Botrytis</u> population in snap bean fields located in the Willamette Valley.
- 2. Evaluate the efficacy of experimental fungicides for control of gray mold and white mold of snap beans.
- 3. Evaluate the efficacy of biological antagonists for control of gray mold of snap beans.

PROGRESS REPORT:

Objective 1:

A total of 20 snap bean fields were surveyed to estimate the frequency of both dicarboximide (Ronilan) and benzimidazole (Benlate) resistant strains of B. cinerea in these plantings. Fields were selected from throughout the Willamette Valley to provide a range in geographic distribution, field size, and farming intensity within the immediate area. Twenty isolates of B. cinerea were collected per field. Spores from gray mold lesions on blossoms or pods were transferred to a culture medium and sporulating subcultures were screened for both dicarboximide and benzimidazole resistance by transferring spores to a culture medium containing either vinclozolin (Ronilan 50DF at 40 mg a.i./L) or benomyl (Benlate 50DF at 40 mg a.i./L).

Data for frequency of resistant isolates in snap beans in 1991 is given in the figure below. For the second year, benzimidazole resistance occurred more frequently than dicarboximide resistance. Compared to other commodities, however, both benzimidazole and dicarboximide resistance in <u>B. cinerea</u> was less common in snap beans compared to other commodities surveyed (strawberry, caneberry, and grape).

FUNGICIDE RESISTANCE IN B. cinerea

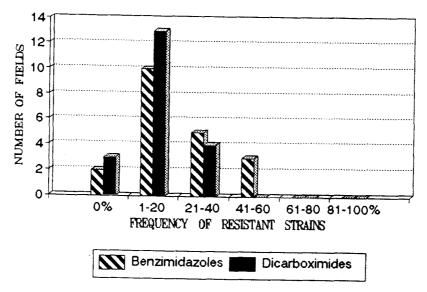


Fig. 1. Distribution on benzimidazole and dicarboximide resistant strains of <u>Botrytis cinerea</u> in snap bean fields.

Objective 2:

A field trial was conducted on the Oregon State University Botany and Plant Pathology Farm near Corvallis. Romano beans were planted on 24 May in three row plots. Plots were 15 ft long and rows were spaced on 30 in centers. Treatments were arranged in a randomized block design and replicated five times. Fungicides were applied to the middle row with a CO₂ pressurized boom sprayer with three nozzles (2 drop nozzles) at 40 psi in 50 gal of water/A. Fungicides were applied on 15 July and again on 19 Jul for three of the ASC-66825 treatments. Botrytis cinerea at a concentration of 10 spores/ml was applied to the foliage on 12, 17, and 21 July. Beginning at bloom, plots were watered every evening for 30 min to create conditions favorable for disease development. Disease incidence was determined on 13 Aug by evaluating 150-200 pods from the middle row of each plot. Data were arcsine transformed prior to analysis by statistical contrasts.

Disease pressure was light in July and August due to warm, dry weather conditions. Incidence of gray mold was significantly less with Rovral + Benlate compared with ASC-66825 or Rovral alone and was less with Ronilan compared with Rovral. Treatment rate had no effect on incidence of grey mold or white mold pod rot. For white mold, percent pod infection was less with ASC-66825 compared with Rovral + Benlate.

Table 1. Efficacy of foliar fungicide sprays for control of gray mold and white mold of beans.

		8	Pod rot ^a
Treatment	Rate/A	Grey mold	White mold
ASC-66825 50W	0.125 lb	3.1	3.2
ASC-66825 50W	0.25 lb	2.1	0.8
ASC-66825 50W ^b	0.5 lb	2.0	1.3
ASC-66825 50W	0.25 lb	3.6	1.6
ASC-66925 50W	0.5 lb	2.5	2.0
Ronilan 4F	0.75 pt	1.7	2.7
Ronilan 4F	1.0 pt	1.5	2.8
Ronilan 4F	1.5 pt	2.7	1.3
Rovral 4F	0.75 pt	3.7	1.2
Rovral 4F	1.0 pt	3.5	2.8
Rovral 4F	1.5 pt	2.3	2.2
Rovral 4F + Benlate 50		1.3	3.4
Rovral 4F + Benlate 50			3.0
Rovral 4F + Benlate 50	L		2.3
Nontreated	<u> </u>	3.1	3.3

^a Based on the number of pods with symptoms of either grey mold or white mold per 150-200 pods per plot.
^b Two applications: one at early bloom and one at late bloom

Table 2. Significance level for contrasts tested.

	Level of si	gnificance
Contrast	grey mold	
ASC-66825 vs Ronilan	NS	NS
ASC-66825 vs Rovral	NS	NS
ASC-66825 vs Rovral + Benlate	P<0.05	P<0.1
Ronilan vs Rovral	P<0.1	NS
Ronilan vs Rovral + Benlate	NS	NS
Rovral vs Rovral + Benlate	P<0.01	NS
High vs medium + low rates	NS	NS
of application		
Low vs medium + high rates	NS	NS
of application		

Objective 3:

Two field trials were conducted on the Oregon State University Botany and Plant Pathology Farm near Corvallis. Plots for the first and second trials were planted 24 and 28 May, respectively, with snap bean cv. OR 91. Plots were 15 ft long and 90 inches (3 rows) wide. Treatments were arranged in a randomized block design and replicated six times. Biological antagonist treatments were applied twice to the middle row of each plot with a $\rm CO_2$ pressurized single-row boom sprayer operated at 40 psi. The sprayer boom was equipped with three nozzles (2 drop nozzles) and delivered 50 gal

of water/A. Dates of treatment application were 15 July and 19 Jul for the first trial, and 22 July and 26 July for the second trial. The fungicide Ronalin was included in both trials as a comparative control. For both trials, <u>Botrytis cinerea</u> at a concentration of 10³ spores/ml was applied to border rows on 10 and 15 July. Beginning at bloom, plots were watered every evening for 30 min to create conditions favorable for disease development. Disease incidence was determined on 13 Aug by evaluating 150-200 pods from the middle row of each plot.

Disease pressure was light in July and August due to warm, dry weather conditions. For both trials, incidence of gray mold averaged 1 to 2% and differences among treatments means were not significantly different.

Table 3. Efficacy of biocontrol agents for control of grey mold and white mold of snap beans.

		Tria	1 1	Tri	al 2
		% Grey	% White	% Grey	% White
		mold	mold	mold	mold
Treatment	Rate	Pod rot ^a	Pod rot	Pod rot	Pod rot
Gliocladium	10 spores/ml	0.9	0.1	0.7	0.0
Trichoderma	10 ⁶ spores/ml	1.0	0.8	0.4	0.1
Penicillium	10 ⁶ spores/ml	1.6	1.8	0.3	0.1
Epicoccum	10 ⁵ spores/ml	2.0	1.7	0.1	0.1
Gliocladium +	•	1.0	0.3	0.4	0.3
Epicoccum	10 ⁶ spores/ml				
Gliocladium +	_	0.8	0.8	0.6	0.6
Trichoderma	10 ⁶ spores/ml				
Gliocladium +	_	0.9	1.0	0.7	0.3
Penicillium	10 ⁶ spores/ml		,		
Penicillium +	_	1.4	1.2	0.7	0.1
Trichoderma	10 ⁶ spores/ml				• •
Ronalin 4F	1.0 pt/A	1.0	1.8	0.1	0.1
Nontreated	_	1.3	1.0	0.3	0.1
<u>co</u> ntrol					

^a Based on the number of pods with symptoms of either grey mold or white mold per 150-200 pods per plot.

SUMMARY

In 1991, the frequency of \underline{B} . <u>cinerea</u> strains resistant to dicarboximide fungicides averaged 13% among the 20 fields surveyed. This average is similar to that obtained in 1990 and lower than average resistance frequencies found in other surveyed commodities (i.e., small fruits). Within beans, the average frequency of dicarboximide resistant strains at this time probably does not threaten the efficacy of Ronalin or Rovral applications used for gray mold control. Research in Europe and New Zealand has shown

that the frequency of resistance in $\underline{\mathtt{B}}$. $\underline{\mathtt{cinerea}}$ is likely to remain low if dicarboximide applications are limited to one or two per year.

Alternative fungicides for grey mold control are needed and the chemical industry has recently indicated that there is new chemistry effective on <u>Botrytis</u>. When these new chemistries become available for field testing, they will be included in our fungicide screening program.

Results presented under objective 2 suggests that Ronilan is superior to Rovral for grey mold control. The incidence of white mold was low in this trail. This was probably due to location of the research plots on land that did not have a history of bean production.

Biological control of grey mold has become a hopeful research area, but development of disease pressure necessary to evaluate this control method in snap beans has proven to be very difficult. In addition, it is not likely that this technology will be commercially available for several years. We do, however, expect biocontrol research for grey mold diseases of other commodities to continue (e.g., strawberry). In this regard, the Oregon Processed Vegetable Commission may wish to adopt the strategy of monitoring research in other commodities until the time that the technology is close to commercial production.

Signatures:

Redacted for Privacy

Mary L. Powelson

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Kenneth B. Johnson

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Stella M. Coakley

Title: Weed Management in Snap Beans, Peas, and Cucurbits
Supplement to Alternatives to Dinoseb Research Project
1991 Oregon Field Trials
Extension Horticulture Weed Management, OSU

Personnel: Ray William, Project Leader
Garvin Crabtree, Professor of Weed Science
Debra Boquist, Research Assistant
Steven Eskelsen, Graduate Student
Ed Peachey, Graduate Student

Funding: \$ 6000 Vegetable Commission - Snap Bean Subcommittee \$ 63,456 Dinoseb Alternatives Special Grant

Research trials established in 1991 evaluated several weed management practices in snap beans, peas, and cucurbits. Much of the work reported was conducted in the Willamette Valley, although results of IR-4 pea residue and tolerance trials from 3 states are included.

SNAP BEANS

Cobra residue analysis in beans was completed. A complete residue and tolerance package is ready for submission by IR-4 headquarters to EPA. Registration could be achieved within 6-12 months. Additional trials were conducted in 1991 to continue field and crop assessments.

As in previous years, snap beans demonstrated good tolerance to broadcast preemergence applications of Cobra at 0.25 lbs ai/A. Bean plants exhibited good vigor in both treatments after 30 days. Stand counts (number of bean plants/3 linear feet) were comparable with untreated plots. No yield reductions (or differences in grade sizes) were recorded with the 0.25 lbs ai/A rate in any of the four trials. Though early leaf crinkling was recorded in 50% of the trials, it was not observed after bean plant establishment. Bean plants treated with the 2x rate (0.50 lbs ai/A) exhibited significantly more leaf crinkling (though not observed once plants became established) and slight yield reductions.

Final results of the 4-year line source irrigation/herbicide activation trial are currently being analyzed. This research has attempted to better understand the activity and efficacy of several herbicides within preferred planting practices (planting to moisture and delaying irrigation for optimum early bean growth which also postpones weed emergence). Cobra applied with delayed irrigation or up to 3/4" of irrigation/precipitation immediately following application exhibited minimal or no symptoms (leaf crinkling) and excellent weed control. Significant damage and diminished weed control activity was seen in isolated areas from Cobra at 0.25 lbs ai/A with irrigation/precipitation above 3/4" immediately after application which may be related to planting depth, low organic matter, or excess water applied soon after planting. As in previous years, Dual weed control performance improved with increasing water.

Prior research trials with acifluorfen (Blazer) identified tolerance in snap beans when postemergence treatments were applied after complete expansion of the first trifoliate and before flower primordia were formed. Control of both nightshade and pigweed was excellent. Although bean leaves were injured initially, they quickly recovered and plants produced similar yields as other treatments. Residue samples were collected in 1990 from Oregon, Wisconsin, New York and North Carolina and are currently being analyzed by OSU Ag Chemistry. This label will require 3rd-party registration since BASF decided the use represents more visual crop injury than Basagran.

A trial was conducted in 1991 at the OSU vegetable farm to further evaluate optimum timing of Blazer applications for crop tolerance and efficacy. Rates of 0.25 lbs ai/A and 0.50 lbs ai/A were applied as directed applications (aimed below the crop canopy) in two sets of postemergence treatments: 1) during the primary leaf stage (first trifoliate still tightly folded) and 2) as directed or broadcast applications at the two-leaf stage (one trifoliate fully expanded) before flower primordia formed. Comparison of harvest weights indicate earlier applications maintained the highest yields and provided optimum control of emerged weeds. The opportunity for the earlier application was important since temperatures dramatically increased causing rapid development of both beans and weeds. Full coverage of both broadcast and directed applications at the later timing was inhibited by the crop canopy, while many of the contacted weeds were oversized and suffered only slight stunting. No injury symptoms or stand reduction was evident from directed applications at either timing; however beans treated with broadcast applications did exhibit injury symptoms and suffered significant yield reduction. Results indicate a broader range of application timing is available for directed applications of Blazer in snap bean production. Additional studies should further evaluate the full range of application timing and crop tolerance.

Decreasing row spacing shifted the competitive advantage of beans over weeds and did not increase the incidence of white mold (sclerotium). Closer row spacing reduced weed biomass, increased bean plant biomass, and improved yields. An earlier trial in 1990 indicated that row spacing had no effect when pigweed predominated. However, in 1991, close-spaced beans suppressed significant populations of pigweed, lambsquarter, hairy nightshade, and henbit. Row spacing had no effect on white mold when population density remained constant (as row spacing decreased, between plant spacing increased). This agrees with the literature which states that the critical factor is the in-row spacing between plants and not row spacing.

PEAS

Tolerance and efficacy trials evaluating preemergence applications of lactofen 2 EC (Cobra) on peas (succulent and dry) were established in the Willamette Valley, the mid-Columbia region of Oregon, the Palouse region of eastern Washington, Maryland, Minnesota, Wisconsin, and California. Residue samples were submitted to IR-4 from Oregon (Willamette Valley), Maryland, Minnesota, Wisconsin, and California with additional residue trials scheduled in New York in 1992.

Response of both dryland and succulent peas differed between regions. Sites varied dramatically in regards to precipitation and organic matter content of soils, providing opportunity to discover some aspects of injury potential. Although a wide range of rates from 0.05 to 0.50 were included at several sites, primary focus centered on lx and 2x rates of 0.25 and 0.50 lbs ai/A used for residue analysis. Crop tolerance to Cobra applied preemergence at 0.25 lbs ai/A directly following planting was seen in Oregon in the Willamette Valley and mid-Columbia regions, and Minnesota. In both California and Maryland trials, where organic matter contents were 1% and 0.7% respectively, limited tolerance was experienced. Significant injury was seen in the Palouse region of eastern Washington and Wisconsin.

Willamette Valley trials were established in plantings throughout the season and included soil types with organic matter at 2-3%. Early plantings received 2 to 3.5" rainfall within the first 2-3 weeks, whereas later trials received 1 to 2" within the first 3 weeks. Although early visual evaluations recorded some stand reduction, plant counts/m2 and harvest weights indicate there was no significant stand or yield reduction when peas were treated preemergence with 0.25 lbs ai/A. California trials exhibited initial pea suppression when treated with 0.25 lbs ai/A, although plants outgrew these symptoms, harvest was delayed. In Maryland, injury to peas planted to low organic matter soils appeared to be increased when applications were dealyed 6-7 days after planting, and when a prolonged wet period at emergence was present. In Wisconsin, Cobra applied to soils with organic matter as high as 3% and minimal precipitation significantly injured peas. Lower rates of 0.10 and 0.20 lbs ai/A were evaluated in peas grown in the Palouse region of eastern Washington and the mid-Columbia region of Oregon. Two trials were established in the Palouse region at sites with 1.7% and 4.7% organic matter. Both experienced significant injury, although less injury was seen at the higher organic matter soil site. In contrast peas, treated with similar rates in the mid-Columbia region of Oregon showed only marginal injury symptoms initially and recovered with no reduction in harvest weights.

Cobra provided excellent preemergence weed control at 0.25 lbs ai/A of both cutleaf and hairy nightshade, and pigweed, but did not control annual bluegrass, chickweed, or knotweed.

Additional study is required to better understand variables associated with potential injury. Factors include soil types, organic matter, seed coverage, prolonged wet periods at planting or emergence, and volatility.

A current research project conducted by Daniel Ball, Pendleton is evaluating effective herbicide treatments for green peas without carry-over potential in subsequent wheat crops. Under study is the carry-over potential of imazethapyr (Pursuit) into subsequent wheat rotations as well as various other treatments such as C4243, lactofen, and Sonalan.

Additional research with peas evaluating genetic engineering for herbicide resistance, phytotoxic interactions between bentazon and various surfactants, increased seeding rates, postplant tillage, and the potential for use of various herbicide compounds is being conducted by Washington State University. For further information regarding this research see 'Dinoseb Alternative Research Grant - The Executive Summary: 1992' or contact WSU.

CUCURBITS

During the summer of 1991, we tested the use of activated charcoal as a protectant for cucurbit crops with three unregistered herbicides: Devrinol, Cobra, and Dual. There is potential for the use of these herbicides preemergence in cucumber, zucchini, and winter squash production if activated charcoal is applied in a band over the row before applying the herbicide.

Devrinol, both with and without the charcoal protectant, is promising on all three crops. Cobra at 0.25 lbs ai/A with activated charcoal reduced growth very little on cucumber and winter squash; however, damage was apparent on zucchini. Dual with activated charcoal did not restrict growth of winter squash but did reduce growth of cucumber and zucchini. These trials will be refined for 1992 along with a series involving allelopathic cereals as potential weed suppressants for cucurbit crops.

Report to the Oregon Processed Vegetable Commission 1991-1992

1. <u>Title</u>: Broccoli breeding

2. Project Leader:

J. R. Baggett, Horticulture

3. Project Status:

Terminating June 30, 1992

4. <u>Project Funding:</u>

\$6,000

\$3,888 supplementary technical support

Funds were used for research farm expenses, student labor for pollination in the greenhouse and field plot work, and provided partial support of two vegetable breeding technicians,

- 5. Objectives: Develop broccoli varieties for processing in western Oregon stressing:
 - a) Elongate habit with exserted heads, easily accessible for harvest.
 - b) Openly branched heads with heavy, clean stem for easy trimming and separation into spears or chunks.
 - c) Medium fine, firm, uniform florets of good color and which are retained after freezing.
 - d) Early to mid-season maturity, concentrated high yield potential.
 - e) Clubroot and downy mildew resistance.

6. Report of Progress:

New inbred lines, from crosses of OSU high exsertion lines x commercial varieties with larger head size, were pollinated in the greenhouse and grown in the field for further selection. Inbred lines grown for perpetuation or reselection were 26 established lines (plus 30 sublines of S240-5) and 133 F_5 lines from new crosses between OSU exserted hybrids and large-headed commercial hybrids. Possibly 200 new selections were made in the F_5 lines, which are becoming uniform and promising in type through the selection work done for three years. If time and space permit,

some of the 1991 inbred selections will be test-crossed with HS179, HS161, or S240-5 to determine their potential value as hybrid parents.

- b) New crosses were made between OSU inbreds and commercial hybrids Arcadia, Emerald City, and Marathon to broaden the germplasm base and introduce more head size into the breeding program. F₁ plants from these crosses were grown in the field and propagated for greenhouse production of F₂ seed.
- c) Experimental hybrids evaluated included a few repeat field crosses, 10 new field crosses, and 193 greenhouse crosses between the established older inbreds. Many of the 193 experimental crosses were made to evaluate and compare the selections of S240-5 and determine if they were true to type.

Study of the experimental hybrids, including observation by industry field reps, indicated that the most promising hybrids for processing were those having large segmented heads with fine florets. These were primarily hybrids with S240-1 and S240-5 as parents. Hybrids which have often been favored in the past, those described as exserted dome types, tend to remain compact even though advanced in maturity, and would tend to be harvested after florets are larger and pedicels elongated. In the segmented type from S240-1 and S240-5 with certain inbreds, florets are smaller and the segmentation appears to encourage pedicels to remain short and internal branch color to improve. Greater stress will be placed on the segmented type in the breeding program. Evaluation of selected experimental hybrids is detailed in Table 1.

- d) Six new field crosses were made in isolation in 1991, with variable success. Certain inbred lines, especially HS179, are poor seed and pollen producers and other inbred lines are too self-fertile. One of the purposes of the field crosses is to determine if such problems exist.
- e) A replicated yield trial at 20" between rows and 10" between plants in the row was planted June 25. Performance of OSU and commercial hybrids is shown in Tables 2 and 3. Highest yielding varieties were Esquire and Hi-Calibur, both fairly early and concentrated. Esquire has been rated fair to poor for exsertion and head color. Hi-Calibur had good color and exsertion. Both varieties were concentrated in harvest maturity. Vantage was also high yielding, but had somewhat loose florets when mature and was too yellow in color to be used for processing. OSU hybrid 87-2, equal to Vantage and Hi-Calibur in yield, is well exserted with a compact head which holds well but has been rated down for internal color. OSU 91-3 was outstanding for exsertion, concentration, and uniformity. Although Table 3 shows it was equally cut during two weeks, a very high percentage could have been cut in one day and it was of very uniform height,

suggesting a strong possibility for mechanical harvest. Characteristics of other OSU hybrids can be found in Table 1.

7. <u>Summary</u>:

Continued breeding of processing broccoli included further selection in the development of new high exsertion inbred lines, testing of experimental handmade crosses and field crosses to identify useful combinations of older OSU inbreds, and production of new field crosses for 1992 evaluation.

Observation plots of about 150 OSU experimental hybrids indicated that inbreds HS179, S233, HS161, S240-1, and S240-5 will produce promising hybrids with exserted heads. Hybrids involving S240-1 and S240-5, which have fine florets on segmented heads, have the best potential for processing because of floret and pedicel size and head color. Material of this type will be stressed in future breeding. Of about 35 commercial hybrids observed, scores which would justify inclusion in yield trials were assigned to Hi-Calibur, Excelsior, Caravel, and FM96.

8. <u>Signatures</u>:

Redacted for Privacy

Project Leader	,,	Date
	Redacted for	Privacy
Department riead		Date

Table 1. Selected OSU experimental broccoli hybrids, Corvallis, Oregon, 1991.

Code	Pare	entage	Mat. Date	Score ²	Head Diam. (in.)	Florets	Head Stem Color	Exser-3	Notes ⁴
87-3	S240-1	HS179	10/3	4.0	5	v. even	VG	VG	
88-1	HS161-3	S366	10/6	4.0	8-10	v. even	P	F-P	high yield, v. smooth head, color too light for processing
88-3	HS161-1	S240-5	10/13	4.5	6-8	even	F	G	good weight, tight segments
90-2	HS179	S240-5	10/8	3.5	6-8	fine	F-P	G	good yield, yellow undercolor, deep-branched
90-5 90-6	HS179 S310	S310 HS179	10/1	3.5	6		F	G	2/38 selfs, some early heads coarse but good form, yellow undercolor, deep-branched 5/37 selfs
90-7 90-8	S233-1 HS179-2	HS179-2 S233-1	10/1	3.5	4-6		G	VG	0/36 selfs, variable, mostly too small, later heads have good size 0/36 selfs
91-1 91-2	HS143 HS179	HS179 HS143	10/1	4.0	5-6		G	VG	24/29 selfs 1/33 selfs, v. uniform
91-3 91-4	HS161-1 S310	S310 HS161-1	10/7	4.0	5-6	fine, even	F	VG	1/38 selfs, dome shape, med. branched, excellent form and uniformity, firm 12/34 selfs
91-5 91-6	S240-10 HS179	HS179 S240-10	10/4	4.0	6	fine, sl. uneven	G	G	3/37 selfs, segmented, deep-branched 6/37 selfs
91-7 91-8	HS179 S361	S361 HS179	10/5	3.0	5	fine, uneven	F	VG	4/27 selfs, deep-branched, rough 3/33 selfs
91-9	S366	HS179	10/1	4.0	6-8		F	G	8/27 selfs, v. smooth
91-10	S350	HS143	10/17	3.0	8-9	coarse, uneven	F	F	7/23 selfs, yellow undercolor

Table 1. Selected OSU experimental broccoli hybrids, Corvallis, Oregon, 1991¹ (cont.).

Code	Par	entage	Mat. Date	Score ²	Head Diam. (in.)	Florets	Head Stem Color	Exser-2 sion	Notes ⁴
91-11	HS143	HS161-1	10/4	3.5-4.0	4-6	sl. coarse, even	F	G	compact, neat dome, good weight but not v. big, holds well
91-17	HS143	HS179-1	10/1	3.5-4.0	5-8	sl. coarse	G	VG	compact, good yield, v. good overall form but variable
91-22	HS143	S240-5-22	10/17	3.5-4.0	8-9	fine, even	G	F	gets fairly big with small florets, looks good for processing, deep- branched
91-23	HS143	S240-10	10/11	3.5+	6-10	med., even	F-G	G	deep-branched, segmented, yellow undercolor, looks OK for processing
91-35	HS143	S315	10/1	3.5-4.0	6-7	sl. coarse	F-G	G	med. compact, good weight, gets loose
91-41	HS161-1	HS179-1	10/4	4.0	5-8	sl. coarse, even	G	VG	sl. branched, solid dome, v. good form
91-45	HS161-1	S233	10/8	4.0	4-6	sl. coarse, even	F	G	firm, compact, neat dome, too small?
91-49	HS161-1	S240-5-17	10/13	4.0	8	med., even	F	VG	tall, segmented umbrella, looks good for processing
91-65	HS161-1	S315	10/4	4.0	5-6		P	VG	good stem size, v. neat compact dome, beautiful fresh market
91-85	HS161-3	S366	10/10	4.0	10-11	med., even	P	F	v. smooth heavy head, good yield, not for processing
91-90	HS179	S240-1	10/8	3.5-4.0	5-7	med., even	F	G	segmented dome, color too light for processing?
91-94	HS179	S240-11-8	10/11	3.5-4.0	6-9	med., even	VG	VG	segmented, deep-branched, good for processing
91-100	HS179	S310	10/1	4.0	4-6	fine, even	G	VG	deep-branched, too small?
91-108	HS179-1	S233	10/4	3.5-4.0	5-6	med., even	VG	VG	compact dome, holds well, v. good form, too small?
91-114	HS179-1	S352	10/5	3.5+	5-6	fine, even	G	G	deep-branched, excellent form, too small?
91-118	HS179-1	S366	10/4	4.0	6-8	med., even	F	G	v. neat, deep-branched

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Table 1. Selected OSU experimental broccoli hybrids, Corvallis, Oregon, 1991¹ (cont.).

Code	Pare	entage	Mat. Date	Score ²	Head Diam. (in.)	Florets	Head Stem Color	Exser-3	Notes ⁴
91-122	S233	S240-13	10/18	4.0	5-8	med., even	G	G	deep-branched, segmented, looks good for processing
91-123	S233	S263	10/18	4.0	6-7	med., even	G	G	tight segments
91-127	S233	S310	10/11	4.0	6-10	med. fine,	F-G	F	deep-branched, segmented, good yield, good processing type
91-133	S233	S366	10/9	3.5-4.0	10	med., even	P	G	med. branching
91-155	S315	S240-5-18	10/18	4.0	8	fine, even	G	G	
91-174	S240-10	\$315	10/10	3.5-4.0	8-10	med., even	F-P	F	segmented, good processing type deep-branched, tight segmented, good yield, color too light for processing
91-176	S240-10	S352	10/10	4.0	6-10	med. fine, even	G	F	v. even smooth head, blue color, large pedicels inside head
91-182	S240-11-5	HS179-1	10/10	3.5-4.0	6-7	med. coarse,	VG	VG	fair stem size
91-192	S240-11-8	S310	10/25	4.0	10+	fine	F	G	quite segmented, good yield, possible processing type

Direct-seeded July 19 in 3' rows, thinned to about 18" between plants. Codes 87-3, 88-1, 88-3, 90-2, 90-5, 90-6, 90-7, 90-8, and 91-1 through 91-10 are field crosses. All other hybrids were hand made in the greenhouse.

²General score, 1-5 scale, 5 best.

 $^{^3}$ Exsertion refers to protrusion of heads above foliage for easy cutting.

Table 2. Broccoli yield trial, Oregon State University, Corvallis, Oregon, 1991¹.

Variety	Source	Total No. Heads/A	Total T/A	Lbs/ Head	No. Weeks Harvested	Avg. Tons/ Week	Largest Tons/Week
87-2	87-2 OSU		7.3	0.65	3	2.4	2.9
87-5	OSU	19,293	3.4	0.37	3	1.1	2.0
88-3	OSU	20,056	5.2	0.52	1	5.2	5.2
88-4	OSU	16,132	4.4	0.55	2	2.2	3.7
90-3	OSU	23,980	5.1	0.43	2	2.5	2.6
90-4	OSU	22,018	4.2	0.38	3	1.4	2.0
90-7	OSU	24,416	4.8	0.40	3	1.6	2.8
91-2	OSU	26,487	5.3	0.40	3	1.8	4.5
91-3	OSU	23,544	5.3	0.45	2	2.7	2.7
91.4	OSU	14,388	3.8	0.54	2	1.9	2.8
91-5	OSU	23,762	3.9	0.34	3	1.3	2.4
Esquire	Harris- Moran	19,511	7.7	0.84	3	2.6	4.2
Hi-Caliber	Harris- Moran	24,416	7.4	0.61	3	2.5	4.2
Vantage	SunSeeds	23,871	6.2	0.52	2	3.1	3.6
Gem	Asgrow	20,165	5.3	0.53	3	1.8	2.7
LSD at 5%		5,315	1.3				

¹Direct-seeded June 25 in 30' plots, 20" between rows, 2 rows per plot, thinned to 10" between plants; 900 lbs/A 12-29-10 broadcast at planting time with 110 lbs. N side-dressed as urea on August 1.

Table 3. Pattern of maturity in broccoli hybrids, Corvallis, Oregon, 1991.

	1			
		T/A fo	or week of	<u> </u>
Variety	9/2	9/9	9/16	9/23
87-2		2.4	2.9	2.0
87-5	0.3	2.0	1.2	
88-3			5.2	
88-4		0.7	3.7	
90-3		2.5	2.6	
90-4	0.3	2.0	1.6	
90-7	1.4	2.8	0.6	
91-2	0.4	4.5	0.4	
91-3		2.6	2.7	
91-4		1.0	2.8	
91-5	0.5	2.4	1.0	
Esquire	1.1	4.2	1.2	
Hi-Caliber	2.1	4.2	1.0	
Vantage		3.6	2.6	
Gem	2.4	2.7	0.3	

Table 4. Commercial broccoli variety observations, April 19 planting, Corvallis, Oregon, 1991.

Variety	Source ²	Mat. Date	Score ³	Head Diam. (in.)	Florets	Head Stem Color	Exser-4	Notes
Emerald City	1	7/11	3.5	8+	fine	F	P	v. compact, non-branching, heavy head, high yield, moderate fiber; recommend for home garden
Arcadia	1	7/23	3.5	9	fine	P	P	heavy heads, productive, late, yellow undercolor
Early Dawn	2	7/5	3.0	4	coarse	F	P	short plant, compact, early
Green Comet	3	7/11	2.5	6		G	VP	some coarse bolters
Sprinter	3	7/11	3.0	5-6	med., even	P	P	umbrella, sl. yellow undercolor, fiber
86-9	1	7/11	2.5	4	fine	P	VP	short, tight segmented dome
Excelsior	3	7/14	3.0	8	fine	F	P	sl. rough, generally uniform, yellow undercolor
Hercules	3	7/3	1.0	2-3	coarse, uneven	P	P	
XPH 5773	2	7/6	3.0	3-5	fine	P	F	compact
XPH 5683	2	7/17	2.0	6-7		P	VP	v. short exposed dome; no processing value
Florette	2	7/11	2.5	5	coarse, uneven	G	P	loose, rough
XPH 5611	2	7/11	3.0	6-8		VP	P	large head, v. short non-branching plant, yellow undercolor, probable fiber
Big Sur	2	7/5	3.0	6		P	P	v. good size and shape, compact, yellow undercolor, fiber
XPH 5608	2	7/9	2.0	6-8	fine	VP	VP	v. short, big heavy heads, good yield, some dead florets

¹Direct-seeded in 3' rows, thinned to about 18' between plants.

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²Sources: 1 * Sakata, 2 * Asgrow, 3 * Harris-Moran.

³General score: 1-5 scale, 5 = best.

⁴Exsertion refers to protrusion of heads above foliage for easy cutting.

Table 5. Commercial broccoli observations, July 19 planting, Corvallis, Oregon, 1991¹.

Variety	Source ²	Mat. Date	Score ³	Head Diam. (in.)	Florets	Head Stem Color	Exser-4	Notes
Vantage	1	10/11	3.5	10	med., uneven	G	G	
Hi-Calibur	2	10/5	3.5	10	med., even	G	G	sl. rough and loose, good size and yield, yellow florets tight segmented dome, tall vigorous plant, good yield
Emerald City	3	10/10	3	9	fine	F	P	good yield, open florets
Green Comet	2	10/1	2	6	coarse	F	P	Bood yield, open notets
Sprinter	2	10/5	2.5	8	med. even,	G	P	heavy stem, yellow undercolor
86-9	3	10/17	3	8-10	fine	F	P	hig hours asked a
Emperor		10/11	3	8	med., even	P	F	big, heavy, solid dome; short plant
Excelsior	2	10/11	3.5	9	fine, even	G	F	hi
Hercules	2		1.5	4	fine, uneven	P	P	big umbrella, good yield
XPH 5773	4	10/20	2.5	5-8	med., uneven	P	P	huge plant with small, uneven head
XPH 5683	4	10/17	2	8	med. coarse,	P	VP	very uneven maturity, short plant, variable type small, short plant, uneven maturity
Big Sur	4	10/1	2.5	9-10	uneven	F	P	very early, good yield
XPH 5608	4	10/5	2.5	8	med., even	P	P	early, fiber
Arcadia	3	10/12	3	8	fine, uneven	P	F	big dome
Caravel	5	10/11	3.5	8-10	fine, even	G	G	
Gem	4	10/11	2.5			F	G	segmented dome, fiber
Freen King	6	10/1	2			F	P	rough and uneven
accus	4	9/21				F	P	compact, uniform, very early

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Table 5. Commercial broccoli observations, July 19 planting, Corvallis, Oregon, 1991¹ (cont.).

Variety	Source ²	Mat. Date	Score ³	Head Diam. (in.)	Florets	Head Stem Color	Exser-4	Notes
Elegance	6	9/26	2.5	8-9	med., uneven	P	P	
Packman	7	9/28	3	9	med. coarse	F	F	compact, very short plant
FMX 117	8	10/17	2	8	med., uneven	P	F	heavy, high yield
FMX 94	8	10/5	2	9	fine, uneven	P	F	light floret color, good yield
FMX 96	8	10/8	3.5	9	fine	F	F	big heavy umbrella, yellow color
Tendergreen	6	9/28	3	9	med. coarse	P		heavy stems, compact heads, good yield, fiber
Mariner	7	10/15	2.5	8	med. coarse, uneven	F	F F	yellow undercolor, good yield compact head, heavy stem
Premium Crop	7	10/12	1	6	fine	VP	VP	big umbrella, good yield
Cruiser	5	10/11	2	8	med., even	P	P	ong unitorena, good yield
Embassy	4	10/11	2	5	med. coarse,	F	P	compact, poor floret color
XPH 5168	4	9/28	3	7	med. coarse	F	P	good yield too short and salar to 1' Luc
Sultan	3	10/11	2		fine, even	P	F	good yield, too short and color too light for processing good yield and form, bad fiber

¹Direct-seeded in 3' rows, thinned to about 18" between plants.

²Sources: 1 = SunSeeds, 2 = Harris-Moran, 3 = Sakata, 4 = Asgrow, 5 = Royal Sluis, 6 = Known-You, 7 = Peto, 8 = Perry Morse.

³General score, 1-5 scale, 5 = best.

⁴Exsertion refers to protrusion of heads above foliage for easy cutting.

PROJECT REPORT TO THE OREGON PROCESSED VEGETABLE COMMISSION

TITLE: Effect of Nitrogen Rate, Timing, Placement, and Catch Crops on Yield and Nitrogen Utilization in Vegetable Crops.

PROJECT LEADERS: Delbert D. Hemphill, North Willamette R&E Center John Hart, Dept. of Crop and Soil Science, OSU

PROJECT STATUS: Continuing, expect completion of broccoli subproject in 1992.

FUNDING: \$5645 in 1991-92 from OPVC. Other funding from CAAR and OSU. Funds expended for fertilizer, 15N-urea, pesticides, soil and tissue analysis, labor for plot establishement, maintenance, and harvest.

OBJECTIVES:

- 1. To evaluate the effect of several rates of applied N, as affected by timing and method of placement, on the yield of broccoli.

 2. To determine the time of maximum broccoli uptake of applied N.
- 3. To determine how much of the applied N remains in the soil as nitrate at harvest and following winter rainfall.
- 4. To evaluate the efficiency of a winter cover/catch crop in capturing residual nitrate N.

PROGRESS REPORT:

Nitrogen Rates and Placement (Seeded Planting)

'Gem' broccoli was direct-seeded into fallowed ground on June 12. planting compared several rates and methods of application of urea (Table 1). Spacing between rows alternated between 12 and 28 inches. The seedlings were thinned to about 10 inches between plants. Following harvest, the plots were split, with half of each plot containing cereal rye seeded into the standing broccoli stalks.

When all fertilizer was broadcast, yield increased with increasing rate of N to a maximum at 250 pounds N/acre (Table 2). Not all N rates were included when the second N application was banded between the paired 12-inch rows or when the first application was shanked-in rather than broadcast. However, the trends in yield response to increasing rate of nitrogen were similar to that when all N was broadcast (Tables 3 and 4). The greatest yield was obtained when the sidedressed N was split between two applications at four and seven weeks after planting rather than a single application at five weeks (Trt. 11, Table 2). However, the yield with the split application was not significantly greater than with the same rate of N with a single sidedressing.

Method of N placement did not significantly affect yield. Banding the sidedressed N between the closely-spaced paired rows was no more efficent than spinning the N over the entire area at this plant population (31,360/acre) and row spacing (Table 3). Apparently, fertilizer landing in the 28-inch space between paired rows was effectively utilized. Alternatively, concentrating the N between the paired rows may have resulted in excessive N in the band or exposure of too small a fraction of the root system to the available N. Likewise, shanking the initial fertilizer application in a band two inches to the side and beneath the seed line did not increase mean head weight (Table 4). Also, there was a single comparison of shanked at-planting fertilizer and banded sidedressed fertilizer at a total N rate of 100 pounds/acre (Treatment 4). This treatment produced an average head weight for the season of 133~g, less than that obtained with all-broadcast N at 100~pounds (141~g) or the shanked-broadcast combination at 100 pounds (136 g).

Irrigation in this trial was controlled to prevent movement of nitrate out of the root zone. A total of 10 inches of irrigation was applied and there was no significant rainfall. Wells (vacuum lysimeters) were installed in the $^{15}\mathrm{N}$

plots. There was no movement of water below two foot depth. A comparison of pre-plant and post-harvest soil samples taken to 40-inch depth indicated no movement of nitrate-N or ammonium N below 20 inches depth during the growing season. Only at the highest rate of applied N was there any evidence of N movement to a depth greater than 10 inches (Table 5). With greater irrigation amounts or significant precipitation, band placement might still keep more of the applied N in the root zone.

Results from the 1991 ¹⁵N uptake studies are not available yet. Results from the 1990 uptake studies indicate that about two-thirds of N taken up by broccoli fertilized at the optimal 250 lb/A N rate comes from applied fertilizer. Total N uptake was 310 lb/A and essentially all the ¹⁵N was taken up. This indicates that an optimally-fertilized and irrigated broccoli crop leaves almost no unutilized N in the soil. However, non-uniform plant stand and growth in these plots caution against extrapolating the results to commercial fields.

Table 1. List of N application treatments, 1991 broccoli N utilization trial.

NO.	Total N applied	N applied at planting	N applied at five weeks	
		1b/A		
1	0	0	0	
2	100	50 broadcast	50 broadcast	
3	100	50 shanked	50 broadcast	
4	100	50 shanked	50 banded	
5	100	50 broadcast	50 banded	
6	175	50 broadcast	125 broadcast	
7	175	50 broadcast	125 banded	
8	250	50 broadcast	200 broadcast	
9	250	50 broadcast	200 banded	
10	250	50 shanked	200_broadcast	
11	250	50 broadcast	0 ²	
12	250	50 broadcast 15	200 broadcast 15N	
13	250	50 broadcast ¹⁵ N	200 broadcast	
<u>14</u>	325	50 broadcast	275 broadcast	

²100 broadcast at 4 weeks; 100 broadcast at 7 weeks.

Table 2. Effect of N rate on yield and mean head weight of broccoli when all fertilizer is broadcast, 1991.

	Mean head weight (g)										
Trt. No.	N rate (lb/A)	First harvest	All harvests	Total vield (T/A)							
1	0	95	91	2.9							
2	100	137	141	5.5							
6	175	145	153	5.4							
8	250	154	158	5.9							
11	250	159	162	6.0							
14	325	123	140	4.1							
	LSD (0.05)	48	40	1.8							

Table 3. Comparison of N rate on mean head weight of broccoli when all fertilizer is broadcast versus band placement of the second nitrogen application, 1991.

		Broadcast-broad	lcast		Broadcast-band						
Trt.	No.	N rate (lb/A)	Mean wt	· (q)	Trt. no.	N rate (lb/A)	Mean wt. (g)				
2		100	14]		5	100	129				
6		175	153	}	7	175	145				
8		250	_ 158	}	9	250	161				
		<u>M</u> e	an ^Z 151				145				

ZNo significant difference between means (P=0.05).

Table 4. Comparison of N rate on mean head weight of broccoli when all fertilizer is broadcast versus shanked-in placement of the at-planting nitrogen application, 1991.

	Broadcast-broad	lcast	Shank-broadcast						
Trt. No.	N rate (lb/A)	Mean wt. (q)	Trt. no.	N rate (lb/A)	Mean wt. (q				
2	100	141	3	100	136				
8	250	158	10	250	151				
	M∈	ean ^Z 150			144				

No significant difference between means (P=0.05).

Table 5. Soil nitrate and ammonium concentrations before planting and after broccoli harvest, 1991.

			Nr	ate, l	o/A	
		0	100	175	250	325
Depth of sample (inches)	Pre-plant			Post	-harve	3t
Nitrate						
0-10	6.3	0.1	0.4	3.4	9.0	23.3
10-20	3.3	0.8	0.1	0.7	2.4	4.2
20-30	2.0	0.6	0.1	0.3	1.2	2.0
30-40	2.4	0.8	0.3	0.4	1.0	1.7
Ammonium						
0-10	3.2	3.7	4.0	7.6	12.9	30.8
10-20	3.7	2.4	2.7	2.3	4.2	12.1
20-30	6.7	3.7	4.9	2.8	4.8	5.2
30-40	8.2	3.0	3.1	2.3	2.7	4.0

Cover Crop N Recovery

Broccoli was also grown in the NWREC long-term crop rotation study in 1991. These plots had been in sweet corn or red clover in the summer of 1990 and in cereal rye or cereal rye plus Austrian pea cover crops, or in a red clover seed crop, or fallowed, during the winter of 1990-91. Nitrogen added to the sweet corn crop in the summer of 1990 significantly affected the growth of the cover crops. Both the cover crop biomass (Figure 1) and N uptake (Figure 2) increased as the rate of N applied increased. To estimate the amount of N recovered from the fertilizer applied to the sweet corn, the amount of N recovered in the cereal rye without applied N can be subtracted from the amount recovered with 200 pounds per acre applied N. This difference of about 80 pounds per acre suggests that, without a cover crop, 80 pounds per acre would have been available for leaching.

Adding Austrian pea to the cover crop increased N content of the total cover crop at the 0 and 50 pound N rates, but not at the 200 pound rate. The legume contributed only about 10 pounds N per acre, but there was a synergistic effect on the companion rye crop, which accumulated additional N in the presence of the legume. Pea growth was suppressed at the high rate of N, probably by competition with the vigorously growing rye. The number of pea plants per unit area decreased from 30-35 per square meter at 0 or 50 pounds applied N per acre to 11 per square meter at 200 pounds N per acre. Thus, legumes in a cover crop mix to fix N may be effective only following low rates of N on the preceding crop.

Broccoli Response to the Preceding Cover Crop or Seed Crop (Transplants)

'Gem' was transplanted into the rotation plots on June 4. The plots which had been in a winter cover crop were split by a herbicide variable, with half the plots receiving no herbicide and the other half receiving Treflan at planting. Three rates of urea were applied to the fallow and cover-crop plots and two rates to the clover plots. Plant spacing was 12 inches in the row with paired rows on 20-inch centers and a 40-inch wheel track. After harvest, the rotation plots were seeded back into the same cover crops which had been seeded in 1989 and 1990.

With transplanting allowing the crop a head start on weed growth, and with the subsequent cultivation of all plots, herbicide application had no effect on yield (Table 6). This suggests that it is practical to grow transplanted broccoli with only mechanical tillage and obtain satisfactory yields.

The cereal rye cover crop failed to increase broccoli yield, even though it trapped a significant amount of nitrogen from the previous corn crop (Table 6). The rye plus pea cover crop also failed to significantly increase broccoli yield. This is in contrast to the 1990 sweet corn crop, where the combination of rye and Austrian winter pea increased yield, particularly at low rates of applied nitrogen. One can speculate that the cereal rye had an allelopathic effect on the growth of the broccoli root system or that decomposition of the cover crop took applied N from the broccoli crop rather than acting as a source of readily available N.

For the plots which had been in red clover, yields were generally higher than for the fallowed plots or the cover crop plots (Table 7). Plots receiving urea produced greater broccoli yields than those not receiving applied N, regardless of whether the cover was plowed in the spring or fall. Spring-plowing was definitely advantageous, as yields exceeded those with fall-plowing. The yield of broccoli following clover was greater, with no applied nitrogen, than for broccoli following fallow or winter cover crops. The greatest yield in this experiment (4.6 tons/acre) was with the combination of spring-plowed cover and 200 pounds N/acre (interaction data not shown).

The disorder hollow stem is, at least in part, related to high rates of nitrogen and rapid growth. In this trial, the incidence of hollow stem increased with applied N compared to no applied N, with pea plus rye compared to rye only as cover crop, and with spring rather than fall plowing of the preceding clover crop. In each case, this is consistent with hollow stem being related to high rates of available N.

Table 6. Main effects of winter cover crop and N rate on yield, head size, and incidence of hollow stem of transplanted 'Gem' broccoli, NWREC crop rotation study, 1991.

·		First har	vest		Sum of two	harvests
	.eld !/A)	Head wt.	Hollow stem (%)	Yield (T/A)	Head wt.	Hollow stem
Cover crop	7	(9/		(1/5)		(%)
	2.1	160	40.7	2.8	151	34.4
rye, - herb.	1.2	123	14.9	2.2	122	11.7
rye+pea, -herb.	2.1	156	35.0	3.1	155	28.5
rye, +herb.	1.8	136	19.8	2.7	134	16.3
rye+pea, +herb.	1.9	143	44.4	2.8	143	33.0
LSD (0.05)	0.4	18	16.9	0.4	20	12.3
Contrasts:						
Fallow vs. others	NS	*	*	NS	NS	*
-herb. vs. +herb	NS	NS	NS	NS	NS	NS
rye vs. rye+pea	*	**	**	*	**	**
N rate (lb/A)						
0 ` ′ ′	1.1	110	14.6	2.1	109	11.4
125	2.7	170	66.5	3.1	160	48.0
250	2.9	197	58.4	3.8	196	49.7
Significance	Q**	0**	0**	L**	0**	0**

NS,*,**,L,Q: No significant differences, differences significant at 5%, 1% levels, respectively, linear, quadratic.

Table 7. Main effects of fall versus spring plowing of an established red clover seed crop and nitrogen rate on yield, head size, and incidence of hollow stem of transplanted 'Gem' broccoli, NWREC crop rotation study, 1991.

		First ha	rvest		Sum of two	harvests
	Yield	Head wt.	Hollow stem	Yield	Head wt.	Hollow stem
	(T/A)	(g)	(%)	(T/A)	(g)	(%)
Plowing season						
Fall	2.3	180	47.7	3.3	176	37.5
Spring	3.5	193	65.3	3.9	186	58.4
Significance	**	*	*	*	*	*
N rate (lb/A)						
0	2.0	143	43.0	2.8	140	33.4
200	3.6	224	70.0	4.2	222	62.6
<u>Significance</u>	**	**	**	**	**	**

^{*, **:} Significant at 5% and 1% levels, respectively.

SUMMARY:

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These results are consistent with those obtained in 1990, when maximum yield occurred at 250 pounds N, regardless of source of the applied N. Rates of N in excess of 250 pounds do not appear to increase potential return to the grower. Method of fertilizer application did not significantly affect yield. Thus, it appears that at high plant populations and small between-row spacings, broadcast applications are as effective as any other means of application.

With the surprisingly high N uptake efficiency observed in these trials and the ability of a winter cover crop to catch most of the un-utilized N, it appears that a combination of avoiding excessive N application, careful irrigation management to keep N in the root zone, and catch-cropping to trap excess nitrate in organic manner, is promising as a means of avoiding leaching of nitrogen fertilizers from broccoli fields.

Objective 1 has been completed for broccoli except for obtaining more information on the effect of timing of N application on uptake efficiency. It would be very valuable to have more information on the comparative efficiency of N utilization by broccoli at a wide range of rates of applied N. This could be measured more precisely using ¹⁵N-enriched fertilizer at all rates of applied N. Objective 2 should be satisfied when the results of measurements of total plant N uptake at various growth stages is completed. These samples are now being analyzed. Objective 3 will be completed at the end of the winter-spring rainy season. Objective 4 has been met, in part, as the 1990 and 1991 experiments have generated considerable information on the amount of N recovered by catch crops as a function of the rate of N applied to the previous crop. However, more work is needed to determine what factors affect crop response to the N contained in catch crops. We should introduce broccoli into the rotation plots again in the near future.

IGNATURES: Project Leader	Redacted for Privacy
Project Leader	Redacted for Privacy
Department Head	Redacted for Privacy
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Department Head	

Fig. 1. Cover Crop Biomass

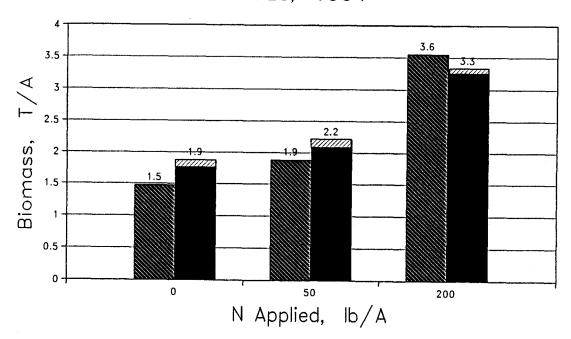
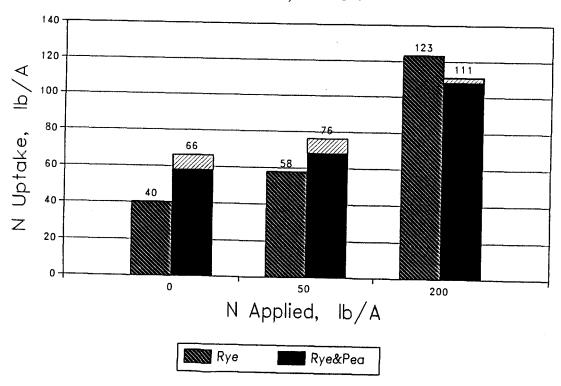


Fig. 2. Cover Crop N Uptake
NWREC, 1991



Note: The diagonally cross-hatched area at the top of the Rye&Pea bars represents the contribution of the Austrian pea to the biomass (or uptake) of the cereal rye-Austrian pea mixture.

Report to the Oregon Processed Vegetable Commission 1991-1992

1. <u>Title</u>: Supersweet corn variety evaluation

2. Project Leaders: J. R. Baggett, Horticulture

Diane Barrett, Food Science and Technology

3. Project Status: Terminating June 30, 1992

4. Project Funding: \$6,150 field trials

\$1,296 supplemental technical support

\$2,400 processing

\$9,825

Funds were used for research farm expenses and labor for harvesting, processing, and evaluation of corn samples.

5. Objectives:

- A. To determine relationships among maturity time, percent moisture, yield, flavor, texture, color, and appearance in SE varieties.
- B. To determine the production and processing potential of new introductions of sweet corn.

6. Report of Progress:

A. Yield and quality of SE sweet corn varieties on multiple harvest dates.

Five SE corn varieties, with Jubilee as a control, were planted May 28, 1991 in a randomized complete block design with four replications. The random design was modified so that Jubilee was always on the north or south edge (alternating with replications, with several border rows on the edge) and separated from the SE varieties by three extra rows of SE corn. This arrangement was used to reduce the loss of SE quality factors in SE varieties because of pollination by Jubilee. Each plot included 3 rows 80 feet long. Rows were overseeded and thinned to a minimum spacing of about 8 inches between plants (approximately 22,000/acre), in rows 36" apart. Final stands varied somewhat, and generally ranged from 35-38 per 25 foot plot (8.6" to 7.9" between plants) as shown in Table 1. The plots received 450 lbs. of 12-29-10 fertilizer banded at planting, and 145 lbs. N as urea on July 10. Irrigation was applied as needed. Each variety was harvested seven times, at approximately 2 to 3 day intervals (usually two). We planned to harvest each

variety for the first time at 76% $\rm H_2O$ but actual first harvest moisture % ranged from 78 to 75. Seven harvests were made of each variety; the last harvests ranged from 67.8 to 69.6% $\rm H_2O$.

Field data are shown in Table 1 for the seven harvests and as variety means. Yield data were obtained from the 25-foot samples, and the remaining data were obtained from 20 ears/replication, carefully sorted to represent the typical maturity for the harvest date. Ear samples from each replication were combined and delivered to the Department of Food Science and Technology for canning and freezing, and determination of percent moisture and cut-off percentage. Processed quality evaluations will be presented in a supplementary report. Except for pericarp toughness, measured at harvest by puncture test, it is not possible to relate quality, maturity, and production until quality evaluations are completed.

Varieties outstanding for yield were SE varieties GH 2419 and XPH 3013. The remaining varieties were similar and close to Jubilee. GH 2419 had the longest and heaviest ears by a good margin and also had a good percent cut-off. Summarized evaluation of the field notes follows (additional subjective scores and notes are given in Table 4).

Incredible. Fair yield, ear size, and tenderness; lowest percent cut-off, rough, pale ears, often curved, good flavor.

Citadel. Bad for curved ears, good flavor but highest toughness measurements. Average yields (same as Jubilee) and ear size. Ear length and percent cut-off were good.

GH 2419. The outstanding variety for production and ear size. Toughness measurements were lowest and flavor and color were judged to be good. This variety appeared to be slow in moisture change, never getting below 70%.

XPH 3013. High yielding, good ear size, and cut-off percent. Tenderness only fair. Average flavor, color OK. This hybrid had noticeable lodging.

GH 1676. Yield same as Jubilee. Ear length and weight were lowest, even though moisture range for the harvests was low. Ear size started low, but final weight was better. Performed much like Jubilee, but ears slightly shorter. Toughness score low, but subjective notes indicated chewy kernels. Uniformity was poor and flavor was good.

Jubilee. Only fair in production and appeared to be adversely affected by the cold early season. For example, few plants had two good ears, though it should be noted that the stand was a little high. Flavor and overall ear scores were good.

B. Replicated single-harvest trials.

Single-harvest, four-replication yield trials included 18 supersweet varieties in one planting made on June 13, and 17 SE and sugary (ordinary sweet corn) varieties planted on May 31. The supersweet and SE-sugary trials were grown in separate fields about 200 yards apart. Additionally, 8 varieties of supersweet and 9 varieties of SE or sugary types were grown in single plots for yield and observation in the respective isolated plantings. Culture, spacing, etc. of these trials was essentially the same as described for the harvest date SE study. Plots were 30' long from which 25' were harvested. Promising processing varieties were canned and frozen, but this did not include varieties already processed in the multiple harvest date study.

From the replicated supersweet varieties (Tables 5 and 7), the following yellow varieties looked promising:

Fanciful. Good yield, fair tenderness, ears slightly small, flavor fair to good.

GSS 3492. Good yield, long ears, good flavor, somewhat tough.

FMX 284. Good yield, very straight long ears, tender, fair flavor.

Supersweet Jubilee. Very good yield of medium-sized ears, good color, very good flavor, fair tenderness.

Challenger. Good yield, variable but best ears were good size and quality, good flavor, fairly tough.

Zenith. Good yield of small ears, very good flavor, tender.

Also included in the trial was Crisp 'n Sweet 710, a variety in current use. Yields of Crisp 'n Sweet 710 was good, but the pericarp was tough. Most other varieties observed generally lacked refinement, yield, or uniformity.

Of the regular sweet corn varieties (Tables 2 and 4) in the replicated trial, 5 looked promising. They were:

GH 1703. Good yield, very uniform, good color, good flavor.

Renown. Very good yield, very refined ears, tender.

FMX 292. Good yield, long ears, uniform, tender.

Rely. Good yield, refined ears but poor tip fill.

FMX 293. Very good yield, long ears, refined, tough.

C. Single-plot observation trials of 10 supersweet and 9 sweet or SE varieties did not result in the identification of varieties which should be included in future trials. In many cases, especially in the supersweet varieties, pericarp toughness was a noticeable problem.

7. <u>Summary</u>:

A multiple harvest date trial of five promising SE corn hybrids with Jubilee as control indicated that GH 2419 and XPH 3013 may be promising for yield and ear size, although XPH 3013 may be lodging susceptible. GH 2419 was also promising for flavor, tenderness, and slowness to become overmature. Relating the yields obtained at levels of moisture with processed acceptability will be done when panel evaluations are completed.

Replicated single-harvest trials of 18 supersweet and 17 SE + sugary varieties indicated that recent supersweet introductions Fanciful, GSS 3492, FMX 284, Challenger, and Zenith should be tried again. Supersweet Jubilee and Crisp 'n Sweet 710 were competitive with new varieties. Su varieties GH 1703, Renown, FMX 292, Rely, and FMX 293 deserve further trial.

8. <u>Signatures</u>:

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Project Leader	Date
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Project Leader	Date
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Department Head	Date
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Department Head	Date

Table 1. Yield and ear measurements of sugary enhancer (se) corn varieties on seven harvest dates, Corvallis, Oregon, 1991 (cont.).

	1991 (con	1/1		N. 2	70./ 4			-			
Variety	Harvest Date	Plants/ 25 ft.	Percent Moisture	No. ² Good Ears	T/A Good Ears	T/A Culls	Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Percent Cut-off	Pericarp ³ Toughness
XPH 3013	8/30	36	77.0	26.3	8.0	0.9	0.61	8.3	1.9	59.3	117
	9/2	36	73.3	24.5	8.4	0.3	0.69	8.3	2.0	61.7	76
-	9/3	37	72.7	24.8	8.8	0.8	0.71	8.3	2.1	62.2	104
	9/5	37	71.6	26.7	9.5	0.9	0.71	8.2	2.1	62.0	111
	9/7	35	70.7	25.3	9.4	0.9	0.75	8.3	2.1	61.7	117
e V	9/9	37	68.9	24.1	9.0	0.7	0.75	8.3	2.1	59.3	133
	9/11	37	68.1	25.1	9.9	0.6	0.79	8.3	2.2	59.6	126
	mean	37		25.3	9.0	0.7	0.72	8.3	2.1	60.8	112
GH 1676	9/5	36	75.3	21.5	5.5	1.3	0.52	7.5	1.9	56.3	103
	9/7	35	74.3	23.1	6.2	0.7	0.54	7.7	1.9	57.8	93
	9/9	35	72.3	24.5	6.8	0.8	0.56	7.5	1.9	62.5	103
	9/11	35	70.2	24.7	7.7	1.1	0.62	7.7	2.0	60.0	100
	9/13	36	69.7	27.5	8.7	0.5	0.63	7.6	2.0	77.7	102
	9/16	35	68.8	29.3	9.7	0.4	0.66	7.8	2.1	62.7	95
	9/18	35	68.1	26.7	9.6	0.7	0.72	7.7	2.1	70.4	107
	mean	35		25.3	7.7	0.8	0.61	7.6	2.0	63.9	100
Jubilee	9/3	37	76.4	23.7	6.3	1.1	0.53	7.9	1.9	55.9	105
	9/4	38	74.3	23.7	6.7	0.7	0.57	8.0	1.9	59.7	104
	9/6	37	74.6	23.2	6.9	0.6	0.60	7.9	1.9	61.3	93
	9/9	39	70.9	24.0	7.6	0.6	0.63	7.9	2.0	63.5	110
	9/11	37	69.8	25.7	8.7	1.5	0.68	8.0	2.0	65.0	96
	9/13	38	68.4	27.5	9.4	1.1	0.69	8.0	2.1	61.4	107
	9/16	38	67.8	25.1	9.1	0.8	0.73	7.9	2.1	68.4	102
	mean	38		24.7	7.8	0.9	0.63	7.9	2.0	62.2	102
LSD at 5% f	or variety i	neans		2,0	0.7	0.2	0.02	0.1	0.03		3

All values except % moisture and % cut-off are means of 4 replications; for ear length, ear diameter, and tenderness, the value used for each replication was the mean of 20 individual ear measurements. Planting date: May 28.
3 Number of ears/acre divided by 1,000.
3 Comparative scale determined by a Chantillon spring puncture gauge; lower numbers indicate more tender pericarp.

Table 1. Yield and ear measurements of sugary enhancer (se) corn varieties on seven harvest dates, Corvallis, Oregon, 1991¹.

Variety	Harvest Date	Plants/ 25 ft.	Percent Moisture	No. ² Good Ears	T/A Good Ears	T/A Culls	Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Percent Cut-off	Pericarp ³ Toughness
Incredible	9/3	40	76.2	25.0	7.2	1.7	0.58	7.9	1.9	46.3	101
7	9/5	38	73.9	24.0	7.7	1.4	0.65	8.0	2.0	55.7	99
	9/7	39	72.8	20.5	7.3	1.7	0.72	8.0	2.1	59.7	98
	9/9	37	70.8	22.9	7.7	1.4	0.68	8.0	2.1	59.5	123
	9/11	37	70.7	21.1	7.6	1.3	0.73	8.0	2.1	56.0	111
	9/13	39	69.6	22.7	8.5	1.1	0.75	8.0	2.1	58,8	111
	9/16	37	68.6	22.9	8.8	1.2	0.77	8.0	2.1	60.4	131
	mean	38		22.7	7.8	1.4	0.70	8.0	2.1	56.6	111
Citadel	9/3	36	74.6	20.3	6.7	0.9	0.66	8.4	1.9	58.1	103
	9/4	36	73.9	21.2	6.7	0.7	0,64	8.3	1.9	61.6	106
	9/6	36	72.6	18.4	6.4	1.1	0.69	8.3	2.0	63.0	125
	9/9	35	69.8	21.6	7.8	0.5	0.72	8.3	2.1	63.1	124
	9/11	37	69.7	22.9	8.6	0.8	0.75	8.3	2.1	69.4	125
	9/13	36	68.8	21.6	8.4	0.9	0.78	8.5	2.1	71.4	135
	9/16	37	67.9	12.2	9.2	1.0	0.83	8.4	2.2	63.2	139
	mean	36	/	21,2	7.7	0.8	0.72	8.4	2.0	64.3	122
GH 2419	9/3	36	78.2	22.8	7.6	0.6	0.67	9.0	1.9	61.5	73
	9/5	37	76.6	22.7	8.0	0.7	0.71	9.0	1.9	60.3	103
	9/7	<i>3</i> 5	75.0	25.7	9.3	0.4	0.72	9.0	2.0	62.1	83
	9/9	35	73.2	24.0	9.2	0.8	0.77	9.0	2.1	65.4	89
	9/11	35	71.8	25.1	10.3	0.2	0.83	9.1	2.1	64.8	93
	9/13	35	70.4	24.4	9.9	0.3	0.82	9.0	2.1	68.8	111
	9/16	35	70.6	24.3	10.5	1.0	0.86	9.1	2.1	67.9	105
	mean	36		24.1	9.3	0.6	0.77	9.0	2.0	64.4	94

Table 2. Yield and ear measurements, sugary enhancer (se) and sweet (su₁) corn replicated trial, Corvallis, Oregon, 1991.

Variety	Source ²	Type ³	Silk Date	Days to Harvest	Stand	1000/A	Good F T/A	ears No./Plant	Cu 1000/A	illsT/A	Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Kernel Depth (mm)	Pericarp Toughness
*GH 1703	11	Y su	8/5	95	42	23.2	7.6	1.0	1.7	0.4	0.65	7.8	2.0	11.5	120
*Rival	2	Y su	8/10	97	41	22.9	6.5	1.0	1.7	0.3	0.57	7.2	1.9	12.0	111
*Renown	3	Y su	8/12	102	38	20.6	8.7	0.8	3.3	0.9	0.84	7.8	2.1	12.5	96
*Jubilee	11	Y su	8/11	102	42	27.3	8.4	1.1	5.2	1.1	0.61	7.8	2.0	13.0	112
*FMX 292	4	Y su	8/9	103	40	25.0	8.1	1.1	2.2	0.4	0.65	8.2	1.9	12.0	110
*Rely	3	Y su	8/12	103	41	21.4	8.0	0.9	3.2	0.9	0.75	7.9	2.1	13.0	119
*Cornucopia	4	Y su	8/13	103	40	23.5	8.3	1.0	3.1	0.7	0.71	8.3	2.0	12.3	111
*FMX 293	4	Y su	8/12	103	41	24.8	9.1	1.0	3.6	0.9	0.73	8.4	2.0	12.3	140
*More	2	Y su	8/13	104	41	26.1	8.2	1.1	1.6	0.3	0.63	7.5	2.0	12.5	117
Gallant	3	Y su	8/14	104	41	19.6	6.1	0.8	7.0	1.5	0.63	8.0	1.9	11.7	121
Champ	2	Y se	8/2	94	40	23.4	7.2	1.0	2.0	0.4	0.62	7.6	2.0	11.0	136
*Terminator	3	Y se	8/7	101	44	27.3	9.4	1.1	6.8	1.6	0.69	8.0	2.0	13.0	153
*GH 2419	1	Y se	8/8	102	39	24.8	9.3	1.1	2.8	0.6	0.75	8.6	2.1	14.0	
*XPH 3013	2	Y se	8/8	102	37	21.4	8.2	1.0	4.5	1.1	0.77	8.1	2.1		101
*Esca	5	Y se	8/12	103	39	22.2	6.6	1.0	1.3	0.2	0.77	7.9		13.0	128
*Citadel	1	Y se	8/8	103	38	20.3	7.3	0.9	3.8	1.1	0.72	8.2	1.9 2.0	11.3	115
GH 1676	1	Y se	8/9	104	37	28.2	9.3	1.3	3.5	0.7				13.0	137
LSD at 5%						3.8	1.4	1.0	3.1	0.7	0.66 0.06	7.6 0.2	2.0 0.06	13.3 0.9	103 19

Planted May 31 in 36" rows. All values shown are means of 4 replications. For ear length, ear diameter, and tenderness, the value used for each replication was the average of 20 individual ear measurements.

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²Sources: 1 = Rogers, 2 = Asgrow, 3 = Crookham, 4 = Ferry-Morse, 5 = Agrigenetics.

³Endosperm type: Y = yellow; su = sweet, se = sugary enhancer.

⁴Tenderness determined by a spring-operated puncture gauge; lower numbers indicate more tender pericarp.

^{*}Varieties selected for processing.

Table 3. Yield and ear measurements, sugary enhancer (se) and sweet (su₁) corn observation trial, Corvallis, Oregon, 1991¹.

Variety	Source ²	Type ³	Silk Date	Days to Harvest	Stand	1000/A	Good I T/A	Sars No./Plant	<u>Cu</u> 1000/A		Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Kernel Depth (mm)	Pericarp Toughness
Early Sunglow	11	Y su	8/2	89	46	24.4	4.6	0.9	3.5	0.5	0.38	6.7	1.7	11	135
Sunre 2711	2	Y su	8/2	89	40	21.5	6.6	0.9	2.3	0.4	0.62	7.4	2.0	11	138
GH 35	3	Y se	8/5	95	36	19.8	6.2	0.9	4.6	0.9	0.63	8.6	1.9	12	89
Sunre 2707	2	Y su	8/8	97	42	23.2	6.3	1.0	1.7	0.3	0.54	6.9	1.9	13	
GH 2759	3	Y se	8/12	102	43	15.7	5.2	0.6	2.3	0.5	0.67	7.9	2.1	13	126 95
Sunre 2709	2	Y su	8/13	103	36	21.5	7.0	1.0	0.6	0.1	0.65	7.4	2.1	12	
Sunre 2718	2	Y su	8/9	103	30	26.9	8.7	1.3	0.6	0.1	0.82	7.9			91
Esteem	4	Y se	8/12	103	31	16.8	5.7	0.9	2.3				2.2	14	113
Sweet Pak	4	Y se	8/13	104	42				-	0.5	0.68	7.9	2.0	13	143
		1 30	0/13	104	42	25.0	7.7	1.0	2.3	0.5	0.62	7.8	1.9	12	111

Planted May 31 in 36° rows. Yield estimates are from a single 25' plot. For ear length, ear diameter, and tenderness, the value shown is the average of 20 individual ear measurements.

²Sources: 1 = Burpee, 2 = SunSeeds, 3 = Rogers, 4 = Harris-Moran.

³Endosperm type: Y = yellow; su = sweet, se = sugary enhancer.

⁴Comparative scale determined by a spring-operated puncture gauge; lower numbers indicate more tender pericarp.

Table 4. Descriptive observations, sugary enhancer (se) and sweet (su₁) corn variety trial, Corvallis, Oregon, 1991¹.

Variety	Source ²	Kernel Refine- ment	Row Straight- ness	Tip Fill	Cylind. Shape	Ear Unif.	Mat. Unif.	Kernel Unif.	Flavor	Overall Score	Row #	Notes
GH 1703	11	2	4	3	4	4	4	4	4	4	16	fairly coarse but neat, uniform, good color
Rival	2	4	4	3	4	3	3	3	4	3.5	16	very short
Renown	3	5	4	3	3	4	4	4	3.5	4	24	Total Broth
Jubilee	1	4	4	3	3	3	3	4	3.5	3.5	18	·
FMX 292	4	3	3	4	3	4	4	4	3	3	18	neat ears
Rely	3	4	3	2.5	3	3	2	3.5	3.5	3	20	neat ears but poor tip fill
Cornucopia	4	5	3	3	4	3	4	3.5	2	3	22	nice looking ears but pale color
FMX 293	4	4	3	4	3	3	4	3	3.5	3	18-20	sl. pale, uniform, neat ears, tough
More	2	4	4	3	3	4	4	4	2	3	18	small, neat, pale yellow ears, no sweetness
Gallant	3	5	4	1	3	4	3	5	4	3	20-22	not productive, very poor tip fill, otherwise nice looking
Champ	2	2	2	4	3	3	3	2	4	3	16-20	coarse, rough ears
Terminator	3	3	3	4	2	2	3	3	2	2	18	pale color, quite variable in shape and size, not sweet
GH 2419	1	2.5	4	3.5	4	4	4	3	4	3.5	16-18	very long ears, good color, sl. coarse, very good flavor
XPH 3013	2	3	3	4	4	4	4	3	3	3	18	sl. pale color, lodging susceptible
Esca	5	4	3	3	2	3	2	3	4	2.5	16	very narrow, pointed, curved ears, pale, very sweet
Citadel	1	5	2	5	4	3	2	2	3.5	2.5	20	pale color, curved ears, rough

Table 4. Descriptive observations, sugary enhancer (se) and sweet (su₁) corn variety trial, Corvallis, Oregon, 1991¹ (cont.).

Variety	Source ²	Kernel Refine- ment	Row Straight- ness	Tip Fill	Cylind. Shape	Ear Unif.	Mat. Unif.	Kernel Unif.	Flavor	Overall Score	Row	Notes
GH 1676	1	4	3	2.5	4	1	2	4	3.5	2.5	14-20	variable for size and shape
Incredible	3	4	1	3	3	2	3	1	4	2	18-22	rough, pale, curved ears
Early Sunglow	6	3	4	1	3	2	3	3	1	1	12	very small ears, early, possible home garden
Sunre 2711	7	4	3	2	4	3	4	4	2	3	16	fat Jubilee shape, short ears
GH 35	1	3	3	3	2	3	2	2	4	3	18	many curved ears, pale, rough, pointed
Sunre 2707	7	4	3	2	5	3	4	4	3	3	20	not productive, short ears, uniformly blank tips
GH 2759	1	4	3	3	2	3	4	3	3.5	2.5	18	pale
Sunre 2709	7	4	3	3	2	3	2	2	2	2.5	20-22	short, fat, pointed ears, variable, pale
Sunre 2718	7	2	2	1	1	2	2	1	1	1	20	very fat, rough ears
Esteem	8	4	3	4	4	2	3	4	3	3.5	16-18	good corn flavor but not sweet, tough
Sweet Pak	8	5	3	2	4	3	3	3	2.5	2.5	18-22	not sweet, uniformly poor tips

¹ Planted May 31, 3' between rows, thinned to about 8" between plants. Scores 1-5 scale, 5 = best; overall score based on general characteristics of harvested ears.

²Sources: 1 = Rogers, 2 = Asgrow, 3 = Crookham, 4 = Ferry Morse, 5 = Agrigenetics, 6 = Burpee, 7 = SunSeeds, 8 = Harris-Moran.

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Table 5. Yield and ear measurements, supersweet (sh₂) corn replicated trial, Corvallis, Oregon, 1991.

Variety	Source ²	Silk Date	Days to Harvest	Stand	1000/A	Good Ea T/A	irs No./plant	Cu 1000/A	lls T/A	Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Kernel Depth (mm)	Pericarp Tough-
XPH 3027	11	8/13	92	35	19.8	5.9	1.0	2.0	0.4	0.60	8.0	1.9	13.0	118
*FMX 285	2	8/15	95	34	19.6	7.1	1.0	1.9	0.4	0.72	7.9	2.1	11.0	108
*Fanciful	3	8/16	95	36	26.3	7.7	1.3	5.1	1.0	0.58	7.5	2.0	12.5	124
*GSS 3492	4	8/16	96	36	19.6	8.0	0.9	2.0	0.5	0.83	7.8	2.2	13.7	133
Prominence	3	8/17	96	35	20.3	6.6	1.0	1.7	0.4	0.65	8.0	2.0	12.3	137
*Zenith	5	8/19	98	37	27.5	7.2	1.3	1.9	0.4	0.52	7.6	1.9	12.0	115
*Crisp 'n Sweet 710	3	8/17	98	39	23.2	8.0	1.0	0.9	0.2	0.69	8.4	2.1	13.0	135
*Challenger	11	8/18	98	37	21.5	7.4	1.0	0.9	0.3	0.69	8.2	2.1	13.3	154
*FMX 284	2	8/19	99	37	21.1	7.7	1.0	1.7	0.3	0.73	9.2	2.1	12.7	
HMX 9352S	5	8/18	99	36	26.4	9.1	1.3	1.2	0.2	0.69	7.9	2.0	13.0	113
FMX 320	2	8/18	99	36	21.1	8.5	1.0	0.7	0.2	0.81	8.6	2.1	13.0	178
*Supersweet Jubilee	4	8/20	102	36	28.8	9.3	1.4	3.3	0.7	0.65	7.9	2.1		162
Tribune	3	8/19	102	35	23.7	7.6	1,2	1.7	0.3	0.64	7.6	2.1	13.5	123
XPH 3030 W	1	8/20	102	37	21.8	7.6	1.0	2.6	0.5	0.70	7.9	2.1	13.7	167
Even Sweeter	1	8/19	102	36	31.7	9.3	1.5	3.9	0.8	0.59	7.6		13.5	162
*Golden Gourmet	5	8/20	103	35	24.3	7.6	1.2	1.2	0.3	0.63		2.0	13.0	142
FMX 272	2	8/21	103	35	19.0	6.3	0.9	3.2	0.6	0.66	8.1	1.9	12.3	145
Crisp 'n Sweet 730	3	8/20	103	35	21.6	6.7	1.1	1.2	0.0	0.62	7.1	2.1	13.5	168
LSD at 5%					2.5	1.1		1.6	0.2	0.02	0.2	2.0 0.05	0.6	158 12

Planted June 13 in rows 36° apart. All values shown are means of 4 replications arranged in randomized complete blocks. All data except cull no. and T/A were obtained from typical husked good ears. For ear length, ear diameter, and tenderness, the value used for each replication was the average of 20 individual ear measurements.

²Sources: 1 = Asgrow, 2 = Perry Morse, 3 = Crookham, 4 = Rogers Brothers, 5 = Harris-Moran.

³Comparative scale, determined by a spring-operated puncture gauge; lower numbers indicate more tender pericarp.

^{*}Varieties selected for processing.

Table 6. Yield and ear measurements, supersweet (sh₂) corn observation trial, Corvallis, Oregon, 1991.

Variety	Source ²	Silk Date	Days to Harvest	Stand	1000/A	Good Ea	ers No./plant	<u>Cul</u> 1000/A		Lbs/ Ear	Ear Length (in.)	Ear Diam. (in.)	Kernel Depth (mm)	Pericarp Tough- ³ ness
WSS 4948	1	8/14	92	34	19.8	5.7	1.0	0.6	0.1	0.58	7.1	2.1	13	111
Nun 9026	2	8/15	95	37	18.6	5.9	0.9	2.3	0.5	0.64	8.2	2.0	12	146
Ivory 'n Gold	3	8/17	95	36	32.0	9.4	1.5	2.9	0.7	0.59	8.3	2.0	12	158
Honey 'n Pearl	3	8/17	95	35	23.2	7.9	1.1	1.2	0.3	0.68	8.1	2.1	12	144
BSS 4273	1	8/15	95	35	22.1	6.6	1.1	0.6	0.1	0.60	7.6	2.0	12	161
Phenomenal	4	8/19	99	36	14.5	3.0	0.7	4.1	0.7	0.42	6.9	1.9	11	134
SCH 4035	3	8/18	99	33	23.2	7.3	1.2	3.5	0.8	0.63	8.3	2.0	12	149
Showcase	1	8/19	102	35	20.9	7.4	1.0	0	0	0.70	7.7	2.1	13	142
SCH 5245	3	8/18	102	31	17.4	6.5	1.0	1.2	0.2	0.75	8.6	2.1	15	181
SCH 6152	3	8/21	102	37	20.9	6.7	1.0	0	0	0.64	8.3	1.9	13	192

¹ Planted June 13 in rows 36° apart. All data except cull no. and T/A were obtained from typical husked good ears. For ear length, ear diameter, and tenderness, the value shown is the average of 20 individual ear measurements.

²Sources: 1 = Rogers, 2 = Canners, 3 = Illinois Foundation Seed, 4 = Crookham.

³Comparative scale, determined by a spring-operated puncture gauge; lower numbers indicate more tender pericarp.

Table 7. Descriptive observations, supersweet (sh₂) corn trial, Corvallis, Oregon, 1991¹.

Variety	Source ²	Color	Kernel Refine- ment	Row Straight- ness	Tip Fill	Cylind, Shape	Ear Unif.	Mat. Unif.	Kernel Unif.	Flavor	Overall Score	Row #	Notes	
XPH 3027	1	yellow	1	2	3	4	2	3	2	4	1	12-14	picks easily, very coarse	
FMX 285	2	yellow	2	3	3	4	1	4	3	3	2	14-20	fairly coarse, variable, susceptible to lodging	
Fanciful	3	yellow	3	2	2	4	4	4	3	3.5	3	16	sweet but tough, some fat ears (18-22 rows)	
GSS 3492	4	yellow	3	3	3	4	3	3	3	4	3.5	16	nice looking except sl. pale; somewhat tough	
Prominence	3	yellow	3	3	3	2	2	2	2	3	2.5	18-20	rough, pale, some curved ears, seems tough	
Zenith	5	yellow	3	3	3.5	3	3	2	3	5	3.5	16-18	small, fairly refined ears but variable for tip fill and maturity; pale	
Crisp 'n Sweet 710	3	yellow	3	2	3.5	2	2	3	2	3	2.5	18	curved, crooked ears, tough, pale	
Challenger	11	yellow	3	3.5	2	4	2	2	4	4	3	16-20	quite variable, best ears are very good	
FMX 284	2	yellow	2	4	4	4	4	4	4	3	4	16	very straight and long	
HMX 9352S	5	yellow	3	3	2	3	2	3	2	2	2	16-18	very tough	
FMX 320	2	yellow	2	1	2.5	4	2	3	1	4	2	16-18	very big ears, very rough	
Supersweet Jubilee	4	yellow	4	4	2.5	3.5	3	3	4	5	4.5	16	good color, neat ears, worst fault is poor tips	
Tribune	3	yellow	2.5	2	1	1	3	4	3	4	1.5	18	short, fat, pointed ears, very poor tip fill, tough	
XPH 3030W	1	white	4	3	3	3.5	2.5	3	4	. 3	2	20	not productive, nice looking but very tough	
Even Sweeter	1	white	4	3	2	3	2	3	3	4.5	3.5	18-20	variable tip fill, very good yield	
Golden Gourmet	5	yellow	3.5	2.5	4	4	3.5	3.5	2	3	3	18-22	rough, picks easily, susceptible to lodging	
FMX 272	2	yellow	4	2.5	1	4	1	3	3	2	1	16-24	short, fat, highly variable, poor tips, poor flavor, poor yield	

		Т	т	Т	A	T	_		T					_	5 T
	Notes very nice looking, not productive.	sweet but tough	curved ears, not productive	susceptible, J. F, susceptible	curved ears, pale	neat ears, good flavor		short, narrow, fairly coarse ears	highly variable, many curved ears,	many spades	small ears, very unproductive, good	variable length and tip fill, some	curved ears	Somewhat rough	some very bad extended tips, some
Row	# 16-18	15	14-16		16	16		16	16-20		14-18	14-18		18-20	16-18
Overall	200re	,	7		2.5	4		2.5	1.5		1.5	3		2.5	2
G	4.5	,	3		2	4		4	2		S	3		3	3.5
Kernel Hrif	4	6	3	1	7	4		3	2		ო	3		2	3
Mat. Unif	2.5	"	2	,	4	m	,	m	7		7	4		3	3
Ear	4	3.5	3	,	7	ო	,	7	-	Ī	2	2		7	2
Cylind. Shape	3	4	5	1,6	-	4	,	5	4		3	3		4	4.5
ill ill	4	3	2	1,5	2	2.5	,	1	-	ļ	-	ю		4	1
Row Straight- ness	3	2	3	,		4	,	7	7	,	2	m	,	7	3
Kernel Refine- ment	4	3	2	3		es.	,	7	က	•	+	7	,	2	-
Color	bicolor	white	yellow	bicolor		Dicolor	hicolor		yellow	hingles	Ologio	yellow	0110	YCIIOW	yellow
Source ²	3	4	9	7	,	`	4		,	"	,	7	V	+	7
Variety	Crisp 'n Sweet 730	WSS 4948	Nun 9026	Ivory 'n Gold	Honey 'n	Pearl	BSS 9273	COLT 4035	3CH 4033	Phenomenai		SCH 6152	Showcase	200	SCH 5245

Planted June 13, 3' between rows, thinned to about 8' between plants. Scores 1-5 scale, 5 * best; overall score related to general characteristics of harvested ears. 2Sources: 1 = Asgrow, 2 = Petry Morse, 3 = Crookham, 4 = Rogers Brothers, 5 = Harris-Moran, 6 = Canners, 7 = Illinois Poundation Seed.

Report to the Oregon Processed Vegetable Commission December 5, 1991

Title: Corn Earworm Control in Processed Sweet Corn

Project Leaders: Brian Croft, Glenn Fisher, Ray Drapek, Len Coop

Entomology Department Oregon State University Corvallis, Oregon 97331-2907 (503) 737-5498

Status: Continuing until June 30, 1992

Funding: \$4,500

Objectives:

1. Verify the relationship observed in 1990 between local corn acreage and damage.

2. Verify the relationship observed in 1990 between wind-blocking features and damage.

- 3. Look more closely at regional damage patterns. Determine if consistent regional patterns exist.
- 4. Look at how well traps in one field can be used to predict damage in another field.
- 5. If the improvements made in 1990 to the damage prediction model improve damage prediction in 1991 as well, they will be incorporated into CEWSIM in as simple a manner as possible.

Report of Progress:

Field Activities During the 1991 Season

Pheromone traps were placed at twenty nine sites in the southern half of the Willamette Valley. These sites, from Junction City to Stayton, were monitored every three days throughout the growing season. The first trap was placed on April 29 and the last trap was removed on September 23, 1991. All corn growing within 1.5 miles of the trap at each site was mapped as well as all wind blocking features within 1/3 mile of the trap. 100-200 corn ears were examined for damage at harvest time at each site and surrounding corn plantings. A total of 77 corn plantings and approximately 11,000 ears of corn were sampled in this fashion.

Moth flight and corn ear damage in 1991

Moth flight activity was delayed considerably as a result of a cool and wet late spring (Figure 1). Moth catch was low, comparable to 1990, but damage was less because of the lateness of flight peaks. None of the fields inspected for damage exceeded 14% ear infestation. The majority had less than a 5% infestation level. These low values for ear damage obscured any apparent trends between date (Figure 2) or cumulative trap catch (Figure 3) and damage. The trends observed in the past between dates or trap catches and damage were from those plantings with both ear damage and moth catches much higher than those occurring this year. Though this year's activity did not provide us additional data concerning fields requiring treatment, the additional field information is adequate for the completion of the objectives outlined in our research proposal.

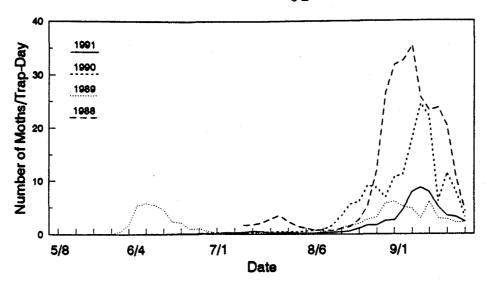


Figure 1. Average corn earworm moth catch for years 1982-1991.

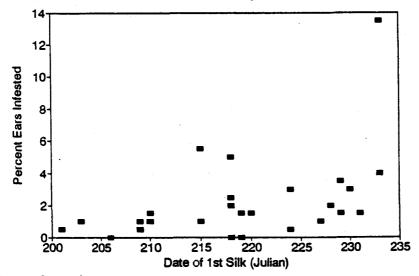


Figure 2. Date of 1st silk versus subsequent damage, 1991.

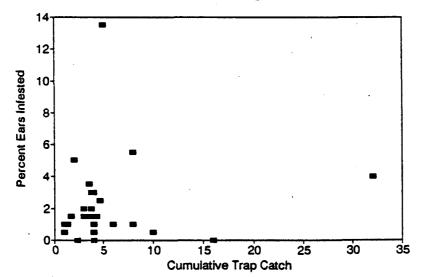


Figure 3. Cumulative moth catch between 1st tassel and 1st silk versus subsequent damage, 1991.

Because of the extraordinarily low ear damage levels, our damage prediction computer program (CEWSIM) did not predict damage with a high degree of accuracy (Figure 4). However, it did correctly indicate that damage levels for all plantings would be well below the treatment threshold, which we've calculated as being 28% ear infestation.

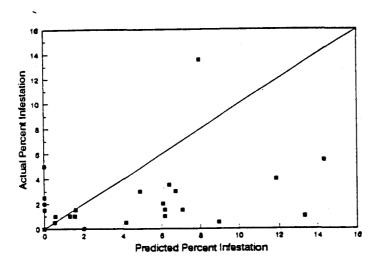


Figure 4. Percent ear infestation predicted by CEWSIM versus actual infestation.

Progress on Objectives

All of the objectives require an analysis of spatial factors such as the relative positions of corn plantings and wind blocking features around the trap. For this type of analysis, computer programs called geographical information systems are used. The initial process of setting up data files and creating map layers for geographical information systems requires considerable time. Therefore analyses are not yet completed. To date we have created map layers for elevation and for all corn growing within 1.5 miles of all of our traps. By the end of December we expect to have the following map layers completed: all corn plantings within 1.5 miles of all traps in 1990, all corn plantings within 1.5 miles of all traps in 1991, wind blocking features within 1.5 miles of each trap (1991), and elevation. At that time we will begin actual analyses. All of the objectives of this proposal should be met by the end of this project's funding period once all of the map layers are in place.

Signatures:

Project Leader(s)	Redacted for Privacy
	Redacted for Privacy
	Redacted for Privacy
	Redacted for Privacy
Department Head	Redacted for Privacy
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RESEARCH REPORT - OREGON PROCESSED VEGETABLE COMMISSION

Title:

Evaluation of Sweet Corn Varieties for Production in the Columbia Basin

Project Leader:

George H. Clough, Horticulturist Hermiston Agricultural Research and Extension Center

Status:

Completed.

Funding:

Approximately 80% of the \$2,500.00 allotted to this project for 1991 was expended for labor, with the remainder utilized for services and supplies. Additional support was provided as part of a grant from the Oregon Department of Economic Development to the Umatilla-Morrow Counties Regional Strategy High Value/Value Added Research Program.

Objectives:

Determine yield and quality characteristics of sweet corn cultivars which may be appropriate for climate and cultural practices in the Columbia basin.

Progress Report:

Nine supersweet (sh_2) , six regular (su), and three sugary-enhanced (se) sweet corn varieties were grown in replicated trials to evaluate their potential for processing in the Columbia Basin (Table 1). Fertilizer was broadcast $(100N-100P_2O_5-160K_2O-4OS-4Cu-3Zn-1\%B)$ and rototilled. Herbicide (Confidence (alachlor) at 2 qts/acre + Atrazine 80W at 1.25 lbs/acre) was applied through the sprinkler irrigation system for weed control. Plots were seeded on Apr 26 (su, se) and Apr 29 (sh_2) , 4-30' rows/plot, 30" between rows, and thinned to 9" (23,200 plants/acre) between plants. Additional nitrogen fertilizer was applied through the irrigation system; 90 lb/acre total in 3 equal weekly applications beginning 6 weeks after emergence. Plots were sprinkler-irrigated 3 times/week; 22.5" of water was applied during the season. One application of Asana XL at 8 oz/acre was made for earworm control.

Twenty feet of the interior 2 rows of each plot were harvested for data. Data recorded included days from planting to tassel, silk and harvest; yield (number and husked weight) of marketable and cull ears; per cent moisture at harvest; weight, length and diameter of ears; and depth and number of kernel rows.

Plots were harvested when sample ears tested at 72 and 76% moisture for su/se and $\rm sh_2$ sweet corns, respectively. Only physiologically-mature ears of marketable size were taken in the once-over harvest operation. Atypically cool temperatures in May and June delayed maturity; days from planting to harvest ranged from 101 to 112 days for su and se sweet corns, and 100 to 109 days for the $\rm sh_2$ types.

Table 1. Sweet corn varieties, Hermiston, Oregon, 1991.

Variety	Туре	Source
Challenger	sh_2	Asgrow
Citadel	se	Rogers Bros.
Cornucopia	su	Ferry-Morse
Crisp 'n Sweet 710	$\mathtt{sh}_{\mathtt{2}}$	Crookham
Crisp 'n Sweet 711	sh_2	Crookham
Fanciful	$\operatorname{\mathfrak{sh}}_2$	Crookham
FMX-284*	sh_2	Ferry-Morse
Incredible	se	Crookham
Jubilee	su	Rogers Bros.
Rely*	su	Crookham
StylePak	su	Ferry-Morse
Stylesweet	${\tt sh}_2$	Ferry-Morse
Supersweet Jubilee	sh_2^-	Rogers Bros.
Sweet Belle	sh_2^-	Asgrow
Terminator*	se	Crookham
Ultrasweet*	$\mathtt{sh}_\mathtt{2}$	Ferry-Morse
1703	s u	Rogers Bros.
2439	su	Rogers Bros.

^{*} Varieties not previously tested at HAREC.

Earliest maturing varieties were 1703, Incredible, and Ultrasweet (Table 2). Latest varieties included Citadel and Rely, although these and FMX-284 were past optimum maturity at harvest, and should have been harvested somewhat earlier.

Table 2. Sweet corn maturity, Hermiston, Oregon, 1991.

		He			
Variety	Type	Tassel	Silk	Harvest	% Moisture
Citadel	se	1024	1135	1744	68.4
Incredible	se	1024	1283	1529	71.8
Terminator	se	1024	1091	1555	72.5
Cornucopia	su	1097	1204	1680	71.5
Jubilee	su	1024	1135	1605	72.4
Rely	su	1024	1101	1744	69.0
StylePak	su	1166	1204	1722	70.2
1703	su	885	1061	1505	71.4
2439	su	1135	1283	1701	72.9
Challenger Crisp 'n	sh_2	981	1058	1535	76.3
Sweet 710 Crisp 'n	sh ₂	981	1017	1562	75.8
Sweet 711	sh ₂	981	1054	1535	75.9
Fanciful	sh_2	981	1027	1535	76.9
FMX-284	sh_2	981	1126	1657	71.9
Stylesweet	sh_2	1064	1215	1701	76.0
Supersweet	_				
Jubilee	sh_2	1027	1137	1679	75.5
Sweet Belle	sh_2^-	1037	1109	1701	73.3
Ultrasweet	sh ₂	889	1017	1512	74.4

 $^{^{\}rm z}$ Heat units calculated with 50°F base temperature.

Maturity data from the 1990 trials were combined with the 1991 data to provide a more accurate assessment of the development pattern of the different varieties over more than one season (Table 3). Incredible and 1703 were the fastest maturing of the se and su types, but 1703 was harvested prematurely in 1990; 2439 was the last to mature. Challenger and Crisp 'n Sweet 711 were earliest of the sh_2 sweet corns; Ultrasweet and FMX-284 exhibited similar early maturities, but were only tested in 1991. Sweet Belle and Supersweet Jubilee were the slowest-maturing sh_2 varieties over both years.

Table 3. Two-year average sweet corn maturity, Hermiston, Oregon, 1990-1991.

		Не	at Units²	to	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Variety	Туре	Tassel	Silk	Harvest	Moisture	
Citadel	se	944	1106	1688	70.6	
HMX5393E ^y	se	864	1064	1554	73.3	
Incredible	se	989	1161	1542	71.7	
Terminator ^x	se	1024	1091	1555	72.5	
Cornucopia	su	1058	1160	1687	71.8	
Jubilee	su	955	1077	1580	72.8	
Rely*	su	1024	1101	1744	69.0	
StylePak	su	1060	1154	1708	70.5	
1703	su	827	950	1393	76.2	
2439	su	1072	1218	1720	73.0	
Challenger	\mathtt{sh}_2	1022	1155	1634	77.2	
Crisp 'n	_				•	
Sweet 710	${\tt sh_2}$	1079	1201	1729	77.6	
Crisp 'n	_					
Sweet 711	\mathtt{sh}_2	1029	1153	1634	75.7	
Fanciful	sh_2	1042	1143	1691	77.2	
FMX-284*	sh_2^-	981	1126	1657	71.9	
Stylesweet	sh_2^-	1064	1202	1717	75.5	
Supersweet	_					
Jubilee	$\mathtt{sh}_{\mathtt{2}}$	1140	1275	1818	75.5	
Sweet Belle	sh_2	1145	1261	1807	74.2	
Ultrasweet×	sh_2	889	1017	1512	74.4	
Zenith ^y	sh_2^2	1252	1413	1895	72.8	

 $^{^{}z}$ Heat units calculated with 50°F base temperature.

y 1990 only.

^{* 1991} only.

Ultrasweet, Sweet Belle and Crisp 'n Sweet 710 yielded the greatest husked weights of marketable ears (Table 4). Thirteen of the 18 varieties tested produced statistically equal marketable yields, ranging from 3.31 to 5.11 tons/acre. Terminator, 2439, Challenger and Stylesweet had unacceptable low yields. Challenger had significant weight of cull ears due to poor tip fill. As in the 1990 trial, Crisp 'n Sweet 711 produced a good yield of marketable ears, but had a high proportion of cull ears due to poor tip fill, along with some short ears.

Table 4. Sweet corn yield, Hermiston, Oregon, 1991.

		71 6	Yield (Husked)							
Variety	Туре	Plant Stand	No. Ears	Marketable	Cull	Total				
		% 1	000's/acre		Tons/acre					
Citadel	se	75cd e	15.5	4.04bcd ²	0.54cd	4.58bcde				
Incredible	se	100a	15.2	3.39bcd	0.22cd	3.61cdef				
Terminator	se	100a	13.2	2.87cde	0.45cd	3.32def				
Cornucopia	su	100a	13.2	3.31bcd e	0.24cd	3.55cd e f				
Jubilee	su	100a	17.1	3.65bcd	0.45cd	4.10bcde				
Rely	su	83abcd e	16.6	4.70bc	0.37cd	5.07bcde				
StylePak	su	100a	16.3	3.96bcd	0.28cd	4.24bcde				
1703	su	68 e	14.2	3.79bcd	0.74bcd	4.53bcde				
2439	su	78bcd e	6.7	1.45 e	0.07d	1.53 f				
Challenger Crisp 'n	\mathbf{s} h $_2$	100a	10.0	2.48de	2.52a	5.00bcd e				
Sweet 710 Crisp 'n	\mathbf{s} h $_2$	100a	17.9	5.07ab	0.85bc	5.92ab				
Sweet 711	\mathtt{sh}_2	100a	16.5	4.21bcd	1.31b	5.52abcd				
Fanciful	$\mathbf{s}\mathbf{h}_2$	89abcd	16.1	3.82bcd	0.90bc	4.72bcde				
FMX-284	sh_2	72d e	14.8	4.29bcd	0.32cd	4.63bcd e				
Stylesweet	sh_2	93abc	9.8	2.89cd e	0.28cd	3.17 ef				
Supersweet	_									
Jubilee	${f s}{f h}_2$	99ab	15.7	3.43bcd	0.70bcd	4.13bcde				
Sweet Belle	$\mathbf{s}\mathbf{h}_2$	100a	20.6	5.11ab	0.73bcd	5.84abc				
Ultra s weet	$\mathbf{s}\mathbf{h}_{2}^{-}$	92abcd	21.8	6.71a	0.71bcd	7.42a				

² Means followed by different letters are significantly different at the 5% level.

Sweet Belle, Crisp 'n Sweet 710, Stylepak, Crisp 'n Sweet 711 and Fanciful produced the largest marketable yields over 2 years of evaluations. Poorest yields were obtained from 2439, Incredible, 1703 and Challenger.

Table 5. Sweet corn yield, Hermiston, Oregon, 1990 - 1991.

		N T	Y	Yield (Husked)			
Variety	Туре	No. Ears	Marketable	Cull	Total		
		1000's/acre	2	Cons/acre			
Citadel	se	16.0cdef ²	3.82bcdef	0.59cde	4.41bcd		
HMX5393E	se	17.9abcde	3.75bcdef	0.83bcde	4.58bcd		
Incredible	se	10.1g	2.35fg	0.26de	2.59e		
Terminatorx	se	14.0defg	2.89efg	0.45de	3.34de		
Cornucopia	su	15.4cdefg	3.49cdef	0.66bcde	4.14cde		
Jubilee	su	19.labcd	3.89bcde	0.69bcde	4.58bcd		
Rely×	su	16.9bcde	4.70bcd	0.37de	5.08bc		
StylePak	su	18.4abcde	4.63bcd	0.20e	4.84bcd		
1703	su	18.4abcde	2.91efg	1.16abc	4.07cde		
2439	su	11.1fg	1.82g	0.82bcde	2.64e		
Challenger	${\tt sh_2}$	17.9abcde	3.22defg	1.68a	4.91bcd		
Crisp 'n	-		J	•			
Sweet 710	sh_2	18.7abcd	4.62bcd	0.93bcd	5.55bc		
Crisp 'n	-						
Sweet 711	sh_2	20.6abc	4.53bcd	1.34ab	5.87b		
Fanciful	sh_2	19.3abcd	4.09bcde	0.91bcde	5.00bcd		
FMX-284*	sh_2	14.9cdefg	4.29bcde	0.32de	4.61bcde		
Stylesweet	sh_2	12.7efg	3.80bcdef	0.27de	4.07cde		
Supersweet		_					
Jubilee	${\tt sh_2}$	19.6abcd	3.90bcde	0.70cde	4.60bcd		
Sweet Belle	sh_2	22.8a	5.15b	0.78bcde	5.93b		
Ultrasweet*	sh_2^-	22.4ab	6.71a	0.71bcde	7.42a		
Zenith ^y	sh_2^2	23.6a	5.03bc	0.34de	5.37bc		

² Means followed by different letters are significantly different at the 5% level.

y 1990 only.

^{* 1991} only.

Sweet Belle, Crisp 'n Sweet 710, Stylepak, Crisp 'n Sweet 711 and Fanciful produced the largest marketable yields over 2 years of evaluations. Poorest yields were obtained from 2439, Incredible, 1703 and Challenger.

Table 5. Sweet corn yield, Hermiston, Oregon, 1990 - 1991.

		N-	Y	ield (Husk	ed)
Variety	Type	No. Ears	Marketable	Cul1	Total
		1000's/acre		Tons/acre	
Citadel	se	15.5	3.71bcde ²	Ø.57cd	4.83bcde
HMX5393E	se	19.5	3.29cde	/0.77abc	4.02abc
Incredible	se	15.2	2.35ef	0.24cd	3.81cdef
${\tt Terminator}^{\mathbf{x}}$	se	13.2	3.04cdef/	0.48cd	3.52def
Cornucopia	su	13.2	\3.35cde∕	0.25cd	3.74cdef
Jubilee	su	17.1	3 74bøde	0.48cd	4.33bcde
Rely*	su	16.6	4.96,16	0.39cd	5.35bcde
StylePak	su	16.3	4.37% bcd	0.29cd	4.46bcde
1703	su	14.2	2.89def	0.78bcd	4.77bcde
2439	su	6.7	∕1.73f ·\	0.08d	1.61f
Challenger	sh_2	10.0	/ 3.05cdef	2.66a	5.27bcde
Crisp 'n					
Sweet 710	sh_2	17.9	4.50bc	0.90bc	6.24ab
Crisp 'n	-				
Sweet 711	${\sf sh_2}$	16.5	4.35bcd	1.\38ь	5.81abcd
Fanciful	sh_2^-	16/.1	3.93bcd	0.94bc	4.98bcde
FMX-284*	sh_2	1/4.8	4.52bc	0.34ca	4.86bcde
Stylesweet	sh_2^-	/ 9.8	3.59bcde	0.29cd	3.34ef
Supersweet	-			\	
Jubilee	${\tt sh_2}$	15.7	3.73bcde	0.74bcd	\ 4.35bcde
Sweet Belle	sh_2	20.6	4.97b	0.77bcd	6.15abc
Ultrasweet*	sh_2 /	21.8	7.07a	0.75bcd	7.82a
Zenith ^y	sh_2	26.0	4.41bcd	0.30de	4,71bcde

² Means followed by different letters are significantly different at the 5% level.

y 1990 only/.

^{* 1991} on Yy.

In the 1991 trial Jubilee, Terminator and 2349 produced the lightest ears, and Rely and Ultrasweet produced the heaviest ears (Table 6). FMX-284 and Stylesweet produced the longest ears, followed by Rely, Cornucopia and Crisp 'n Sweet 710. Fanciful and Incredible produced the shortest ears. Ear diameter ranged from 1.76" with 2439 to 2.21" with Rely.

Table 6. Sweet corn ear characteristics, Hermiston, Oregon, 1991.

			Earz		Kerne	l
Variety	Туре	Weight	Length	Diameter	Depth	Rows
		Lbs		Inches		No.
Citadel	se	0.65cde ^y	8.19efg	2.00cd	0.43cdefg	20.lab
Incredible	se	0.54ijk	7.72ij	1.88f	0.39fg	18.7cd
Terminator	se	0.53jkl	7.95h	1.94ef	0.39g	18.5cd
Cornucopia	su	0.6lefg	8.55bc	1.93ef	0.40efg	20.2ab
Jubilee	su	0.51kl	8.07fgh	1.81g	0.40fg	16.7ef
Rely	su	0.74a	8.62b	2.21a	0.57a	20.2ab
StylePak	su	0.61efg	8.26def	1.93 ef	0.50bc	19.5bc
1703	su	0.63def	7.91hi	2.03c	0.55ab	16.4ef
2439	su	0.501	8.10fgh	1.76g	0.40 f g	21.la
Challenger Crisp 'n	\mathbf{sh}_2	0.56hij	7.93h	1.88f	0.4lefg	17.le
Sweet 710 Crisp 'n	${\sf sh}_2$	0.67bcd	8.47bcd	2.00cd	0.42defg	17.3e
Sweet 711	$\mathbf{s}\mathbf{h_2}$	0.60fgh	8.27def	1.92 ef	0.43defg	17.2e
Fanciful	$\mathbf{s}\mathbf{h}_{2}^{2}$	0.57ghi	7.62j	1.91ef	0.49cd	15.8f
FMX-284	\mathbf{sh}_2^{z}	0.69bc	9.10a	1.95de	0.46cdef	16.8e
Stylesweet	$\mathbf{s}\mathbf{h}_2^{z}$	0.70b	9.21a	1.94ef	0.45cdefg	18.4d
Supersweet	_				5	
Jubilee	\mathtt{sh}_2	0.64def	8.06fgh	2.01cd	0.47cde	16.6 e f
Sweet Belle	$\mathtt{sh}_2^{\mathtt{z}}$	0.63 ef	8.02gh	2.06bc	0.46cdef	18.9cd
Ultrasweet	\mathbf{sh}_2	0.75a	8.39cde	2.11b	0.42defg	17.le

² Average of 8 marketable ears/replication, 4 replications/variety.

<u>Summary</u>:

Measured characteristics varied significantly among the cultivars evaluated (see Tables 2-6). Three of the 4 varieties which produced the largest yields were sh₂ types; 2 of the 4 were evaluated in 1991 only, and probably should be tested again.

y Means followed by different letters are significantly different at the 5% level (DMRT).

Signatures:

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COMMERCIAL SORTING OF SUPERSWEET CORN SEED FOR ASSURED YIELD

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Objective

The effects of seed class and seed density on supersweet corn plant stand, plant development, and yield were examined using a single lot of Crisp 'N Sweet 710. Seed class and seed density can be controlled in packaging supersweet corn seed and could provide a means to more reliable plant stand establishment.

Introduction

Emergence and performance of supersweet corn can be unpredictable. The roles of pathogens, genotypes, seed lots, fungicides, and bactericides in stand and vigor loss are being investigated. Within any commercial lot of supersweet corn seed, variation exists as to seed size, type, and weight. The seed industry and growers have a mutual interest in understanding what fractions of supersweet corn seed are of high quality and what fractions have marginal quality. Results of the 1990 trials showed the negative influence of low seed density and the extra large round class on plant stand and on yield and ear quality.

Materials and Methods

A supersweet corn trial was located on a Greenleaf silt loam soil following sugar beets. One hundred pounds of phosphate was broadcast and then the field was ripped and chisel plowed in November of 1990. The field was then corrugated into 30 inch rows. Roundup at 1qt. ai/acre and 2,4D at 1qt. ai/acre were applied preplant on April 22. The field was preirrigated on May 4, and treated with a preplant application Lasso at three pounds active ingredient per acre on May 14. The Lasso was incorporated with a bed harrow and roller. The trial was planted May 15. Weedar (2,4 D) was sprayed for weed control at 2 lbs ai/acre on June 19. The field was sidedressed with 150 pounds N per acre as urea June 28 and was cultivated on July 2. After planting, the trial received seven irrigations in alternating furrows starting on June 12.

A single lot of Crisp 'N Sweet 710 seed was divided by seed industry equipment into normal seed classes including the following:

- Large flat
- 2. Extra large flat
- 3. Large round
- 4. Extra large round
- and Other classes.

Each of the four seed classes based on seed size and shape was divided by seed density. First the seed was divided into thirds based on density using a gravity table to obtain low, medium, and high density seed. The high density seed was further divided into thirds to yield low, medium and high density fractions (Figure 1).

The four seed classes times seven seed density fractions (with five average

densities) resulted in 28 seed fraction treatments. All seed were treated with Thiram plus Difolitan plus Apron. Seed was planted May 15 with treatments arranged in a randomized complete block design with five replicates. Each plot consisted of four rows of corn 25 feet

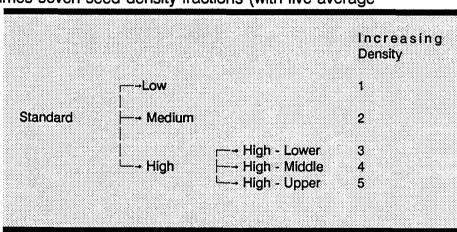


Figure 1. Density Divisions on Each Seed Class.

long. Seedling emergence and plant stand counts were made June 4, 7, 11, 14 and 18. Average plant heights were measured July 19 and vigor was judged subjectively for each plot based on a scale of 0-10.

Plant stand was thinned as close as possible to 24,000 plants per acre on June 26. In thinning no preference was made as to plant size, health, or vigor. Plots were thinned and carried to harvest maturity to determine if there were seed class or density effects on yield, grade, or maturity independent of their effects on plant stand alone. Before harvest the interior seventeen feet from the middle two rows of each four row plot were flagged and the plants were counted. At harvest all potentially useable ears were harvested, counted, and weighed. Fifteen ears were shucked, weighed, and rated for maturity (scale 1-5) and percent culls. The seven seed density classes were evaluated based on their progressive ranking into five average density classes (Figure 1).

Cool soil temperatures delayed emergence, providing conditions favorable for seed pathogens and seedling blight. Average stand reached a maximum of 78.9 percent June 14 then declined to 77.8 percent by June 18. Flat seed resulted in significantly higher plant stands than round seed classes at all observation dates (Table 1). Plant stand was closely related to seed density (Table 2).

Seed class and density had no significant interactive effects on plant stand on any of the observation dates. For simplicity the complete data from only June 18 are presented (Table 3).

Corn was at 74% moisture August 16 and harvest occurred on August 21. Seed class had a significant effect on yield with the large flat seed yielding significantly more than the extra large round class (Table 4). Low seed density had a negative effect on plant population, despite the plots being thinned to a uniform stand (Table 5). Neither seed class nor seed density had any significant effect on the other performance parameters (Tables 4 and 5).

Conclusions

From the 1990 and 1991 results, supersweet corn plant stands are clearly influenced by seed class and seed density. In spite of thinning to uniform stand, the negative influences from certain fractions of low density seed and from the round classes can persist to harvest. Further studies can confirm these trends or determine if they are limited to this variety. Further understanding of seed lot fractions with poor performance can improve seed reliability and reduce risks to growers.

Acknowledgements

Financial support for this study was provided by the Oregon Processed Vegetable Commission.

Table 1. Seed class and plant stand over time of Crisp 'N Sweet 710 supersweet corn planted May 15. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

<u>Treatments</u>	Dates of Plant Stand Counts				
Seed Classifications	June 4	June 7	June 11	June 14	June 18
			%		
Large Flat	80.7	79.0	80.4	81.2	80.1
Extra Large Flat	80.9	80.6	81.4	80.2	79.9
Large Round	74.9	75.1	76.6	77.4	75.7
Extra Large Round	77.5	76.1	76.7	76.8	75.3
LSD (0.05)	3.2	2.9	2.4	2.7	2.7

Table 2. Seed density and plant stand over time of Crisp 'N Sweet 710 supersweet corn planted May 15. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

Treatments	Dates of Plant Stand Counts					
Seed densities	June 4	June 7	June 11	June 14	June 18	
			%			
1. Low	73.3	71.0	73.4	71.8	71.8	
2. Medium	79.5	79.4	79.3	80.3	79.6	
3. High-Lower	78.3	77.5	78.1	78.8	76.5	
4. High-Middle	80.7	79.7	80.4	80.7	80.4	
5. High-Upper	80.8	81.1	82.7	82.7	80.6	
LSD (0.05)	3.6	3.2	2.6	3.0	3.0	

Table 3. Interactive effects of seed density and seed class on the stand of Crisp 'N Sweet 710 supersweet corn planted May 15. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

Percent Plant Stand June 18					
		See	ed Classificat	ion	
Seed density fraction	Large Flat	Extra Large Flat	Large Round	Extra Large Round	Average
			%		%
1. Low	73.4	75.9	69.7	68.2	71.8
2. Medium	83.7	82.8	76.2	75.6	79.6
3. High-Lower	76.3	79.1	73.8	76.9	76.5
4. High-Middle	83.3	82.5	77.9	77.8	80.5
5. High-Upper	84.0	79.4	80.9	77.8	80.4
Average	80.1	79.9	75.7	75.2	77.7

LSD (0.05) Density = 3.0

LSD (0.05) Classification = 2.7

LSD (0.05) Density x Classification = ns

Table 4. Effects of seed class on the performance of Crisp 'N Sweet 710 supersweet corn. The effects are independent of the effects of seed class on plant stand, because plots were thinned to uniform stand. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

Treatment	July	July 19		At Harvest				
Seed Classification	Average Plant Height	Plant Vigor	Plant Numbers*	Number of Ears Harvested	Yield	15 Husked Ear Weight	Percent Culls	
	cm	0-10			t/ac	lb	%	
Large Flat	156.0	6.2	33.5	35.7	9.4	11.4	7.7	
Extra Large Flat	156.5	6.2	33.6	35.8	9.2	11.3	11.6	
Large Round	155.6	6.1	34.1	37.2	9.2	11.3	11.8	
Extra Large Round	154.4	6.0	33.0	34.2	8.9	11.5	10.6	
LSD (0.05)	ns	ns	ns	ns	0.36	ns	ns	

^{*} Based on 85 ft² in the plot interior replicated five times

Table 5. Seed density and performance of Crisp 'N Sweet 710 supersweet corn. These effects are independent from the effects of seed density on plant stand, because the plots were thinned to uniform stand. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

Treatment	July	19	At Harvest				
Seed Density	Average Plant Height	Plant Vigor	Plant Numbers*	Number of Ears Harvested	Yield	15 Husked Ear Weight	Percent Cuils
	cm	0-10			t/ac	lb	%
1. Low	153.4	5.9	32.6	35.7	9.1	11.4	11.5
2. Medium	156.2	6.2	. 33.1	36.0	9.2	11.3	9.2
3. High-Lower	155.3	6.0	33.0	33.9	9.0	11.5	8.9
3. High-Middle	155.1	6.1	34.3	36.8	9.2	11.2	13.0
5. High-Upper	158.1	6.5	34.8	36.4	9.3	11.5	9.4
LSD (0.10)	ns	ns	1.48	ns	ns	ns	ns

OPTIMUM PLANT POPULATION OF SUPERSWEET CORN

Erik Feibert^{1,} Clint Shock¹, Jim Zalewski² and Monty Saunders¹

¹Malheur Experiment Station Oregon State University and ²Ore-Ida Foods, Inc. Ontario, Oregon, 1991

Objective

Few studies have been done to determine the range of ideal plant populations for supersweet corn. Ideal plant populations to maximize grain yield of field corn and useable ear yield of sweet corn are well established based on production area, cultivar maturity, soil, and fertility status. For sweet corn ideal plant populations are lower than for field corn because ear quality is a primary consideration. Ideal plant population for the normal sweet corn cultivar Golden Jubilee grown in the Treasure Valley of eastern Oregon and southwestern Idaho is thought to be 25,000 plants per acre.

Materials and Methods

The field, planting date, and cultural practices were identical to those already described above in "Seed class and seed density of supersweet corn." Abbott and Cobb 7710 supersweet corn seed treated with Thiram-Benomyl-Apron was planted in four row plots twenty-five feet long. Seed was planted at 30, 40, 50, 60, and 70 thousand plants per acre and thinned to final plant stands of 15, 20, 25, 30, and 35 thousand plants per acre. When plants were thinned, plants were not selected for removal based on size or vigor. Each population treatment was replicated five times in a randomized complete block design with five replicates.

Before harvest the middle 17 feet of the center two rows of each plot was flagged and the number of plants in the harvest area was counted to determine the final plant population. Ears from the plants in the interior part of the plot were harvested, weighed, and counted.

A twenty ear subsample from each plot was husked. Ear length, ear diameter at the base, and ear diameter six inches from the base were measured and averaged for each plot. Ears were evaluated for kernel row number, maturity, and cobs graded as A, B, and C according to processing standards. Population treatment effects on all parameters was based on regression using the actual plant population in each harvest area.

Results and Discussion

Supersweet corn yields increased with plant population to a maximum of 9.97 tons/acre at 24900 plants per acre according to the relationship in Figure 1 as follows:

 $Y = -2.09 + 7.71 \times 10^{-4}P - 1.55 \times 10^{-8}P^{2}$ $R^{2} = .84$

Where Y = yield in tons per acre

P = plant population in plants per acre.

In 1990 the maximum yield was 7.43 tons/acre at 23200 plants/acre.

The number of marketable ears also increased and then decreased with plant population with a maximum at 31200 plants per acre (Figure 2). In 1990 the number of marketable ears increased to 28000 plants per acre. There is a clear trade- off of total cob yield and yield of marketable cobs. The number of marketable ears peaks at a higher population than total cob yield.

On the other hand, ear quality measurements showed declines with increasing plant population. Average ear length declined with population dipping below eight inches at 32300 plants per acre (Figure 3). Basal-end ear diameter and ear diameter at six inches also decreased with increasing plant population (Figure 4). Average ear weight declined with increasing plant population (Figure 5). Ear maturity, kernel row number and the proportion of the different ear grades were unaffected by plant population.

As indicated by this and last years' results, there are clear trade-offs of number of marketable ears per acre and ear quality. Populations targeted well below the population resulting in maximal number of marketable ears (31200 plants per acre) are desirable to assure market quality of the ears. Abbott and Cobb, the supplier of 7710, recommends a population of 22,000 to 24,000 per acre for this variety. This research indicates an optimal plant population of 23200 to 24900 for supersweet corn yields in the Treasure valley. Given the sensitivity of supersweet stands to planting conditions and the year to year variation in seed vigor, a target seeding rate considerably above 25,000 seed per acre may be advisable to obtain a final plant stand of 23000 to 25000 plants per acre.

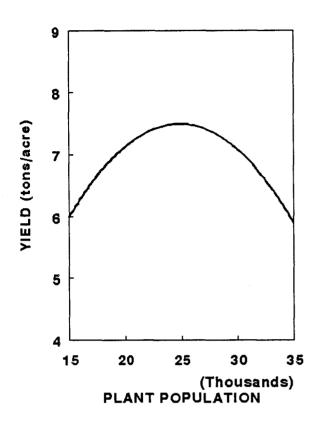


Figure 1. Primary ear yield of Abbott and Cobb 7710 supersweet corn in response to increasing plant population, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

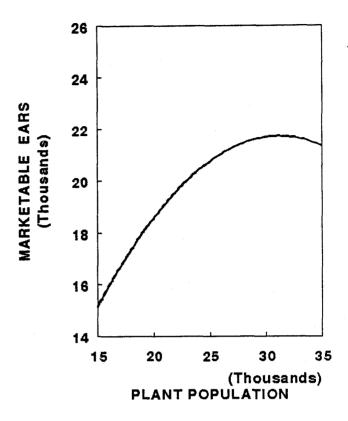


Figure 2. Marketable ears of Abbott and Cobb 7710 supersweet corn in response to increasing plant population, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

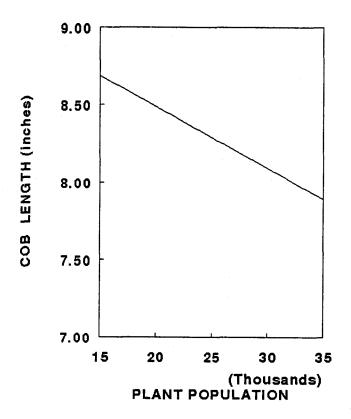


Figure 3. Cob length in inches decreased with plant population, r² = .73. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

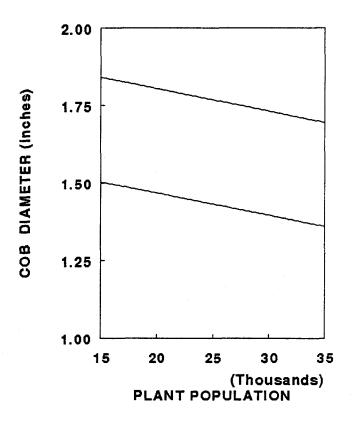


Figure 4. Both cob diameter at the base (upper line), $r^2 = .43$, and cob diameter at 6 inches (lower line), $r^2 = .45$, decreased with plant population. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

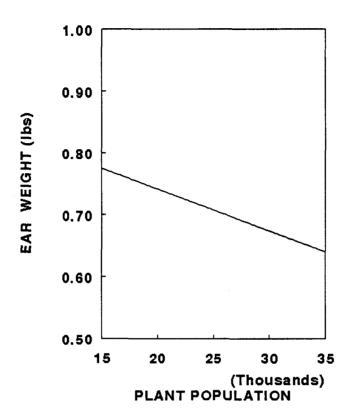


Figure 5. Ear weight decreased in response to increasing plant population, $r^2 = .26$. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

RESEARCH REPORT TO OREGON COMMODITY COMMISSION

TITLE: Control of Rust, Cercospora, and Mildew of Table Beets

PROJECT LEADERS: Ross Penhallegon, OSU Extension, Commercial

Horticulture, Lane County

Paul Koepsell, Dept. of Botany and Plant

Pathology, OSU

PROJECT STATUS: Continuing - completion time: December 31, 1991

PROJECT FUNDING by Commission for this report period was \$1750. The funds were used to purchase plot materials, spray equipment, and hire labor to harvest the plots. Funds from Lane County Extension budget (\$500) were also used on this project.

OBJECTIVE: To evaluate the effectiveness of non registered chemicals (Bayleton, Folicur) and registered chemical (Sulfur) for the control of Rust, Leaf Spot, and Mildew in Table Beets (Uromyces betae, Cercospora beticola, Peronospora schachtii, and Erysiphe polygoni.)

METHODS: Fungicide trials were replicated on three commercial plantings to control foliar disease on table beets near Junction City and Harrisburg, Oregon. Field tests were conducted on site 1 - Malabon silty clay loam and Salem gravelly silt loam, and site 2 - Cloquato silt loam, site 3 - Camas gravelly sandy loam. Each replication was three rows wide (row spacing 18") and 40 feet long.

Table beets were planted in all three sites, May 5, 6, and 10, 1991. Three fungicides were applied two times during the growing season. The early and late plantings of beets were sprayed September 6 and October 2. A 5 lb. aluminum CO2 cylinder, with three nozzle spray boom was used in the applications. Fungicides were applied at 35 psi in 82 gallons of water/A with a hand held CO2 boom sprayer held 12-15 inches above the foliage. Visual evaluations also were made for leaf spot, rust, downy and powdery mildew. The sites were visually evaluated for phytotoxicity on September 12 and October 9.

RESULTS: Diseases of leaf spot, powdery mildew and rust began in July and August, but due to hot weather the diseases weren't significant until October.

For Leaf Spot (<u>Cercospora</u>) Control, Bayleton rated best with only 2.5% average leaf infection. It was followed by Folicur - 3.5%, Sulfur - 8.8%, and control had 10.5% infection.

For Rust Control, Folicur was best with only 6.7% leaf infection, followed by Bayleton - 8.9%, Sulfur - 13.5%, and control

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For Leaf Spot (<u>Cercospora</u>) Control, Bayleton rated best with only 2.5% average leaf infection. It was followed by Folicur - 3.5%, Sulfur - 8.8%, and control had 10.5% average infection.

For Rust Control, Folicur was best with only 6.6% leaf infection, followed by Bayleton - 8.8%, Sulfur - 13.5%, and control with 20.0% average infection.

For Powdery Mildew Control, Bayleton provided excellent control, with Folicur also providing very good control.

The Over-all Disease Control rating showed Bayleton and Folicur with excellent ratings for leaf spot, rust, and powdery mildew.

						* 1
Treatment Name	Foliage Cercops	Area w/ ora*	Foliage Rust*	Area w/	-	Area w/- Mildew*
and Rate/A	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
Untreated	0.0a	10.5 b	20.0 b	20.0 b	76.3 b	31.3 bc
Sulfur	0.0a	8.8ab	14.5ab	12.5ab	71.3 b	22.5 bc
Folicur	2.5a	4.5ab	8.75a	4.5a	41.3a	8.8 ab
Bayleton	2.0a	3.0a	12.5a	5.3a	37.5a	6.3 a

^{*} Treatment means within a column followed by the same letter do not significantly differ according to Duncan's Multiple Range Test (P=0.05).

Yield/Weight Ratings

	lb/40 ft./row	Tons / Acre
Folicur	√0 59.69 a ·	21.67
Bayleton	65.81 ab	23.89
Sulfur	74.92 b	27.2/
Control	76.57 b	27.8

SUMMARY: The findings of this years study showed that Bayleton and Folicur did an excellent job of controlling foliar diseases.

SIGNATURES	Redacted for Privacy
Project Leaders	
Department Head	

betev91.doc

Title: Carrot Decline

Project Leader and Department: Mary L. Powelson, Department of

Botany and Plant Pathology

Project Status: Continuing to 1993

Project Funding: \$2000

Funds were used for local travel and for soil fumigation.

Objective: Determine cause of reduction in carrot productivity

Progress:

During the first year of the project, our purpose was two fold: to identify growers who have had a problem with yield decline in carrot and to gain a perspective of this "problem" in the 1991 crop. Based on conversations with several growers, we identified three growers who had fields with a history of yield decline on their farms. These growers were scheduled to plant carrots in 1992 and agreed to have research plots established in these fields. On 11 October 199, plots were fumigated and tarped with methyl bromide (67%)-chloropicrin (33%) at 350 lbs/acre in three fields. Fumigation and nonfumigated treatments were arranged in a randomized complete block design with four replication. These plots will be monitored for disease symptoms and vigor next summer.

In July and early September, samples of foliage and/or roots were collected from fields with mild or severe symptoms of blight (leaf spot). Fusarium and Alternaria were isolated routinely from root samples regardless of whether or not the field had a history of yield decline. Either Cercospora carotae or Alternaria dauci were isolated from leaf spot symptoms with the former associated more frequently with these symptoms. Severe symptoms of blight were more of a problem in fields with a history of carrot production than those fields newly cropped to carrot. In all fields sampled, both Cercospora and Alternaria were present.

Summary:

In the fields that were sampled, both Cercospora blight and Alternaria blight occurred in the same field. However, Cercospora blight appeared to be more prevalent than Alternaria blight this year. The importance of these two diseases, however, may vary from year to year and from farm to farm. Fungicides that are effective against Alternaria blight are not that efficacious against Cercospora blight and vice versa. The efficacy of different fungicides for control of these diseases should be evaluated. In other words, since both diseases occur in most fields what is the optimum fungicide management program. There appeared to be no organism consistently isolated from roots of carrot collected from fields with a decline problem. Finally, attention should be given to the complex of virus diseases of carrots in the Willamette Valley.

Signatures:

Redacted for Privacy

Project Leader

Redacted for Privacy

Department Head

Report to the Oregon Processed Vegetable Commission 1991-1992

1. <u>Title</u>: Cauliflower variety observations

2. <u>Project Leaders</u>: J.R. Baggett, Horticulture

J.R. Stang, Horticulture

3. Project Status: Terminating June 30, 1992

4. Project Funding: \$3,500

\$1,944 supplementary technical support

Funds were used primarily for research farm expenses and labor for transplanting, weeding, and harvesting.

5. Objectives:

Evaluate head quality, maturity time and total yield of 10 promising (based on 90-91 observations) cauliflower varieties at a wide range of planting times; relate timing of maturity to turning of curd initiation and the period between curd initiation and harvest; screen additional cauliflower varieties to identify those having head characteristics suitable for processing.

6. Report of Progress (preliminary):

Harvest was not finished in time to complete the analysis of data before this report was due. The trial was conducted as follows:

Three replicated (4x) plantings of 10 promising varieties were established using transplants grown in seedbeds on the research farm. Planting 1 was seeded on 23 April and transplanted 11 June. Planting 2 was seeded on 31 May and transplanted 9 July. Planting 3 was seeded on 24 June and transplanted 31 July. The second and third plantings included twenty additional varieties planted in unreplicated screening trials. Transplanting was done mechanically at 1.5 feet within the rows and 3 feet between rows. About 450 lbs/acre of 12-29-10 fertilizer was banded prior to transplanting. An additional 120 lbs of N

in the form of urea was sidedressed between 4 and 5 weeks of transplanting. Overhead irrigation was applied about once each week in amounts sufficient to promote vigorous growth.

Four plant samples were collected from the 10 varieties in the replicated trials around the time of curd initiation for use in growth analysis. Data collected included stem diameter, leaf number, whether or not a curd had been initiated, and meristem/curd size.

Twenty heads were harvested from each plot. Harvesting occurred weekly, with heads cut at a stage of maturity judged to be comparable to the industry standard. Data obtained from the harvested heads included: external and internal color, shape, riciness and fuzziness, dimensions, weight, curd depth and curd solidity and chunkiness. This data currently is being statistically analyzed.

The following is a list of varieties that were evaluated, and their sources:

A. Replicated trial of promising varieties

Crystal Petoseed Snowball Y improved Harris Moran Profil Zwaan Olympus Asgrow Snowman Harris Moran Snowflower Asgrow Harris Moran Imperial 10-6 Snowpak Petoseed Snowball 123 Harris Moran Castlegrant Yates

B. Screening trial

Aubade Nickerson Zwaan Floriade Nickerson Zwaan Rushmore **Royal Sluis** RS 84374 Royal Sluis S 88001 Royal Sluis 045-16-03 Zwaan Seeds, Inc. 045-17-04 Zwaan Seeds, Inc. 045-15-03 Zwaan Seeds, Inc. 045-22-02S Zwaan Seeds, Inc. 045-23-048 Zwaan Seeds, Inc.

Screening trial (continuted)

045-19-02S	Zwaan Seeds, Inc.
045-21-02S	Zwaan Seeds, Inc.
045-14-02S	Zwaan Seeds, Inc.
Tulchan	Yates
Taymount	Yates
Balmoral	Yates
Woomera	Yates
Batsman	Elsoms Seeds, Ltd.
Lateman	Elsoms Seeds, Ltd.

7. <u>Summary</u>: To be included in final report.

8.	Signatures: Project Leaders:	Redacted for Privacy	
		Redacted for Privacy	
	Department Head:	Redacted for Privacy	