

**Report to the Oregon Processed Vegetable Commission
2006–2007**

1. Title: Broccoli Breeding, Evaluation and Seed Production
2. Project Leaders: James R. Myers, Horticulture
Brian Yorgey, Food Science and Technology
3. Cooperators: None
4. Project Status: Terminating 30 June, 2007
5. Project Funding: \$7,693 breeding
\$3,642 processing
\$11,335 total

Research efforts were focused on testing various inbred combinations for hybrid production, and evaluating commercial cultivars for adaptation to Oregon growing conditions and for head rot resistance. Breeding funds were used for a major portion of the support of a vegetable breeding technician, student labor, supplies, and research farm expenses. Processing funds were used for processing samples of experimental hybrids.

6. Objectives:
 - I. Develop broccoli varieties adapted to western Oregon with suitable quality, high yields, and disease resistance. Specific traits include:
 - a. Early to midseason maturity
 - b. Concentrated yield potential
 - c. Downy mildew & head rot resistance
 - d. Exerted heads with large openly branched heads with heavy, clean stem for easy trimming and separation into spears and chunks
 - e. Firm, uniform florets of good color
 - f. Fine beads with short pedicels, which are retained after freezing
 - II. Evaluate cytoplasmic male sterility (CMS) as a method for producing F₁ hybrid seed.

7. Report of Progress:

Greenhouse inbred and hybrid seed production: Cuttings were taken from inbreds and breeding lines grown in the field in 2005 to establish material for crossing and hybrid seed production in the greenhouse during the winter of 2005-2006. A total of 10 cross combinations (Tables 1 & 2) were obtained. The number of combinations tested was lower this year mainly due to poor establishment of cuttings, thus having fewer plants for crossing. Cuttings were lost to microbial contamination, which may be a function of later maturity of trials and loss of effective fungicides.

Yield Trial: Ten hybrid combinations, four of which used CMS parents, were tested in replicated yield trials (Table 1). This year, we experimented with a transplanted yield trial. Entries were seeded into nursery on 20 June, then lifted and machine transplanted on 26 July into 30 ft rows spaced 30 in between rows with four replications. Within row spacing was 12 in. between plants. Because of limited numbers of seedlings, some entries into the trial did not have full number of reps and/or had short plots. This necessitated a General Linear Model approach to data analysis with least square means analyzed to determine statistical significance. In general, variability in this trial was greater than normal, resulting in poorer resolution for statistical comparisons. Data were collected at harvest maturity on plant and head characteristics, yield, and a sample of each hybrid was sent to the OSU Food Science and Technology Pilot Plant for processing and evaluation. Data from the Pilot Plant had not been completed at the time of this report and will be reported separately. Three check hybrids (Regal, Excelsior, and Emerald Pride) were included for comparison to experimental hybrids.

Eight of the experimental hybrids had maturities similar to Emerald Pride and Excelsior (64 days) while one was earlier and three were later; however, overall differences were not statistically significant. Two experimental hybrids had greater net ton/acre than the check (Table 1, Figure 1). Only one hybrid (S387 x S454) had significantly lower net yield compared to Emerald Pride. There was a greater degree of variability in maturity of reps across the field, resulting in greater numbers of young and over mature (cull) heads. Percent leaves is particularly informative in indicating which entries had plots that were under mature. While our expectation was that we could achieve a more uniform trial with transplants, the reverse, in fact, seems to be the case. It may be that we need to modify procedures to achieve a more uniform trial.

From observation data on the yield trial (table 2), we identified several new hybrids that show potential. These include S442 x S441, S442 x S454, S447 x S410, and S447 x S411. Two previously evaluated hybrids that did well were S446 x S454 and CMS13-1B (S454) x S411. For this latter hybrid, the CMS version had more desirable head characteristics than the non CMS version (S411 x S454). A low disease incidence was found in this trial; both head rot in the more susceptible entries and a mild infection of downy mildew on most entries. When examining hybrids that have been tested over several years, we found that S387 x S454 had very low yields compared to previous years (Table 3). S411 x S446 appears to have consistently good performance across years.

We also performed a head rot screening trial of commercial broccoli hybrids and selected OSU lines. Trial was planted on July 14 in 30 in. rows, and then thinned to a nine in. within row spacing. Data on head rot incidence and severity were recorded on November 10. Head rot incidence and severity in 'Emerald Pride' (susceptible check) was 100% and 7.7 on a 9 point scale, respectively (Table 4). Several commercial hybrids had significantly less head rot than others, including Concord, Heritage, Hallmark, Marathon, and the OSU OP population. Hallmark had essentially no head rot, but this hybrid is unlike any other broccoli in having a head intermediate between cauliflower and broccoli. We were surprised that the OSU OP population had a low incidence, although this population has been selected for head quality and performance under Oregon growing conditions for the past seven years now.

Observation Trials: These trials included 33 inbreds, 11 lines under selection, and eight hybrid combinations (Table 5 and 6). After evaluation, cuttings from inbreds were rooted in the greenhouse to be used in selfing and crossing during the winter of 2007. Among lines under selection, several showed desirable attributes. Selections were taken from these plots for propagation and self pollination in the greenhouse. With the exception of two normal hybrids, the other hybrids in the observation trial were tests of CMS lines as parents. Hybrids from CMS lines performed well. Some of the seed of these had been produced in the field in 2005 (Table 6). We found the progeny in grow-outs to be very uniform, indicating that no chance outcrossing or selfing was happening. The normal hybrid S445 x S454 was produced under field conditions as well, and appeared to be composed of all hybrid progeny. The reciprocal cross was a mix of inbreds and hybrids as was expected because of the self fertility of S454 (data not shown). A number of inbred line cross combinations have been tested in the past seven years (table 7) but additional testing is needed among the S440 series inbreds.

We also evaluated commercial hybrids in an observation trial. Material chosen for this trial was a mix of old and new as this trial had multiple purposes, including material for teaching the vegetable crops laboratory, evaluations for fresh market, and evaluations for processing. Overall, most of these are not suitable for processing, with Diplomat from Harris Seed Company being the best. Because of the moderately hot summer and fall, we were able to get some information on heat tolerance.

8. Summary:

Trials at the Vegetable Research Farm included a yield trial of OSU derived hybrids, observation trials of OSU inbreds and hybrids, and an observation trial and head rot trial of commercial hybrids. We see progress in the OSU material with the most recently derived inbreds being the best. It is of interest that the OSU OP population had a relatively low head rot incidence, and perhaps we are making progress in selecting material more tolerant of head rot. Another season of evaluation would be useful in this regard.

Table 1. Yield data from a hybrid broccoli trial, Corvallis, 2006.^z

Hybrid ^y	Days to Harvest	No. Plts/Plot	% Blind Plants	Gross T/A	Young Heads T/A	Culls T/A	Net T/A	Net Heads/A	Head Diameter (cm)	% Leaves
S387 x S454	65	20.0	11.0*	2.93*	0.38	0.50	1.32*	49963	11.1	21.0
S411 x S446	61	18.0	6.5	5.52	0.60	0.00	4.23	68293	13.2	16.2
S411 x S454	64	25.0	11.2*	5.51	0.23	0.56	4.22	77787	12.2	9.7
S442 x S411	64	30.5	9.8*	6.26	0.12*	0.55	5.28	64948	13.8	4.9*
S442 x S454	64	24.0	10.1*	5.21	0.42	0.32	3.65	60820	11.5	17.5
S446 x S454	65	29.5	3.2	5.27	0.33	0.34	3.68	77426	11.6	20.0
S447 x S410	68	29.0	4.3	4.80	0.09*	0.27	4.29	72462	13.1	3.4*
S447 x S411	64	28.8	3.5	5.20	0.39	0.88	3.41	65121	11.8	10.0
CMS12-2B x S454	68	29.7	3.5	3.40*	0.06*	0.33	2.75	68711	10.8*	8.5
CMS13-1B x S411	68	26.0	9.1	6.11	0.08*	3.03*	2.74	72515	14.0	5.5
CMS14-1A x S398	65	25.0	14.9*	2.91*	0.17	0.47	1.81	63392	11.8	13.2
CMS14-1C x S454	65	20.3	6.3	4.97	0.37	0.42	3.52	83234	12.0	13.6
Emerald Pride	64	28.3	0.9	6.51	0.72	0.76	3.91	71223	13.2	18.2
Excelsior	64	29.3	1.8	7.45	0.60	0.72	4.45	70470	13.8	22.9
Regal	54	29.5	15.2*	6.17	0.41	1.41	3.62	56421	12.4	15.4

^zPlanted July 10 in 30' plots, rows 30" apart, thinned to 12" between plants. Mean of two to four replications. * indicates significantly different from Emerald Pride for this characteristic ($p < .05$); means for Net Heads/A were not significantly different.

^yBackground of CMS lines: CMS 12-2 = S410; CMS 13-1 = S454; CMS 14-1A & CMS 14-1C = S411

Table 2. Observation notes from a broccoli yield trial, Corvallis, 2006.

Line	Maturity (days) ^z	Head Ht (cm)	Plant Ht (cm)	Head Shape ^y	Bead Size ^x	Stem color ^w	Exser-tion ^w	Segment-ation ^w	Unifor-mity ^w	Branch-ing ^w	Diseases ^v	Overall ^w	Notes
S387 x S454	65	55	69	5	M-C	5	6	6	1	5	3 (DM & HR)	4	
S411 x S446	61	61	78	6	C	6	6	2	5	1	0	4	
S411 x S454	64	67	75	6	C	7	7	3	7	5	0	6	
S442 x S411	64	67	68	6	F-M	9	8	7	7	1	0	9	
S442 x S454	64	58	66	5	M	7	7	6	5	5	2 (DM)	7	
S446 x S454	65	55	62	5	M	5	6	5	7	1	3 (DM)	7	
S447 x S410	68	60	71	6	F-M	7	7	7	7	3	0	8	
S447 x S411	64	67	72	5	M-C	7	7	3	5	3	0	7	
CMS12-2B x S454 ^u	68	60	73	7	M-C	5	6	4	5	5	0	5	
CMS13-1B x S411	68	66	79	6	F-M	7	8	7	7	3	0	8	
CMS14-1A x S398	65	72	75	6	F-M	7	7	7	5	5	2 (DM)	6	
CMS14-1C x S454	65	67	73	6	M	7	7	3	2	3	0	5	1 bolter
Emerald Pride	64	48	65	4	F-M	3	6	3	5	1	2 (HR)	6	
Excelsior	64	51	65	5	M	5	3	5	5	1	0	4	
Regal	54	46	64	4	M-C	5	3	3	3	3	0	3	

^zPlanted 20 June, transplanted 26 July; days to maturity is from date of transplant.

^yScale of 1 - 9 where 1 = concave and 9 = extreme dome.

^xF = fine; M = medium; C = coarse.

^wScale of 1-9 where 1 = poor and 9 = excellent.

^vScale of 0-9 where 0 = no disease present and 9 = severe disease; DM = downy mildew, HR = head rot.

^uBackground of CMS lines: CMS 12-2 = S410; CMS 13-1 = S454; CMS 14-1A & CMS 14-1C = S411

Table 3. Yield data (net T/A) from seven years of broccoli yield trials, Corvallis, 2006

Entry	Tons/Acre						
	2000	2001	2002	2003	2004	2005	2006
S387 x S410					4.62	1.39	
S387 x S411					2.45		
S387 x S438		2.82					
S387 x S445			3.79				
S387 x S446		2.73		5.40			
S387 x S454 ^z	3.83	4.14	5.67	6.40	3.34		1.32
S396 x S445			3.66				
S396 x S446		1.83		4.90			
S396 x S454 ^z		2.64	4.12	4.30			
S398 x S438		1.88					
S398 x S445			4.24				
S398 x S446		2.56		5.20			
S398 x S454 ^z		4.37	4.99				
S399 x S453	3.26						
S399 x S454	3.36						
S400 x S438		1.84					
S400 x S445			3.06				
S400 x S446				3.90			
S400 x S453	3.05						
S400 x S454 ^z	2.87	2.36	5.10	3.80			
S410 x S442						2.32	
S410 x S445			3.87				
S410 x S446					3.43	1.36	
S410 x S447						1.46	
S410 x S453	3.44						
S410 x S454 ^z	3.79	3.72	5.35	5.70	3.79		
S411 x S445			3.58				
S411 x S446		3.70		5.30			4.23
S411 x S453	2.96						
S411 x S454 ^z	3.49	3.96	3.30		2.72		4.22
S438 x S442		4.22					
S440 x S446				5.10			
S442 x S411							5.28
S442 x S454		3.65			3.92		3.65
S443 x S454		3.14					
S445 x S454 ^z		4.07	4.32	6.10	3.40		
S446 x S454				3.70	4.83		3.68
S447 x S410							4.29
S447 x S411							3.41
S447 x S454					2.31	2.24	
Arcadia	3.73						
Excelsior	2.43	3.78	4.97	3.90	3.43	2.25	4.45
Legend	3.23		4.71				
Regal	3.95	3.63		5.30	4.17	3.30	3.62
Emerald Pride				3.40	4.54	4.32	3.91
LSD @5%	0.52	0.84	1.39	0.90	0.93	0.79	

^zCross and reciprocal combined.

Table 4. Head rot incidence and severity in selected broccoli cultivars and lines from a head rot trial, Corvallis, 2006^z

Entry	Source	Total No. Plants			No. Infected			% Infected			Average % In-fected	Severity ^y	Notes
		Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3			
Arcadia	Sakata	32	29	22	31	28	22	97	97	100	98	6.3	
Avenger	Sakata	23	24	28	22	22	6	96	92	21	70	5.0	
B1 10		27	24	27	27	22	26	100	92	96	96	6.7	
Bejo 1959	Bejo	15	23	28	15	23	27	100	100	96	99	9.0	
Centura	Syngenta	13	17	24	13	16	24	100	94	100	98	7.3	
Concord	Syngenta	25	28	24	4	16	8	16	57	33	35	3.3	Head rot found mostly under leaves in head
Coronado Crown	Seminis	26	25	24	26	25	24	100	100	100	100	7.7	
Emerald Pride	Sakata	18	19	22	18	19	22	100	100	100	100	7.7	Plants lodged
Everest	Johnny's	24	22	22	10	22	22	42	100	100	81	4.3	Bolted
Green Goliath	Seminis	26	29	18	18	27	3	69	93	17	60	4.0	
Green Magic	Sakata	26	26	28	20	26	25	77	100	89	89	8.3	
Greenbelt	Rupp	27	22	30	24	22	27	89	100	90	93	8.0	
Gypsy	Johnny's	29	28	27	28	28	25	97	100	93	96	8.3	
Hallmark	Bejo	16	10	12	0	0	0	0	0	0	0	-	
Heritage	Seminis	20	24	21	18	6	5	90	25	24	46	3.0	
Legend	Sakata	17	22	23	17	20	23	100	91	100	97	8.7	
Marathon	Sakata	23	26	25	5	15	16	22	58	64	48	5.0	
Maximo	Sakata	26	26	24	7	26	19	27	100	79	69	4.3	
Monaco	Syngenta	21	17	15	20	14	7	95	82	47	75	3.7	
Nutri-Bud	Seeds of Change	20	17	20	18	17	20	90	100	100	97	6.3	Bolted
Packman	Nichols	26	24	25	26	24	25	100	100	100	100	4.3	Bolted
Patron	Rupp	25	21	22	25	21	22	100	100	100	100	7.7	

Table 4. Head rot incidence and severity in selected broccoli cultivars and lines from a head rot trial, Corvallis, 2006 (cont.)^z

Entry	Source	Total No. Plants			No. Infected			% Infected			Average % Infected	Severity ^y	Notes
		Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3			
Premium Crop	Takii	26	26	24	26	24	21	100	92	88	93	6.3	Bolted
Regal	Harris Moran	17	23	21	15	21	21	88	91	100	93	5.7	Bolted
Revolution	Seminis	19	27	24	18	20	24	95	74	100	90	7.7	
Sultan	Sakata	21	18	22	21	18	22	100	100	100	100	9.0	
OSU 454	Oregon State University	19	23	15	19	23	14	100	100	93	98	7.3	Plants lodged
OSU OP Population	Oregon State University	14	24	28	6	14	13	43	58	46	49	4.3	Plants lodged
(CMS 13-1 x OSU 454) x OSU 387	Oregon State University	21	25	19	15	24	19	71	96	100	89	5.7	
LSD @ 0.05											30		

^zPlanted July 14 in 30" rows, thinned to 9" between plants; data taken on November 10.

^yAverage of scores from 3 reps; scores based on a 1-9 scale with 9 = severe.

Table 5. Broccoli observation trial, OSU inbreds, Corvallis, 2006.^z

Inbred	Maturity (days)	Head Ht (cm)	Leaf Canopy Ht (cm)	Head Diam (cm)	Head Shape ^y	Head Color ^x	Head Size ^w	Stem Color ^x	Head Exser-tion ^x	Head Seg-ment-ation ^x	Plot Uni-form-ity ^x	Branch-ing ^x	Overall Score ^x	Notes
OR CR1	103	30	70	17	7	5	C	5	3	1	5	3	3	
OR CR2	103	40	55	10	6	7	M	5	5	7	5	3	3	Leafy heads
HS143	93	49	63	11	6	6	C	5	4	1	7	1	3	
HS161-3	103	47	58	16	7	6	C	5	4	3	5	3	3	Rosetting
HS179-1	85				3	6	M-C	5	7	3	7	1	6	
S233B	93	56	67	14	5	7	C	5	6	4	1	5	3	
S310	93	38	49	15	4	5	M	5	3	5	3	5	3	
S315	88	57	59		5	6	C	5	7	1	7	3	5	
S352	103	40	51	14	4	7	C	5	5	3	6	7	5	Branched at base but very clean stems; resem-bles S446.
S370	88	62	49		5	5	C	4	5	9	1	6	5	
S384	103	46	38	19	7	5	F	5	7	9	7	3	4	Loose heads with leaves in head; heavy aphid and downy mildew infestation; shaded by maples trees on west end.
S387	93	71	67	13	5	8	M	7	8	8	6	3	7	
S389	93	35	54	14	6	7	C	5	6	5	4	7	4	
S392	91	67	59	14	5	7	M	5	8	8	7	3	6	
S396	87	72	60	11	5	6	M	5	7	6	7	7	6	
S398	93	57	52	13	7	7	M	7	8	9	7	5	7	
S399	91	56	60	15	5	7	C	6	6	3	7	3	4	
S400	87	62	51	14	7	7	C	5	9	3	7	3	4	
S403	92	65	65	13	3	7	F	7	6	9	7	2	6	
S410	89	54	53	12	4	7	F	7	6	8	6	5	6	

Table 5. Broccoli observation trial, OSU inbreds, Corvallis, 2006 (cont.)^z

Inbred	Maturity (days)	Head Ht (cm)	Leaf Canopy Ht (cm)	Head Diam (cm)	Head Shape ^y	Head Color ^x	Bead Size ^w	Stem Color ^x	Head Exsertion ^x	Head Segmentation ^x	Plot Uniformity ^x	Branching ^x	Overall Score ^x	Notes
S411	103	52	62	11	5	7	C	5	6	1	2	5	6	
S414	88	58	55	11	7	7	C	7	7	3	4	7	4	
S437	92	63	64	17	6	7	M	7	6	3	6	3	7	
S438	94	54	61	21	7	7	F	7	5	9	5	2	7	Very loose heads
S440	90	54	56	10	8	5	C	5	6	2	6	1	4	
S442	94	58	60	16	7	7	F	7	6	8	7	4	7	Loose heads
S443	90	60	63	22	3	5	M	5	7	6	7	1	7	
S445	94	57	48	17	6	7	M	7	7	8	6	2	5	
S446	94	54	55	16	6	7	F	6	5	7	5	5	6	
S447	92	59	61	12	6	7	VF	7	6	7	7	1	8	
S448	94	58	55	18	4	5	F	5	7	8	7	1	7	Similar to S446 but heads somewhat loose; sweet flavor
S449	103	58	55	18	4	5	F	5	7	8	7	1	7	
S454	94	51	45	17	4	5	M	7	6	8	7	3	7	Loose heads

^zPlanted July 10 in 30" rows, thinned to 12" apart.

^yScale of 1-9 where 1 = concave, 3 = flat, 5 = slight dome, 7 = moderate dome and 9 = extreme dome.

^xScale of 1-9 where 1 = poor and 9 = excellent.

^wF = fine, M = medium, C = coarse.

Table 6. Broccoli observation trial, OSU hybrids and breeding lines, Corvallis, 2006.^z

Hybrid	Maturity (days)	Head Ht (cm)	Leaf Canopy Ht (cm)	Head Diam (cm)	Head Shape ^y	Head Color ^x	Bead Size ^w	Stem Color ^x	Head Exser-tion ^x	Head Seg-ment-ation ^x	Plot Uni-form-ity ^x	Branch-ing ^x	Overall Score ^x	Notes
RS1-1-1	94	85	80	14	5	5	F	7	8	8	7	3	7	
RS1-1-2	94	77	77	12	5	5	F	5	8	9	3	1	5	Loose heads
RS1-2-1	91	86	75	15	5	5	M	7	7	9	3	7	4	Loose heads
04-3-2-3	94	50	50	15	4	5	F	7	6	7	4	1	7	
04-3-2-4	94	54	59	20	4	5	F	7	5	9	3	5	6	Loose heads
04-4-1-1	94	77	63	20	4	4	F	7	7	9	8	1	9	Uniform; vigorous
04-5-2-1	103	51	64	11	5	7	F	5	6	4	5	5	8	Early; heat tolerant; trace of head rot
04-5-2-2	94	49	54	14	4	3	F	7	6	6	3	1	6	
04-5-3-3	91	66	75	12	4	7	F	7	7	6	3	5	6	
04-5-4-1	87	61	67	15	7	5	M-C	7	6	1	7	1	4	
04-5-4-2	87	47	48	16	4	3	M	7	5	3	5	1	3	
S387 x S411	103	51	69	15	6	6	C	5	5	1	4	5	4	
CMS6-1 x S411 BC3 ^v	87	64	70	19	5	5	F-M	7	7	3	7	3	7	
CMS12-2A x S410 BC3 ^v	94	55	67	14	5	7	F	7	6	6	-	3	7	1 plant
CMS7-2/S410 BC3 ^v	90	58	56	17	3	7	F	7	7	9	5	3	7	Loose heads
CMS14-1B x S411 BC3 ^v	94	66	67	18	7	7	F	7	7	5	7	3	7	Best S411 CMS line but later than CMS 6-1
S445 x S454 field '05	89	70	67	19	4	6	C	7	7	8	5	3	4	
(CMS13-1 x S454) x 5S446 field '05	94	62	71	19	6	7	F	7	6	6	8	1	8	

Table 6. Broccoli observation trial, OSU hybrids and breeding lines, Corvallis, 2006 (cont.)^z

Hybrid	Maturity (days)	Head Ht (cm)	Leaf Canopy Ht (cm)	Head Diam (cm)	Head Shape ^y	Head Color ^x	Head Size ^w	Stem Color ^x	Head Exsertion ^x	Head Segmentation ^x	Plot Uniformity ^x	Branching ^x	Overall Score ^x	Notes
(CMS14-1 x S411) x S454 field '05	93	65	69	18	4	7	F	7	7	7	7	1	7	Loose heads

^zPlanted July 10 in 30" rows, thinned to 12" apart.

^yScale of 1-9 where 1 = concave, 3 = flat, 5 = slight dome, 7 = moderate dome and 9 = extreme dome.

^xScale of 1-9 where 1 = poor and 9 = excellent.

^wF = fine, M = medium, C = coarse.

^vCMS inbred

Table 7. Inbred line combinations tested in 7 years of broccoli yield trials, Corvallis, 2006^z.

Inbred Line	S410	S411	S438	S442	S445	S446	S447	S453	S454
S387	2	1	1	0	1	2	0	0	6
S396	0	0	0	0	1	2	0	0	3
S398	0	0	1	0	1	2	0	0	2
S399	0	0	0	0	0	0	0	1	1
S400	0	0	1	0	1	1	0	1	4
S410	-	0	0	1	1	2	2	1	5
S411		-	0	1	1	3	1	1	5
S438			-	1	0	0	0	0	0
S440				0	0	1	0	0	0
S442				-	0	0	0	0	3
S443					0	0	0	0	1
S445					-	0	0	0	4
S446						-	0	0	3
S447							-	0	2

^zNumber in each cell indicates the number of times this combination has been tested.

Table 8 . Commercial broccoli cultivars observation trial, Corvallis, 2006.^z

Entry	Source	Maturity (days)	Plant Ht (cm) ^y	Head Diam (cm)	Head Shape ^x	Head Color ^w	Bead Size ^v	Stem Color ^w	Head Exser-tion ^w	Head Seg-ment-ation ^w	Plot Uni-form-ity ^w	Branch-ing ^w	Overall Score ^w	Notes
Rosalind	Territorial	93	39/89	14	5	purple	VF	4	1	6	4	3	5/1	
Umpqua	Territorial	86	45/80	16	7	4	M to C	5	3	6	4	1	4/1	
Green Goliath	Seminis	93	39/58	14	4	4	F	5	3	2	3	1	7/3	
Marathon	Sakata	102	45/75	18	5	4	F to M	5	5	5	7	1	7/5	Variable bead size from heat stress
Everest	Johnny's	70	36/69	15	4	5	M	5	3	3	5	1	5/1	Leafy heads; variable bead size
Liberty	Territorial	93	41/71	13	5	5	F	3	2	2	5	1	7/3	
Patron	Rupp	93	50/78	14	5	4	F	3	5	7	7	2	5/5	
Greenbelt	Rupp	90	42/52	14	6	5	F	5	3	3	5	1	5/3	
Green Magic	Sakata	88	46/70	18	6	5	M	5	4	2	5	2	5/3	
Maximo	Sakata	93	51/80	15	4	3	F	5	4	5	3	2	3/3	
Avenger	Sakata	93	36/67	15	6	4	F	5	3	4	4	1	5/1	
Premium Crop	Takii	84	45/77	15	3	5	C	5	5	5	5	3	3/1	
DSP 133	D. Palmer	93	48/72	15	7	5	F	5	5	7	7	1	7/5	
DSP 138	D. Palmer	88	42/54	17	4	5	F to C	5	6	5	4	1	3/3	Uneven bead develop-ment due to heat stress
Legend	Sakata	91	59/84	13	4	6	M	4	6	1	5	3	5/3	
Sultan	Sakata	90	48/55	11	6	6	F	5	6	4	6	3	5/5	Some head rot

Table 8. Commercial broccoli cultivars observation trial, Corvallis, 2006 (cont.)^z

Entry	Source	Maturity (days)	Plant Ht (cm) ^y	Head Diam (cm)	Head Shape ^x	Head Color ^w	Bead Size ^v	Stem Color ^w	Head Exsertion ^w	Head Segmentation ^w	Plot Uniformity ^w	Branching ^w	Overall Score ^w	Notes
Diplomat	Harris	90	54/65	20	3	5	F to M	5	5	6	5	1	5/6	
Regal	Harris Moran	73	45/60	16	4	5	C	2	5	2	4	7	4	
Packman	Nichols	70	32/51	13	5	3	C	3	3	5	3	3	5/1	
Nutribud	Seeds of Change	70	34/67	15	4	5	C	3	1	1	3	1	3/1	Variable bead size
Gypsy	Johnny's	89	39/70	14	6	5	F	5	3	5	5	1	7/1	
Bejo 1959	Bejo	82	33/63	12	6	4	M	2	2	1	6	1	5/1	
Hallmark	Bejo	109	37/85	10	6	3	VF	1	1	1	7	1	7/1	Like a coarse beaded cauliflower; very late
Heritage	Seminis	93	38/54	19	7	5	F to M	3	3	4	7	1	7/3	Leafy heads
Coronado Crown	Seminis	93	51/71	14	5	5	F	7	6	5	4	3	5/3	
Revolution	Seminis	90	34/64	15	4	3	F to M	1	3	4	4	1	3/3	Variable bead size; head rot
Centura	Syngenta	93	43/62	13	7	5	F	3	3	5	3	1	3/1	Very rough heads
Alborada	Bejo	96	43/62	16	7	5	F	3	4	4	6	1	7/3	

^zPlanted July 10 in 30" rows, thinned to 12" apart.

^yFirst value is height of the head, second value is height of the tallest leaves.

^xScale of 1-9 where 1 = concave, 3 = flat, 5 = slight dome, 7 = moderate dome and 9 = extreme dome.

^wScale of 1-9 where 1 = poor and 9 = excellent; first score is for fresh market type and second is for processing potential

^vF = fine, M = medium, C = coarse.

Figure 1. Broccoli Yield Trial 2006

