

**Report to the Oregon Processed Vegetable Commission
2009–2010**

1. Title: Broccoli Breeding, Evaluation and Seed Production
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3. Cooperators: None
4. Project Status: Terminating 30 June, 2010
5. Project Funding: \$5,749 breeding
\$3,840 processing
\$9,589 total

Research efforts were focused on testing various inbred combinations for hybrid production, and evaluating commercial cultivars for adaptation to Oregon growing conditions. Trials at the Vegetable Research Farm included a yield trial of OSU derived hybrids, and observation trials of OSU inbreds and hybrids. 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.

Objectives:

Develop broccoli varieties adapted to western Oregon with suitable quality, high yields, and disease resistance. Specific traits include:

Early to midseason maturity

Concentrated yield potential

Head rot and downy mildew resistance

Large openly branched heads that are well exerted and have clean stems for easy trimming and separation into florets

Firm, uniform florets of good color

Fine beads with short pedicels, which are retained after freezing

Develop seed production systems using cytoplasmic male sterility (CMS) or self incompatibility (SI) to produce field scale quantities of F₁ hybrid seed.

Conduct pilot scale field production of inbreds and hybrids that produce sufficient quantities of seed.

6. Report of Progress:

Greenhouse inbred and hybrid seed production: Cuttings were taken from inbreds and breeding lines grown in the field in 2008 to establish material for crossing and hybrid seed production in the greenhouse during the winter of 2008-2009. A total of 45 cross combinations (Tables 1 - 2) were obtained. Only 16 hybrids had sufficient seed for a four rep yield trial. An additional group of 14 hybrids had enough seed to plant two reps, so

the two groups were planted and managed together in the yield trial, but the data were analyzed separately. Twenty-five inbreds were selfed for seed production and 14 additional hybrid combinations with seed only sufficient for a single plot trial was produced. We also evaluated and selected about 20 CMS lines.

Yield Trial: Overall, we encountered many blind plants this year. The cause of this condition is unknown, but may represent an early season insect infestation. Data for the 16 hybrids in four-rep trial are shown in tables 1 and 3, and figures 1 and 3. Results for the 14 hybrids in two-rep trial may be found in tables 2 and 3, and figures 2 and 4. In the four rep trial, 'Imperial' had reduced stand and this may have artificially inflated the adjusted T/A (adjusted to 22 plants/plot). 'Imperial' had highest gross T/A but also highest % leaves so net T/A was just average. S462/S446 had significantly higher adjusted gross as well as net and adjusted net T/A compared to anything else. It was also the latest hybrid in the trial. Two others (S411/S455 and S456/S454) had net T/A significantly higher than 'Imperial' and 'Emerald Pride'. No hybrid other than S462/S446 was significantly higher than Imperial for adjusted net T/A. S411/S446 had adjusted net T/A significantly higher than 'Emerald Pride' but not 'Imperial'. S454/S387 and S459/S446 had net T/A significantly lower than both checks and S454/S459 was significantly lower than 'Emerald Pride'. S454/S387 and S454/S462 had adjusted net T/A significantly lower than the checks. S462/S446, S454/S446, S456/S454 had significantly larger heads than 'Emerald Pride'. Only S454/S387 had significantly smaller heads than 'Imperial'. All experimental hybrids had significantly lower % leaves than 'Imperial'. S456/S454, S411/S447, S462/S446, and S411/S455 had significantly lower % leaves compared to 'Emerald Pride'.

In the two-rep trial, 'Avenger' had significantly higher net T/A and adjusted net T/A than the OSU hybrids. Only S455/S446 was not significantly different from 'XBC 5526'. Six experimental hybrids were not significantly different from 'XBC 5526', and when adjusted for stand, four more were not significantly different. None had worse yields than 'Patron'. 'Emerald Crown' had yield statistically equivalent to 'XBC 5526' but was not considered to be a processing broccoli based on quality characteristics. All commercial entries had statistically significantly higher % leaves than the OSU hybrids. 'Avenger' had largest head diameter but S458/S446 was not significantly different.

Ten year data (table 4) revealed that S411/S446 had consistently good yields in four years of testing, S411/S455 had good yields over two years, and S449/S454 had good yields in three years. None of the other hybrids appeared to be as consistent. For example, we have liked the processing characteristics of S446/S454, but over six years of testing it has not yielded consistently.

Observation Trials: OSU inbred observation notes are shown in table 5. The most interesting inbred of the newest in development is RS1-1-2-3. Its heads are exerted to almost one meter, with good size and quality characteristics. In spite of its height, it appears resistant to lodging. Heads are deeply branched which makes this inbred more suitable to floretting, but not for making crown cuts. Fourteen additional hybrids with limited seed availability were grown as single reps in the observation trial (table 6). Among the best of these was S460/S454 which combined desirable field and processing traits into a single package. Some head rot was observed in this trial, but was not sufficiently consistent to distinguish among hybrid and inbreds. Table 7 shows inbred combinations tested over the past 10 years.

Cytoplasmic Male Sterile (CMS) Facilitated Hybrid Seed Production: Five CMS backcross lines were grown in the observation trial and evaluated (table 6). These represent three inbreds (S410, S411, and S454) into which the Arnaud CMS source has been backcrossed six times. The CMS from this source affects flower structure in causing a reduction in petals along with absence of anthers. We have observed that honeybees foraging in CMS and normal lines will exhibit different food gathering behaviors; those on normal flowers are foraging for pollen while those on CMS flowers are apparently gathering nectar. The bees mostly visit only those plants on which they are imprinted even when rows of normal and CMS plants are planted side by side. This may be one of the major reasons for reduced levels of outcrossing observed in attempts to produce hybrid seed using CMS. The other reason for reduced seed set may be an increase in flower abnormalities in CMS types that reduces fertilization and seed development. This past summer, we grew out the original Arnaud CMS materials and were able to distinguish variation in flower petal development. We selected about 20 of those with the showiest petals to be backcrossed to OSU inbreds. Our intent is to evaluate and select inbreds for more normal flower development as we conduct the backcross process.

7. Summary:

Trials at the Vegetable Research Farm included a yield trial of OSU derived hybrids, and observation trials of OSU inbreds and hybrids. Several promising hybrid combinations were identified and the newest cycle of inbred lines are showing improved horticultural characteristics. There are still many cross combinations that need to be assessed. Selection for more normal flower type in CMS lines was conducted. Because of budget cutbacks, the final objective (pilot scale evaluation of OSU hybrids) was not pursued.

Table 1. Yield data from a hybrid broccoli trial, 4 rep plots, Corvallis, 2009.^z

Hybrid	Days to Harvest	No. Plts/ Plot	% Blind Plants	Gross T/A	Adj Gross T/A ^y	Young Heads T/A	Culls T/A	Net T/A	Adj Net T/A ^y	Net Heads/A	Adj Net Heads/A ^y	Head Diameter (cm)	% Leaves
Emerald Pride	75	21.3	30.9	3.86	4.00	0.30	0.03	3.07	3.17	8712	8990	15.6	11.6
Imperial	75	18.0	16.7	6.98	8.50	0.42	0.00	3.16	3.94	6534	8115	14.0	46.9
S410 x S461	79	21.8	30.8	2.86	2.92	0.20	0.00	2.49	2.54	10454	10619	13.9	6.1
S411 x S446	76	21.5	30.7	4.52	4.69	0.12	0.02	4.15	4.30	12923	13473	15.6	5.2
S411 x S447	75	22.0	19.2	3.42	3.42	0.13	0.00	3.18	3.18	10312	10312	14.2	3.2
S411 x S455	75	20.8	29.0	4.49	4.78	0.09	0.04	4.24	4.53	10454	11094	15.8	2.6
S449 x S411	76	23.5	32.3	3.34	3.14	0.14	0.00	2.82	2.65	11761	10892	12.8	11.7
S449 x S454	76	20.8	32.8	3.80	4.03	0.16	0.03	3.25	3.45	12197	12971	14.5	9.4
S454 x S387	82	21.8	37.8	2.96	3.00	0.37	0.36	2.03	2.06	9874	9977	15.7	6.7
S454 x S446	82	21.0	27.6	4.32	4.53	0.47	0.16	3.43	3.56	9293	9682	17.4	6.3
S454 x S447	76	22.8	31.2	2.84	2.74	0.09	0.00	2.49	2.42	11906	11418	12.7	8.7
S454 x S455	79	21.3	29.0	3.75	3.88	0.41	0.26	2.78	2.88	6970	7256	15.0	7.8
S454 x S458	79	22.0	29.8	3.00	3.00	0.25	0.25	2.24	2.24	8127	8127	15.0	9.0
S454 x S459	79	21.8	24.7	2.98	3.04	0.36	0.11	2.13	2.19	8131	8275	13.9	12.5
S454 x S462	79	23.8	32.9	3.09	2.86	0.36	0.16	2.22	2.04	7986	7346	14.3	12.1
S456 x S454	82	21.5	29.4	4.76	4.87	0.36	0.06	4.16	4.26	10019	10268	16.9	3.7
S459 x S446	79	20.3	29.9	2.60	2.95	0.18	0.14	2.02	2.32	9728	10723	13.1	13.1
S462 x S446	86	21.3	28.7	5.99	6.26	0.08	0.07	5.68	5.95	16843	17562	17.5	3.0
LSD 0.05		2.6	14.3	0.96	1.03	0.23	0.25	0.99	1.11	2770	2727	1.3	7.0

^zPlanted July 8 in 30' plots, rows 30" apart, thinned to 12" between plants. Mean of 4 replications.

^yAdjusted to a stand of 22 plants per plot.

Table 2. Yield data from a hybrid broccoli trial, 2 rep plots, 2009^z

Hybrid	Days to Harvest	No. Plts/ Plot	% Blind Plants	Gross T/A	Adj Gross T/A ^y	Young Heads T/A	Culls T/A	Net T/A	Adj Net T/A ^y	Net Heads/A	Adj Heads/A ^y	Head Diameter (cm)	% Leaves
Avenger	86	19.5	12.8	9.55	10.82	0.28	0.00	7.49	8.48	8422	9482	20.0	18.9
Emerald Crown	72	21.5	6.9	8.58	8.78	0.20	0.35	5.42	5.57	10164	10430	14.9	30.2
Patron	79	21.5	28.0	5.23	5.30	0.39	0.00	3.51	3.57	9583	9792	14.4	25.4
XBC 5526	76	23.5	12.8	10.63	9.95	0.13	0.00	6.33	5.96	13068	12336	15.2	38.8
RS1-1-2-3 x S446	79	20.0	32.7	4.14	4.55	0.20	0.30	3.53	3.90	11326	12505	15.6	2.4
S411 x S456	76	23.0	41.3	3.57	3.42	0.13	0.04	3.11	2.97	11035	10555	13.5	8.1
S411 x S458	72	23.5	10.6	4.23	3.97	0.04	0.00	4.09	3.85	10745	10081	15.7	2.2
S411 x S460	75	21.5	40.2	3.14	3.20	0.10	0.01	2.95	3.00	13649	14139	15.0	2.5
S446 x S456	79	21.0	24.3	3.86	4.20	0.20	0.23	3.14	3.37	10164	11003	15.3	7.5
S454 x S457	84	21.5	38.9	4.07	4.19	0.17	0.39	3.33	3.42	12487	12778	17.0	4.2
S454 x S460	79	21.0	45.2	2.74	2.88	0.22	0.12	2.16	2.27	7841	8214	14.7	9.0
S455 x S446	84	22.5	34.0	6.00	5.89	0.15	0.10	5.60	5.49	14230	14055	17.0	2.4
S457 x S411	79	19.0	33.1	4.50	5.18	0.10	0.25	3.98	4.56	11035	13136	15.1	4.0
S457 x S446	83	19.5	23.3	4.92	5.55	0.20	0.10	4.44	5.00	13939	15669	17.9	3.6
S458 x S446	82	19.5	33.3	5.18	5.89	0.26	0.10	4.69	5.34	10164	11611	19.3	2.5
S459 x S411	79	20.0	44.2	4.18	4.56	0.22	0.26	3.50	3.80	13068	14423	15.3	5.2
S460 x S446	84	24.5	26.4	5.49	4.94	0.13	0.07	5.10	4.59	16843	15141	16.1	3.5
S462 x S411	79	22.0	27.3	3.85	3.85	0.17	0.12	3.33	3.33	11035	11035	15.9	6.1
LSD 0.05		4.5	24.0	1.83	1.79	0.35	0.33	1.45	1.56	3289	4590	2.1	5.2

^zPlanted July 8 in 30' plots, rows 30" apart, thinned to 12" between plants. Mean of 2 replications.

^yAdjusted to a stand of 22 plants per plot.

Table 3. Observation notes from a broccoli yield trial, Corvallis, 2009.

Line	Maturity (days) ^z	Head Ht (cm)	Plant Ht (cm)	Head Shape ^y	Bead Size ^x	Bead Color ^w	Stem color ^w	Exsertion ^w	Segmentation ^w	Uniformity ^w	Branching ^w	Overall ^w	Notes
Avenger	86	53	77	5	F	3	4	3	3	5	5	4	
Emerald Crown	72	32	61	7	M	4	5	1	1	5	4	3	Excellent for fresh market but not for processing; no hollow stems
Emerald Pride	75	27	66	4	M	5	3	4	3	3	3	5	Three heads with head rot
Imperial	75	32	74	5	M	5	5	5	1	7	1	3	
Patron	79	46	70	5	F-M	3	4	3	5	7	7	4	
XBC 5526	76	25	62	6	F	4	3	1	2	6	1	3	
RS1-1-2-3 x S446	79	82	88	7	M	6	7	7	7	7	5	8	
S410 x S461	79	66	66	5	M	5	7	7	5	5	5	4	
S411 x S446	76	67	74	5	C	5	7	6	3	5	3	5	Some very large heads
S411 x S447	75	57	70	6	M	6	7	7	6	4	7	5	
S411 x S455	75	64	75	6	M	7	7	6	7	7	7	7	A few leafy heads
S411 x S456	76	64	71	4	F-M	5	7	7	3	3	5	3	Many blind plants
S411 x S458	72	56	72	4	M	7	7	5	5	3	3	5	Variable plant height; some leafy heads
S411 x S460	75	69	72	4	M-C	6	7	7	5	5	3	5	
S449 x S411	76	54	70	4	F-M	5	7	4	3	5	7	5	Two heads with head rot
S449 x S454	76	45	58	4	F-M	5	5	4	5	5	5	6	
S454 x S387	82	72	70	5	M	7	7	7	7	2	7	3	
S454 x S446	82	67	69	7	F-M	7	5	5	5	1	5	6	Highly variable maturity; some very nice heads

Table 3. Observation notes from a broccoli yield trial, Corvallis, 2009 (cont.).

Line	Maturity (days) ^z	Head Ht (cm)	Plant Ht (cm)	Head Shape ^y	Bead Size ^x	Bead Color ^w	Stem color ^w	Exser-tion ^w	Segment-ation ^w	Unifor-mity ^w	Branch-ing ^w	Over all ^w	Notes
S454 x S447	76	59	65	7	F-M	7	7	6	5	6	5	8	Very attrac-tive heads
S454 x S455	79	54	64	5	F-M	5	7	5	6	5	3	5	Lodging
S454 x S457	84	65	75	5	F	7	6	5	5	4	5	5	
S454 x S458	79	61	75	4	M	5	7	5	3	3	7	3	One plant with head rot
S454 x S459	79	68	65	7	M	5	7	7	6	3	3	3	
S454 x S460	79	62	63	5	M	5	5	6	4	3	7	3	
S454 x S462	79	61	68	6	M-C	5	5	5	5	6	3	6	
S455 x S446	84	66	64	5	F	6	6	7	7	7	5	7	
S456 x S454	82	64	69	6	M	7	7	6	5	4	5	7	Large heavy heads; head rot develop-ing
S457 x S411	79	54	60	5	M-C	5	6	5	4	7	3	6	
S457 x S446	83	63	77	6	F	7	6	6	8	4	7	5	
S458 x S446	82	62	68	5	F	5	5	5	7	3	5	4	
S459 x S411	79	64	74	5	M	5	5	5	4	3	5	3	
S459 x S446	79	66	71	7	F	7	7	5	7	4	5	7	
S460 x S446	84	68	66	6	F	5	4	7	8	7	5	5	
S462 x S411	79	68	76	5	M-C	5	7	6	2	5	4	5	
S462 x S446	86	74	71	7	M	6	7	7	7	5	3	6	

^zPlanted July 8 in 30' plots; rows 30" apart, thinned to 12' between plants.

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

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

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

Table 4. Yield data (net T/A) from ten years of broccoli yield trials, Corvallis, 2009²

Entry	Tons/Acre									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
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				4.27		
S387 x S454	3.83	4.14	5.67	6.40	3.34		1.32	4.17	2.21	2.06
S410 x S442						2.32				
S410 x S445			3.87							
S410 x S446					3.43	1.36				
S410 x S447						1.46				
S410 x S454	3.79	3.72	5.35	5.70	3.79				4.39	
S410 x S456									2.61	
S410 x S461									1.92	2.54
S411 x S445			3.58							
S411 x S446		3.70		5.30			4.23			4.30
S411 x S447										3.18
S411 x S449										2.65
S411 x S454	3.49	3.96	3.30		2.72		4.22			
S411 x S455									5.40	4.24
S438 x S442		4.22								
S440 x S446				5.10						
S442 x S411							5.28			
S442 x S454		3.65			3.92		3.65			
S445 x S454		4.07	4.32	6.10	3.40			3.31	3.57	
S445 x S456									3.23	
S445 x S461									1.45	
S446 x S454				3.70	4.83		3.68	4.07	2.80	3.56
S447 x S410							4.29			
S447 x S411							3.41			
S447 x S454					2.31	2.24		4.16	1.70	2.42
S448 x S454								2.79		
S449 x S454								4.30	4.19	3.45
S454 x S455									3.09	2.88
S454 x S456									3.10	
S454 x S458										2.24
S454 x S459										2.19
S454 x S462										2.04
S456 x S454										4.26
S459 x S446										2.32
S462 x S446										5.95
Arcadia	3.73							4.09	3.87	
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	5.21		
Emerald Pride				3.40	4.54	4.32	3.91	4.23		3.17
Imperial										3.94
LSD 0.05	0.52	0.84	1.39	0.90	0.93	0.79		0.95	0.93	1.11

²Uneven number of plots in 2006 prevented calculation of an LSD.

Table 5. Broccoli observation trial, OSU inbreds, Corvallis, 2009.^z

Inbred	Ma- turity (days)	Hea d Ht (cm)	Leaf Cano- py Ht (cm)	Head Diam (cm)	Head Sha- pe ^y	Stem Co- lor ^x	Head Co- lor ^x	Bead Si- ze ^w	Head Ex- ser- tion ^x	Head Seg- ment- ation ^x	Plot Uni- form- ity ^x	Branch -ing ^x	Over- all Score ^x	Notes
S387	89	78	66	14	4	7	5	F-M	9	7	3	5	5	Four blind plants; head rot developing
S410	77	52	46	11	6	7	7	M	6	7	6	5	7	Three blind plants
S411	77	51	59	14.5	5	5	6	C	5	3	4	3	5	Five blind plants
S437	69	40	55	11.5	5	5	7	M	5	3	7	3	7	
S438	77	51	54	8.5	7	7	7	M	8	8	6	6	6	Soft heads; 5 blind plants
S440	77	50	51	11	9	8	5	C	6	2	7	6	5	Mix of highly domed, coarse beaded types and finer beaded, segmented types; ro- gued coarse beaded types
S442	89	63	55	16	4	7	7	VF	7	5	6	5	5	Leafy heads
S443	89	62	60	15	5	5	5	F	5	5	7	5	5	Soft heads
S445	89	56	62	11	6	5	7	C	6	1	8	3	3	Head rot developing
S446	89	50	55	18	5	3	5	M	5	3	6	5	7	Very firm heads; head rot developing
S447	89	56	51	17	6	5	5	F-M	7	8	7	3	6	Soft heads; severe head rot
S448	89	74	68	13	6	7	7	F	7	3	5	7	6	Some head rot
S449	89	45	59	13	4	5	5	M	4	3	7	3	5	One glossy off-type
S454	89	63	56	18	5	7	5	M-C	6	5	6	5	7	Moderate head rot
S455	89	47	51	15	3	7	7	F	4	9	5	3	7	Slight head rot
S456	89	54	58	18	4	7	7	F-M	5	9	5	5	7	Slight head rot
S457	89	53	58	17	5	7	5	F	7	8	7	3	7	Firm heads with no head rot; some leafy heads
S458	77	50	55	12	4	7	6	F-M	7	8	7	3	7	Firm heads; 5 blind plants; try crossing this to S440

Table 5. Broccoli observation trial, OSU inbreds, Corvallis, 2009.^z

Inbred	Ma- turity (days)	Hea d Ht (cm)	Leaf Cano- py Ht (cm)	Head Diam (cm)	Head Sha- pe ^y	Stem Co- lor ^x	Head Co- lor ^x	Bead Si- ze ^w	Head Ex- ser- tion ^x	Head Seg- ment- ation ^x	Plot Uni- form- ity ^x	Branch -ing ^x	Over- all Score ^x	Notes
S459	89	63	54	12	9	7	9	F	7	9	3	3	5	Uniform heads with no head rot
S460	89	73	66	13	7	5	5	F	7	3	5	7	5	Moderate head rot
S461	89	55	58	9	5	5	3	F	6	1	5	5	3	Very small, leafy heads
S462	89	59	52	16	4	3	5	M	6	5	7	7	6	Moderate head rot
S463	89	60	61	15	5	7	7	M	6	7	7	5	7	Moderate head rot
S465	89	54	61	15	3	7	5	F-M	7	5	1	3	5	
RS1- 1-2-3	89	95	75	20	3	7	5	F	9	9	5	5	7	Deeply branched

^zPlanted July 8 in 30" rows, thinned to 12" apart.

^yScale of 1-9 where 1 = flat 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, 2009.^z

Hybrid	Maturity (days)	Head Ht (cm)	Leaf Canopy Ht (cm)	Head Diam (cm)	Head Shape ^y	Stem Color ^x	Bead Color ^x	Bead Size ^w	Head Exser-tion ^x	Head Segment-ation ^x	Plot Uni-form-ity ^x	Branch-ing ^x	Over-all Score ^x	Notes
S387 x S454	89	79	79	12	4	7	7	F-M	6	5	5	5	7	Some head rot
S410 x S446	89	65	72	14	5	3	5	F-M	6	7	7	3	7	
S411 x S449	77	56	71	18	6	8	6	M-C	4	6	7	4	7	Four blind plants
S411 x RS1-1-2-3	77	77	78	15	6	7	5	M	7	3	7	5	7	Very tall; robust; stands well; 3 blind plants
S447 x S411	77	61	69	18	8	7	6	M	5	6	5	4	7	Four blind plants
S447 x S454	89	61	62	16	7	7	7	F	6	7	7	5	7	Soft heads with head rot
S454 x S449	89	60	67	17	4	5	3	M	6	2	7	3	3	Tight heads with head rot
S455 x S411	77	59	71	18.5	5	6	5	M	4	6	6	3	6	Plants are lodging; 5 blind
S458 x S454	89	60	64	16	4	5	7	M	6	5	5	5	5	Head rot developing
S459 x S454	78	60	67	14	4	7	5	M	5	5	3	5	3	Eleven blind plants
S460 x S454	89	77	75	21	5	5	5	F-M	7	5	5	5	8	Head rot developing
S461 x S410	77	58	57	15	8	5	5	M	5	4	8	5	8	Soft heads; 5 blind
S462 x S410	77	54	56	13	7	8	5	M	5	7	5	3	7	One blind plant
S462 x S454	89	65	69	14	4	5	5	M	6	3	3	3	5	Variable maturity
CMS6-1 x S411 BC6	89	54	60	10	4	3	5	M	5	3	3	7	5	
CMS7-2 x S410 BC6	89	57	57	15	3	7	5	F	6	7	5	5	7	
CMS12-1 x S410 BC6	89	59	66	11	6	5	5	F	6	3	5	3	5	
CMS13-1 x S454 BC6	89	63	65	12	6	7	7	M	6	5	5	3	7	
CMS14-1 x S411 BC6	89	64	73	15	5	5	5	M	5	3	7	5	7	

^zPlanted July 8 in 30" rows, thinned to 12" apart.

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

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

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

Table 7. Inbred line combinations tested in 10 years of broccoli yield trials, Corvallis, 2009².

Inbred Line	S410	S411	S438	S442	S443	S445	S446	S447	S449	S453	S454	S455	S456	S457	S458	S459	S460	S461	S462	RS1-1-2-3
S387	2	1	1		1	1	3				9							1		
S396						1	2				3									
S398			1			1	2				2									
S399										1	1									
S400			1			1	1			1	4									
S410				1		1	2	2		1	6		1					1		
S411				2		1	4	2	1	1	5	2	1	1	1	1	1		1	
S438				1																
S440							1													
S442											3									
S443											1									
S445											5		1					1		
S446											6	1	1	1	1	1	1		1	1
S447											5									
S448											1									
S449											3									
S454												2	2	1	1	1	1		1	

²Number in each cell indicates the number of times this combination has been tested.

Figure 1. Broccoli Yield Trial, 4 Replications, 2009

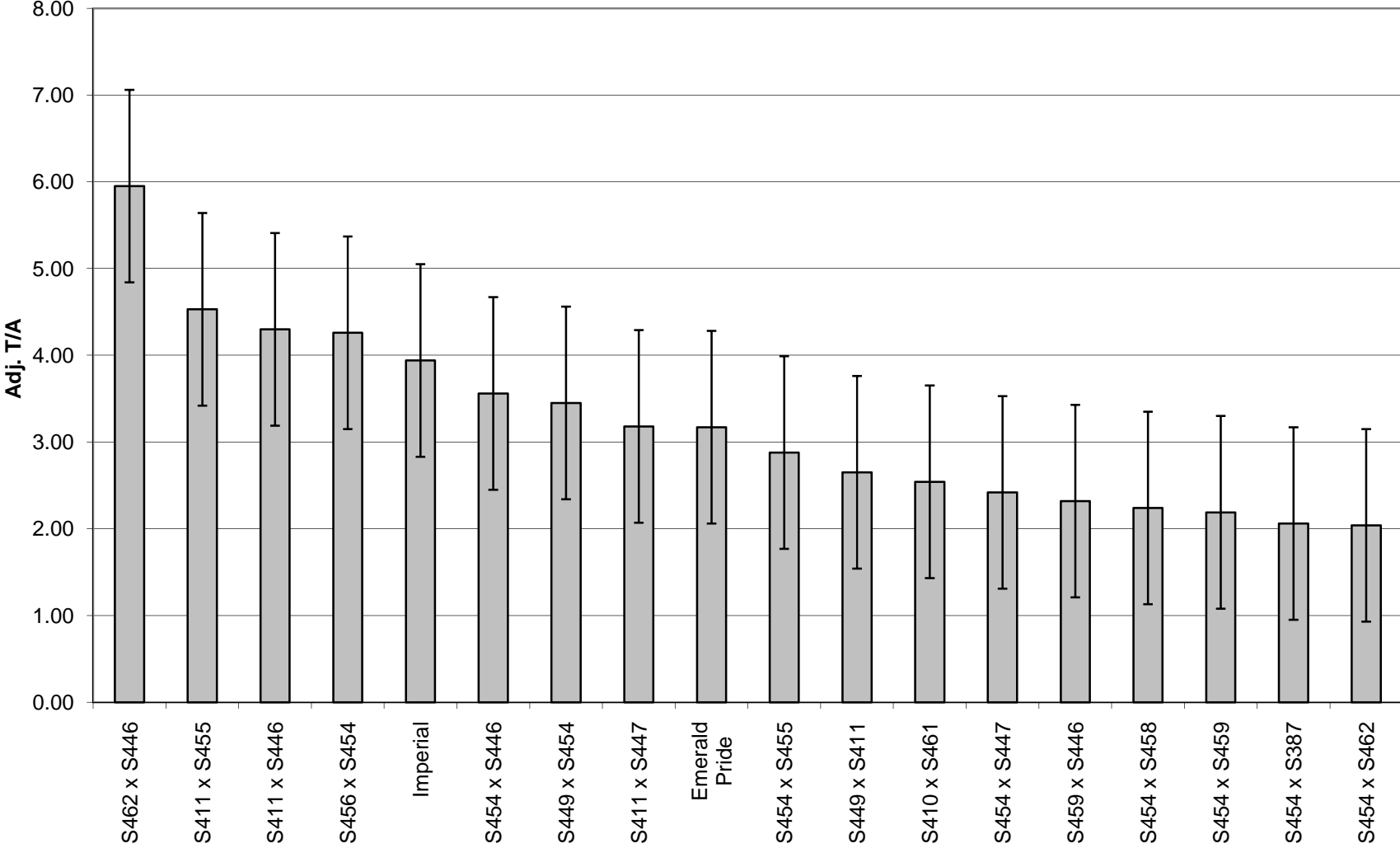


Figure 2. Broccoli Yield Trial, 2 Replications, 2009

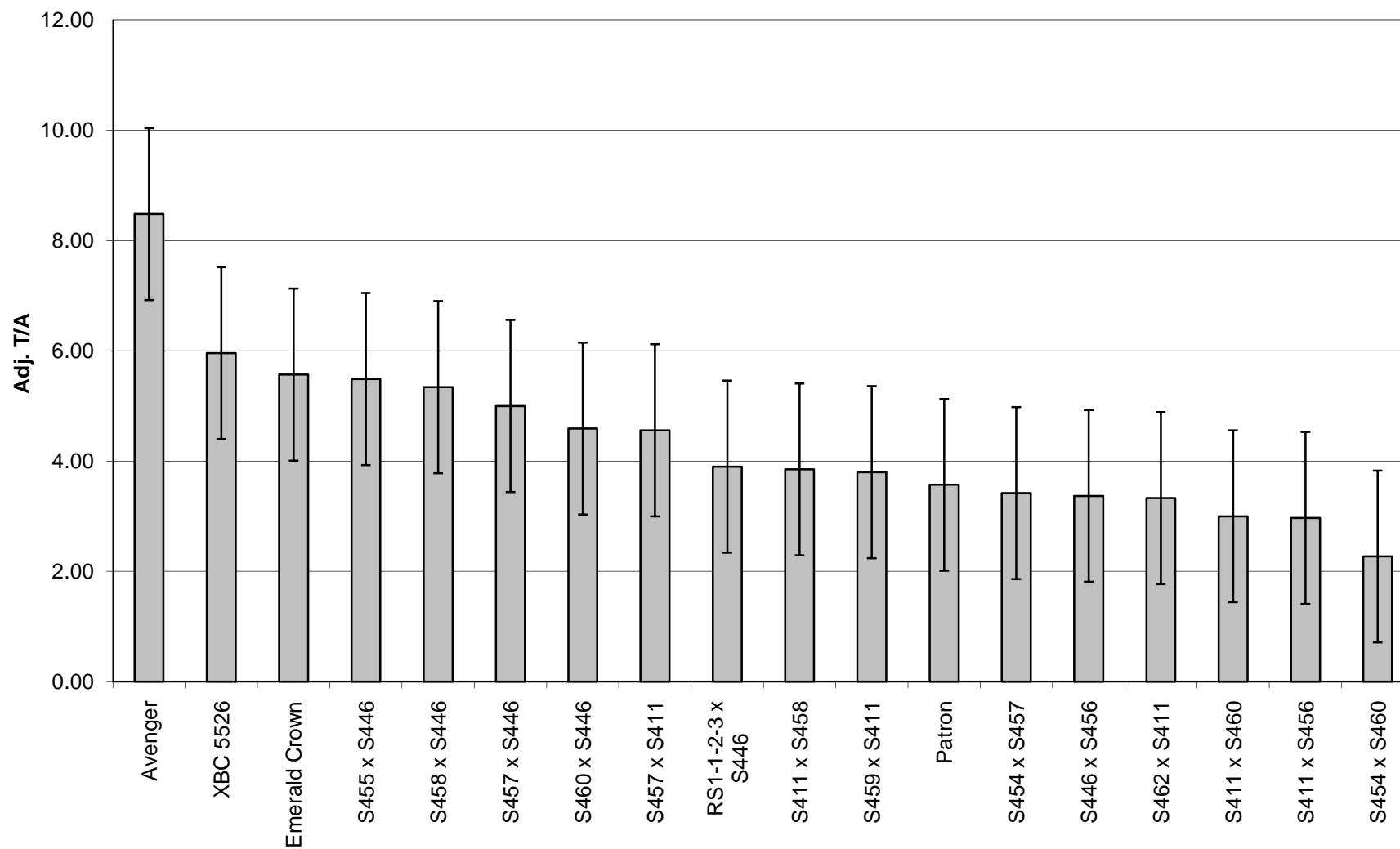


Figure 3. Plant and Head Heights, 4 Rep Broccoli Trial, 2009

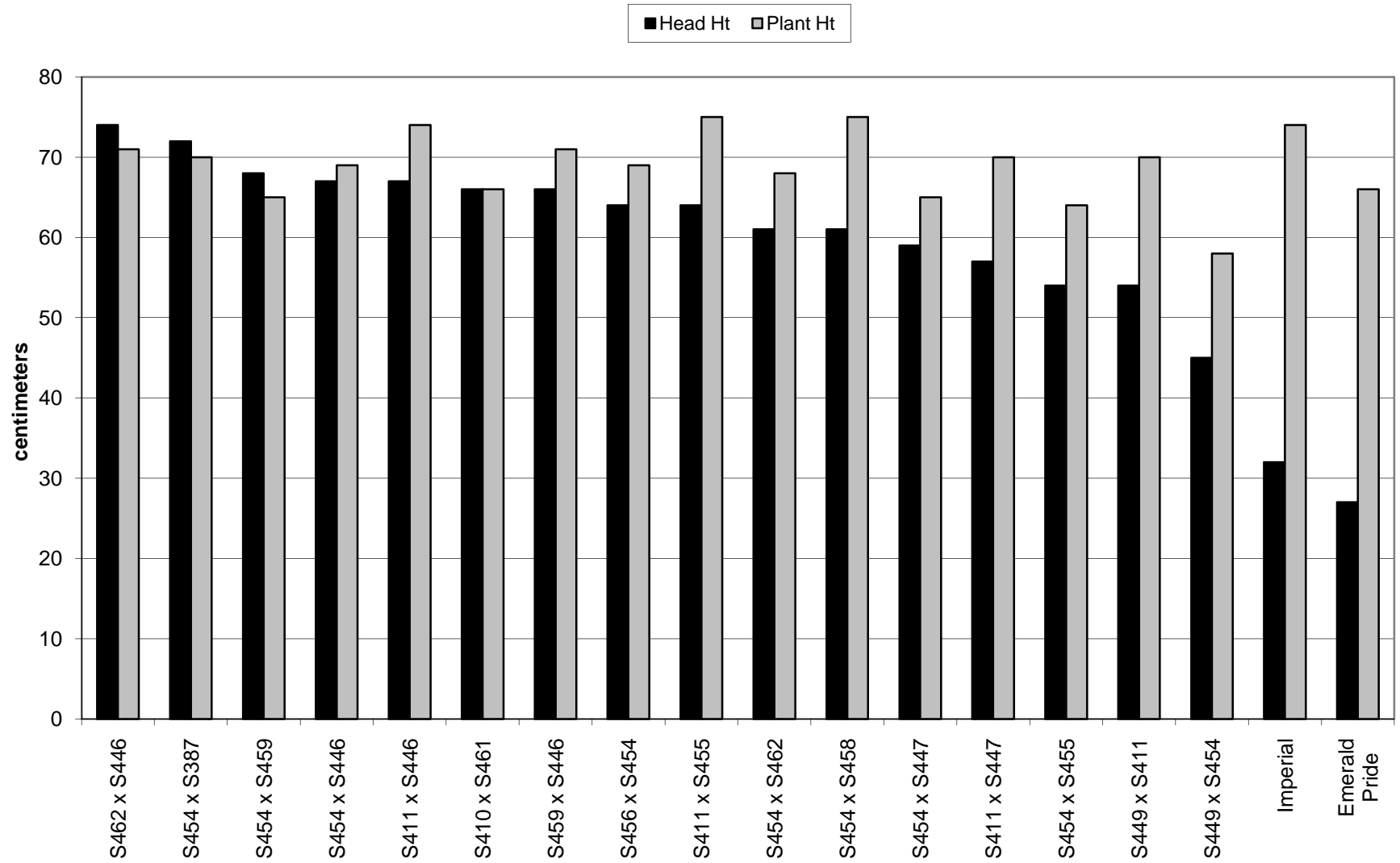


Figure 4. Plant and Head Heights, 2 Rep Broccoli Trial, 2009

