

**Report to the Oregon Processed Vegetable Commission
1997-1998**

1. Title: Broccoli Breeding and Evaluation
2. Project Leaders: James R. Myers, Horticulture
3. Project Status: Terminating 30 June, 1998
4. Project Funding: \$10,882

Breeding funds were used for a major portion of the support of a vegetable breeding technician, student labor, supplies, and research farm expenses.

5. Objectives:

Develop broccoli varieties adapted to western Oregon with the following attributes:

- i. Relatively tall plants with exerted heads for easy mechanical harvest.
- ii. Large openly branched heads with heavy, clean stem for easy trimming and separation into spears and chunks.
- iii. Medium fine, firm, uniform florets of good color and short pedicels, and which are retained after freezing.
- iv. Early to midseason maturity, concentrated yield potential.
- v. Head rot, clubroot and downy mildew resistance.

6. Report of Progress:

Two broccoli trials were grown in 1997. One planted May 2 contained 17 commercial hybrids or open-pollinated varieties, and 42 OSU inbred lines in one row plots replicated once. The second trial, a main fall season trial planted 3 July, included 26 commercial hybrids and open pollinated varieties, 58 OSU inbred lines, and 217 OSU hybrids. These were planted in one row plots replicated once. Plots were evaluated for horticultural characteristics (Tables 1-4) with emphasis on tall plants with segmented, exerted heads. No head rot, clubroot or downy mildew was observed in plots this season.

The 91-203 – series inbreds have potential as open-pollinated varieties. They tend to be tall plants with large heads, good color, moderate to good exertion and segmentation. Selection was practiced to eliminate the worst of these lines such that 25 lines remain. They tend not to combine well with the S 240 – series of inbreds, probably because the two sets of material are similar genetically.

The best hybrid combinations occur between the S 240 – series inbreds and the S 300 and S400 – series inbreds. This year's evaluation was a continuation of hybrid combination evaluation done in 1996. S 240-5-1, S 240-5-8, and S 240-5-20 inbreds were evaluated in all possible combinations with the S 300 and S400 series inbreds. Some of these hybrids show large potential head size and other desired head characteristics. Evaluation of the best hybrid combinations identified in 1996 and 1997 should be performed next season.

Initiation of recurrent selection: After evaluation of the first trial, heads were cut and plants allowed to re-flower to initiate a population improvement program using recurrent selection. Seventeen OSU inbreds and six commercial hybrids were selected. The inbreds were selected for tall plant height, low leaf branch angle, good color, and a high degree of exertion and segmentation of the heads. The commercial hybrids were selected primarily for large head size, and secondarily for head exertion and segmentation.

Hybrids and inbreds used to initiate a recurrent selection program for improved exertion and segmentation combined with larger head size.	
Commercial Hybrids	Arcadia, San Miguel, Barbados, Decathlon, Excelsior, Shogun,
OSU Inbreds	S 370, S 388, S 391, S 399, S 401, S 411, 91-203-2-1-1-1, 91-203-2-1-2-1, 91-203-2-1-2-2, 91-203-2-1-2-3, 91-203-2-1-2-4, 91-203-2-1-5-1, 91-203-2-1-6-3, 91-203-2-1-6-4, 91-203-2-3-1-5, 91-203-2-3-2-1, 91-203-4-1-2-1

In order to produce hybrid seed for a small scale farm trial, S 240-5-1 and S 401 were planted in isolation at the Lewis-Brown Farm. Both lines were late in maturity, and it is not known at this time whether sufficient seed will be available for the 1998 field season.

Commercial hybrids that received a score of 4 or better in trial one and 5 or better in trial two were considered worth further evaluation. These hybrids are generally outstanding for some but not all traits considered important for mechanical harvest, and have not been evaluated for processing potential.

8. Summary:

Mid-season summer and main season fall broccoli trials were conducted to evaluate commercial hybrids and OSU inbreds and hybrids. Selections were continued on the 91-203 –series inbreds. Hybrid combination evaluation of OSU lines continued with S 240 – series inbreds crossed to S 300 and S 400 – series inbreds in all possible combinations. Approximately 10 commercial hybrids show potential, and should undergo further testing.

9. Signatures:

Redacted for Privacy

Project Leader:

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Department Head

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Table 1. Evaluation of Broccoli Cultivars in a Mid-Season Trial Planted 2 May.

Entry	Source	Maturity (days)	Head Dia. (In)	Head Shape ¹	Bead Size ²	Stem Color ³	Head Exsertion ³	Head Segment-ation ³	Overall Score ⁴	Comments
Arcadia	Sakata	90	9	5	M	G	F	P	3	Rough head
Barbados	Ferry-Morris	81	8	3	C	P	G	F	4	Floret size large-short branches
BR 40	Osborne	79	6	3	F	F	G	G	4	Some irregular heads
Decathlon	Sakata	91	7	4	M	G	G	G	4	Fairly tight round head
Emerald City	Sakata	87	8	4	M	P	F	P	3.5	Leaves erect
Excelsior	Harris-Moran	81	7	4	F	F	F	G	3.5	Short & somewhat exserted for a hybrid
Genji	Johnny's	88	6	4	M	G	G	F	3.5	Rough head
Legend	Sakata	81	6	6	F	G	G	P	3.5	Good exsertion for commercial type
Liberty	Osborne	89	9	4	F	F	F	P	3	Short plant
Major	Osborne	69	6	3	C	F	F	F	2.5	Short, compact
Marathon	Sakata	90	9	5	F	F	F	P	3	Rough head
Patriot	Abbott & Cobb	91	10	6	M	P	P	P	3	Large potential head size
Samari	Sakata	89	8	6	C	P	F	P	2.5	Highly dissected leaf w/ acute leaf angle
San Miguel	Johnny's	82	9	4	F	F	G	F	3.5	Good exsertion for a hybrid
Shogun	Sakata	91	10	5	F-M	F	G	G	4	Fine beads-segmented-rough head
Triathlon	Sakata	91	6	7	F	F	P	F	3	Tight head

¹Scale of 1 to 9; 1 = concave, 3 = flat, 5 = convex, 7 = moderate dome, 9 = strong dome. ²F = fine, M = medium, C = coarse. ³E = excellent, G = good, F = fair, P = poor. ⁴Scale of 1 to 5; 1 = poor, 5 = excellent.

Table 2. Evaluation of Broccoli Cultivars in a Late Season Trial Planted 3 July.

Entry	Source	Maturity (days)	Plant Ht. (in)	Head Dia. (in)	Head Shape ¹	Bead Size ²	Stem Color ³	Head Exsertion ⁴	Head Segment-ation ⁴	Plot Uniform-ity ⁴	Overall Score ⁴	Comments
Arcadia	Sakata	86	22	9	4	F	F	5	3	7	5	Leaves erect
Barbados	Ferry-Morris	79	22	6	5	C	M	6	5	3	7	Leaves not as upright
BR 40	Osborne	74	24	8	4	M	M	5	3	7	5	
Decathlon	Sakata	81	17	5	7	M	M	5	3	5	5	Upright leaves
Emerald City	Sakata	82	24	7	5	M	P	7	7	5	5	Best hybrid for exsertion & segmentation
Excelsior	Harris-Moran	81	24	6	7	M	G	4	5	7	5	Upright leaves
Genji	Johnny's	83	22	6	5	M		3	5	5	3	Rough heads
Legend	Sakata	81	24	8	5	C	M	5	2	7	5	Upright leaves
Liberty	Osborne	84	19	8	6	M	P	2	2	7	2	Florets large
Major	Osborne	76	20	10	5	C	P	3	5	6	3	Large heads
Marathon	Sakata	86	20	10	5	F	P	3	5	2	3	Stem almost white
Packman		69	22	8	4	C	P	4	7	7	3	Fairly large open flat head
Patriot	Abbott & Cobb	91	18	7	6	F	F	2	3	7	3	
Pirate	Peto Seed	94	16	8	4	F		5	7	5	5	Uneven floret development
PS 19590	Peto Seed	91	18	10	4	F	P	1	3	7	2	Uneven floret development
PS 21290	Peto Seed	83	16	7	6	M	P	1	3	5	2	Open canopy, very short plants, lax Leaves
PS 21290	Peto Seed	83	16	8	7	M	F	3	7	3	3	Heads well segmented
PSX 16284	Peto Seed	83	18	9	5	C	F	3	3	5	3	Uneven head development
Regal		67	20	6	5	M	P	3	5	7	3	Leaves held low
San Miguel	Johnny's	78	24	10	3	F	P	5	5	7	5	Leaves held high, flat heads
Shogun	Sakata	86	28	8	5	F	G	7	6	5	5	Exserted but leaves erect w/ long petioles
Triathlon	Sakata	92	18	6	6	M		3	1	3	3	

¹Scale of 1 to 9; 1 = concave, 3 = flat, 5 = convex, 7 = moderate dome, 9 = strong dome. ²F = fine, M = medium, C = coarse. ³E = excellent, G = good, F = fair, P = poor. ⁴Scale of 1 to 9; 1 = poor, 9 = excellent.

Table 3. Evaluation of OSU Broccoli Inbreds in a Mid-season Trial Planted 2 May.

Entry	Maturity (days)	Head Dia. (in)	Bead Size ¹	Stem Color ²	Head Exsertion ²	Head Segment-ation ²	Head Shape ³	Overall Score ⁴	Comments
91-203-2-1-1-1	81	5	F-M	G	E	F	5	4.5	Might be acceptable OP. Var.
91-203-2-1-2-1	76	4	M	E	G	G	7	4.5	Some rosetting
91-203-2-1-2-2	80	7	M	G	E	G	7	4.5	Tends to loose head
91-203-2-1-2-3	81	7	M	G	E	G	2	4.5	Excellent type but floret size large
91-203-2-1-4-1	81	6	C	G	E	E	7	4.5	Loose head
91-203-2-1-5-1	76	5	F	E	G	G	7	3.5	Tall plants
91-203-2-1-6-3	79	5	M	E	E	E	7	4.5	Head somewhat loose & light
91-203-2-1-6-4	81	8	F	G	E	E	7	4.5	May yield well-thick stems
91-203-2-3-1-5	81	7	M	F	E	E	7	4.5	Long floret stems
91-203-2-3-2-1	81	5	F	G	E	E	9	5	Heavy, thick stem-not exserted, uniform, fine bead
91-203-4-1-2-1	91	8	F	E	E	E	7	4.5	Tendency to sunken centers-not as tall
HS143	87	6	C	G	G	F	7	4	Short plant, good head size
HS161-3	80	3	C	G	G	G	2	3.5	Irregular head shape, floret stems short
HS179-1	80	3	C	E	E	G	2	3.5	Extreme exsertion but small heads, variable
HS179-1	81	2	M	G	E	F	2	3.5	Extreme exsertion but very small heads
S233B	82	4	C	G	F	F	7	3.5	Medium height
S240-1	91	4	M	G	G	G	5	4	Late, leafy, & short
S240-5-1	91	6	F	G	E	E	2	4.5	Loose head
S240-5-12	93	6	F	G	E	E	7	4.5	Loose head-light yellow immature florets
S240-5-17	91	4	F	E	G	E	2	4	Fairly compact head
S240-5-20	91	5	F	E	E	E	2	4.5	Leafy, loose head, low branching
S240-5-24	91	6	F	E	E	E	2	4.5	Leafy, loose head, low branching
S240-5-26	91	5	F	E	E	E	2	4.5	Open head, low branching
S240-5-30	91	5	F	E	G	E	7	4	Loose head
S240-5-5	92	5	F	E	F	F	7	4	Leafy, not exserted, sunken center
S240-5-8	93	8	F	E	E	E	5	4.5	Young florets light green
S240-5-8	93	5	F	E	E	E	-	4	Very loose head, immature florets light green
S310	90	6	M	G	G	E	2	4	Loose head
S315	70	4 to 5	M	F	G	F	3	3.5	Short plant
S352	83	5	M	F	F	F	2	3	Short plants, not very exserted
S366	81	7	C	E	P	P	7	4	Looks like a hybrid, smooth uniform dome
S370	81	5	M	G	E	F	3	4	Nice but somewhat small heads

Entry	Maturity (days)	Head Dia. (in)	Bead Size ¹	Stem Color ²	Head Exsertion ²	Head Segment-ation ²	Head Shape ³	Overall Score ⁴	Comments
S384	89	8	F-M	G	G	F	7	3.5	Rough head
S387	89	8	C	G	E	G	2	4	Tendency to sunken centers
S388	81	4	C	E	E	G	4	4	Irregular head shape
S389	80	4	M	F	G	E	9	4	Variable plot, rosetting
S391	80	5	F	G	E	E	7	4	Somewhat loose head
S392	81	5	M	G	G	G	7	3.5	Variable plot, tendency to extreme dome
S396	75	4	M	G	E	E	6	4	Tall plant
S398	75	3.5	M	G	E	E	9	4	Very tall & uniform
S399	81	4	C	F	E	G	6	4	Nice but small heads
S400	81	3	M	G	E	E	7	3.5	Button heads due to stress?
S401	81	4	M	G	G	G	7	4	Small, attractive heads
S403	80	5	M	E	E	E	9	4	Tall plant w/ loose head
S410	80	6	M	G	E	E	2	4.5	Very tall w/ loose head
S411	82	6	F	E	E	E	2	4.5	Nice tight florets, but well segmented
S414	75	4	M	G	E	E	4	3.5	Rather loose head

¹F = fine, M = medium, C = coarse. ²E = excellent, G = good, F = fair, P = poor. ³Scale of 1 to 9; 1 = concave, 3 = flat, 5 = convex, 7 = moderate dome, 9 = strong dome. ⁴Scale of 1 to 5; 1 = poor, 5 = excellent.

Table 4. Evaluation of OSU Broccoli Hybrids in a Late Season Planted 3 July.

Source	Maturity (days)	Plant Ht. (in)	Head Dia. (in)	Head Shape ¹	Head Size ²	Stem Color ³	Head Exsertion ⁴	Head Segment-ation ⁴	Plot Uniform-ity ⁴	Overall Score ⁴	Comments
S 240-5-1 crosses											
S 370 X S 240-5-1	81	24	10	3	M		8	8	8	7	Loose head but uniform
S 384 X S 240-5-1	85	25	10	3	F		7	7	7	7	Flat leafy heads w/ irregular floret development
S 387 X S 240-5-1	85	30	8	4	M	G	7	7	7	5	Leafy head
S 240-5-1 X S 387	83	28	8	4	C	E	8	7	?	5	Coarse, leafy head
S 240-5-1 X S 388	83	30	8	4	C	E	8	7	7	7	
S 388 X S 240-5-1	85	32	10	3	M	G	9	8	5	7	Some rough heads
S 389 X S 240-5-1	84	28	7	5	M	F	8	7	7	7	Irregular heads
S 391 X S 240-5-1	85	30	8	5	F	G	8	8	8	5	Leafy rough heads
S 392 X S 240-5-1	82	34	8	5	M	G	8	9	8	8	
S 396 X S 240-5-1	84	34	10	5	M	E	9	9	7	9	Highly exserted nice heads
S 398 X S 240-5-1	82	34	10	5	M	E	9	9	7	9	Highly exserted nice heads
S 399 X S 240-5-1	82	34	9	5	M	E	9	9	7	9	Highly exserted nice heads
S 400 X S 240-5-1	90	24	5	5	M	E	8	9	9	9	Uniform segments
S 401 X S 240-5-1	87	30	10	5	M		9	9	9	9	Flat heads but nicely segmented.
S 403 X S 240-5-1	83	26	10	3	M	G	8	9	7	7	Irregular floret size
S 240-5-1 X S 410	86	28	10	4	M	G	8	8	?	7	Small, irregular florets
S 410 X S 240-5-1	87	29	10	3	F		9	9	8	8	Loose flat head w/ sunken centers-badly lodged
S 411 X S 240-5-1	85	24	8	4	F	F	8	8	8	9	
S 413 X S 240-5-1	85	26	6	4	M	G	8	8	9	9	Slightly irregular florets
S 414 X S 240-5-1	83	28	8	4	M	G	8	9	8	9	Uniform florets
S 240-5-8 crosses											
S 370 X S 240-5-8	92	26	12	4	M		9	9	?	9	One plant-compact head, good yield potential
S 384 X S 240-5-8	89	27	10	3	F	G	8	7	6	6	Very rough heads, irregular small florets
S 240-5-8 X S 387	84	28	11	4	M	F	8	9	7	9	Short but otherwise good potential
S 387 X S 240-5-8	86		10	3	F		8	9	5	7	Loose head w/ sunken centers
S 240-5-8 X S 388	82	30	10	4	M	G	8	8	5	7	Loose head
S 388 X S 240-5-8	86	28	9	4	m		8	9	8	7	Slower development of inner head
S 240-5-8 X S 389	84	26	10	4	M	G	7	8	3	7	
S 389 X S 240-5-8	86	28	12	4	M		8	8	8	7	Rough head, irregular floret size
S 391 X S 240-5-8	84	34	15	4	M		9	9	9	9	Deeply branched loose heads
S 240-5-8 X S 392	81	30	10	4	M	G	9	8	8	8	Heads slightly irregular
S 396 X S 240-5-8	85	32	12	2	M		9	9	9	7	Deeply branched loose flat heads
S 398 X S 240-5-8	81	33	14	4	M		9	9	9	8	Loose heads
S 399 X S 240-5-8	83	32	12	4	M		9	9	8	9	Large heads, some loose, some compact
S 240-5-8 X S 400	84	32	7	5	M	F	8	7	3	5	
S 400 X S 240-5-8	89	30	10	4	M		8	9	8	9	Nicely segmented heads
S 240-5-8 X S 401	83	28	9	5	C	G	7	8	5	8	Could be nice if uniform
S 401 X S 240-5-8	85	24	6	4	M		8	8	7	8	Uniform floret size
S 403 X S 240-5-8	86	25	14	2	M		8	9	8	8	Some sunken centers, but good yields
S 410 X S 240-5-8	84	28	14	3	F		9	9	7	8	Loose flat head w/ small florets

Source	Maturity (days)	Plant Ht. (In)	Head Dia. (In)	Head Shape ¹	Bead Size ²	Stem Color ³	Head Exsertion ⁴	Head Segment-ation ⁴	Plot Uniform-ity ⁴	Overall Score ⁴	Comments
S 411 X S 240-5-8	86	23	8	5	M		7	9	5	8	Compact head
S 240-5-8 X S 411	91	26	7	4	F		8	8	7	7	Small loose heads
S 413 X S 240-5-8	84	27	8	4	M		8	9	7	8	Floret size uniform
S 414 X S 240-5-8	84	26	9	3	F		8	8	5	8	Flat, loose head
S240-5-20 crosses											
S 240-5-20 X S 370	80	26	10	4	M	G	7	8	7	7	Loose head
S 370 X S 240-5-20	81	32	11	4	M	G	8	9	8	8	Nice head conformation
S 240-5-20 X S 384	89	27	10	3	F		8	8	?	8	Uneven floret size & development
S 384 X S 240-5-20	85	22	7	5	M	G	7	7	8	7	Not strongly exserted
S 387 X S 240-5-20	84	30	9	4	C	G	7	8	8	7	Not as exserted
S 388 X S 240-5-20	83	36	9	4	M	G	9	7	5	6	Head development irregular
S 389 X S 240-5-20	85	34	9	5	M	G	8	8	5	7	Nice head potential but not uniform
S 391 X S 240-5-20	84	32	9	7	M	G	8	8	7	8	Heads slightly irregular
S 240-5-20 X S 392	79	30	10	5	M	F	8	9	9	8	Deeply branched, loose heads
S 392 X S 240-5-20	84	28	8	6	M	F	8	9	9	7	Heads slightly irregular
S 396 X S 240-5-20	76	28	8	5	M	G	7	9	7	7	Deep branches, leaves by head
S 240-5-20 X S 398	77	24	10	6	F	F	8	9	7	8	Deeply branched, most plants lodged
S 398 X S 240-5-20	81	32	9	5	M	G	8	8	7	8	Large heads, good varietal potential
S 399 X S 240-5-20	81	32	9	5	M	G	8	8	7	8	Large heads, good varietal potential
S 240-5-20 X S 400	80	28	7	5	F	G	7	9	9	8	Loose head
S 401 X S 240-5-20	83	28	7	5	M		8	8	7	7	Florets fairly segmented & uniform
S 403 X S 240-5-20	84	30	11	3	F	G	7	8	7	7	Sunken centers, irregular head
S 240-5-20 X S 410	82	26	8	4	VF	E	8	9	7	7	Rough head, irregular floret size
S 410 X S 240-5-20	85	27	9	4	M	E	8	8	7	7	Short plant but nice exsertion
S 240-5-20 X S 411	76	24	7	6	F	F	7	9	?	7	One plant, leaves at head height
S 411 X S 240-5-20	92	26	10	3	M		8	9	7	9	Nicely segmented, large heads
S 240-5-20 X S 413	82	24	5	5	M	G	7	7	5	8	
S 413 X S 240-5-20	83	26	10	4	C	E	8	9	8	5	Branching, stem lodging
S 240-5-20 X S 414	81	24	7	6	F	G	6	9	7	7	Short petioles

¹Scale of 1 to 9; 1 = concave, 3 = flat, 5 = convex, 7 = moderate dome, 9 = strong dome. ²F = fine, M = medium, C = coarse. ³E = excellent, G = good, F = fair, P = poor. ⁴Scale of 1 to 9; 1 = poor, 9 = excellent.