

**Report to the Oregon Processed Vegetable Commission
1992-1993**

1. Title: Broccoli Breeding
2. Project Leader: J. R. Baggett, Horticulture
3. Project Status: Terminating June 30, 1993
4. Project Funding: \$6,000
\$3,780 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 exerted heads, easily accessible for harvest
 - B. Openly branched and segmented heads with heavy, clean stems for easy trimming and separation into spears or chunks
 - C. Small, firm, uniform florets with short pedicels and good color 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:

- A. Emphasis in 1992 was evaluation of a large number (216) of new inbred lines to identify those most promising as parents for hybrids of good processing type (open segmented heads with firm segments, good color, small florets with pedicels which stay short because of light exposure, and exerted heads). The new inbreds had reached the F₆ generation and were generally becoming quite uniform. They were evaluated by observation in plots direct-seeded July 8-16. It was possible to identify the 63 best lines and discard the remainder so that efforts in 1993 can be concentrated. Because of the additive nature of the inheritance of most broccoli characteristics of interest, it is possible, to a large degree, to predict what an inbred line will contribute to an F₁ hybrid. Thus, those with good exertion, small florets, and segmented heads were favored in selecting lines for continuation.

Concurrently, we grew 352 experimental hybrids from greenhouse crossing. These "test crosses" were made to get an early indication of how representative lines may combine in F₁ hybrids. We were able to use 118 of the new inbreds in crosses. In most cases, the new inbred was crossed with one or several S240-5 sublines, and also to S315, an inbred of a more compact and coarse type. The S240 inbred lines have

been identified as our best parents for producing F_1 hybrids of the segmented, small floret type, with clubroot resistance as a possible bonus.

Table 1 shows average scores of crosses made between new inbreds and the best S240-5 sublines, in comparison to crosses made with our poorest S240-5 lines (with less segmented heads) and with S315. Note that these crosses included those involving the least promising new inbreds, so that average scores are not as high as they might be. Evaluations in 1993 will include crosses between the 63 new inbreds saved in 1992 with the best of the S240-5 sublines saved in 1992.

- B. A replicated yield trial (Tables 2 and 3) was direct-seeded July 10 in rows 20" apart, with two 30-foot rows/plot. Hi Calibur, which is early but does not fit current objectives very well, was high yielding, as it was in 1991. Excelsior was also high. The variety Vantage was included in the trial but abandoned because the head color was quite yellow. The low yield shown in Table 2 for Pirate was due to a heavy discard of heads with bacterial soft rot. The very late maturity of Pirate probably contributed to the high incidence of soft rot.

Most of the OSU hybrids were lower in yield. OSU 91-3, which is a very uniform, nicely exerted hybrid which should be highly adapted to machine harvest, was not significantly lower than Gem. OSU 92-5 was high in yield, but was observed to be somewhat coarse in an early observation trial. It now generally appears that the highly exerted OSU hybrids, such as 87-3 and 87-5, do not have sufficient yield potential, especially since they must be cut before the florets enlarge.

- C. Commercial varieties were observed in a planting made July 16. Of these, shown in Table 4, none rated over 3.0, indicating that none of the hybrids had any promise for processing, in our judgement. Many of these hybrids had excellent yield potential, but were poorly exerted, often yellow or light in color, and often coarse.

7. Summary:

Evaluation of 216 new inbred lines, now in the F_6 generation, was done in a fall planting and through test crosses made between 118 of the new lines and sublines of the prime old inbred S240-5. Stressing head segmentation, small florets, short pedicels, and head exertion, 63 of the new inbreds were saved for continued evaluation in 1993.

8. Signatures:

Redacted for Privacy

Project Leader: _____

Redacted for Privacy

Department Head: _____

Table 1. Hybrid performance of crosses between older OSU inbred lines and new breeding lines, Corvallis, 1992.¹

Inbred	Mean Score ²	Size (in.)	Florets	Head Stem Color	Exsertion ³	Notes
S240-5-1	3.8	7.2	small	G	G	most hybrids have good processing potential, open segments, small florets, heads may be too small
S240-5-5	3.7	7.9	small	G	G	most hybrids segmented, with good processing potential, but some are too tight and compact
S240-5-8	3.8	8.0	small-sl. coarse	G	G	most hybrids are good sized and segmented with good processing potential, some are too compact with slightly coarse and uneven florets and long pedicels
S240-5-12	3.7	8.2	small	G	G	hybrids are big, mostly firm, with somewhat tight to very open segments, good processing potential
S240-5-15	3.2	7.2	medium-coarse	G	G	most hybrids have small, compact heads with tight segments and long pedicels; florets too coarse; some soft rot; poor processing potential
S240-5-17	4.1	8.2	small	G	G	firm segmented dome with good processing potential
S240-5-18	3.3	7.0	medium-coarse	G	G	most hybrids have small, compact heads with coarse florets and long pedicels; some soft rot; poor processing potential
S240-5-20	3.9	8.1	med. small-small	G	G	firm, segmented, good processing potential
S240-5-24	3.6	7.3	medium-med. coarse	G	G	some hybrids are segmented domes with medium-small florets and processing potential; others are too compact and uneven with medium coarse florets and some long pedicels
S240-5-26	3.7	8.9	med. small-small	G	G	hybrids are large, segmented, most have good processing potential; a few have somewhat tight, uneven segments with long pedicels
S240-5-30	3.5	7.9	small-med. coarse	G	G	some hybrids are segmented domes with good processing potential, some are too tight with coarse florets and long pedicels
S315	2.7	6.6	coarse	F	G	florets are too coarse with long pedicels; heads are small, compact, with some uneven florets and soft rot

¹Direct-seeded July 8 in 3' rows, thinned to about 15" between plants. All scores, measurements, and notes are based on averages of the hybrids made with each inbred and are rough estimates because of non-uniform numbers of hybrids in each case. All hybrids were hand-made in the greenhouse.

²General score 1-5 scale, 5 = best and would indicate a good fit with the current concept of a good processing head: highly segmented, segments firm with small florets with short pedicels, good color, and good head exsertion.

³Exsertion refers to protrusion of heads above foliage for easy cutting.

Table 2. Broccoli yield trial, Corvallis, 1992.¹

Variety	Source	Total No. Heads/A	Total T/A	Lbs/Head	No. Weeks Harvested	Avg. Tons/Week	Largest Tons/Week
88-3	OSU	10,464	3.8	0.74	3	1.3	2.3
90-3	OSU	12,971	4.5	0.69	3	1.5	3.1
91-2	OSU	7,412	2.3	0.60	3	0.8	1.7
91-3	OSU	15,151	5.5	0.74	3	1.8	4.0
92-2	OSU	16,132	4.9	0.60	3	1.6	3.4
92-5	OSU	20,274	5.8	0.58	3	1.9	5.4
92-7	OSU	15,805	4.1	0.54	4	1.0	2.3
92-9	OSU	14,279	3.7	0.52	3	1.2	1.8
92-10	OSU	10,573	3.5	0.67	4	0.9	2.0
91-12	OSU	17,985	4.9	0.55	4	1.2	2.5
Hi-Calibur	Harris-Moran	20,492	7.0	0.69	3	2.3	3.5
Excelsior	Harris-Moran	19,511	6.6	0.68	3	2.2	1.9
Gem	Asgrow	19,293	6.2	0.65	3	2.1	3.8
Pirate	Peto	12,317	3.8	0.60	2	1.9	2.8
LSD at 5%		4,166	0.9	NS			

¹Direct-seeded July 10 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.

Table 3. Pattern of maturity in broccoli hybrids, Corvallis, 1992.

Variety	T/A For Week Of				
	9/21	9/28	10/5	10/12	10/19
88-3		0.2	2.3	1.2	
90-3		0.8	3.1	0.6	
91-2		0.5	1.7	0.1	
91-3		1.4	4.0	0.1	
92-2		0.8	3.4	0.6	
92-5		0.2	5.4	0.1	
92-7	0.1	1.1	2.3	0.4	
92-9		0.6	1.8	1.3	
92-10	0.3	1.1	2.0	0.1	
92-12	0.6	2.5	1.6	0.2	
Hi-Calibur	1.3	3.5	2.2		
Excelsior	1.9	0.1	0.4		
Gem	2.0	3.8	0.4		
Pirate				0.9	2.8

Table 4. Commercial broccoli variety observations, Corvallis, 1992.¹

Variety	Source ²	Mat. Date	Score ³	Head Diam. (in.)	Florets	Head Stem Color	Exsertion ⁴	Notes
PSX 16284	1	10/10	2.0	8	med. coarse	VP	F	too compact, some soft rot
Sprinter	2	10/5	2.0	8	coarse	P	P	light color, rosettes
Arcadia	2	10/15	3.0	8	med. coarse	P	P	heavy firm dome but poor color, too coarse
Legend	2	10/10	2.0		med. coarse	P	G	compact, pedicels extremely long and curled
Green Comet	3	10/1	2.0		med. coarse	P	P	compact, coarse florets with long pedicels
XPH 5774	4	10/15	3.0	9	med. coarse	P	F	very compact, heavy dome
XPH 5858	4	10/15	3.0	10	med. coarse	P	VP	coarse florets, very heavy
XPH 5859	4	10/9	3.0	6	medium	F	F	compact heads with long pedicels
Patriot	2	10/20	2.5	6	med. coarse	VP	P	firm head, yellow
Emerald City	2	10/10	3.0	9	medium	P	F	heavy, rosettes, long pedicels
Chancellor	2	10/10	3.0	9	medium	P	F	poor color, long pedicels
Embassy	4	10/5	2.0	6	coarse	P	P	coarse and compact, long pedicels
Pinnacle	5	10/10	3.0	6-8	medium	F	F	long pedicels
Shogun	2	10/20	3.0	8	med. coarse	VP	F	tall plant, heavy heads
Excelsior	5	10/10	3.0	8	small	F	F	yellow undercolor
Hi-Calibur	5	10/1	3.0	10	coarse	F	F	yellow undercolor, long pedicels
Vantage	6	10/12	2.5	9	medium	VP	F	very yellow color
Caravel	7	10/5	2.5	8	coarse	F	F-G	compact, coarse dome, long pedicels

¹Direct-seeded July 16 in 3' rows, thinned to about 15" between plants.

²Sources: 1 = Peto, 2 = Sakata, 3 = Parks, 4 = Asgrow, 5 = Harris-Moran, 6 = SunSeeds, 7 = Royal Sluis.

³General scores, 1-5 scale, 5 = best.

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