

Report to the Oregon Processed Vegetable Commission  
1986

Title: Broccoli Breeding

Project Leader: J. R. Baggett, Horticulture

Project Status: continuing, indefinite

Project Funding: \$5,000

Funds were used to pay a research farm assessment, for miscellaneous supplies, and to provide technical support and seasonal labor for hand pollinations, maintenance of plots, and harvesting.

Objectives:

Develop broccoli varieties for processing in Western Oregon stressing:

1. Upright habit with heads easily accessible for harvest.
2. Openly branched heads with clean stem for easy trimming and separation into spears or chunks.
3. Medium fine, uniform plants of good color.
4. Maturity ranging from early to midseason and good production potential.
5. Clubroot and downy mildew resistance if possible.

Report of Progress:

The major part of this work is the maintenance of OSU inbred breeding lines and evaluation of experimental  $F_1$  hybrid combinations from these lines. In 1986, seed of 41 inbred lines was produced in the greenhouse using hand self-pollination. About half of these lines were involved in  $F_1$  hybrid combinations made in the greenhouse to determine the best lines and sub-lines for production of hybrid processing varieties. Of these, the most promising inbreds are HS 161 (3 sublines) which transmits very good dome shaped, well exerted, and firm heads in its progenies; HS 179 (2 sublines) which transmits good exertion, deep branching, and good florets but possibly not enough size; S240 (9 - sublines) which has been a parent in most of the promising hybrids, is clubroot resistant and transmits resistance to  $F_1$  hybrids in most cases, has fine florets, good color and deeply branched, somewhat segmented heads; and S366, which produces  $F_1$  hybrids of good size and very good form, but which will have to be used as a male parent only because it self pollinates too easily.

In 1986, 175  $F_1$  hybrids were evaluated. These included 21 new crosses with 'Packman' and 'Citation' to produce new breeding material; 150 were experimental hand crossed combinations of OSU lines; and 4 were the following field produced crosses:

86-1 S240-2 x HS161-3  
86-2 HS161-3 x S240-2  
86-3 S240-5 x HS161-1  
86-4 HS161-1 x S240-5

Hybrids 86-3 and 86-4 are possibly the best processing hybrids we have produced from OSU inbreds having very firm florets, firm dome-shaped, well exerted heads, about the right size for current processing plant operations, and easy to harvest. Previous versions of these hybrids were produced in 1981 and tested for several years under the numbers 82-9 and 82-10. Samples were taken in 1986 from the breeding plots for freezing in two processing plants. Plans are being made to produce a larger supply of seed of 86-3 and 86-4 in 1987. Hybrids 86-1 and 86-2 have good florets but head shape is less compact and these are of less interest to processors.

The 4 hybrids described above, 2 additional OSU hybrids and 6 commercial hybrids were grown in a replicated yield trial in 18" rows, 10" between plants (see Tables 2; 3). In this trial, highest yields were obtained from 86-3, 86-4, 'Citation', 'Packman', and 'Topstar'. 'Packman' and Exp.45B were very early and concentrated in production. Packman was too short and fibrous. 'Citation' had the most damage from soft rot. 'Topstar' was productive and concentrated, but was slightly short and had slightly rough heads. 'Gem' tended to be rough, uneven in maturity and perhaps produced more branched plants than the other varieties. OSU 86-3 and 86-4 looked very favorable in this trial in comparison with commercial hybrids, but 86-1 and 2 suffered considerable losses from soft rot and yielded less.

Summary:

Of a total of 175 experimental F<sub>1</sub> hybrids tested in 1986, 21 were made for the purpose of developing new breeding material, 150 were handmade crosses between sublimes of OSU inbred lines, and 4 were field crosses between the best OSU inbreds. One of these field crosses, 86-3 (S240-5 x HS161-1) and its reciprocal, 86-4, show considerable promise for processing use, having firm, exerted, dome-shaped heads of a size which fits current processing practices. These hybrids compared favorably with higher yielding commercial varieties, such as 'Packman', 'Citation', and 'Topstar' in a replicated yield trial. An additional, larger seed production of 86-3 and 86-4 is planned for 1987 to provide seed for commercial trials in 1988.

Signatures:

Redacted for Privacy

Project Leader

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Department Head

JRB/td

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Table 1. Selected OSU experimental broccoli hybrids, Corvallis, Oregon, 1986<sup>1</sup>.

Code	Parentage		Mat. Date	Score <sup>2</sup>	Head Diam.	Florets	Unif. Type	Unif. Mat.	Ex. <sup>3</sup>	Notes <sup>4</sup>
86-1	S240-2	HS161-3	10-2		10"					G. size, too much SR, SG, 86-1 about 96% hybrids, 86-2 about 88%
86-2	HS161-3	S240-2								
86-14	HS161-1	S240-1	9-22	4.0	6-8"	med. coarse, firm	F	F	G	DB excellent, dome shape, holds very well
86-15	S240-1	HS161-1								
86-16	HS161-1	S240-2	10-3	4.0	8-10"	uniform	F	F	V	DB, mod. SG, SR starting, very similar to 86-1 and 86-2 but less SR
86-17	S240-2	HS161-1								
86-18	HS161-1	S240-5	10-3	4.0			F	P		More SR than 86-1 and 86-2 and not as big. Same crosses as 86-3 and 86-4
86-19	S240-5	HS161-1								
86-13	HS155	S366	9-16	4.0	7-8"	coarse, very uniform	G	G	F	Solid dome, medium yellow color, DB, firm, not SG
86-48	HS161-3	S366	9-22	4.5	9"	med. coarse, even	VG	VG		Perfect shape, broad dome, DB, heavy, firm, tall, and sl. coarse
86-79	HS165	S366	9-12	4-4.5		fine, uniform				Very good, firm, similar to 86-48, small, but held well to 10" with large, useable SG
86-139	S240-10	S366	9-22	4.5	10+"	med., even	VG	VG	G	Slightly flat, DB
86-147	S240-11-5	S366	9-22	4.0	10"		G	G		V. good form, good size, yellow color, SG
86-179	S351B	S366	9-22	4.0	8-10"	med., even			G	Very good form and color, DB umbrella, some not very big
86-189	S359	S366		4.0	9-10"	good, uniform				Big, SG but segments useable
86-191	S361	S366	9-20	4.0	9"	med., even	G	G	F	DB, color slightly light, becoming somewhat SG at 11"
86-195	S364	S366	9-12	4.5	10"	med., even, uniform	G	G	G	Compact, large head, sl. tight, large SG
Gem			9-16	2.0						Tall, flat, SG, many off color

<sup>1</sup> Direct seeded June 30 in 3' rows, thinned to about 16" between plants. Codes 86-1 and 86-2 are field crosses made in 1985. All other hybrids were hand made in the greenhouse.

<sup>2</sup> General score, 1-5 scale, 5 best.

<sup>3</sup> Exsertion refers to protrusion of heads above foliage for easy cutting.

<sup>4</sup> Abbreviations used in notes: SG = segmentation, DB = deep branched, SR = soft rot.

Table 2. Broccoli Yield Trial, Oregon State University, Corvallis, Oregon, 1986<sup>1</sup>

Variety	Source	Av. Stand	Total No. Heads/Acre	Total Tons/Acre	Lbs./Head	No. Harvests	Avg. <sup>2</sup> Tons/Weekly Harvest	Tons Largest Weekly Harvest	Tons Largest <sup>2</sup> Weekly Harvests	% Plants <sup>3</sup> Harvested
85-4	OSU	59.2	19965	6.8	0.68	3	2.3	3.2	6.2	69.6
85-5	OSU	55.5	17545	5.9	0.69	3	2.0	3.2	4.8	65.2
86-1	OSU	50.5	20328	7.5	0.74	3	2.5	5.1	7.1	83.1
86-2	OSU	59.2	20449	7.3	0.72	3	2.4	5.3	6.5	71.3
86-3	OSU	59.5	21780	8.1	0.75	4	2.0	3.7	6.7	75.6
86-4	OSU	60.5	25410	8.2	0.64	4	2.1	3.8	6.7	86.8
Gem	Asgrow	63.5	24684	5.9	0.48	3	2.0	2.9	5.4	80.3
Neptune	Royal Sluis	62.0	25773	7.1	0.55	3	2.4	4.9	6.4	85.8
Citation	Harris-Moran	62.5	25773	8.9	0.69	3	3.0	4.4	7.7	85.1
Exp. 45B	Harris-Moran	63.0	26499	7.3	0.55	2	3.7	4.2	7.3	87.0
Packman	Peto	60.2	26620	8.2	0.61	2	4.1	7.5	8.2	91.4
Topstar	Northrup-King	57.2	22506	8.9	0.79	3	3.0	6.0	8.2	81.3
LSD at 5%			3265	1.4	0.09					

<sup>1</sup> Direct-seeded July 1 in 30' plots, 3' between rows, thinned to 10" between plants; 1000 lbs/A 8-24-8 broadcast at planting time with 100 lbs. N side dressed as ammonium nitrate on August 18.

<sup>2</sup> Packman and Exp. 45B averages are artificially high because first harvest was missed.

<sup>3</sup> This value the result of natural culls, the incidence of soft rot at the particular harvest time, and the presence of late, out of season, heads.

Table 3  
 Pattern of Maturity in Broccoli Hybrids  
 Corvallis, Oregon, 1986

Variety	T/A for Week of:				
	9-8	9-15	9-22	9-29	10-6
85-4			3.2	3.0	0.5
85-5			1.2	3.2	1.6
86-1			0.4	5.1	2.0
86-2			0.8	5.3	1.2
86-3		0.4	3.0	3.7	1.0
86-4		0.5	2.9	3.8	1.0
Gem	2.9	2.5	0.5		
Neptune		4.9	1.5	0.8	
Citation		4.4	3.3	1.1	
Exp45B	4.2	3.1			
Packman	7.5	0.7			
Topstar		6.0	2.2	0.7	