**Report to the Oregon Processed Vegetable Commission**
**1995-1996**

1. Title: Broccoli Breeding

2. Project Leader: J. R. Baggett, Horticulture

3. Project Status: Terminating June 30, 1996

4. Project Funding: $12,000

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 exserted heads, easily accessible for harvest

B. Large, 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. Club root and downy mildew resistance

6. Report of Progress:

A. Emphasis in 1995 was on continued evaluation by direct observation and evaluation of experimental hybrids of our newer inbred lines. Nineteen of these lines were retained after the 1994 field evaluations (15 of these were released to broccoli breeders in 1994, along with nine OSU 240-5 sublines, to facilitate development of commercially usable $F_1$ hybrids with the high exsertion, segmented character considered of promise for processing; the released inbred lines were sent to breeders at Harris-Moran, Ferry Morse, Asgrow, Rogers, Bejo, Sakata, Takii, Shamrock, Peto, Royal Sluis, and Daehnfeldt seed companies).

In 1995, the potential of the new inbred lines was tested by crossing them with several of the OSU 240-5 sublines. The inbreds and hybrid were direct-seeded July 5. Because the crosses and reciprocal crosses obtained by crossing a new inbred with the OSU 240-5 subline were so similar, and because they matured over a short period of time, the group of hybrids from a single new inbred was assigned a single score and description (Table 1). Decisions to save or discard a particular line were based

on these scores and on observations of the inbred line itself. Intercrosses between some of these lines were also made and evaluated. These intercrosses were generally smaller and lower scoring than crosses involving an S240-5 parent.

Selections were made in $F_5$ families from new crosses involving commercial hybrids 'Arcadia', 'Emerald City', and 'Marathon'. These new lines appear to be retaining good size as they are inbred, and are very promising for head and plant type. Because of the use of commercial hybrids as parents, the chance exists for obtaining new incompatibility factors which could facilitate developing usable $F_1$ hybrids. The new selections have been propagated for self-pollination in the greenhouse.

B. Commercial broccoli hybrids were tested in a replicated trial (Tables 2 and 3). Many of these varieties yielded well, but many of them had very poor head exsertion and were difficult to cut, or had poor color. Varieties considered very poorly exserted were 'Packman', 'Excelsior', 'Regal', and 'Pirate'. 'Arcadia' and 'Emerald City' had good dome form and good florets, but 'Arcadia' had yellow rosettes and yellow undercolor and 'Emerald City' had dead florets and soft rot. Outstanding for plant and head type was HMX 1134. This hybrid had tall plants and large, firm exserted dome heads similar to hybrids we have produced from our inbreds. Although they lacked segmentation, they were considered to be promising for commercial use in Oregon.

C. Commercial variety observations are reported in Table 4. In that table, varieties with an overall score of 3.5 or over are considered to be worth including in future trials, but while these scores reflect some outstanding attributes, they do not fully reflect processing potential. The only variety receiving scores of 3.5 in 1995 was HMX 1134.

7. Summary:

Nineteen new inbred lines were evaluated by direct observation and by producing and observing 113 experimental crosses between these lines and OSU 240-5 sublines. These evaluations resulted in retention of 17 of the newer inbreds. Selection continued on a new cycle of inbred lines derived from crosses of OSU lines x 'Arcadia', 'Emerald City', and 'Marathon'. HMX 1134 was considered the outstanding commercial hybrid tested in a replicated trial. Others, while high yielding, usually had poor head exsertion and/or color.

8. Signatures:

Redacted for Privacy

Project Leader: _____

Redacted for Privacy

Department Head: _____

Table 1. **Hybrid performance of crosses between new OSU broccoli breeding lines and OSU 240-5 sublines, Corvallis, 1995.**[z]

| Breeding Line | Score[y] | Size (in.) | Florets | Head Stem Color | Exser-tion[x] | Notes |
|---|---|---|---|---|---|---|
| S370 | 4.0 | 8 | fine | G | G | firm, good segments, deep-branched, fair yield |
| S373 | 3.0 | 5 | fine | G | G | rougher, smaller heads, and later than S370 crosses |
| S384 | 4.0 | 7 | fine | G | G | deep dome, good big segments |
| S387 | 4.0 | 8 | fine | G | G | deep-branched, very good firm segments |
| S388 | 3.5 | 8 | fine | G | VG | tall, deep-branched dome but some rough with too much segmentation, sunken centers and soft rot |
| S389 | 3.75 | 8 | fine | G | G | deep-branched, highly segmented dome, some sunken centers, rosettes and soft rot |
| S391 | 4.0 | 8 | fine | G | G | highly segmented, deep-branched dome |
| S392 | 4.5 | 8 | fine | G | G | very good, firm, well separated segments |
| S394 | 3.0 | 8 | fine | G | G | too rough |
| S396 | 3.75 | 6 | fine | G | VG | very good form and segments but may be too small |
| S398 | 3.75 | 6 | fine | G | G | highly segmented dome but may be too small |
| S399 | 4.0 | 8 | fine | G | VG | tall segmented dome, firm |
| S400 | 4.0 | 7 | fine | G | VG | tall deep-branched dome, some slightly rough |
| S401 | 4.0 | 8 | med. fine | G | G | deep-branched, firm segments |
| S403 | 4.0 | 9 | fine | G | G | good size, highly segmented, some slightly rough |
| S410 | 3.5 | 6 | fine | G | G | segments possibly too small and uneven |
| S411 | 4.0 | 9 | fine | VG | G | good size, firm segments |
| S413 | 3.75 | 7 | fine | VG | VG | deep-branched, good segments |
| S414 | 3.75 | 7 | fine | G | VG | tall, deep-branched, good segments, some slightly rough |

[z]Direct-seeded July 5 in 3' rows, thinned to about 15" between plants. All scores and measurements are based on overall observations of all hybrids made with each breeding line (about 6 hybrids, including reciprocals). All hybrids were hand-made in the greenhouse. The OSU 240-5 sublines served as a common parent.
[y]General 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.
[x]Exsertion refers to protrusion of heads above foliage for easy cutting.

**Table 2. Broccoli yield trial, Corvallis, 1995.[z]**

| Variety | Source[y] | Total No. Heads/A | Total T/A | Lbs/ Head | No. Weeks Harvested | Avg. Tons/ Week | Largest Tons/ Week |
|---|---|---|---|---|---|---|---|
| Pirate | 1 | 16895 | 5.9 | 0.71 | 2 | 3.0 | 4.7 |
| HMX 1134 | 2 | 20383 | 9.3 | 0.92 | 2 | 4.7 | 6.5 |
| Excelsior | 2 | 24416 | 6.5 | 0.53 | 2 | 3.3 | 6.0 |
| Regal | 3 | 18857 | 6.6 | 0.71 | 1 | 6.6 | 6.6 |
| Emerald City | 2 | 24089 | 9.4 | 0.78 | 2 | 4.7 | 6.1 |
| Arcadia | 4 | 24307 | 9.5 | 0.78 | 2 | 4.8 | 5.7 |
| Packman | 1 | 15914 | 5.4 | 0.69 | 1 | 5.4 | 5.4 |
| LSD @ 5% | | 3783 | 1.4 | 0.07 | | | |

[z]Direct-seeded July 7 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 and 100 lbs N side-dressed on August 29.

[y]Sources: 1 = Peto, 2 = Harris-Moran, 3 = Ferry Morse, 4 = Sakata.

**Table 3. Pattern of maturity in broccoli hybrids, Corvallis, 1995.**

| Variety | T/A For Week Of | | | |
|---|---|---|---|---|
| | 9/18 | 9/25 | 10/2 | 10/9 |
| Pirate | | | 4.7 | 1.2 |
| HMX 1134 | | | 6.5 | 2.8 |
| Excelsior | | 6.0 | 0.4 | |
| Regal | 6.6 | | | |
| Emerald City | | 6.1 | 3.3 | |
| Arcadia | | 5.7 | 3.8 | |
| Packman | 5.4 | | | |

Table 4. Commercial broccoli variety observations, Corvallis, 1995.[z]

| Variety | Source[y] | Mat. Date | Score[x] | Head Diam. (in.) | Florets | Head Stem Color | Exser-tion[w] | Notes |
|---|---|---|---|---|---|---|---|---|
| Emerald City | 1 | 9/20 | 2.5 | 10 | medium fine | F | P | yellow undercolor, some bad soft rot, dead florets, heavy heads, good dome shape |
| HMX 1134 | 2 | 9/30 | 3.5 | 10 | medium | F | G | tightly segmented, firm, heavy, big head, rosettes, light color, tall plant |
| Cruiser | 3 | 9/15 | 2.5 | 8 | coarse | F | P | flat heavy heads with large tight segments |
| Arcadia | 1 | 9/20 | 3.0 | 6-8 | fine | F | F | good firm dome, some yellow rosettes and yellow undercolor |
| Patriot | 1 | 9/20 | 3.0 | 11 | medium | F | P | firm, heavy, compact heads, light floret color, poor processing potential |
| Gem | 4 | 9/12 | 2.5 | 5-6 | medium fine | F | G | very rough and uneven |
| Excelsior | 2 | 9/20 | 2.5 | 8 | medium | P | P | tight, compact dome, heavy stem, somewhat soft |
| Barbados | 5 | 9/24 | 3.0 | 10 | medium | P | F | solid heavy head, uneven florets, color varies from blue-green to yellow-green |
| Claudia | 5 | 9/19 | 2.5 | 10 | coarse | P | P | very large, solid umbrella, non-branching plant, uneven florets, soft rot |
| S89020 | 3 | 9/15 | 2.5 | 9 | medium | F | F | very uniform, non-segmented, large compact heads, long pedicels, poor processing potential |
| Hi-Caliber | 2 | 9/12 | 3.0 | 8-9 | coarse | F | G | tall plant, tightly segmented dome, long pedicels, poor processing potential |
| Pinnacle | 2 | 9/20 | 3.0 | 8 | medium | F | G | late branching, tall plant, rosettes, yellow undercolor, large firm dome head |
| PS 21290 | 6 | 9/22 | 2.0 | 8-10 | fine | VP | P | very short, compact, shallow-branched plant, yellow undercolor, soft rot |
| Pirate | 6 | 9/30 | 3.0 | 9 | medium | F | P | uneven florets, some sunken centers, compact plant, late |
| PS 19590 | 6 | 9/20 | 2.0 | 9-10 | fine | P | VP | brownish-yellow florets, dead florets, very short plant |
| PSX 16284 | 6 | 9/21 | 2.0 | 10 | coarse | P | P | short, compact plant, light color |
| Packman | 6 | 9/12 | 2.5 | 10 | medium coarse | P | P | non-branching plant, large, flat, compact head |

[z]Direct-seeded July 5 in 3' rows, thinned to about 15" between plants.

[y]Sources: 1 = Sakata, 2 = Harris-Moran, 3 = Royal Sluis, 4 = Asgrow, 5 = Ferry Morse, 6 = Peto.

[x]General scores, 1-5 scale, 5 = best.

[w]Exsertion refers to protrusion of heads above foliage for easy cutting.