Broccoli Varieties and Spacing Studied

Vegetable Crops Field Day Planned for August 2

A Borga single-row snap bean harvester will be demonstrated at the Vegetable Crops Research Farm on August 2. The field day begins at 1:30 p.m. Major emphasis will be on bush and pole bean breeding and cultural studies, although there will be an opportunity to see work on other crops—sweet corn, broccoli, beets, carrots, peas, onions, and tomatoes.

To reach the Vegetable Research Farm, cross the Van Buren Street bridge going east from Corvallis, then turn left on Smith Lane about one-half mile from the bridge; proceed past the Botany and Plant Pathology Farm, and through the "cut." Parking areas will be designated.

Broccoli continues to be the major cole crop produced for freezing in the North Willamette Valley. The main variety is N.W. Waltham, or strains of it, which is of good quality and quite acceptable to the freezer trade. It does, however, have the characteristic of producing a major portion of the yield as "side shoots." This necessitates as many as five to six harvests for maximum yields and, consequently, means high harvesting costs.

A variety adaptable to this area that would produce a high yield of good quality heads in one or two cuttings would greatly reduce labor costs.

Work was undertaken at the North Willamette Experiment Station in 1964 to evaluate a new broccoli hybrid, Primo, and to compare it with other varieties usually grown in this area.

The varieties included Coastal, FM 4638 (a strain of N.W. Waltham) and the hybrid Primo. Plots were seeded on July 5 and thinned on August 12. Single-row plots were thinned to 18 to 20 inches, and the double-row plots (2 rows, 12 inches apart) were thinned to 12 inches in the row. All plots received the same

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fertilizer sidedressing at time of thinning. Pest control measures were carried out as required and sprinkler irrigation applied as needed.

Harvest began on October 10 and continued thereafter on October 16, October 22, and November 7. At the first harvest, the diameter of heads and stems were measured and recorded along with the weight. In subsequent harvests only the number of heads and total weight were recorded. Yield totals are based on marketable heads with a 5- to 6-inch stem length.

The experimental results are summarized in Table 1. In a comparison of three broccoli varieties, Primo was outstanding in yield, with little difference between Coastal and FM 4638. The main difference between Coastal and FM 4638 was in the distribution of the crop by picking date. In the case of FM 4638, the crop was distributed over 4 weeks, with the sideshoot production continuing after this study was closed. Only 54% of the total crop was harvested in the first two pickings. With the Coastal variety 82% of the crop was harvested during these first two pickings, and with the Primo variety, 72%.

In measuring the effect of plant spacing, the single-row plots had an equivalent of 8,300 plants per acre, while the double-row plots had the equivalent of 25,000 plants per acre. In the double-row planting, with the higher number of plants per acre, FM 4638 produced twice as much tonnage as compared to the single-row plots. For the Primo variety, yields were increased approximately 20% in the closer plant spacing. Of particular interest, however, is the fact that in the closer plant spacings the FM 4638 produced only 36% of its crop in the first two pickings, while the Primo variety produced 94% of its crop in these first two pickings.

Table 2 shows a comparison of head and stem sizes of these varieties, indicating that there is a progressive increase in head size with approximately the same stem size when FM 4638 is compared to Coastal and Primo. In the comparison of plant spacing and its effect on head and stem size, the variety FM 4638 was influenced very little when the number of plants per acre was increased from 8,300 to 25,000. Under the same conditions, Primo decreased head size 30% and stem size 20%, while increasing yield 20%.

The seasonal temperature from the time of seeding until heavy frost on November 18 was below normal, resulting in less rapid growth than normal. The Primo variety showed superior vigor in the seedling stage, but after 3 or 4 weeks there was little visual difference in growth among varieties until near time of heading. Approximately 97 days elapsed from the time of seeding until the first heads were observed in the Primo, followed by those in the Coastal variety and FM 4638.

At maturity the Primo variety attained the largest plant size, followed by FM 4638 and Coastal.

The heads in the FM 4638 and Coastal appeared to be more compact, while in the Primo they tended to be more loose and branching.

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Broccoli Varieties Studied . . . (Continued from page 2)

There did not appear to be any appreciable difference in the varieties as to their susceptibility to insect or disease injury, although the Primo variety showed symptoms of boron deficiency in the form of elongated, whitish lesions on the main stem just below the head.

Work will be continued in 1965.

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Clackamas County Extension Agent

Richard M. Bullock
North Willamette Experiment Station

Table 1. Yield and Harvest Distribution of Broccoli Varieties by Picking Date
(North Willamette Experiment Station, 1964)

<table>
<thead>
<tr>
<th>Spacing and variety</th>
<th>Harvest date</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10/10</td>
<td>10/16</td>
<td>10/22</td>
<td>11/7</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>lbs./A.</td>
<td>%</td>
<td>lbs./A.</td>
<td>%</td>
<td>lbs./A.</td>
<td>%</td>
</tr>
<tr>
<td>SINGLE ROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FM 4638</td>
<td>910</td>
<td>30.8</td>
<td>690</td>
<td>23.2</td>
<td>475</td>
<td>16.0</td>
</tr>
<tr>
<td>Coastal</td>
<td>1,840</td>
<td>64.5</td>
<td>510</td>
<td>18.0</td>
<td>190</td>
<td>6.5</td>
</tr>
<tr>
<td>Primo</td>
<td>4,750</td>
<td>67.0</td>
<td>360</td>
<td>5.2</td>
<td>910</td>
<td>12.8</td>
</tr>
<tr>
<td>DOUBLE ROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FM 4638</td>
<td>1,580</td>
<td>26.3</td>
<td>550</td>
<td>9.5</td>
<td>2,400</td>
<td>40.0</td>
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<tr>
<td>Primo</td>
<td>5,850</td>
<td>68.8</td>
<td>2,175</td>
<td>25.6</td>
<td>475</td>
<td>5.6</td>
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Table 2. Average Head and Stem Diameter of Broccoli, First Harvest
(Diameter in Inches)

<table>
<thead>
<tr>
<th>Spacing</th>
<th>FM 4638 Heads</th>
<th>Stems</th>
<th>H/S</th>
<th>Coastal Heads</th>
<th>Stems</th>
<th>H/S</th>
<th>Primo Heads</th>
<th>Stems</th>
<th>H/S</th>
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<tbody>
<tr>
<td>SINGLE ROW</td>
<td>3.99</td>
<td>1.21</td>
<td>3.89</td>
<td>4.44</td>
<td>1.22</td>
<td>4.33</td>
<td>5.54</td>
<td>1.15</td>
<td>5.45</td>
</tr>
<tr>
<td>DOUBLE ROW</td>
<td>3.23</td>
<td>0.94</td>
<td>3.44</td>
<td></td>
<td></td>
<td></td>
<td>3.89</td>
<td>0.92</td>
<td>4.23</td>
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</tbody>
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Soil Temperature Affects Snap Bean Emergence

The number of days from planting to emergence of bush snap beans varied from about 5 days for late June and early July plantings to 14 days or more for late April plantings in studies at Corvallis. In 1961, OSU 949 was planted on 20 different dates, beginning April 25 and continuing through June 26, while in 1963, OSU 2065 was planted May 14 through July 16.

Data showing these effects of soil temperature on snap bean emergence are presented in Figure 1 on page 5. Also shown are results of a test in the greenhouse in which beans were germinated in cans of soil that were kept at constant temperatures in controlled water bath temperature tanks. Days from planting to emergence ranged from 4.5 at 85°F to 17 days at 55°F. At 50°F in the greenhouse there was no germination or very poor germination and rotting of seeds was prevalent. If emergence of seedlings did occur at 50°F, 25 to 28 days were required.

In Figure 2 (page 6) monthly temperatures, under bare soil at a depth of 4 inches, range from 56°F for April to 79°F for July. These are averages of minimum and maximum temperatures for a five-year period, 1959-63, at the OSU Vegetable Research Farm. April soil temperatures for a longer term average may tend to be lower than those presented here. In 1965 average soil temperatures at 4-inch depth were 53°F for April and 61°F for May.

Further work is being conducted in 1965 to study soil temperatures and emergence, as well as other aspects of the effects of planting dates on the growth and development of bush snap beans.

(Continued page 5)

Vegetable Note...

At Riverside, California, Takatori, Lippert, and Whiting found that petroleum mulch and clear polyethylene films at band widths of 6 inches or more increased soil temperatures during the daylight hours to a depth of 6 inches and retained some soil heat during the night. Increases in soil temperatures when black polyethylene film was used were smaller than those of either petroleum mulch or clear polyethylene film during the day, but the black polyethylene film retained more soil heat during the night. (Proc. Amer. Soc. Hort. Sci., 85:532-540. 1964.)
Soil Temperature Affects Beans . . . (Continued from page 4)

Figure 1. The effect of soil temperature (4-inch depth) on emergence of bush snap beans.

△ 1965 Greenhouse
x 1961 Field
○ 1963 Field

(Continued page 6)
Soil Temperature Affects Beans . . . (Continued from page 5)

Figure 2. Average monthly soil temperature (4-inch depth) for a 5-year period, 1959-1963, Corvallis.

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OSU Beans Screened for Disease Resistance

During the past winter, large numbers of OSU bean-breeding lines derived largely from Blue Lake, Tendercrop, G-50, and other parental materials, were screened for resistance to rust, root rot, yellow mosaic, and halo blight. While no single line was found to carry high resistance to all of these diseases, several lines are resistant to two or three of the pathogens.

The most promising lines have been planted in the bean disease area of the Vegetable Research Farm at an earlier date than usual so the plants will be maturing at the time of our field day on August 2. The gladiolus (host plant for yellow mosaic virus) area has been enlarged and all pole lines, as well as many bush lines, have been planted within this area.

Fusarium root rot inoculum was placed under the seed at the time of planting. By the first week in June, moderate root rot attack was apparent in highly susceptible lines.

It is likely that our reading for rust resistance will be weak this year because of the earlier planting.

We do not plan to inoculate beans with bacterial blight on the research farm because of potential damage to other experiments or to bean-breeding materials of value for other characteristics. Some seed from beans inoculated with the bacterial organism in the greenhouse was planted on the farm, however, and we hope that seeds of these apparently tolerant types are free of the bacterium. After greenhouse screening of many additional OSU breeding lines for resistance to halo blight, it appears that, for rough classification in our breeding work, the lines may be placed in three categories.

(1) "Killer" or highly susceptible class, in which plants are killed when heavily inoculated at the first trifoliate leaf stage of development. The organism continues to grow in the main stem and develops extremely high concentrations of bacteria. Several of our best bush types derived from Blue Lake-Tendercrop crosses, as well as Tendercrop types, fall into this class.

(2) Intermediate class, represented by large numbers of OSU bush and pole lines derived from crosses to Blue Lake—especially back-cross lines. These types, under greenhouse conditions, are capable of isolating the organism in the tissue and will continue to grow and produce a seed crop.

(3) High resistance, with minor attack on tissues, exemplified by a selection of PI 150,414 from Walker, Patel, and Hagedorn, University of Wisconsin.

All pole bean lines are now being planted in the disease area, because this obviously offers the clearest means of adding substantially to improvement of Blue Lake germ plasm. Many bush bean lines which involve the difficult area of combining essential Blue Lake pods with superb plant habits have been planted separately, so that plants of highest promise will not be lost from disease attack. Pollen from these plants is used for crosses on plants in the disease area.

New commercially developed lines on test will include Rogers 206 bush, Asgrow XP 272 bush, Asgrow 7 pole, and certain other less advanced lines from seedsmen and experiment stations.

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OSU Beans Screened . . . (Continued from page 7)

Other OSU bean breeding plantings can be observed at the North Willamette Station, near Aurora, in late July or early August. Several new lines have been planted for single-row mechanical harvester work at the OSU research farm, Corvallis, and should be ready for field day on August 2. A few weeks later, single-row harvester experiments will be under way at the North Willamette Station.

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Vegetable Notes . . .

In Michigan, Van Den Brink and Carolus found that in a tomato field, temperature was lowered as much as 18°F. 12 inches above the soil surface and temperature was lowered 22°F. at the surface of muck soil by midday sprinkling during moderately arid conditions. (Michigan Agr. Expt. Sta. Quart. Bull., 47:358-363. 1965.)

Skapski and Oyer suggested that buttoning of cauliflower is caused by transplanting seedlings in which a curd has been initiated. The primary factor affecting buttoning was not plant size itself but the physiological age of the transplant, which can be conveniently measured by size when growing temperature is considered. Curd initiation takes place only after the plant has passed the juvenile stage which occurs at a stem diameter of approximately 5 millimeters and fresh weight of 5 grams. (Proc. Amer. Soc. Hort. Sci., 85:374-385. 1964.)