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Transplant Size Affects Premature Heading of Broccoli

Vegetable Crops Field Day August 4

The 1964 field day at the OSU Vegetable Research Farm has been set for August 4 at 1:30 p.m. Emphasis will be on snap bean research, but work on other crops, such as beets, sweet corn, onions, and peas, will be viewed. The various phases of research involve breeding, culture, insect control, and weed control.

To reach the Vegetable Research Farm, cross the Van Buren Street Bridge going east from Corvallis, 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.

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In This Issue . . .

Premature heading (bolting or "buttoning") of broccoli can be a serious source of yield loss, particularly in certain varieties. Not all the factors involved are fully understood; for example, while it is generally recognized that excessively hot weather can cause small, loose heads, it has been observed in Oregon that distinctly cool weather and large size of transplants increase bolting. In cauliflower, which is a crop closely related to broccoli, it is known that button heading is associated with high C:N ratios in the plant, stunting of the seedlings before transplanting (situations unfavorable for vegetable growth), and low temperatures (1,2).

In 1963, at Corvallis, an experiment was conducted to determine the magnitude of the effects of transplant size and planting dates on bolting in Coastal and Northwest Waltham varieties. The modified split plot experiment with four replications also involved two rates of nitrogen. On each of three dates, July 15, July 23, and July 30, three sizes of broccoli plants (described in Table 1 footnotes) were transplanted from seedbeds planted at approximate weekly intervals. Nitrogen rates of 80 and 160 pounds per acre were compared. All plots received a basic band application of 625 per acre 8-24-8 before transplanting. The required extra N was applied as side dressing.

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Transplant Size . . . (Continued from page 1)

Heads under two inches in diameter at normal floret maturity were considered to be buttons or bolted heads and were cut and counted as they appeared.

Center heads of usable quality over two inches in diameter were cut and weighed. Side branches were ignored. There were originally 22 plants per plot, but some losses occurred, especially in the case of small plant size. While variation in stand may have affected yield of usable heads, bolting occurred before there was any appreciable competition effect.

Summarized results are shown in Table 1 as percent bolters for each variety, planting date, plant size, replication, and averages for replications and plant sizes. Figures from nitrogen treatments have been combined because differences are not apparent. The data obtained have not as yet been statistically analyzed, pending completion of further work under way in 1964. Treatment differences in percent bolting are large, and it should be recognized in comparing replications that a difference of only one head caused a difference of 4.5% to 6.2%, depending on stand.

Plant size was the most important factor influencing the percentage of bolters, but varietal differences were also outstanding; the overall average bolting percent for Coastal, calculated from the treatment averages of the entire experiment, was 31.7%, while that of Northwest Waltham was only 4.5%.

Later transplanting tended to reduce bolting, particularly in the large and medium sizes.

Differences in yield of usable heads were not outstanding, and were somewhat inconsistent except in the case of plots with very high percent bolting such as the Coastal large plant size where there were very few plants remaining to produce.

Results suggest that the high percent of bolting in the large transplant treatment was caused by a failure of larger plants to recover from transplanting shock and resume a vegetative condition before flowering induction occurred. Large plants were probably relatively close, physiologically, to flower induction before they were removed from the seedbed. Differences normally observed in commercial production of Coastal and Northwest Waltham were greatly magnified by the differences in transplant size in this experiment. Such results illustrate a means of applying selection pressure against the bolting tendency in breeding material. Further experiments, with fewer treatments, but more varieties, are under way in 1964.

References Cited

1. Carew, J., and H. C. Thompson. 1948. A study of certain factors affecting buttoning of cauliflower. Proc. Amer. Soc. Hort. Sci. 51: 406-414.

2. Robbins, R. W. 1928. Premature heading in cauliflower as associated with the nutrient treatment and chemical composition of the plant. Proc. Amer. Soc. Hort. Sci. 25: 359-360.

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Table 1. Effect of Transplant Size[a/] and Planting Date on Bolting in Coastal and Northwest Waltham Broccoli

Planting date	Rep.	Bolting					
		Coastal			Northwest Waltham		
		Small	Medium	Large	Small	Medium	Large
		%	%	%	%	%	%
7-15-63	1	0	20.4	81.8	0	0	14.9
	2	4.6	31.8	84.1	0	0	29.5
	3	4.5	22.7	80.9	0	2.2	22.7
	4	4.7	18.7	81.8	0	0	36.3
	Planting date average	3.4	23.4	82.1	0	0.5	26.1
7-23-63	1	0	11.4	95.4	2.2	2.2	4.5
	2	9.1	15.9	86.3	2.2	0	9.1
	3	4.6	12.1	88.6	0	0	9.1
	4	4.5	18.2	88.0	0	0	6.8
	Planting date average	4.6	14.4	93.0	1.1	0.5	7.3
7-30-63	1	2.5	15.9	52.2	0	0	2.2
	2	5.6	6.8	45.4	0	0	6.8
	3	9.7	15.9	50.0	0	2.2	9.1
	4	2.6	22.7	34.1	0	0	0
	Planting date average	5.1	14.1	45.4	0	0.5	4.5
Average for plant sizes		4.4	17.3	73.5	.4	.5	12.6

a/ Large: 5-6 leaves; stem diameter 6-9 mm. for Coastal, 7-10 mm. for N.W. Waltham; height to extended leaf approximately 38 cm.
Medium: 4-5 leaves; stem diameter 4-6 mm; height about 28 cm.
Small: 3 leaves; stem diameter 3-4 mm; height about 20 cm.

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Vegetable Note . . .

R. M. Davis of the University of California, found that refractometer readings of the leaf sap of muskmelons reflected changes in soil moisture condition, soil salinity, and plant nitrate concentrations. The readings were related to yield, as shown by regression analysis. It was suggested that such measurement could be used as an index of effective soil moisture and other environmental factors. (Proc. Am. Soc. Hort. Sci. 83, 1963.)

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Recent Developments in Slug Control

The subject of slug control in vegetable plantings in western Oregon was discussed in the Digest in 1956 and again in 1958. At that time the effectiveness of metaldehyde preparations was pointed out, but the need for something more dependable under wet weather conditions was emphasized. The molluscicidal action of calcium cyanamide and dinitro herbicides were recognized, particularly when used in the cultural programs normally employed in raising pole beans. As a preventive measure against the buildup of large slug populations, the extensive use of metaldehyde baits was suggested, concentrating especially on the egg-laying slugs present in the early fall just after the first rains, and again in the early spring before large numbers of eggs were laid.

For control of slugs present in vegetable plantings during, or close to, harvest, no good remedy is available. Metaldehyde dusts or sprays can be used on vegetable seedlings, and metaldehyde baits can now be applied to strawberry plantings within seven days of harvest; but the search is still on for a better control material and, hopefully, one which could be used close to harvest in vegetable plantings. Work of the past two years has now produced some promising results.

Laboratory and greenhouse tests have been going on for several years at OSU for the purpose of screening chemicals in the hope that something could be found which would be better than metaldehyde. Established fungicides, herbicides, and insecticides have been explored without finding anything which showed outstanding promise. The dinitro pre-emergence herbicides are fast-acting contact molluscicides, but their use is, of course, restricted to relatively few situations. The insecticide Sevin was reported a few years ago as being effective against slugs. Greenhouse screening trials have shown that this carbamate chemical has some molluscicidal action, but it is definitely inferior to metaldehyde. Zectran, a fairly new carbamate insecticide developed by the Dow Chemical Company and having federal registration for restricted use on certain ornamental plants, has been advertised as being effective against slugs and snails. Repeated trials by the greenhouse testing method have shown that, while this material could indeed be classified as a molluscicide, it does not seem to hold much promise of exceeding metaldehyde in general effectiveness. A safer dinitro insecticide-miticide (designated UC-21427 by the Union Carbide Company) and another carbamate insecticide (Bayer 44646 by the Chemagro Corporation) have given fair results when incorporated into baits in greenhouse trials. They are still being studied; but, again, results do not indicate that they will seriously compete with metaldehyde.

At the present time there is one material, still designated by number (Bayer 37344 by the Chemagro Corporation), which has consistently given results surpassing those of comparable bait formulations of metaldehyde. Recovery by slugs from feeding on baits treated with Bayer 37344 appears to be considerably lower than with metaldehyde. One of the drawbacks of the latter material is the fact that a high percent of recovery can occur, depending on weather conditions and age of the slugs involved. (Cloudy, moist weather following exposure to metaldehyde or ingestion of metaldehyde baits by immature slugs often result in very poor control). Bayer 37344 appears to be just as toxic to the small, common, gray garden slug as to the rapidly spreading European black slug (Arion ater). This also holds true for the brown garden snail, Helix aspersa, common to southern California and now found in at least two localities in Oregon.

Although federal registration is being sought by the manufacturing company for the use of Bayer 37344 in a slug bait, much needs to be done before its role as a possible replacement for metaldehyde can be determined. Field tests are planned to compare its effectiveness with metaldehyde baits in pasture land under the moist conditions of

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Slug Control . . . (Continued from page 4)

coastal Clatsop County. Different bait formulations are being tested to determine whether the addition of apple pomace to the mill-run bran base will lower its attractiveness to slugs. Apple pomace is attractive to snails , but not to most slugs. Control of slugs by spraying crops under attack has not been tested thoroughly, and little is known yet of the possibilities of obtaining official tolerances for the use of 37244 on food crops. In addition to the intensified research on the most promising material, Bayer 37344, studies will be continued on the screening of new chemicals and on the biology and habits of our slugs and snails.

In spite of the promise shown by these new chemicals, slug control should still be viewed as a year-round practice. If, and when, more effective materials are cleared for use, early fall baiting will still be the main line of defense against build-ups of slug populations in crop land.

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Vegetable Notes . . .

Curing and storage practices for winter squash were studied with respect to flavor and chemical composition by Schales and Isenberg of Cornell University. High-temperature curing was not beneficial and was detrimental to both skin color and flavor in the variety Table Queen. Fruits stored at 40° for three weeks developed chilling injury not found in those stored at 50-60°. Taste panels showed little correlation between scores and reducing sugars, total sugars, starch, and refractometer determinations. (Proc. Amer. Soc. Hort. Sci. 83, 1963.)

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Experiments at Parma, Idaho, by Foley, suggest that many vegetable crops, including beans, limas, lettuce, cabbage, watermelons, and cucumbers, are injured by high ultra-violet radiation. Shading experiments with cucumbers indicated that symptoms such as reduced growth and leaf size, as well as necrosis, are due to ultra-violet. Elimination of two thirds of the ultra-violet with polyethylene, while light intensity was reduced only 20%, eliminated leaf symptoms and increased growth, but greater growth was obtained under glass. Foley suggests that damage may consist of (1) direct damage of leaf tissue from high levels of ultra-violet, and (2) limitation of growth through the prevention of auxin formation or through auxin destruction. (Proc. Amer. Soc. Hort. Sci. 83, 1963.)

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1964 Tests of Snap Bean Breeding Lines Reported

Bean plantings of green and wax bush types at the vegetable research farm, Corvallis, were made at approximate two-week intervals from late April to mid-June. It will be possible, therefore, for visitors to observe maturing plants of many of the breeding lines from mid-July to mid-August. It is hoped that a major cross-section will be available for observation on the August 4 field day mentioned in this issue of Oregon Vegetable Digest.

Bush types derived from Romano have not been planted as often as the others. It is anticipated that some of these lines will be maturing by August 4; most of them, however, will be maturing somewhat later.

No new green pod OSU bush lines are being increased this year by seedsmen; increases of 2065 and 949-1864-2 are being continued. Numerous new selections, with better habits, will be seen in the research plots. Quality of pod remains a major question in these lines.

Two new wax bush lines--3340 and 3933--are being increased. These lines are not considered as desirable in growth habit as some types, but pod quality has been improved through insertion of Blue Lake genes. It is not yet clear whether a tendency for slowness to "wax" will be a serious weakness. Since these are initial increases, on the part of seedsmen, seed will be very limited for 1965 processor pilot trials. Several distinctly new wax lines will be available for observation on the field day. In the wax beans, as with green pod types, we have found excellent growth habits to be associated, usually, with undesirably high fibre.

Most accessions of new bush beans from breeders elsewhere were planted the first week in June. They may be slightly immature on the field day, but should be far enough advanced for reasonably good observation. Some were also planted at earlier dates. No major avalanche of advanced new bush beans for trial--with Blue Lake lineage--is appearing this year.

A major planting of bush beans for new selections, as well as about 400 lines or sub-lines of green and wax pod types, has been made at the North Willamette Station, Aurora. It is anticipated that this material will be maturing about August 10 to 15.

In the "disease plot" area on the vegetable research farm, Corvallis, both bush and pole selections will be under test for resistance to yellow mosaic virus, root rot, and rust. All pole bean tests are now being made in this area. Advanced pole lines, in replicated plots, will be well along by August 4; most of these carry no major resistance to diseases. Yellow mosaic resistant material approaching Blue Lake types will be given more detailed observation for yield and quality than heretofore. Much of the rust resistant material was planted in late June or early July, in order to facilitate development of a heavy rust epidemic in September. Along with this material will be new combinations involving combined resistance to rust, root rot, and yellow mosaic.

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