OREGON VEGETABLE Digest

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Topping Reduces Sweet Corn Yields

Horticultural Society to Meet November 20-22

Plan to attend the 78th annual meeting of the Oregon State Horticultural Society, November 20, 21, and 22 on the OSU campus. Sessions on vegetable crops will be held November 21 and 22.

John Carew, Chairman, Horticulture Department, Michigan State University, will give the principal address at the general session Thursday, November 21. His topic will be "Big Horticulture in a Small World." Dr. Carew was named "Vegetable Man of the Year" in 1961 by the Vegetable Growers Association of America.

In This Issue...

Topping reduced yields of Golden Cross Bantam sweet corn in tests at Corvallis during 1960, 1961, and 1962. Amount of yield reduction depended on severity and time of topping.

In recent years, many growers have shown interest in topping sweet corn. Reduction of lodging, ease of moving pipe for late irrigation, and increased ease and efficiency of harvesting have been some of the reasons given for topping.

Although the above reasons were not considered, experiments were conducted to evaluate the effect on yield by three amounts of topping at three different stages of growth. Topping by hand was done at full silk, the time when silks had emerged and were turning buff or light brown, and at one and two weeks after full silk. Amount of topping included a check treatment with no topping and topping so that four, two, and no leaves remained above the top ears. Plots were grown under adequate irrigation and fertilizer levels.

Data in Table 1 show that yield reduction was highest when no leaves were left above the ears; reduction ranged from 12 to 45%. When four leaves remained above the ears, reduction was much less, and in some cases, no reduction in yield occurred. Yield reduction

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Topping Sweet Corn . . . (Continued from page 1)

was related to amount of leaf surface removed, and it can be assumed that topping treatments reduced photosynthetic capacity or efficiency of the plant in food manufacture. This is supported by the observation that more culls and fewer good ears were produced from severe topping treatments. Also, as might be expected, there was a trend toward greater yield reduction when topping was done at full silk, as compared to topping one and two weeks after silk. Yield reduction was greater in 1961 than in the other two years. It is not clear why there was so much variation from year to year in these tests.

It appears that an average of about two leaves remain above the top ear in most commercial fields of sweet corn that have been topped. Results from this study suggest that a potential yield reduction up to about 15% or higher might be expected from topping at full silk or one week later.

Table 1. Effect of Topping on Yield of Husked, Graded Sweet Corn, Corvallis

Time of topping	Amount of topping (No. of leaves remaining above ear)	Yield			Reduction in yield as compared to check		
		1960	1961	1962	1960	1961	1962
		T/A	T/A	T/A	%	%	%
----	Check (no topping)	5.7	5.9	4.5	--	--	--
Full silk	4	---	5.2	4.5	--	10	0
	2	5.6	4.3	4.1	1	28	10
	0	4.9	3.2	3.2	14	45	29
One week after silk	4	---	5.1	4.5	--	13	0
	2	5.4	4.9	4.1	5	17	10
	0	4.8	3.4	3.3	15	42	27
Two weeks after silk	4	---	---	4.4	--	--	4
	2	5.8	4.8	4.3	0	18	5
	0	5.0	4.2	3.2	12	29	29
L. S. D.	5%	0.4	0.5	0.5			
	1%	0.6	0.8	0.7			

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Beet and Snap Bean Herbicide Trials

Chemicals that have shown promise for selective weed control in table beets and bush snap beans were included in trials at Corvallis in 1963.

Beets

At the present time, no completely satisfactory broad spectrum herbicide is available for selective weed control in beets. EPTC and PEBC as preplant soil incorporated herbicides and CDEC as a pre-emergence herbicide were included as the standard materials in this test. The complete list of herbicide treatments, visual ratings of crop response, and weed control and yield data are included in Table 1. Preplant applications were made on June 7th and incorporated into the soil immediately with a rotary tiller. The crop was planted on June 8 with pre-emergence applications following shortly on the same day and the first irrigation was also applied June 8. The postemergence applications were made June 24; beets and weeds at that time were mostly in the cotyledonary stage of growth. Principal weed species present in this experiment were red root pigweed (*Amaranthus retroflexus*), lambsquarters (*Chenopodium album*), and mustard (*Brassica rapa*).

Table 1. Results of Table Beet Weed Control Experiment

No.	Herbicide	Rate	Visual ratings July 11 1/ Crop response	Weed control	Yields Under 2 ½ in. diameter	Total
		lbs ai/A*			lbs/plot	lbs/plot
1	EPTC	2	0	7	8.7	14.5
2	EPTC	4	4	8	5.4	12.2
3	PEBC	2	0	8	11.8	18.7
4	PEBC	4	0	7	7.6	16.1
5	HS-119 2/	3	0	7	10.8	19.2
6	HS-119	2	0	4	8.8	14.6
7	HS-119	3	0	5	8.9	16.1
8	HS-119	4	0	6	10.3	15.8
9	CP32179 3/	2	0	7	10.6	20.0
10	CP32179	4	3	8	6.9	16.9
11	CP32179	6	4	9	8.1	17.6
12	DP 634 4/	1	0	4	10.2	16.5
13	DP 634	2	0	6	10.0	17.0
14	CDEC	6	1	7	7.5	13.7
15	HS-119-1 2/	2	1	5	8.5	13.2
16	HS-119-1	3	2	6	8.2	17.1
17	HS-119-1	4	3	8	6.6	18.2
18	Untreated check		0	1	8.1	12.7

1/ Ratings of 0-10 with 0 = no effect, 10 = complete kill of crop or weeds.
2/ Experimental compounds supplied by BASF.
3/ Experimental compound supplied by Monsanto Chemical Co.
4/ Experimental compound supplied by DuPont Co.
Preplant applications No. 1-4 deep soil incorporation, No. 5 shallow soil incorporation. Pre-emergence applications No. 6-14. Postemergence applications No. 15-17.
* Pounds active ingredient per acre.

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Herbicide Trials . . . (Continued from page 3)

There was considerable variation in the development of the crop in this experiment. The variance associated with replications was high, but there was also evidence of considerable variation within replications, leading to a low degree of precision for measuring treatment differences.

Early visual ratings of crop response were reflected in reduction of yield of small size beets, but these responses did not result in significant reductions in total yield. Often, early stand thinning does not affect total yield, but the higher proportion of large size beets reduces the grade of the crop. In the small sized beets, none of the plot yields were significantly lower than the untreated check, and none were significantly higher than the untreated check; however, the lowest yielding plots were significantly lower than the highest yielding plots. These effects were greatest with the high rate of EPTC, the high rate of postemergence application of HS-119-1, and the higher rates of CP32179. Weed control was quite good with a number of the herbicide treatments in addition to the standard materials. Acceptable selective control was obtained with the lower application rates of CP32179 and the preplant and postemergence applications of HS-119.

Bush snap beans

The bean weed control trial was planted on June 3. Pre-emergence applications were made on June 5 and the planting was irrigated on the same day. Postemergence applications were made as the beans were in the crook stage of development on June 14. A detailed list of chemical treatments is given in Table 2.

Table 2. Results of Bush Snap Bean Weed Control Experiment

No.	Herbicide	Rate	Visual ratings July 1		Yield
			Crop response	Weed control	
		lbs ai/A			lbs/plot
1	DNBP amine (spray)	3	1	7	17.6
2	DNBP amine (spray)	6	0	8	17.1
3	DNBP amine (granular)	3	0	7	16.8
4	DNBP amine (granular)	6	0	8	17.5
5	PCP Na	6	0	6	17.4
6	PCP Na	9	1	8	16.5
7	PCP amine	6	0	6	17.2
8	PCP amine	9	0	7	17.7
9	amiben (spray)	2	0	8	16.5
10	amiben (spray)	4	1	9	17.8
11	amiben (granular)	2	0	8	17.0
12	amiben (granular)	4	0	9	18.2
13	trifluralin	4	1	7	18.2
14	trifluralin	6	1	8	16.6
15	trifluralin	2	1	8	16.3
16	trifluralin	4	4	9	11.5
17	prometryne	3	1	7	16.8
18	DCPA	9	0	5	17.0
19	DNBP amine (spray)	2.25	3	8	17.7
20	DNBP amine (granular)	2.25	1	6	17.4
21	PCP Na	4	3	7	16.4
22	PCP amine	4	3	8	17.5
23	Untreated check	-	0	3	16.6

Pre-emergence applications No. 1-14, 17-18 surface applied,
No. 15-16 shallow soil incorporation.
Postemergence applications No. 19-22.

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Herbicide Trials . . . (Continued from page 4)

Some minor leaf burning occurred with the postemergence spray applications, but the only herbicide treatment that seriously injured the bean plants and resulted in a significant reduction in yield was the 4 pound-per-acre rate of trifluralin incorporated into the soil after planting. Most herbicide applications resulted in acceptable control of the weed species in these plots. The primary weed species present were redroot pigweed and lambsquarters. Applications resulting in the least satisfactory control were DCPA and the two formulations of PCP applied pre-emergence and the post-emergence application of the granular formulation of DNBP amine.

Results of this test indicate that the 9 pound ai/A rate of PCP, as presently recommended, approaches the minimum effective rate for weed control. Also, there appeared to be no distinct benefit from changing from the sodium to the amine salt formulation of PCP. Potential values of amiben and trifluralin as selective herbicides for beans are reaffirmed in this test, and some recommendations for the use of these compounds will be made when USDA registration is completed. However, the potential injury problem with trifluralin should be noted, and further research should be conducted with this herbicide for selective weed control in beans.

A number of the herbicide treatments in the 1963 weed control trial for beans were also included in a similar trial in 1962. Of these, there was a significant yield reduction with applications of the granular formulation of DNBP amine. This response was not repeated in the 1963 test, and this suggests that the 1962 injury was associated with uneven distribution of the granular herbicide. A new granular applicator used in 1963 resulted in more accurate distribution of the chemicals within the plot areas. These results also emphasize the importance of proper distribution of granular herbicides when applied on a commercial scale.

-- Garvin Crabtree
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Vegetable Note . . .

D. T. Tompkins of the Puyallup, Washington, Experiment Station reported to the American Society for Horticultural Science on chilling requirements for forcing rhubarb.

In forcing rhubarb during late fall and early winter, crown dormancy is a serious problem since crowns yield poorly when forced before receiving sufficient chilling to completely break dormancy. Accumulated cold degree units from a 49° F. base line at a 4 inch soil depth were used to determine crown chilling requirements in 1962. Results indicate that varieties vary in their chilling needs and hothouse rhubarb yields may be predicted. Gibberellic acid (GA) was also used to break dormancy. In late October 1962, crowns not receiving any cold degree units were dug, placed in the hothouse, and some treated with GA. Treated crowns produced well, whereas untreated crowns did not produce any marketable stalks. Additional experiments with roots receiving insufficient chilling showed that GA would substitute for cold weather in breaking dormancy.

A Review . . .

Current Vegetable Crops Breeding Research

Papers presented at the annual meetings of the American Society for Horticultural Science often represent a good cross-section of horticultural research in the United States. Some of the sessions are crop-oriented, permitting one to listen to papers on crops of special interest in his area.

The following brief notes, of interest in Oregon, were taken at the August 1963, meeting in Amherst, Massachusetts.

Carrots

Younkin (Campbell Soup), in a general paper on raw product processing needs, pointed out the widespread interest in improving the color of carrots. Improved carrots will soon be available for trial from Campbell Soup Company. These will not be F_1 hybrids. He stated that various defects -- not shape -- were the source of major losses in carrots.

Peterson (Michigan) reported on use of male sterility in carrot production, and indicated that male sterile line 874 has been released to the seed trade for further developmental work with hybrids. Outstanding breeding work with carrots is also under way in Wisconsin, the USDA, Idaho, other states, and by various seedsmen. In a few years, partial to excellent solutions are likely to be found for such problems as color, hollow heart, green shoulders, uniformity of size and shape, cracking, and uniformity of taste. It is difficult at this time to predict how widespread the adaptation of these new types will become. Most of the available test materials are now being grown, or will be grown in the immediate future, in Oregon. Peterson also reported that the meadow mole showed distinct preference for certain carrot lines, and that the creature "might be used as a means of screening for palatability or nutritive value in carrots."

Beets

Gabelman (Wisconsin) detailed beet improvement in that state. Improvements in color, "monogerm" (single seed, rather than "seed-ball" types commonly grown), tolerance to low boron in soils, and uniformity as well as high yield are the goals. He stated that "at the present time, inbreeding table beets and the subsequent development of F_1 hybrids are practical." It is likely to be some years, however, before excellent garden beet F_1 hybrids are generally available. We are not aware of breeding work elsewhere designed to develop resistance in table beets to certain damping-off organisms.

Snap beans

Relatively few papers were given on snap beans. Wallace (New York) reported on transgressive (better than either parent) resistance to fusarium root rot. This material, as has been the case with other bean lines from Cornell, may be of distinct long-time value in bean improvement.

Coyne (Nebraska) reported on screening tests of beans for resistance to common (bacterial) blight. He reported good tolerance in a few varieties and species; almost all were late maturing types. He is hybridizing with commercial beans. This disease -- and the closely related halo blight -- can be seedborne, and should be watched carefully by the bean industry. They have not been of major importance in Oregon.

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Vegetable Crops Research . . . (Continued from page 6)

Mecklenburg and Tukey (New York) showed that inorganic compounds (metabolites) are leached from bean foliage by rain and mist. "Leached nutrients are replaced by root absorption and translocation."

Incidentally, field men and others interested in bean improvement in the Northwest should keep in mind the January 9, 1964, meeting of bean breeders from throughout the country. It will be held in Seattle, immediately after the Northwest Canners and Freezers Association meeting.

Peas

Of particular interest, because of the bold, imaginative approach involved, was a paper given by Markariam (Michigan State) on Inheritance of Winter Hardiness in Pisum. He crossed Early Perfection garden pea with the winter hardy field pea, Austrian Winter. A bulked F_3 population was subjected to " -11° F. with $1\frac{1}{2}$ inches of snow. A large number of segregates with commercial type seed were recovered." Only about 1 in 20,000 of the thick-stemmed, determinate type was recovered, however. He concluded that "selected segregates to date indicate a winter hardy pea could provide an early crop with higher yield, lower seeding rates due to the tillering habit, more efficient use of moisture in areas of low rainfall, and absence of insect and pathogenic problems." Additional years of work will be required, since recovery of good commercial type peas will require backcrossing (additional crossing) to commercial types.

Tomatoes

As usual, the tomato was given far more attention than any other vegetable crop. Only a few items will be mentioned here. Active work is underway to develop tomatoes with higher acidity; deeper red color; concentration of maturity for mechanical harvest (after a few more years most tomatoes, according to many researchers, will be harvested mechanically); solidity to withstand rough handling; crack resistance; resistance to the mosaic virus, verticillium, fusarium, and many other diseases; germination at low temperatures to facilitate production from direct seeding (also predicted as a widespread practice in the future); and excellent fruit set at either high or low temperatures. "Internal browning" and/or blotchy ripening are receiving an unusual amount of attention.

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The Spotted Cucumber Beetle . . .

Larvae Attacking Sweet Corn Roots

The spotted cucumber beetle, Diabrotica undecimpunctata undecimpunctata (Mann.), is a common pest of many crops and home gardens in the Willamette Valley. The yellow-green black spotted beetles often require control measures on green beans and less frequently on cole or other vegetable crops. Although they feed heavily on squash male blossoms, their control on cucurbit crops in general is not necessary. Sweet corn, however, may be damaged in two different ways. The beetles have been known to feed so heavily on emerging silk as to interfere with fertilization of the kernels and cause irregularly filled ears. A more serious type of damage is that inflicted by the larvae on sweet corn roots.

The life history of this insect is as follows: Winter is spent in sheltered locations (such as bunch grass, fence rows, bush piles, etc.) as a fertilized female. The males are largely destroyed during the first freezing weather of the winter. The females may be seen during warm periods of the winter, but usually do not become active until late March. Egg laying starts early and may continue into June. Cracks in the soil are favored sites for deposition of the yellow, oval eggs and for this reason overflow land, cracked by surface drying, is often the most heavily infested. The straw-colored larvae feed on roots of many plants, or they may enter fruits and leaves lying on the surface of moist soil. The presence of a dark brown plate at the posterior end of the body gives the impression that the larvae are two-headed.

Pupation takes place in the soil and the new generation of beetles starts to emerge in late June. Before the extensive use of irrigation in the Willamette Valley, a single generation per year was the rule. Now a strong second generation occurs during the summer, and a partial third generation may occur under favorable conditions. Mating takes place during the summer and fall until cold weather decimates the male population.

The principal damage to sweet corn is caused by second generation larvae feeding on the brace roots. The tips of the developing brace roots are attacked just below the soil line and further development is stopped. Without sufficient brace roots, corn is subject to lodging, particularly following an irrigation. This situation can result in economic loss in commercial fields where mechanical pickers are used. Severe root damage can stunt the plants and reduce yield.

Studies at the Oregon Agricultural Experiment Station in the late 1940's and early '50's disclosed that broadcast soil treatments of the then new insecticides aldrin, heptachlor, and dieldrin, applied and disced in before planting, would give excellent control of diabrotica larvae. Another method of application for aldrin tested at this time consisted of spraying the diluted emulsion onto the prepared soil just ahead of the planter shoe. The insecticide was mixed with the soil by the action of the shoe, side sweeps, and packer wheel. This method was equally as effective as the preplanting broadcast method and used only 1/2 pound of actual toxicant per planted acre, but it necessitated the installation of a spray rig on the planter. Additional studies followed to determine the rate of application needed, effects on flavor and yield, methods of application, and the possibility of toxic residues being present in the corn at harvest time. Recommendations were released for broadcast treatments of aldrin and heptachlor at the rate of 2 pounds actual toxicant per acre and Circular of Information 540, explaining the recommendations, was issued in 1954. It is now out of print.

In the meantime growers were requesting a "stop gap" treatment which could be applied to kill larvae working on the roots of established, untreated sweet corn. The only practical way to get an insecticide into contact with the larvae was through the sprinkler irrigation

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Larvae Attacking . . . (Continued from page 8)

system. Field trials with growers showed that toxaphene, at 3 pounds actual toxicant per acre, gave a satisfactory reduction of the larval population, and was more effective than DDT used in this manner. Both materials were relatively inexpensive compared to aldrin or heptachlor.

In the years following the development of these control measures, a number of changes occurred in the pesticide picture which merit discussion at this time. The use of corn husks and stalks in feeding cattle is an important side line in the production of sweet corn. This practice precludes the use of residual pesticides, such as DDT or toxaphene, on corn plants after the seedling stage. More recently the registration for aldrin and heptachlor soil treatments in land to be planted to potatoes and carrots has been rescinded due to the appearance of residues in excess of tolerance in these root and tuber crops.

These developments leave the recommendation for soil treatments of aldrin and heptachlor at 2 pounds actual toxicant per acre for protection of sweet corn in a precarious position. Land treated this year for corn may well be used next year, or the year after, for root crops. It would be well for contract growers to consult with their processor field men before continuing this practice. Soil plots treated once at the 2-pound rate have been found to retain enough toxicant to give satisfactory diabrotica larval control over a 4-year period.

If you grew corn this year and had losses from diabrotica larvae, or if you plan to grow corn next year in land you know has never been treated with an effective soil insecticide, what should you do? Although the broadcast treatment of the soil with aldrin or heptachlor at the rate of 2 pounds actual toxicant per acre is still legal, this practice does not seem wise under the circumstances. One suggestion is to use aldrin, heptachlor, or dieldrin, but at a lower rate. This means confining application to a band in which the corn is planted. The method described above, in which aldrin was sprayed in front of the planter shoe, is effective and uses only 1/2 pound of toxicant per planted acre.

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