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Three New Tomato Varieties Released

Zinc Deficiency Observed in Sweet Corn

Field plot experiments in 1963 have identified a zinc deficiency in sweet corn in the Stayton area. This research confirmed previous observations.

Experiments on bush beans at the Red Soils Experiment Station, the North Willamette Experiment Station, and on poorly drained Dayton soil near Lebanon failed to show a response to zinc application.

Farmers in the Stayton area are encouraged to try zinc applications on problem soils and where uneven maturity of sweet corn has been a problem. Rates of 2 to 3 pounds of zinc can be included with banded fertilizer, or 10 pounds actual zinc in broadcast applications can be used, and should last more than two years. The deficiency can be recognized in corn as papery thin, white stripes on leaves which have greener outer edges. These stripes do not occur in nitrogen- or sulfur-deficient plants.

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In This Issue . . .

The Oregon Agricultural Experiment Station has released three tomatoes adapted especially to the Willamette Valley and Medford areas. Two of the varieties--Willamette and Medford--have been under development, through hybridization and selection, since 1951. The third--Large German Cherry--was selected from material of German origin.

The Medford and Willamette varieties have been selected in the relatively cool summer climate of western Oregon, and are considered second-early in maturity. They have relatively good fruit setting ability, good fruit quality, good concentration of maturity, moderate resistance to fruit cracking, and are satisfactory for home and market gardeners. Because they are determinate (self pruning) in type, they should not be pruned heavily. They should respond well to relatively heavy applications of fertilizer and water when compared to the usual indeterminate types.

The three new varieties are not resistant to the destructive curly top virus of eastern Oregon, nor have they been screened for resistance to other diseases. They are not early enough for adaptation to the cool coastal strip of western Oregon.

Interest in these lines, because of their fruit refinement (smoothness, small stem and blossom end scars), has been shown in other northern states where growing seasons permit production of "second

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New Tomato Varieties . . . (Continued from page 1)

early" tomatoes. Their maturity, for example, is intermediate between Stokesdale and Victor.

Descriptions of the releases follow:

Willamette (Formerly O.S.U. 435-4): Vine determinate; medium small frame; medium sprawling; foliage cover medium to good under high fertility; fruit medium large, unusually smooth; uniform color gene; globe to deep globe with some tendency to nippling; small stem and blossom scars; medium to good firmness; solidity, flavor, interior color good; resistance to radial cracking good; resistance to concentric cracking fair to good. Developed from (Campbell Soup Line 10 X Pennheart) F_2 X Queens.

Medford (Formerly O.S.U. 395): Vine determinate; medium vigor; more upright than Willamette; foliage cover good under high fertility; fruit medium to large, maintaining size well throughout season; variable for smoothness; uniform color gene; globe to slightly flattened; medium to large size; medium large stem end and blossom end scars; medium firm; internal color, flavor, good; maturity slightly later than Willamette; yield generally lower than Willamette, but especially well liked in Medford area of southern Oregon because of maintenance of fruit size and foliage cover. Developed from Campbell Soup Line 10 X Pennheart.

Large German Cherry: Vine indeterminate; vigor medium to good; habit somewhat sprawling; foliage cover medium to good; fruit a large cherry, up to 2 inches in diameter but generally 1 to 1 1/2 inches; normal green immature fruit color, smooth, few locular; rather soft, prolific, sweet, pleasing taste to some gardeners; good resistance to cracking. Developed from Kondine Red X wild species *Lycopersicon pimpinellifolium*; original cross made in Germany by Dr. Baur.

Small packets of seed of each of the three new varieties have been made available to interested seedsmen. The seeds have been massed from plots closely adjacent to each other; some field crossing may be anticipated and roguing of off-type plants should be practiced.

Since 1955, tests of these tomato breeding lines have been carried out in cooperation with Extension Horticulture Specialist Ralph Clark, and many county agents in all areas of the state who have worked with hundreds of gardeners in evaluation of tomato breeding lines and varieties. At the Southern Oregon Experiment Station, Medford, Oregon, John Yungen, in association with Harold White, tested the lines for several years, and found that 395 performed especially well, along with 435-4. As a result of their work line 395 has been named Medford.

--W. A. Frazier
Department of Horticulture

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Zinc Deficiency . . . (Continued from page 1)

It should be stressed that preventative zinc applications should not be made except where the deficiency has been proved to exist--at present only in the Stayton area. Further extensive experimental work is planned for 1964 and will be reported later.

--T. L. Jackson
Soils Department

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Weed Control in Direct-Seeded Broccoli

Most growers do not consider weed control as a difficult problem in broccoli production from transplants. There is interest in the production of this crop from direct field seeding, and with this type of culture the control of weeds becomes a major problem. Herbicides that appear to have promise for the selective control of weeds in this crop have been tested for the past few years at Corvallis.

From a 1962 experiment in which a large number of herbicides were tested for effectiveness in controlling weeds and for potential selective use in broccoli, DCPA and trifluralin were chosen for more extensive study. Since the activity of trifluralin appears to be considerably enhanced by incorporation into the soil, a test was conducted in the greenhouse to study the effect of this material and interactions with water movement.

Greenhouse Test with Trifluralin

Broccoli was seeded on January 2, 1963, into a greenhouse soil mixture of loam and peat moss in plastic pans with drainage. These were placed in metal pans to facilitate sub-irrigating. The various herbicide and watering treatments are outlined in Table 1.

Early visual response ratings appeared to be more sensitive to herbicide effects than the measured fresh weights of the broccoli plants when harvested about three months after planting. Visual ratings indicated that the degree of injury increased with rate and that applications incorporated into the top one inch of soil resulted in the most injury. Trifluralin incorporated into the second inch of soil resulted in less injury than surface applications. The mode of watering did not appear to greatly influence the activity of the surface applications.

In the analysis of the yields of fresh weights of the broccoli plants, the only significant effect was the weight reduction of plants treated with 8 pounds active ingredient per acre incorporated into the top one inch of soil. The apparent responses exhibited by plants subjected to sub-lethal concentrations of trifluralin were a lack of growth and some malformation of leaf tissues.

Field Test of Weed Control in Broccoli

Broccoli (variety Northwest Waltham) was seeded in the field on July 1, 1963, following preplant applications of herbicides on June 27. All preplant applications had been incorporated into the soil with a rotary tiller to a depth of one inch (shallow) or three inches (deep). Preemergence applications of herbicides were made on July 1 following planting, and the planting was irrigated the following day. Each plot, which consisted of a single row 15 feet long, was thinned to 15 plants except where fewer than that number existed at the time of thinning. Herbicide treatments and the results of the test are presented in Table 2.

Although the number of seeds planted per plot was not controlled, most plots showed a considerable excess of plants and those plots having fewer than 15 surviving plants were well correlated with visual ratings of crop injury and lower yields. This would indicate that stand thinning may result from the use of some of these herbicide treatments which would make them undesirable for use on precision planted, direct seeded broccoli.

There was a large amount of variability in the maturity and yield of broccoli harvested from these plots. Total yields, analyzed on a plot basis or corrected for plant population, were not significantly different. Since it appeared that there was a delay in maturity of plants in plots with the most crop injury, the first three harvest dates were arbitrarily chosen to represent early harvest and an analysis of variance was calculated for these

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Weed Control in Broccoli . . . (Continued from page 3)

yields. The analysis showed significant differences in yields between the highest and lowest yielding plots, with the untreated plot yield intermediate. In general, plots with the lowest yields were those treated with EPTC, which had been included for a comparison with R-2063, and the 2-pound rate of trifluralin incorporated into the soil.

From these studies it appears that a number of herbicide programs may prove to be of value for selective control of weeds in direct-seeded broccoli. The use of combinations of materials, such as DCPA and CDEC, can give control of a wider range of weed species than higher rates of the herbicides used alone.

The soil-incorporated applications of trifluralin resulted in more crop injury in the 1963 field test than in the 1962 test. In 1963 a rotary tiller was used that gave a more efficient incorporation than the tiller in 1962, which may explain, in part, this difference in response. From this, and the placement effects observed in the greenhouse study, it may be concluded that the type of incorporation of trifluralin is quite critical in relation to its use as a selective material on seeded broccoli.

--Garvin Crabtree
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Vegetable Notes . . .

Tightness and length of husks of sweet corn ears have long been considered as factors giving protection against corn ear worm infestation. Del Valle and Miller of Louisiana State University (Proc. Amer. Soc. Hort. Sci., 83) examined 5,200 sweet corn ears in two years' work at two locations. They found that these characters, studied in seven hybrids, were occasionally associated with reduced ear worm damage, but not consistently. They concluded that tight, long husks were only accidentally associated with other resistance factors such as possible lethal or volatile repellent compounds in the silks.

Three hybrids, Calumet, Huron, and Goldenyield, were consistently more resistant than four others grown.

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Recent studies by D. C. MacLean, et al. in Michigan as reported in Proc. Amer. Soc. Hort. Sci., 83, have shown that N^6 Benzyladenine causes a reduction in respiration in harvested broccoli heads. This material has the property of prolonging the retention of green color and fresh appearance of broccoli heads and other vegetable products, and has been termed an "anti-senescence" agent. The Michigan work suggests that N^6 Benzyladenine prolongs storage life through the suppression of respiration.

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Three methods of precooling were compared for effect on quality and shelf life of Brussels sprouts by Steward and Barger of the United States Department of Agriculture, Fresno, California (Proc. Amer. Soc. Hort. Sci., 83). After a simulated transit period of eight days at 34°, followed by a simulated retail period of two days at 70°, observation showed that vacuum cooling caused no injury but increased wilting and therefore reduced salability. Wet vacuum cooling caused less wilting but was similar in cooling effectiveness. Hydrocooled sprouts lost less moisture, wilted less, and rated highest in salability. There were no differences in color, spotting, or decay from the three methods.

Weed Control in Broccoli . . . (Continued from page 4)

Table 1. Greenhouse Test with Trifluralin

Chemical	Application rate	Type of application	Watering practice[1]	Emergence	Crop response rating[2]	Yield (Fresh weight)
	lbs. ai/A					Gms.
Trifluralin	2	Surface	A	Normal	3	55
Trifluralin	2	Surface	B	Normal	2	83
Trifluralin	2	Incorp. in top inch	C	Slight delay	4	78
Trifluralin	2	Incorp. in second inch	C	Normal	1	62
Trifluralin	4	Surface	A	Normal	5	61
Trifluralin	4	Surface	B	Normal	5	66
Trifluralin	4	Incorp. in top inch	C	Severe delay	7	52
Trifluralin	4	Incorp. in second inch	C	Slight delay	2	62
Trifluralin	8	Surface	A	Normal	6	53
Trifluralin	8	Surface	B	Normal	5	54
Trifluralin	8	Incorp. in top inch	C	Severe delay	9	7
Trifluralin	8	Incorp. in second inch	C	Slight delay	5	86
Untreated check	-	-	A	Normal	1	59
Untreated check	-	-	B	Normal	1	65
Untreated check	-	-	C	Normal	1	82

1/ Watering practices: A -- Soil wet before herbicide application and thereafter watered only from below.
B -- Watered with 1/2 inch on Jan. 3 and Jan. 4, thereafter watered from above as needed.
C -- Watered from above as needed.

2/ Crop response rating: O = No effect, 10 = plants dead; average of ratings made Jan. 28 and Feb. 11.

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Weed Control in Broccoli . . . (Continued from page 5)

Table 2. Field Test of Weed Control in Broccoli

Chemical	Application rate	Type of application	Weed control rating 1/	Broccoli plants surviving in 4 plots	Early yield (first 3 harvests)	Total yield (5 harvests)
					Kgms.	Kgms.
EPTC	2	Soil incorp. -deep	5	54	0.40	1.38
R-2063	2	Soil incorp. -deep	4	59	0.81	1.64
R-2063	4	Soil incorp. -deep	5	60	0.82	1.68
Trifluralin	1/2	Soil incorp. -deep	7	60	0.95	1.68
Trifluralin	1/2	Soil incorp. -shallow	8	58	1.11	2.03
Trifluralin	1	Soil incorp. -deep	8	58	0.89	1.79
Trifluralin	1	Soil incorp. -shallow	9	57	0.72	1.75
Trifluralin	1	Preemergence	6	60	1.33	2.42
Trifluralin	2	Soil incorp. -deep	9	50	0.71	1.28
Trifluralin	2	Soil incorp. -shallow	9	52	0.54	1.61
Trifluralin	2	Preemergence	9	58	1.11	1.94
Trifluralin	4	Preemergence	9	55	0.58	1.53
DCPA	6	Soil incorp. -shallow	7	60	1.39	2.37
DCPA	6	Preemergence	6	55	1.41	2.18
DCPA	9	Soil incorp. -shallow	7	59	0.52	1.69
DCPA	9	Preemergence	6	60	1.39	2.46
DCPA + CDEC	6 + 4	Preemergence	9	60	0.90	1.93
Untreated check	-	--	2	60	1.14	2.08

1/ Weed control rating: 0 = No effect, 10 = complete kill; ratings made August 2, 1963.
Predominant weed species present: redroot pigweed, common lambsquarters, mustard (Brassica rapa L.), and common chickweed.

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Mutants in Snap Bush Beans

Plant breeders have encountered difficulties in transfer of high pod quality of pole beans to bush beans of excellent habit. The most common, and often the most efficient method is that of hybridization, followed by selection of individuals having new combinations of hereditary units. These new, desired combinations may permit the organism--in this case the snap bean--to fit the exacting demands of our processing industry. Another approach is that of induction of mutations--changes of permanent nature which do not involve hybridization.

In our breeding program we found it possible to transfer an essential Blue Lake pod, via repeated crosses (backcrosses) to Blue Lake pole, to a determinate (bush) bean. However, the sprawliness, leafiness, and general growth habit of these new beans has led to serious problems in cleaning the machine-harvested beans. These problems include the removal of leaves, stems, and petioles, as well as declustering. Mechanical harvesters are relatively efficient in actual removal of pods from plants, so that the "bottleneck" is unquestionably one of subsequent removal of debris. We have hybridized these new types with varieties of much better growth habit, with upright, stiff small leaves and concentrated set. Hundreds of selections are under study (including numerous crosses between the new selections) which approach Blue Lake in pod quality. Careful evaluations of quality must still be carried out for all of these selections, however, and the exact duplication of the Blue Lake pod within them remains to be shown. A short cut has been attempted with OSU beans of excellent pod quality but lacking desirable growth habit, either by radiating or by exposing them to a chemical mutagen. It was hoped that improved habits could thus be obtained, but no such desired changes have been found. Three distinct mutants involving leaf size, leaf color, and an apparent specific reaction to sunlight have occurred. Whether any of the mutations will be of applied value remains to be seen. We will describe them here and discuss their possible implications. It has become obvious in the greenhouse this winter that these are true mutants.

1. "Small leaf." This mutant has distinctly smaller leaves than the Blue Lake-backcross-derived bush parent. The green color of the leaves is also slightly different. Pods are smaller, but otherwise distinctly near Blue Lake in appearance. Plants are relatively small and their general habit closely resembles the parent. Pod set is good. The small leaf and small plant frame are desirable; the small pod may have little value. The question is: can the small leaves and small plant character be combined with normal pod size? Crosses are underway to explore the possibilities. The progeny should also permit determination of the mode of inheritance of the mutation.

2. "Dark green." This mutant is characterized by extremely dark green foliage--darker than any snap bean varieties or breeding lines yet observed. Pods, although smaller, closely resemble normal Blue Lake. Pod set, however, is sparse. The dark green leaves are savoyed (crinkled) and leaf edges are slightly curled. Plants are less vigorous than normal. If this characteristic is detrimental to pod set, practical value would obviously be questionable. The plant is slightly stiffer than Blue-Lake-derived-bush types, but overall habit does not appear promising.

3. "Silver." The term "silver" is given this mutant because the leaves become silver in color when exposed to bright sunlight. In bright, direct sun the effect is so marked that plants remain very small and some may die. Chlorophyll and photosynthesis are obviously reduced to extremely low levels. In the greenhouse in winter, this character is barely expressed, and plants have been more productive. A less severe expression of the character has long been noted in various breeding lines, especially those involving species hybridization.

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Bean Mutants . . .(Continued from page 7)

Nature of the action of radiation (light waves) on the chlorophyll in this mutant would be of basic interest. From the practical view, potentialities remain to be explored. Most mutations in living things are harmful rather than useful, within usual environments. The "silver" mutant offers an unusually clear example of the interaction of germ plasm with environment. In shade the gene may be harmless and possibly useful; in the sun it is highly destructive.

Each of these three mutants apparently involve chlorophyll. Each was secured through the use of diethyl sulfate rather than from exposure to thermal neutrons, although the number of progeny (individual plants) observed was approximately 5,000 for the chemical mutagen and 44,000 for the neutron exposure. This does not necessarily mean that the chemical is relatively more effective in inducing all kinds of mutations. (Additional data will be published elsewhere.)

The authors wish to acknowledge the cooperation of Brookhaven Laboratory workers Dr. S. Shapiro (now at the U of O) and Dr. Jerome P. Miksche in the irradiation of the bean seeds.

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