OREGON VEGETABLE Digest

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Snap Bean Breeding Test Results Discussed

During the field day on August 1, visitors will be able to see some of the results of snap bean improvement work here, as well as several new varieties and breeding lines from seedsmen and public breeders from throughout the United States. Goals of various breeders differ, of course, with the needs of a given area. In general, the OSU program has been one of the most complex in this country. It involves both pole and bush beans and such plant characters as stem sturdiness, uprightness, germination, concentration, earliness, leafiness, vigor, pod height, and germination; pod characters such as stringlessness, side wall fiber, texture, taste, color, fleshiness, length, straightness, spur, neck, smoothness, fill (seed), shape, internal solidity, seed color, and seed size; and resistance to five diseases—halo blight, root rot, rust, yellow mosaic, and common mosaic. Early phases of cooperative work with L. L. Dean of the University of Idaho are under way to incorporate curly top resistance in bush beans.

Pole beans

It was concluded several years ago that, in order to secure a much wider range of variation in the pole bean, highly complex crosses involving types other than Blue Lake would be necessary. This included crosses to bush beans, especially to incorporate resistance to rust, root rot, and yellow mosaic virus. Virtually all Blue Lake type pole beans are tolerant to the halo blight bacterium, so only in crosses involving certain bush beans will it be necessary to carefully screen pole lines for tolerance to this organism.

With renewed interest in mechanical harvest of pole beans a new appraisal of OSU pole breeding lines is being made in 1967. All of these lines are planted at the Vegetable Research Farm, Corvallis, and many of the

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Vegetable Crops Field Day Set for August 1

Beginning at 1:30 p.m. on August 1, research plots at the OSU Vegetable Research Farm will be viewed and discussed. Major emphasis will be placed on breeding and cultural work on snap beans, sweet corn, beets, and carrots, but research plots of other crops such as peas, onions, tomatoes, and broccoli will be observed.

In addition, the Borga one-row snap bean harvester will be demonstrated, and there will be an opportunity to see two special irrigation systems—a Cyclo-matic solid system and a self-propelled lateral line.

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

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Snap Beans . . .

lines are being observed at Eugene, Salem, Portland, and the Southwestern Washington Experiment Station. In addition to potential tolerance to certain diseases, some of the lines were selected for one or more of the following characters: high vigor, concentration of set, better distribution of pods up and down the plant, pods borne higher on the plant than usual Blue Lake types, longer racemes, smaller leaves, and open foliage. We are indebted to several growers and processors who are cooperating in these tests.

Bush green pod lines

Several new, named varieties of bush green pod beans from elsewhere should be ready for viewing on August 1. Included are: Salem, Lika Lake, Cascade, Orbit, Roundup, Valgreen, Encore, Early Gallatin, Green Isle, and Bonus. Many unnamed lines from public and private bean breeders, along with OSU lines, have been planted alongside the new named varieties. Most of the new bush beans are not claimed by breeders to be potential substitutes for Blue Lake; some, however, do have Blue Lake lineage.

Among the new OSU lines are several selections from massed, bulk plantings at the North Willamette Station. Major emphasis on improved growth habit (stiff, upright types) has been placed on selections there. A few of these lines, of very complex lineage, are definitely of better plant type; one line, OSU 58, is the first selection isolated from many hundreds of thousands of bean plants which has a "taste" biochemistry closely approaching Blue Lake and which has the large stem, erect habit, and highly determinate growth of the more ideal bush types. The line possesses good color, fleshiness, pod length, and smoothness in large sieve sizes. It should be pointed out that rigorous quality tests—steam table behavior, smoothness in small sieve, sloughing, and other quality factors—must yet be made on this and other associated lines.

So far, the more promising of these OSU bush lines have been shown to be susceptible to halo blight. We are studying the inheritance of this association and hope that it is not too difficult to overcome. We do have one line of excellent habit, but poor pod quality, which is resistant, and backcrossing is being initiated to attempt transfer of this resistance to OSU 58. We also are incorporating tolerance in bush types to yellow mosaic, root rot, rust, and common mosaic. Of the various diseases, high tolerance to root rot (in good pod quality and growth habit types) has been the most difficult problem. Continuous selection pressure against this organism is being applied, however, in many of the bush lines and in all pole lines.

Preliminary seed increases of a limited number of the green pod bush lines are under way; some are being tested in small plots at Eugene, Salem, Stayton, Portland, North Willamette Experiment Station, and experiment stations in western Washington.

Bush Romano lines

In the last few years modest emphasis has been placed here on hybridization of Romano pole with bush beans to develop flat podded Romano bush lines. A few of these have been run through OSU as well as industry evaluation (canned, frozen) panels, and two or more lines have shown promise. Preliminary mechanical harvester tests and first seed increases are being made on these lines this summer. These lines are being observed in the same localities mentioned for pole and bush green pod lines.

Wax pod types

OSU line 8387 appears to be the most promising of the wax pod types developed here. Early quality evaluations have been satisfactory; green color in small sieve size appears better than most good quality bush wax selections. More detailed quality evaluations are in order. A small pilot planting has been made at Stayton this year. This line, and most waxes we have observed in our disease test area, is highly susceptible to root rot when planted in the cold soils of early spring.

—W. A. Frazier, J. R. Baggett, H. J. Mack, A. A. Duncan,
Department of Horticulture
G. Varseveld,
Department of Food Science and Technology
E. K. Vaughan,
Department of Botany and Plant Pathology
R. Bullock,
North Willamette Experiment Station
J. Rodgers, D. Booster,
Department of Agricultural Engineering

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National Carrot Trials, Conference Scheduled at OSU

The 1967 carrot trial and conference will be held at the OSU Vegetable Research Farm in October. Tentative date for the conference is October 30 and 31. Approximately 300 breeding lines and varieties of carrots from many seedsmen and breeders in this country, as well as some of foreign origin, have been planted on both sand and loam soils on the farm. On the first day, it is anticipated that breeders and others who are interested will take notes on the varieties and breeding lines. A discussion of the notes is planned for the second day, along with brief talks on varied problems of interest. Carrot breeding, seed production, and processing embrace a wide variety of these problems.

The basic problem of variability for such major characteristics as color, shape, and cracking is associated with cross pollination, which is normally very high for the carrot. The most desirable way to circumvent this variation is through use of F_1 hybrids. Yet, unlike sweet corn which, because of separation of male and female inflorences, is relatively easy to hybridize on a mass scale, the carrot bears these organs in compact flowering heads, and so systems of male sterility and fertility must be utilized to secure F_1 hybrids. These have been in use for some years and limited numbers of hybrids, involving limited seed supplies, are currently available. In the next few years, F_1 hybrids should become far more common. These may not be simple two-way crosses such as hybrids of male sterile x fertile, but rather may be three-way or four-way crosses, in which advantage can be taken via restored vigor of the male sterile parent, to produce good seed yields. It must be recognized that hybrid seed production adds to seedsmen's costs and this necessitates higher seed costs to growers.

Hybrid carrots require careful testing in given environments. They have the potential of high uniformity for given valuable characteristics, but they also may be uniform for undesirable characteristics. This is why the processing industry in Oregon is partially financing the OSU program which was initiated four years ago. Primary objectives are: (1) improved uniformity, brightness, and depth of color; (2) root shapes to fit specific needs; and (3) resistance to cracking. While these are the principal goals, numerous other characteristics must be kept in mind to avoid retrogression of other traits, such as yield, core size, separation

Table 1. Raw Carrot Observations at the Vegetable Research Farm, Corvallis, October 27, 1966, Sandy Soil[1]

Accession	Variety or line	Source	Rank[2]	Suggested use[3]		
				Dice	Slice	Whole
4897	65-157	Mich.	1	+	+	+
5376	W93A4 x W6	Wis.	2	+	+	+
4906	65-125	Mich.	3	+	+	+
.....	48MS x 173PF x 4362-1	OSU	3	—	+	+
4317	63-809	Mich.	4	+	+	+
.....	4362-1 inbred	OSU-Campbell Soup	5	+	+	+
4297	Royal Chant.	NK	6	+	—	—
4922	RCC 156/y 32	NK	7	+	+	+
5270	66-650	Mich.	8	—	+	—
5133	Keiler Rote	.....	9	+	+	+
5378	W93A x W77-1-M2CN	Wis.	10	—	+	—
5242	170A	FM.	11	—	+	—
4571	173	Wis.	11	—	+	—
4561	Nantes Hi-Color	SRS	11	—	+	—
.....	66-36 PF	OSU	11	—	+	+
4300	Scarlet Nantes	NK	11	—	+	+

[1] Carrots from sandy soil were used for canning tests. No carrots from loam soil (Table 2) were canned.

[2] Rank indicates score based on relative number of observers rating the carrot line as acceptable. Observations were primarily for shape, smoothness, color, and cracking.

[3] A plus (+) sign indicates suggested use by at least two observers; a minus (—) sign indicates lack of interest for the type pack specified.

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Carrot Trials . . .

Table 2. Raw Carrot Observations at the Vegetable Research Farm, Corvallis, October 27, 1966, Loam Soil

Accession	Variety or line	Source	Rank[1]	Suggested use[2]		
				Dice	Slice	Whole
.....	4362-1 inbred[3]	OSU-Campbell Soup	1	+	+	+
4897	65-157	Mich.	2	+	+	+
4297	Royal Chant.	NK	2	+	+	+
4911	64-101	Mich.	3	—	+	+
5268	66-606	MSU	3	—	+	+
5269	66-608	MSU	3	—	+	+
5274	66-654	MSU	3	+	+	+
5378	(8551-18) W93A4 x W77-1M-2CM	Wis.	3	+	+	—
.....	119MS x 118 PF	OSU	3	—	+	—
5379	W97A1 x DC112-B26-OP-1CM	Wis.	3	+	—	—
.....	2 x 1	OSU	4			—
.....	182 op	OSU	4	—	+	+
4906	65-125	MSU	4	—	+	—
5264	66-657	MSU	4	—	+	+
5376	(6001-6) W93A4 x W6	Wis.	4	+	+	—
.....	48MS x 173PF x 4362-1	OSU	4	—	+	—
.....	106 x 107	OSU	4	—	+	—
.....	4504 x 4486	OSU	4	+	+	+

[1] Rank indicates score based on relative number of observers rating the carrot line as acceptable. Observations were primarily for shape, smoothness, color, and cracking.

[2] A plus (+) sign indicates suggested use by at least two observers; a minus (—) sign indicates lack of interest for the type pack specified.

[3] An inbred derived from Campbell Soup line Dc112-13-26-B.

of core, taste, smoothness, bolting (seedstalks the first year), branching, water soaking, hollow heart, and texture.

Maintenance of excellent, uniform color for processing is especially difficult. There has been evidence for many years that the most promising carrot selections are the most likely to rot in storage and in the field. This means that not only is careful selection required, but that we need to continue studies of means of maintaining the highest quality roots until they have produced seed. Seed-to-seed production obviously must be based on planting of superb stock seed, since roots cannot be examined carefully as with stored roots. Perhaps more attention should be given to cell or tissue cultures in multiplying outstanding material.

The attached tables show the highest ranking carrots and suggested uses of certain of the approximately 250 lines and varieties grown at the Vegetable Research Farm in 1966. All lines were grown on both sandy and loam soil. Observations were made on October 27. Seeds were planted on both types of soil on May 10. Some late-maturing seeds from the OSU greenhouses were planted July 5.

In general, the carrots grown in sandy soil did not show as good depth of color as those grown on loam. This is not generally to be expected; the sandy area is low in organic matter, which may be one of several possible reasons for the differential behavior.

Lines ranked highest in 1965 rated fairly high in 1966, but they were not outstanding. Seeds of some of the promising lines of 1965 were available for 1966 planting; the relative differences in appearance thus clearly involve environmental as well as hereditary factors. At the same time, there is evidence of "drift" in some experimental hybrids—most likely involving hereditary differences in inbred lines which have not been well "fixed."

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Progress Report . . . . .

The corn earworm is probably the most costly of the various insects attacking sweet corn in the United States. It also attacks field corn, but losses are much less in this case because of the different uses of the harvested product. The Willamette Valley is one of the few places where losses from this pest are usually below the 5% level, but growers in other parts of Oregon and the Pacific Northwest must apply control measures every season in order to grow sweet corn profitably.

DDT has long been the principal chemical used for control of the earworm, but the presence of DDT residues on the husks and stalks has limited its use because of the practice of feeding stalks and cannery wastes to cattle. Carbaryl insecticide (Sevin) is also very effective against the earworm and has been substituted for DDT in many areas. The main drawback from the use of carbaryl is the fact that it is highly toxic to honey bee colonies. It is picked up by the worker bees when they forage corn for the pollen.

A strain of virus specific to the corn earworm (cotton bollworm or tomato fruitworm, as it is known in other parts of the country) has been studied for many years. Only in recent years, however, has it been possible to produce the virus in commercial quantities for widespread experiments on insect control. Most of the studies so far have been on the manipulation of the virus for control of the bollworm on cotton.

Virus Control of Earworms

The commercially produced dry powder preparation of the virus produces a true disease in the insect larva when eaten. Known as a nuclear polyhedrosis virus, the material initiates an infection inside the gut of the larva, disrupting the physiology and resulting in death if the larva becomes infected early enough in its development. A first instar larva will be killed rapidly, while a last instar larva will probably survive to pupation and adulthood, at which time it is generally resistant to the virus.

In cooperation with Mr. Davidson of the Umatilla Experiment Station at Hermiston, attempts have been made during the past two years to control the earworm with this virus. Sprays of the material suspended in water were applied to the silks of the corn in much the same way that DDT or carbaryl might be applied. It is hoped that this highly specific virus preparation (it will infect only larvae of the genus *Heliothis*) can be used to give satisfactory earworm control without introducing the complications associated with chemicals such as DDT or carbaryl. Although results so far have not been satisfactory, studies are continuing with this microbiological insect control approach.

—H. H. Crowell
Department of Entomology

Carrot Trials . . .

It will be noted that the 10 persons ranking the lines grown in sandy soil indicated a considerable range in rankings; on loam soil, the relative range was not great, although the 4362-1 line was rated far above all others; in sand, it was rated fifth.

Correlations between these field observations for raw color and the ranking for processed color were obviously only fair. The OSU line (48 MS x 173 PF) x 4362-1 was the only line rated by all industry personnel as being acceptable in processed appearance. The 4362-1 line was given only a fair processed rating; nine accepted it, while five rejected it for appearance or texture. There is some encouragement, however, in the fact that it is one parent of the highest ranking hybrid line.

The following over-all remarks appear justified:

1. It is extremely important to evaluate the lines for both field and processing behavior.

2. Deep colored roots which may rank high in raw appearance may be too dark when canned.

3. In general, several breeding lines indicate good potentials when compared to current carrot varieties.

4. Variations from year to year—within the same seed lots—indicate major environmental (broad sense) impacts and results of a given year must be interpreted with caution.

5. If all factors of inbreeding, seed increase, variability (due to environment and heredity) are considered, it appears that large quantities of seed of near-ideal carrot hybrids may not appear for some time. Yet progress is clearly visible; in the next few years, whenever seed is available, promising new types will likely merit cautious pilot trials by industry. For the immediate future at OSU there is justification of increase of such lines as 4362-1 and 66-36 PF (or sister lines), either as pollen fertile "synthetics" or as limited cross pollinated hybrid masses.

The lines should also be made available to other breeders for pollinator lines in hybrid combinations.

—W. A. Frazier,
Department of Horticulture
George Varseveld,
Department of Food Science and Technology