OREGON VEGETABLE Digest

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Progress in Carrot Breeding Reported

Edible Pod Peas Available at OSU

Home gardeners, market growers, and some processors have shown interest in producing edible pod or "Chinese" peas. These are strains of the garden pea, *Pisum sativum,* which lack the usual fiber or "parchment" in the sidewalls and therefore have edible pods. Sometimes called "sugar peas," they are used most in Chinese food. Except in extremely early stages of development, it is necessary to remove a fibrous "string" from the dorsal pod suture, as in the case of old-fashioned string bean varieties.

Since edible pod peas must be harvested by hand and are rather light in weight, they are relatively high in price. High labor costs preclude their use in volume processing with the plant types presently available. Prospects for improved plant types or new machinery to permit mechanical harvest are poor.

Virus diseases, especially enation mosaic virus, sometime limit success in the production of peas of any type in western Oregon. This problem is particularly serious

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In This Issue . . .

Carrot breeders from throughout the United States and many representatives of processing firms participated in field evaluation of carrot varieties and breeding lines grown on both sand and loam soils on the Vegetable Crops Research Farm in 1967. Approximately 375 varieties and breeding lines were planted in each of the soil types.

A summary of notes on field appearance is shown in Table 1; processed product ratings are shown in Table 2.

The following observations appear to be justified:

1. It has become very clear that all current stocks of named carrot varieties possess much variability, especially for color. They are also all rather susceptible to cracking, with Nantes being one of the worst.

2. Breeders have made obvious important advances in improvement of color, resistance to cracking in some lines, as well as smoothness and shape.

3. The most promising lines in the test are either in the breeding stage or in the early stages of increase, so appreciable quantities of seed are not available. The highest ranking line for raw product appearance in sandy soil was a very long, slim, cylindrical carrot designated as lot 12 (Ore. Acc. 6116) from C. E. Petersen of Michigan State University. It did not receive distinctly high processed quality ratings because of a tendency for dullness. Michigan lines 16 (Acc. 6113) and 4 (Acc. 6124) were rated higher than lot 12 for canned quality.

4. Conclusions on processing quality should not be based on raw product appearance. Some deep-colored carrots may be far too dark, dull, or brownish colored when processed.

5. A general consensus from discussions at the meeting seemed to be: (a) some new hybrids may be of promise in various areas for given purposes, but ex-

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Carrot Breeding . . .

Table 1. Field ranking and notes on carrots (Corvallis, October 30, 1967)

Ore. acc. no.	Number persons ranking entry high[1]	Origin	Designation	Suggested uses	Remarks
6116	22	Michigan State	Lot 12	Market, slicing	Long, slim, cracks in loam
7432	15	Oregon State	(48x173)x4362-1BC1	Slice, dice, whole	Smooth, all purpose
7462	14	Oregon State	36-10	Whole	Less cracking
7463	12	Oregon State	4911-4x36-4PF	Whole, slice	Med. cracking
5872	12	Asgrow	Asg. 110	Dice	Good size
5778	12	Oregon State	4362-1	Slice, dice, whole	Color good, all purpose?
5887	12	Univ. of Calif.	66-95	Market, slicing	Cylindrical
5755	10	Dessert Seed	1558AxD306C	Dice, whole	Med. cracking
6119	10	Michigan State	Lot 9	Market, slicing	Long, slim
7402	10	Oregon State	Comp. PF7	Dice, whole	Med. cracking
7416	10	Oregon State	(48x173)x4362-1BC1	Slice, dice, whole	Color good, all purpose?
5863	10	Oregon State	Asg. 6448	Dice	Good size
6167	9	PI306588	.....	Dice	Good size
6171	9	Michigan State	774	Slice, whole	Smooth, consid. cracking
6113	8	Michigan State	Lot 16	Dice, whole	Less cracking
6124	8	Michigan State	Lot 4	Market, whole, slice	Med. cracking
7383	8	New York State	1036	Market, whole, slice	All purpose?
7453	8	Oregon State	(48x173)x4362-1BC1	Whole, dice	All purpose?
6176	7	Michigan State	786	Market, slice	Med. cracking
6182	7	Michigan State	797	Whole	Less cracking
6158	7	Pieters-Wheeler	66E1	Dice	Consid. cracking
7421	7	Oregon State	4362-1-18	Slice, dice, whole	Less cracking, all purpose?
7457	7	Oregon State	(48x173)x4362-1-1BC1	Slice, dice, whole	Less cracking
7461	7	Oregon State	36-4x40-12	Whole	Consid. cracking
7388	6	Oregon State	4362-1-44	Whole	Less cracking
7398	6	Oregon State	(48x173)x4362-1BC1	Whole	Smooth
7420	6	Oregon State	4362-1-10x4362-1-19	Slice, dice, whole	Less cracking, all purpose?
5791	6	Oregon State	2x1	Slice, whole	Less cracking
5802	5	Oregon State	157	Market, slice	Variable shape, needs selection
6103	5	Michigan State	Lot 15	Whole	Less cracking
6115	5	Michigan State	Lot 13	Market, whole, slice	Tend. cylindrical
6135	5	Univ. of Wis.	Hybrid Gold	Whole, slice	Consid. cracking
7397	5	Oregon State	43'2-1-12	Whole, dice, slice	Less cracking, all purpose?
7406	5	Oregon State	(48x173)x4362-1x36-10	Whole, slice	Less cracking
7434	5	Oregon State	4362-1-19B	Whole	Less cracking
7460	5	Oregon State	[(48x173)x4362-1]-14	Whole, dice, slice	Less cracking, all purpose?
5716	5	Germany	J. Wagner	Market, slice	Color good, strong taste?

[1] Forty-seven persons attending the carrot conference made rankings. Divergence of opinions was rather marked, with varying emphasis on characteristics depending obviously on needs; relative rankings, however, were considered of value to all concerned. List was arbitrarily "cut" with ranking by five persons.

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Table 2. Processed product quality ratings on selected carrot varietal materials grown at Corvallis, Oregon, in 1967

Ore. acc. no.	Source	Designation	Average canned rating[1]	Average frozen rating[1]	Comments[2]
5755	Dessert Seed	1558AxD306C	6.2	5.8	(F) Occasional green ring
5778	Ore. State	4362-1	5.8	5.3	(F) Bright, variable
5779	Ore. State	(48x173)x4362-1	6.0	7.3	(F) Very bright, uniform color (C) Occasional yellow ring
5802	Ore. State	157 op.	6.4	6.5	
5863	Asgrow	6648	5.4	4.8	(F) Slightly yellow (C) Yellow core and ring
5870	Asgrow	Royal Chantenay	4.4	5.5	(F) Yellow core and ring (C) Yellow ring; some bitter
5872	Asgrow	110	4.0	5.8	(F) Yellow ring (C) Pale color; green ring
5875	Asgrow	Nantes 99	4.8	4.6	(F) Green ring; strong flavor (C) Slightly dull color; strong flavor
5887	Calif.	6695	4.4	4.8	(F) Yellow core; strong flavor (C) Uniform deep orange
6113	Mich. State	Lot 16	7.0	5.3	(F) Reddish-orange
6116	Mich. State	Lot 12	5.2	5.3	(F) Dull (C) Dull orange; slightly bitter
6119	Mich. State	Lot 9	4.2	1.5	(F) Too dark, dull (C) Uniform bright orange
6124	Mich. State	Lot 4	7.4	4.2	(F) Watery, dull core
6135	Wisc.	Hybrid Gold	5.8	3.6	(F) Dark, dull; slightly bitter (C) Green ring; soft texture
6158	Pieters-Wheeler	Chant. R.C. 66E-1	3.8	3.1	(F) Green ring; slightly soft (C) Too red
6171	Mich. State	774	4.4	2.3	(F) Dark, reddish (C) Dark, dull
7402	Ore. State	Comp. PF7	4.2	2.8	(F) Too dark; bland flavor (C) Variable; yellow color
7406	Ore. State	(48x173)x4362-1x36-10	5.0	3.6	(F) Dull, variable (C) Variable color
7453	Ore. State	(48x173)x4362-1 BC1	4.8	5.0	(F) Variable color; slightly soft (C) Uniform deep orange
7461	Ore. State	36-4PFx40-12	6.4	3.0	(F) Uniform but dark

[1] Average overall quality rating given to coded samples by a six-member screening panel of Horticulture and Food Science staff members. Color, appearance, eating texture, taste were considered. The following nine-point scoring system was used: Superior: 9, 8, 7; acceptable: 6, 5, 4; and unacceptable: 3, 2, 1.

[2] F = frozen; C = canned.

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Carrot Breeding . . .

cellent hybrids of proven wide adaptation have yet to be demonstrated; (b) there is a considerable time "lag" between good appearing breeding lines and their commercial availability; (c) breeders are working closely with industry to correct this time lag; (d) care should be used in switching to hybrids which have not been reasonably tested, since a hybrid may be uniformly very good or uniformly very bad.

The relatively new OSU program has moved along satisfactorily, thanks to materials made available from breeders elsewhere during the early hybridization work here. The 4362 line derived from Campbell Soup Company material has been sub-lined and remains of some promise. A male sterile form of essentially a 4362 should be available in two years. Evidence indicates 4362 may combine to give good hybrid carrots.

—W. A. FRAZIER
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Edible Pod Peas . . .

in small plantings made after April 1. Edible pod peas which are resistant to enation mosaic and tolerant to several other viruses have been developed in the pea-breeding program at Oregon State University. The varieties Manoa Sugar and Dwarf Gray Sugar were the sources of the edible pod characteristic, while the virus resistance came from canning or freezing types. The resistant parents also contributed larger pods, shorter plants, and milder flavor than the edible pod parents.

For those who might wish to try one or more lines, seed is available for limited distribution. Requests should be sent to the author at the Department of Horticulture. The amount available will depend on the number of requests received, but up to a pound might be obtained if needed.

—J. R. BAGGETT
Department of Horticulture

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Vegetable Notes . . .

The influence of the plant growth retardant, N-dimethyl amino succinamic acid, on the fiber content of snap beans was investigated in the greenhouse by Nightengale and others. Results were reported in Vol. 92 of the *Proc. Amer. Soc. Hort. Sci.* Four spray concentrations, three times of application, and two soil moisture levels were arranged in a 4 x 3 x 2 fractorial in four replications. The 1,000 m/l concentration induced a highly significant reduction in the fiber content of the pods. However, fiber was not influenced significantly by the higher spray concentrations at 2,500 and 4,000 m/l. No significant differences were associated with either the time of spray application or the soil moisture level.

According to a 1965 survey just published by the U.S. Department of Agriculture (ARS 34-102), of about 6.8 million acres of vegetable crops grown in the United States slightly over 1 million acres were treated with herbicides. The trend in herbicide usage was up in most states reporting. Costs of herbicides and applications on these crops totaled 9.7 million dollars, for an average cost of less than ten dollars per acre. Effectiveness of control was quite variable from crop to crop, but most herbicide programs fell in the "fair" to "good" range in this respect. Many reports indicated a need for improved weed control programs.

The inactivation of simazine and linuron in soil by charcoal was reported in *Weed Research* (Vol. 8, 1968) by A. H. Anderson. He indicates that the amount of charcoal required to inactivate a given dose of the herbicides depends on the organic matter content of the soil and the efficiency of incorporation. His results show that between 200 and 400 times as much charcoal was needed to deactivate a given rate of simazine residue, while the ratio with linuron was about 100 to 1.

Oregon's Agriculture Challenged by Change

The most valuable segment of Oregon's agricultural economy is vegetable processing. With 2 million inhabitants Oregon has only 1% of the U.S. population, and therefore relies heavily on out-of-state markets. Our ability to produce far beyond our needs makes it necessary and profitable to supply a substantial share of the processed vegetables consumed in the United States. The value of raw vegetables is increased about threefold by processing.

Oregon's vegetable industry is located in those parts of the state where there is (1) a favorable summer climate, (2) fertile soil, (3) adequate water for irrigation during the growing season, and (4) skillful farmers willing to grow crops to exacting specifications, under contract to processing companies that have sales organizations throughout the country. Elimination of any one of these factors would effectively eliminate Oregon's vegetable industry. Snap beans, sweet corn, beets, carrots, broccoli, cauliflower, cabbage, and cucumbers for processing are grown in the Willamette Valley; complementary, noncompetitive products such as peas, asparagus, potatoes, and onions for processing are grown in eastern Oregon.

The vegetable industry in Oregon has been expanding since the early 1920's. Expansion of production in Oregon may result in a decline of production in some competing areas. Competition is increasingly keen because the food channels in the United States are full. To further aggravate interregional competition, yields will be increased by new production methods which we group under the catch phrase "optimized cropping systems."

Traditional ways of managing large acreages of vegetable crops are being challenged by new types of equipment, materials, and methods. Optimum plant densities and the use of equidistant spacings made possible by improved weed control promise yield and efficiency advances equal to the discovery of hybrid vigor. In fact, hybrid vigor and competitive efficiency can be exploited fully only at optimum plant densities, in a weed-free environment, at very high fertility levels, and with plenty of water.

Herbicides have eliminated the need for cultivation and the need for wasted space between rows. Generally, a spacing arrangement as nearly square as possible makes best use of soil, water, and light. For example, trials show that the optimum plant arrangement for bush snap beans is 5 by 5 inches and for sweet corn a 12-inch equilateral triangle. The same idea is being extended to many vegetable crops.

Yields of bush snap beans in experimental plots have reached 14.7 tons per acre, as contrasted to the present commercial average of 3.5 tons in the Willamette Valley. If we could increase the average yield to only 7.5 tons on our present 31,000 acres of snap beans, we would then have produced one-half of all the processed snap beans currently used in the United States. Does this new technology mean that we can capture a larger share of the market for Oregon, or does it mean that we must reduce our present bean acreage by one-half? Do we add to our local prosperity by increased income or do we deprive large numbers of farmers of the opportunity to grow snap beans? If we succeed in capturing a larger share of the market for Oregon, it must be done at the expense of competing areas. Our aim is to increase Oregon's prosperity by shipping high-quality, processed vegetables at competitive prices. Our industry is built upon buyer confidence, in a free-choice economy that finds Oregon vegetables displayed in distant markets on grocers' shelves alongside similar local products which are usually offered at lower prices. We should remain highly competitive by introducing the ideas of optimized cropping systems. The educational program along this line has been under way since the winter of 1965.

Because the farmer's share of the consumer's food dollar is so small, there are too few dollars from the economy sifting back to the producer. This condition, fostered by the laws of supply and demand acting on a national bountiful food supply, results in vegetable growers riding a razor's edge between staying in or falling out. The prices paid for raw products make it possible for only the most efficient growers to survive and get financing for the next year's operation.

High taxes and land values, real estate speculation, and lax zoning restrictions are disruptive to agriculture. It has been said that within 20 years the Willamette Valley will be entirely suburban and the horticultural industry will be moved east of the Cascades to the Columbia plateau. If Oregon is to become the most important source of processed horticultural products in the United States, ways must be found for an expanding population and agriculture to grow side by side in the Willamette Valley.

We are changing in Oregon, but not fast enough. Rising production costs, scarcity of people who will accept agricultural employment at present wage rates, and our agricultural competitors are pushing us. There are risks in change, but oftentimes the greatest risk is in failure to move quickly enough to reduce the impacts of adverse change or to take advantage of favorable change in our very competitive economic system.

—ANDREW A. DUNCAN
Extension Vegetable Production Specialist

Dinitro Tested for Slug Control on Beans

Late May rains in the Willamette Valley produced conditions highly favorable for slug activity, emphasizing that there is no truly satisfactory control measure for protection of germinating or emerged vegetable seedlings under attack from immature slugs. The use of metaldehyde baits on seedling vegetables is legal, as is the use of metaldehyde dusts (10%) or sprays. However, during periods of high humidity with overcast skies or during periods of prolonged light rains, slugs affected by contact with metaldehyde in any form will recover in a few days to continue their feeding. Furthermore, immature slugs are small enough to move through the ground between clods of soil and attack the underground portions of seedlings (or the germinating seed) without coming to the surface. When in contact with moist soil, metaldehyde dusts or sprays break down rapidly (largely within 24 hours) and become ineffective.

DNBP (4,6-dinitro-*o*-*sec*-butylphenol) formulations such as dinitro amine are commonly used for pre-emergent weed control on beans, and are known to be highly toxic to slugs by contact. These materials have been recommended for several years as giving some degree of slug control when applied in their normal role as pre-emergence herbicides at the rate of four or five pounds per acre. This amount will kill any slugs directly contacted and probably kills many more just under the surface if the application is followed by rain. This amount also will seriously burn emerged seedlings.

In 1960 the question arose as to whether there might be a rate of application of DNBP which was low enough for use on emerged beans and high enough to kill slugs which could not be lured to poisoned baits. To check the possibility of a "safe" application rate, a test was made in which a variable dosage of herbicide was applied to emerged bean seedlings two weeks after planting. With relatively cool weather and an application at early post-emergence, little crop injury would be expected. In delineating the "safe" application level, the following values were established:

Degree of injury	*Pounds DNBP per acre*
Light leaf burning—no obvious stunting	2.4
Very slight burning—considered to be "commercially safe"	1.6
No apparent phytotoxicity	1.1

Thus it was established that a "safe" rate did exist (undoubtedly subject to variation under differing weather conditions), but no information was obtained on the effectiveness of the "safe" rate for slug control.

The study was resumed this past spring with two trials on bush snap beans on the Vegetable Research Farm. In the first test dinitro amine was sprayed in 8-foot swaths across five 6-row beds of seedling beans (first trifoliate leaves showing) which harbored a moderate infestation of immature gray garden slugs. Application took place on May 30 in sunny weather, but rain occurred by evening of the next day. Examination for slug populations in these plots was made three days later. Rates used in this and the subsequent test were 1, 1½, and 2 pounds active dinitro amine per acre.

In the second trial, beans were planted on four dates and sprayed on July 8. The planting dates and development at time of spraying were as follows:

June 6 .....plants branched
June 18.....first trifoliate leaves expanded
June 25.....first true leaves present
July 2 .....emerging, to "crook" stage

The weather was clear and hot at the time of application, followed by several days of partly sunny weather with no rain.

Leaves present at the time of application in the first test showed some injury proportional to the application rate. Burning at the one-pound rate of dinitro amine was slight, while that at the two-pound rate was moderately severe. Although this injury undoubtedly slowed development of the plants to some extent, they recovered and subsequent growth was normal. In the second trial, plant injury was again proportional to the rate of DNBP used, except in the July 2 planting where very little injury occurred. Also, as in the first trial, plants recovered following the herbicide application and by harvest time, even in the June 6 planting, there was no obvious difference between treated and untreated plots. No yields were taken, however.

Information on slug control was obtained only from the first trial. A total of 8 feet of row from each of the five replicates was searched for living slugs three days after application of the DNBP sprays, with the following result:

Untreated checks ..... 8.8 slugs per plot
DNBP at 1 lb. per acre .. 7.0 slugs per plot
DNBP at 1½ lbs. per acre.. 6.8 slugs per plot
DNBP at 2 lbs. per acre.. 1.0 slugs per plot

Conclusions reached as a result of these limited tests were that bush beans can be sprayed with dinitro amine herbicide at low rates without seriously affecting growth of the plants. However, the rate required to give satisfactory slug control may be very close to that which could cause serious injury to the plants and result in lower yields.

—H. H. Crowell
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