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Spacing Affects Yield, Size of Table Beets

Higher percentages of small roots of table beets were obtained when row spacings were reduced from 24 to 6 inches in tests at Corvallis. Yields at the 6-inch row spacing were significantly lower than for 18- and 24-inch rows, but because of the production of a higher percentage of small beets, gross returns were assumed to be highest at the 6- and 12-inch row spacings.

Preliminary work in 1965 on table beet spacing (*Oregon Vegetable Digest,* Vol. 15, No. 3, July 1966) indicated that row spacing influenced the size distribution and the yield of roots. Tests were continued in 1966 and 1967 at the OSU Vegetable Research Farm with row spacings of 24, 18, 12, and 6 inches. In 1966 three fertilizer rates were used: 50-150-50, 100-300-100, and 200-600-200 pounds of N-P_2O_5-K_2O per acre. Fertilizer was broadcast and disked in prior to planting. Spacing of plants in the row was not varied, and it was estimated that there were six to seven roots per foot of row at harvest, giving about 152,000 roots per acre for a row spacing of 24 inches, 203,000 for 18 inches, 305,000 for 12 inches, and 610,000 for 6 inches. Only one fertilizer rate was used in 1967: 65-195-65 pounds of N-P_2O_5-K_2O was plowed down and 160-290-95 pounds N-P_2O_5-K_2O was disked in before planting.

(*Continued next page*)

Yield and Color of Pea Varieties Observed

Twelve selected varieties of peas were grown in a randomized block experiment with five replications on the Myron Hug farm near Imbler in Union County. This was a continuation of efforts to discover varieties not subject to "blonding."

Each variety was harvested at tenderometer values between 95 and 105, blanched, and frozen in a commercial processing plant. Samples were subsequently thawed and evaluated for color, first by a third party (USDA) grader and later by OSU personnel. The results are summarized in Table 1. Sources of the varieties tested are listed below.

No.	*Variety*	*Source*
1	Early Frosty	Rogers
2	Freezer 661	Rogers
3	Perfected Freezer 60	Rogers
4	OSU 436-1	OSU
5	Dark Skinned Perfection	(Check)
6	Signet	Asgrow
7	Venus	Asgrow
8	Jet	Asgrow
9	157-F	Western Valley
10	159-F	Western Valley
11	160-F	Western Valley
12	174-F	Western Valley

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Table Beets . . .

Three seeding rates were used at each of the row spacings. This was accomplished by using plate holes 27, 31, and 35 of a Planet, Jr. one-row planter. Estimated population densities, based on the number of roots harvested per foot of row, varied from about 295,000 roots per acre at the lowest seeding rate in 24-inch rows to 810,000 roots per acre at the highest rate of seeding in 6-inch rows.

The variety was Detroit Dark Red—Morse's strain, and plots were seeded on May 19, 1966. One half of each plot was harvested on August 10 and the remainder on August 29. June 27 was the planting date in 1967, and the complete crop was harvested on September 16. The following weed control materials were applied: EPTC at 2 pounds per acre (preplant) and Pyrazon at 4 pounds per acre (pre-emergence). Sprinkler irrigation was provided at 7- to 12-day intervals.

Yield of table beets in 1966 was lower at the 6-inch row spacing than at the 24-inch row spacing. However, roots that were 1 to 2 inches in diameter were 56 and 10% at the two respective row spacings at the first harvest and 44 and 6% at the second harvest (Tables 1 and 2). The highest yield was at the rate of 200-600-200 pounds N-P_2O_5-K_2O fertilizer per acre. This fer-

Table 1. Effects of fertilizer rates and row spacings on table beets, Corvallis (First harvest date, August 10, 1966)

Fertilizer rate N-P_2O_5-K_2O	Row spacing	Yield	Size distribution of roots				
			–1″	1-2″	2-3″	3-4″	+4″
lbs/A	*inches*	*T/A*	*%*	*%*	*%*	*%*	*%*
50-150-50	24	16.8	1	11	55	29	4
	18	17.0	2	25	52	20	1
	12	14.5	4	35	58	3	0
	6	13.0	12	70	18	0	0
100-300-100	24	16.3	1	12	50	33	4
	18	17.7	1	15	56	27	1
	12	17.7	3	32	53	12	0
	6	14.8	9	60	30	1	0
200-600-200	24	20.9	1	8	41	41	9
	18	22.4	0	10	47	39	4
	12	20.3	3	33	52	12	0
	6	17.9	5	39	54	2	0
MEANS							
Fertilizer rates							
50-150-50		15.3	5	35	46	13	1
100-300-100		16.6	4	30	47	18	1
200-600-200		20.4	2	22	48	25	3
Row spacings							
24″		18.0	1	10	49	34	6
18″		19.0	1	17	51	29	2
12″		17.5	3	33	55	9	0
6″		15.2	9	56	34	1	0

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Table Beets . . .

Table 2. Effects of fertilizer rates and row spacings on table beets, Corvallis (Second harvest date, August 29, 1966)

Fertilizer rate N-P_2O_5-K_2O	Row spacing	Yield	Size distribution of roots				
			−1″	1-2″	2-3″	3-4″	+4″
lbs/A	*inches*	*T/A*	%	%	%	%	%
50-150-50	24	22.3	1	7	38	45	9
	18	23.9	1	13	47	36	3
	12	24.0	2	27	58	12	1
	6	22.6	6	54	34	4	2
100-300-100	24	25.2	1	7	37	46	9
	18	26.4	1	10	45	38	6
	12	24.1	2	25	60	12	1
	6	23.0	7	47	43	3	0
200-600-200	24	28.6	0	5	27	44	2
	18	26.1	1	7	41	37	1
	12	28.5	1	13	44	38	4
	6	25.4	3	32	55	9	1
MEANS							
Fertilizer rates							
50-150-50		23.2	2	26	44	24	4
100-300-100		24.7	3	22	46	25	4
200-600-200		27.2	1	14	42	32	11
Row spacings							
24″		25.4	1	6	34	45	14
18″		25.5	1	10	44	37	8
12″		25.5	2	22	54	20	2
6″		23.7	5	44	44	6	1

tilizer rate also had the highest percentage of larger beets at both harvest dates. The response to fertilizer may have been primarily due to increased N rates, but this could not be determined because N, P, and K were increased simultaneously.

In 1967 the relationship between row spacings, yield, and size distribution of roots was similar to that of 1966 (Table 3). Yield at the 6-inch row spacing was significantly lower than at 18 and 24 inches, but the narrow row spacing produced the highest percentage of small roots. Increasing the seeding rate did not increase the yield at each row spacing, but it did result in a higher percentage of roots that were less than 2 inches in diameter.

In our study no measurements were made on shape of roots, but it could be reasoned that at a given population density, better shape of roots would be obtained when roots were spaced further apart in narrow rows than when plants were closely spaced in wide rows.

These results suggest that decreasing the row spacing or increasing the seeding rates in the row may be a means of producing a higher percentage of small, high-value beets. Similar results have recently been reported from New York (see Vegetable Note, page 4, in this issue). Seed cost would need to be considered as well as the relationship between row spacing and harvest date. Machinery for precision seeding and for mechanical harvesting of beets in narrow rows is not presently available. Adequate weed control, fertilizers, and irrigation would be essential for narrow row plantings. Possible increased incidence of diseases would also need to be considered.

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Table Beets . . .

Table 3. Effects of seeding rates and row spacings on table beets, Corvallis, 1967

Row spacing	Seeding rate*	Roots/ft. (at harvest)	Yield	Size distribution of roots				
				−1″	1-2″	2-3″	3-4″	+4″
inches		*No.*	*T/A*	%	%	%	%	%
24	A	13.5	19.2	2	19	54	22	3
	B	15.7	19.5	3	24	55	17	1
	C	18.3	17.8	4	31	51	13	1
18	A	13.7	19.7	2	27	54	15	2
	B	15.9	19.0	4	34	50	11	1
	C	17.9	17.4	6	35	50	8	1
12	A	11.5	20.0	4	34	48	14	0
	B	13.4	17.5	8	41	43	7	1
	C	13.1	15.0	11	44	38	7	0
6	A	8.6	16.2	10	47	41	2	0
	B	9.5	16.3	10	56	33	1	0
	C	9.3	17.6	10	49	36	5	0
MEANS								
Seeding rates								
A		11.8	18.8	4	32	49	13	2
B		13.6	18.1	6	39	45	9	1
C		14.6	17.0	8	40	44	8	0
Row spacings								
24″		15.8	18.8	3	25	53	17	2
18″		15.8	18.7	4	32	51	12	1
12″		12.7	17.5	8	40	43	9	0
6″		9.1	16.7	10	50	37	3	0

* A, B, C—Planet, Jr. hole numbers 27, 31, and 35.

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Vegetable Notes . . .

In New York, Peck and Wilczynski found that table beets grown in 9-inch rows were of higher value than those of the normal row width, 24 inches. The value of beets from 24-inch rows with 18 plants per foot of row increased from $240 to $325 per acre, while the value of the beets from 9-inch rows with 13 plants per foot of row increased from $285 to $425 per acre from August 22 to October 6. (New York Agric. Expt. Sta., *Farm Research,* Vol. 33, No. 4, pp. 6-7, Oct.-Dec. 1967).

In California, F. W. Zink studied the effects of nitrogen rates, plant spacing, and foliar application of boron, magnesium, manganese, copper, zinc, and iron on the occurrence of hollow stem in broccoli. No reduction in pith discoloration or in percentage of hollow stem was obtained from repeated foliar applications of the trace elements. At any given nitrogen rate, as plant spacing increased so did the percentage of plants with hollow stem. At a given plant spacing, as the rate of nitrogen increased so did the percentage of hollow stem. Zink suggested that a spacing of 12 inches in the row (2 rows, 14 inches apart on the bed) for the winter and spring crops, when hollow stem is not extensive, is likely to give the most satisfactory bud yield (*Calif. Agriculture,* Vol. 22, No. 1, pp. 8-9, 1968).

Pea Varieties . . .

Table 1. Mean values of observations of pea yields and color scores

Variety	Total yield vines and peas (1,000 lbs.)	Yield shelled peas (1,000 lbs.)	Overall USDA color score	Blondness score*	Base color score*	Color uniformity*
1	45.4	7.24	18.0	8.0	6.3	6.0
2	50.0	6.04	15.8	7.7	7.3	6.3
3	52.2	6.58	18.0	8.0	7.7	6.3
4	43.6	6.30	18.0	9.0	8.3	8.7
5	46.4	3.82	18.0	6.0	6.0	4.7
6	50.2	7.06	18.2	8.0	7.7	7.0
7	48.8	7.10	18.6	9.7	9.0	8.7
8	46.0	7.72	17.6	6.0	8.3	6.0
9	40.8	5.46	18.8	7.0	6.3	6.7
10	55.0	4.40	18.4	7.0	6.3	6.7
11	37.0	7.28	18.0	5.7	6.3	5.7
12	42.8	4.44	18.2	7.3	7.0	7.0
LSD 5%	9.8	1.52	1.4	1.5	1.7	1.3
1%	.....	2.01	.....	2.1	....	1.8

* Mean scores of three judges. 1 = least desirable color, 10 = most desirable color.

Variety No. 7 (Venus) was best in appearance and produced a higher yield than the check (Dark Skinned Perfection). The Western Valley lines 160-F and 174-F were quite uniform in color but somewhat bronze. OSU 436-1 was attractive in most respects except flavor. The flavor of all other varieties was quite acceptable.

Attempts to reduce blonding in adjacent plots by increasing the reflectivity of the soil were not successful. Bright straw and heavy applications of lime to the surface of the soil did not reduce the numbers of light-colored peas in the Dark Skinned Perfection variety.

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Vegetable Notes . . .

Differences in efficiency of potassium utilization in snap beans were found and studied by P. F. Shea and others at the University of Wisconsin (*Proc. Am. Soc. Hort. Sci.*, Vol. 91). Inheritance studies showed a single gene difference between inefficient and efficient bean strains, with inefficiency being completely dominant. No maternal effects were found. Differential ability to take up potassium did not appear to be involved.

Maximum daily evapotranspiration rates for vegetable crops were dependent upon season, stage of growth, and development of crop according to studies by Peck, Vittum, and Gibbs in New York. They reported maximum daily evapotranspiration rates of .17 inches per day for tomatoes and snap beans and .18 inches per day for sweet corn (*Agron. Jour.*, 60:23-26, 1968).

Muskmelon Varieties Tested

Because of the continuing need for improved early varieties of muskmelons adapted to various areas of Oregon, 35 F_1 hybrids and open pollinated varieties were observed in 1967 on the Vegetable Research Farm at Corvallis. Many of the varieties are relatively new, and special attention was given to earlier types since most of western Oregon is a marginal area for melons. Some later varieties also were planted because there are several warmer areas in the state where muskmelons are better adapted. Some of the newer varieties are resistant to Fusarium wilt, a disease which is becoming a problem to some growers using Spear and other older varieties.

The melons were grown on a black plastic mulch, a practice which hastens maturity and improves fruit size and yield in this climate. About 500 pounds per acre of 8-24-8 fertilizer was band-placed before planting. The seeds were planted through holes in the plastic at 24-inch intervals. Three plants were left in each opening or hill. Water was applied as needed and was perhaps excessive for a time, resulting in strong vegetative growth with a possible reduction in quality of the first ripe fruits. The season was warmer than usual, resulting in better performance than was expected for the late varieties.

Descriptions of the better varieties are given below, with the source number in parenthesis referring to the following list:

Sources of varieties

1. Dessert Seed Co., El Centro, California
2. Burgess Seed Co., Galesburg, Michigan 49053
3. Ferry-Morse Seed Co., Mountain View, California
4. Farmers Seed Co., Faribault, Minnesota
5. Burpee Seed Co., Riverside, California
6. Peto Seed Co., P. O. Box 4206, Saticoy, California 93003
7. L. L. Olds Seed Co., P. O. Box 1069, Madison, Wisconsin 53701
8. Northrup King and Co., 1500 Jackson St. N.E., Minneapolis, Minn. 55413
9. Harris Seed Co., Moreton Farm, Rochester, New York 14624

The appearance of the letters F. R. following the description indicates resistance to Fusarium wilt.

Excluded from the variety descriptions because of poor quality, size, or both were the early varieties Farnorth (78 days), Minnesota Midget (82 days), Wheat City (76 days), and Sweet Granite (82 days). Other poorly adapted or low-quality varieties included Hearts of Gold (109 days), Rock O' Honey (98 days), Golden Perfection (104 days), Rockawalkin (98 days), Gulf Stream (91 days), and Penn Sweet (95 days).

Four late varieties excluded from the list because they would probably be difficult to mature in western Oregon in a typical season were Harvest Queen (106 days, source 7), Top Mark (112 days, source 1), New Yorker (105 days, source 7), and Pride of Wisconsin (106 days, source 7). These were fair to good in size and quality and should be tried in the warmer sections of the state. The first two are Fusarium wilt resistant.

Description of varieties

Minnesota Hybrid 26 (4). 78 days; *fair to good;* oblong, 3½-pound fruit with a medium dense net, medium to low sugar, and a strong musky flavor. For early garden use. F. R.

Mainerock F_1 Hybrid (6). 84 days; an oblong netted variety which was of poor quality this year. Should be tried again, since it was good in 1966. F. R.

Gold Star F_1 Hybrid (9). 87 days; *fair to good;* 3-pound fruit, densely netted, nearly spherical, with bright color and strong, musky flavor. Medium to low sugar. Better in previous years. F. R.

Super Market F_1 Hybrid (9). 88 days; *good;* heavily netted, 3-pound fruits, slightly oval, with medium sugar and good mild flavor. Bright flesh color. Good for home use, possibly early market. F. R.

Spartan Rock (8). 88 days; *fair;* 2-pound spherical fruits with a heavy but open net, a small cavity, medium sugar, and a good medium musky flavor. Very attractive when cut. Small, but satisfactory for home use. F. R.

Minnesota Hybrid 16 (4). 91 days; *fair;* 3½-pound oblong fruits with a medium net, medium to large cavity, fair sugar and flavor. Texture was fine and slightly soft; for home use. F. R.

Delicious 51 (9). 91 days; *fair;* 3¾-pound slightly oblong ribbed fruits with a medium open net, light orange color, and mild flavor with a medium sugar content and fine texture. Varieties of the Delicious group are dependable early melons but only fair in quality here. F. R.

Burpee Hybrid (5). 91 days; *good;* 3¾-pound fruits, spherical and ribbed with a heavy dense net, firm texture, and a good medium musky flavor. The flesh color was medium orange. Probably the best of the varieties maturing in 91 days or less.

Sugar Rock (7). 93 days; *fair;* 2¼-pound fruits, nearly spherical, with a heavy open net and bright flesh color. The flavor was strongly musky and medium sweet; slightly tough texture. Production was only fair.

Fordhook Gem (5). 94 days; *fair;* 1¾-pound, oval fruits with green flesh, a medium heavy tight net, and slightly coarse flesh. The flavor is mild and nonmusky,

with a medium to high sugar content. An unusual melon, for home use but not for market.

Howell Spartan F_1 Hybrid (6). 95 days; *good;* 2½-pound nearly spherical fruits with pointed stem end and medium dense net. Very bright, slightly tough flesh with medium sugar content and good medium musky flavor. Slightly small for commercial use.

Lake Champlain (2). 95 days; *fair;* 2-pound fruits, flattened and ribbed in shape with a light, open net. Light orange, slightly coarse flesh of a fair, mild flavor and medium sugar content. Home garden only.

Harper Hybrid (6). 95 days; *exceptional;* 3½-pound very smooth, nearly spherical firm fruits with a dense, medium net. Very good appearance with bright, fine-textured flesh, a green inner rind, and small cavity. Flavor mild with a high sugar content. Probably the best melon in the trial for both home garden and market quality. The yield appeared to be good. F. R.

Hales Best Jumbo (3). 98 days; *fair;* 3½-pound fruits but variable in size, with a dense medium net, and medium oblong shape. The flesh was light orange, slightly coarse and soft in texture, with a good mild, low musk flavor and a medium sugar content.

Saticoy Hybrid (6). 98 days; *very good;* 3½-pound medium oblong fruits, with an open medium net and a small cavity. The flesh was medium orange, firm, with a high sugar content and good flavor, low in musk. The production appeared very good; should have possibilities for commercial use. F. R.

Iroquois (9). 98 days; *fair to good;* 3¼-pound spherical fruits with heavy ribs and net. The flesh was bright orange-yellow with a fine texture, but only a medium sugar content and fair flavor. Production was good and it should be tried for commercial use. F. R.

Milwaukee Market (7). 98 days; *fair to good;* 3¾-pound oblong fruits which were ribbed and medium netted. The flesh was bright but light orange, with a soft but fine and acceptable texture, a good, mild-musky flavor, and a medium sugar content. It was variable with some lightly netted, light-colored fruits. Could be tried for market.

Mel-o-dew (2). 98 days; *good;* 2¾-pound slightly oblong fruits with a light, open net and a small cavity. The flesh was pale orange, of medium sugar content, with a mild, good flavor. A Honeydew-Hales Best cross, probably best used for home gardens.

King Henry (8). 102 days; *fair;* 2¾-pound fruits with a heavy dense net and slightly oblong shape. The rich orange flesh was very hard and tough, with a fairly high sugar content and a fair light-musky flavor. Might be tried as a market or shipping variety.

Hales Best 36 (1). 102 days; *fair;* 2-pound spherical-pointed fruit with a medium net, and a medium to large cavity. The light orange flesh was slightly tough, medium fine, with a fair to good strong musky flavor and medium sugar content. Mostly too small for market but possible garden use if strong flavor is acceptable.

Samson F_1 hybrid (1). 104 days; *fair;* 4-pound slightly oblong fruits with a heavy medium dense net, a small cavity, and a thick green rind. The light orange flesh was moderately coarse, firm, and a little chewy. The flavor was fair, with a mild musk and high sugar content. Production was very good; should be tried for market use in warmer areas. F. R.

The maturity factor

The time required for most varieties to mature was about 10 to 15% (8-16 days) longer than that listed by the seed source. One variety required 22 days longer than the listed time. In 1965 the same varieties required about 10% longer to mature than in 1967. Quality also can be affected by climate factors and cultural conditions. Although the season in western Oregon is long enough to eventually mature most varieties, the lower average temperatures may result in varietal performances different from that described in other areas.

In spite of the maturity factor, muskmelons can be grown successfully in western Oregon, especially in a home garden environment where extra efforts are feasible. For best results, growers should use black plastic mulch and, if possible, a sheltered, sunny location with a south slope and a row of corn or other backing on the north. Enough fertilizer and water should be used to promote good early growth, but an extreme vegetative condition, as would result from large quantities of manure, should be avoided.

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Field Management Affects Storage Life of Onions

Efforts to find and remedy the causes of storage rots in Oregon Yellow Globe Danvers onions were continued in 1967 at Lake Labish in western Oregon.

Each of eight cooperating growers provided three pallet boxes of onions (about 1,000 pounds per box). The boxes were equally distributed and randomly arranged among three different storage locations. Each location provided one of the following conditions: (1) forced air ventilation; (2) tunnel dryer; and (3) common storage.

Treatment 1 provided air forced up through the onions in pallet boxes stacked one on top of the other. The sides of the stack were sealed with plywood to form a "chimney" and prevent the escape of air through the sides. Treatment 2 involved lining up the pallet boxes side by side in random order in a drying tunnel. Treatment 3 was common storage.

In mid-January of 1968 the onions were removed from storage and graded. Decayed and sound onions from each box were separated and weighed, and the percentage of rot was calculated. The results are summarized in Table 1.

It is immediately apparent in Table 1 that onions from certain growers had significantly less decay regardless of storage conditions and that the differences were greater among growers than among storage methods.

This suggests that certain storage rot problems originate in the field and probably are influenced by management practices not yet clearly identified. Irrigation and fertilization may be involved. The participating growers are located within the same geographical and climatic area, and their harvesting and curing methods are very similar.

There appears to be merit also in devising ways to force air continuously through the stacks of pallet boxes during the storage period.

Table 1. Percentage of rot from different storage methods and from different growers

Grower	Percentage of rot			
	Forced air	Drying tunnel	Common (Check)	Mean
	%	%	%	%
1	6	17	14	12.0
2	8	....*	9	8.5
3	11	16	14	13.5
4	3	3	3	3.0
5	5	6	7	6.0
6	6	5	8	6.0
7	5	7	9	7.0
8	3	6	5	4.5
AVERAGE	5.9	8.5	8.6	

* Because of unusual results, this box was not included.

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Vegetable Notes . . .

Charles R. Malone, in *Weeds*, Vol. 15, 1967, reported a rapid method for enumeration of viable seeds in soil. Dispersion of soil in an aqueous solution of sodium hexametaphosphate and sodium bicarbonate facilitates extraction of seeds by flotation with magnesium sulfate. The percentage viability of seeds collected in this manner subsequently can be determined with 2,3,5-triphenyl-tetrazolium chloride. Extraction of seeds is usually 100% efficient, and enumeration of viable seeds via the tetrazolium test is accomplished much more rapidly than with conventional methods.

The influence of temperature on the initiation of floral primordia of broccoli was studied in New York by M. R. Fontes and others (*Proc. Am. Soc. Hort. Sci.*, Vol. 91). It was found that exposure of 3-week-old plants to 40° F temperatures did not result in floral initiation. Some plants at 4 weeks of age and all of those at 5 weeks of age initiated flowers at 40°. These results indicate there is a juvenile period in the varieties used—'Waltham 29' and 'Green Mountain.' The effect of 40° exposure was partially reversed by subsequent exposure to 80°.