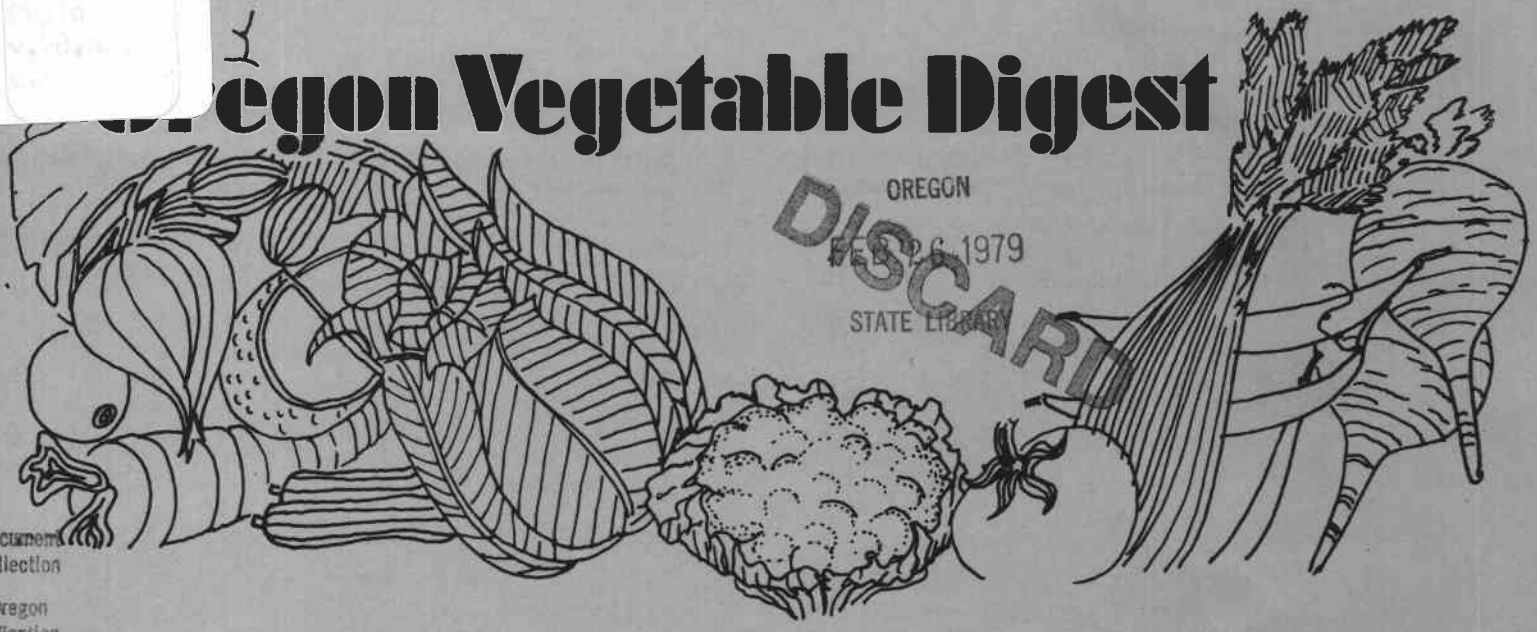
Oregon Vegetable Digest



Volume 28 Oregon State University, January 1979 Number 1

Irrigation treatments tested on bush beans

Two irrigation experiments were conducted on bush snap beans on silty clay loam soil at the OSU Vegetable Research Farm in 1977 and 1978.

Two moisture levels, low and high, were main plots in 1977 and included two varieties, Oregon 1604 and Early Gallatin, planted in 36-inch rows on June 9. Oregon 1604 also was planted in 6-inch rows (plants approximately 6 inches apart). Oregon 1604 was harvested on August 10, 12, and 15 and Early Gallatin was harvested on August 11, 15, and 18.

In 1978, Oregon 1604 and Galamor were grown at three moisture levels and two population densities (6-inch and 36-inch rows) and were harvested on three dates. Plots were seeded on June 7 and harvested on August 4, 7, and 9 for Oregon 1604 and on August 8, 10, and 14 for Galamor. Plots were hand harvested and yield and sieve size measurements were made. Irrigation scheduling was based on gypsum moisture block readings using the 6-inch depth for the first irrigation and the 12-inch depth was used to determine time and amount of later irrigations. The low, medium, and high moisture levels were based on soil moisture suction readings of 2.5, 1.0, and 0.6 bars, respectively, and represented available soil moisture removal of about 65-70, 50-55, and 40-45 percent, respectively.

Number of irrigations in 1977 and 1978 were 3 and 4, respectively, for the low moisture level and 7 and 9 for the high moisture level (Table 1). All treatments received an initial irrigation after seeding which is not counted in the total. Frequency of irrigation ranged from 10 to 14 days for the low moisture level, 8 to 10 days for the

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medium level and 5 to 7 days for the high moisture level. Amounts of water applied (calculated from can catchment) for the treatments are shown in Table 1. Total rainfall was 0.3 inches from June 9 to August 18, 1977 and 1.4 inches for June 7 to August 14, 1978.

Yield of Oregon 1604 in 1977 was about 97 percent higher at the high irrigation level than at the low level, harvest dates and spacings combined, Table 2. The percentage of pods sieve size 1-4 was higher at the low moisture level. Yield was 11 percent higher from 6-inch rows than from 36-inch rows and the percentage of smaller pods was higher from 6-inch rows. At the low moisture level there was no increase in yield from the third harvest date over the second date but at the high moisture level, yield from the third harvest date was 22 percent higher than from the second harvest date.

Table 3 shows results of the comparison of Oregon 1604 and Early Gallatin in 36-inch rows in 1977. There was a marked increase in yield of the high moisture level over the low level. Yield of Oregon 1604 was about 40 percent higher than for Early Gallatin at the low moisture level and about 50 percent higher at the high moisture level. If sieve sizes were equal, the difference between varieties would not be as great. Average yield at the second harvest was 17 percent higher than for the first harvest date but percentage of pods sieve size 1-4 was 72 at the second harvest compared to 87 for the first harvest date.

Results in Table 4 show that in 1978, yield of Galamor was higher than Oregon 1604 at the low moisture level, about the same at the medium moisture level and was lower at the higher moisture level. Yields from the medium irrigation level compared to the low level were increased more at the second and third harvest dates than at the first harvest date.

Data from the 1978 experiment are summarized in Table 5 and show that yields of the medium and high moisture levels were 24 and 76 percent higher, respectively, than the yield of the low moisture level. Percentages of pods of sieve sizes 1-4 were higher at the higher moisture levels for Oregon 1604 but lower for Galamor. Average yield from 6-inch rows, varieties and harvest dates combined, was 76 percent higher than from 36-inch rows. Yields were highest at the third harvest date with an acceptable range of maturity as indicated by 44-48 percent of pods sieve sizes 1-4.

Highest yields of snap beans were obtained in both years from the highest amount of water applied and most frequent irrigation. These ranged from 7 to 9 irrigations with about 9 to 11 inches of water applied at the high moisture level. Mid-season plantings would usually require more irrigation than early and late plantings. In 1977 there were 14 days when maximum temperatures were 90°F or above which occured in the late pod development and harvest period (July 31-August 15). In 1978, seven days were at 90°F or higher during July (July 21-26) and four days in August (August 7-10). Further work is planned on irrigation of bush beans.

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Table 1. Number of irrigations and amount of water applied, 1977 and 1978.

Moisture level	Suction (bars)	1977		1978	
		No. irrigations	Water applied (inches)	No. irrigations	Water applied (inches)
Low	2.5	3	4.8	4	6.5
Medium	1.0	-	-	6	7.3
High	0.6	7	9.1	9	10.5

Table 2. Effects of irrigation levels, spacing and harvest dates on yields and sieve size distribution of Oregon 1604 bush beans, 1977.

Moisture level	Row spacing (in.)	Harvest	Tons/A	% 1-4
Low	36	1	4.9	79
		2	5.2	68
		3	5.6	56
	6	1	4.8	85
		2	6.1	76
		3	5.2	70
High	36	1	8.1	76
		2	9.5	61
		3	11.5	46
	6	1	8.6	76
		2	10.9	63
		3	13.3	48

Means:

Moisture level	high	10.3	62
	low	5.3	72
Row spacing (inches)	36	7.4	64
	6	8.2	70
Harvest	1	6.6	79
	2	7.9	67
	3	8.9	55

Table 3. Effects of moisture levels and harvest dates on yields and sieve size distribution of Oregon 1604 and Early Gallatin bush beans (36-inch rows), 1977.

Variety	Moisture level	Harvest	Tons/A	% 1-4
Oregon 1604	Low	1	4.9	79
		2	5.2	68
	High	1	8.1	76
		2	9.5	61
Early Gallatin	Low	1	3.5	97
		2	3.6	85
	High	1	5.0	97
		2	6.8	74

Means:

Variety	Oregon 1604	6.9	71
	Early Gallatin	4.7	88
Moisture level	low	4.3	82
	high	7.2	77
Harvest	1	5.4	87
	2	6.3	72

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Table 4. Effects of irrigation levels, spacing, and harvest dates on yields and sieve size distribution of Oregon 1604 and Galamor bush beans, 1978.

Moisture level	Row Spacing (in.)	Harvest	Oregon 1604		Galamor	
			Tons/A	% 1-4	Tons/A	% 1-4
Low	36	1	1.4	59	1.4	97
		2	2.5	52	3.2	92
		3	3.2	49	3.0	52
	6	1	2.1	66	3.4	97
		2	3.9	60	4.6	91
		3	4.8	58	7.4	43
Medium	36	1	1.7	63	1.6	91
		2	4.0	54	3.0	84
		3	4.2	50	3.5	45
	6	1	2.6	73	3.4	97
		2	5.6	57	5.2	94
		3	6.9	53	8.8	39
High	36	1	2.5	70	2.5	83
		2	5.3	63	4.1	76
		3	7.1	39	5.0	40
	6	1	4.8	87	4.4	92
		2	8.4	73	6.9	81
		3	10.8	42	10.3	44

Table 5. Summary of yields and sieve sizes of bush beans as affected by moisture levels, spacing and harvests, 1978.

	Oregon 1604		Galamor		Variety Means	
	Tons/A	% 1-4	Tons/A	% 1-4	Tons/A	% 1-4
Moisture levels						
Low	3.0	57	3.8	78	3.4	68
Medium	4.2	58	4.2	75	4.2	66
High	6.5	62	5.5	69	6.0	66
Row Spacing (inches)						
36	3.5	55	3.0	73	3.3	64
6	5.5	63	6.0	75	5.8	69
Harvest						
1	2.5	70	2.8	93	2.6	82
2	5.0	60	4.5	86	4.8	73
3	6.2	48	6.3	44	6.2	46

Effect of pruning method on tomato yield and quality

Pruning and training methods are known to affect yield and quality of tomato fruit. However, specific data for Willamette Valley conditions and varieties have been lacking. The trial reported here grew out of observations on the effect of staking and single-leader pruning vs. no staking or pruning on the variety Early Girl.

In a 1977 tomato variety trial, some plants of the indeterminate Early Girl were allowed to grow and spread along the ground unchecked by pruning or training. Other plants were pruned to a single leader, all suckers removed, and tied to a stake, since the catalog description of the variety claimed that Early Girl responded positively to training. This severe pruning and training resulted in earlier fruit ripening on the first three trusses and slightly larger fruit size, but decreased yield and increased splitting and cracking during a heavy rainfall period.

The 1978 trial was designed to more closely examine these effects. Seeds were planted on April 13 in Jiffy Pots containing a mix of sandy loam:peat moss: perlite (1:1:1) and placed in a heated greenhouse. Seedlings were fed one-half cup weekly of 10-30-20 (30 g/gal) after appearance of the first true leaf. Just prior to first bloom the plants were moved to the field and grown on 1 meter raised bed covered with black plastic mulch. Fertilizer consisted of 1120 kg/ha dolomite incorporated into the Willamette sandy shot loam before bed shaping. All plants received 1/4 l of 30 g/gal 10-30-20 at transplant. Viaflo tubing was used for irrigation. No pesticides were used. Four replicates of three plants each were pruned to a single leader (vine) and tied to 2 meter stakes. An equal number of plants were neither pruned nor staked. Plant density in each case was 1.1 plants/ m^2 or about 10,760 plants/ha. Fruit was harvested weekly after August 1. In an attempt to induce blossom end rot (BER) and cracking, the beds were flooded on July 26 and then dried until plants visibly were wilted. The flooding was repeated on August 16 and the beds again allowed to dry. Water was given as needed after September 1. All fruit was picked at pink to red-ripe stage except that the last two harvests were at breaker stage.

The data for Early Girl in 1977 are summarized in Table 1. Staking decreased yield by nearly 40 percent, increased mean fruit size by about 6 percen and increased the incidence of radial and concentric cracking by more than 100 percent during the period 8/25 to 9/8, 1977. Staking also increased earliness with 10 percent of the fruit from staked plants ripening before 8/11 as opposed to 7 percent for the non-staked plants.

In 1978, with intentional induction of BER and cracking, the 1977 results were confirmed and, indeed, magnified. Fruit size was considerably larger (29 percent) for the more lightly cropped staked plants and earliness was again promoted, with 53 percent ripened by 8/31 for staked plants vs. 35 percent for unstaked plants (Table 2). Total yield was more than halved on staked plants while marketable yield was reduced by nearly half (Table 3). Incidence of BER was nearly 8-fold higher on staked plants and misshapen fruit and radial cracking were 3 to 4-fold greater on staked plants. Concentric cracking was not significantly different between the treatments. However, late blight affected more than five times as many fruit as on non-staked plants. The sugar/acid ratio or apparent ripeness of the fruit after three days at room temperature was not consistently affecte by pruning method (Table 2). Three unblemished red-ripe fruit per replicate per harvest period were used for these measurements. Sugar was estimated by a refractometer reading of expressed juice while acid was estimated by titration against standard base assuming 100 perce citric acid. There was less seasonal

variation in sugar/acid ratio in non-staked fruit.

The lowered yields for staked plants are to be expected since sucker removal greatly reduces the number of flower clusters/plant. But since the trained plants require less space, a greater plant population is easily attainable and can correct the yield difference, although at a higher cost for seed, other materials, and transplanting. The increased fruit size and earlier ripening of the staked plants may be explained by reduced competition for photosynthate, minerals, etc. Early Girl is an early, rather small-fruited variety and increased fruit size might improve marketability when competing against later, larger-fruited varieties. The increased BER and cracking with alternate flooding and drying suggest that fruit on staked plants is more susceptible to changes in water or nutrient availability. However, control of both water and nutrient status normally should be no problem with plastic mulch and drip irrigation. Staking appears to offer some disease protection, possibly because of better air movement, remoteness from soil-borne pathogens, and greater spatial separation between clusters.

In summary, severe pruning and staking of the popular hybrid tomato cultivar Early Girl will produce earlier ripening, increased fruit size, and possibly some disease protection at the cost of decreased yield/plant, possible BER or cracking problems when moisture and nutrients are inadequately controlled, and increased expenditures for materials and labor.

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Table 1. Effect of Staking and Single-leader Pruning on Yield, Fruit Size, Blossom-end Rot, and Splitting of Early Girl Tomato - 1977

Pruning Method	Yield m ton/ha	Mean Fruit Wt. g	Blossom-end Rot %	Cracking 8/25-9/8 %
Staked, single leader	63a[z]	152a	2a	33a
Non-staked, no pruning	101b	143b	1a	15b

[z] Mean in same column followed by different letters are significantly different at 95% confidence level.

Table 2. Effect of Pruning Method on Earliness, Fruit Size, and Sugar/Acid Ratios of Early Girl Tomato at Various Harvest Periods - 1978.

	Pruning Method	Harvest Period 7/31-8/8	8/9-8/31	9/1-9/20	9/21-10/11	10/12-10/24	Season Mean
% ripened during period	Staked	13	40	12	19	16	--
	Non-staked	3	32	45	14	6	--
Fruit size	Staked	137a	159a	176a	117a	106a	141
	Non-staked	94b	124b	113b	85b	60b	109b
Sugar/Acid Ratio[z]	Staked	5.7a	6.3a	5.9a	4.9a	--	5.8a
	Non-staked	5.2a	5.3b	5.9a	5.5b	--	5.5a

[z] Sugar/Acid Ratio is the % by weight soluble solids/% by weight titratable acidity.

Table 3. Effect of Pruning Method on Yield, Incidence (% by #) of Blossom-end Rot, Concentric Circular Cracking, Radial Cracking, Rough Fruit, and Susceptibility to Late Blight of Early Girl Tomato - 1978.

Pruning Method	Total Yield m ton/ha	Marketable Yield[z] m ton/ha	BER %	Concn. Cracking %	Radial Cracking %	Rough, Misshapen %	Late Blight %
Staked	50a	32a	19.0a	15a	18a	14a	7a
Non-Staked	117b	61b	2.4b	11a	5b	4b	40b

[z] Marketable yield is the total yield less any fruit which were severely cracked, split, blighted, severely misshapen, or blossom-end rotted. Many individual fruits had a combination of two or more defects.

Seed treatments tested for effect on sweet corn yield and head smut infection

The use of fungicidal seed treatments, especially carboxin (Vitavax-R Uniroyal), to reduce head smut infection has shown some promise, but results have been inconsistent.

In 1978, a test of combinations of carboxin with captan and thiram was included, with tests for resistance of commercial hybrids and breeding line in an inoculated plot area. Seeds of 'Jubilee' sweet corn were coated with the fungicide treatments and planted June 6 with a belt planter along with a mixture of head smut spores and vermiculite (see Ore. Veg. Dig. No. 4, 1978). Irrigation in these plots was minimal because moisture stress appears to increase head smut infection or symptom expression. About 600 pounds per acre of 8-24-8 NPK fertilizer were banded prior to planting. Plots were 30 feet long, rows 36 inches apart, and there were four replications in four blocks. Plants were thinned initially to a maximum of 45 per plot. As shown in Table 1, there were some variations in stand because of plant losses or insufficient emergence.

All plots were harvested on September 12, even though there was some apparent effect of treatment on maturity. Thus, differences in number and weight of mature ears, compared to immature ears, were due in part to harvest date.

The untreated controls were relatively poor in performance in all measured characteristics (Table 1), though differences were statistically significant for only weight of mature ears, number of mature ears, and gross unhusked weight. Seedlings were obviously less vigorous and uniform in the controls. Silking date was about two days later in the controls. Thus, some of the lower yield of mature ears in these plots was related to time of harvest. However, there was a generally greater maturity variation in the control plots. There were no significant differences between seed treatment combinations for any factor. Although differences in head smut infections were not significant, there was a slightly higher infection rate in the control, which may be related to the lack of vigor rather than to a direct effect of the seed treatments on infection.

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Table 1. Effect of seed treatments on performance and head smut infection of 'Jubilee' sweet corn [1]

Treatment[2]	Av. Stand	Seedl. unif.	Seedl. vigor	Unhusked ears wt	Husked ears				Total ears	Av. ear wt	% mature wt	% mature no.	% smut
					Mature wt	Inmature wt	Mature no.	Inmature no.					
1. V-3	42.5	2.75	3.00	24.0	9.3	4.6	17.2	12.8	30.0	.46	65	57	31
2. C-2, T-1.5, V-3	43.0	2.50	3.25	18.8	9.2	2.4	18.0	6.2	24.2	.48	79	76	37
3. C-2, T-1.5, V-1.5	42.7	2.25	3.25	20.4	10.0	2.5	19.2	7.3	26.5	.47	83	77	25
4. C-2, T-1.5	42.0	2.75	3.25	22.8	10.2	3.1	19.0	9.2	28.2	.47	78	71	32
5. C-2, T-1.5, V-6	39.5	2.50	3.25	20.0	9.0	2.4	17.2	6.8	24.0	.48	78	72	30
6. Untreated	38.0	2.00	2.25	15.1	3.9	3.7	9.0	10.0	19.0	.40	57	55	43
LSD (5%)	--	N.S.	N.S.	5.5	3.4	N.S.	3.2	N.S.	--	--	N.S.	N.S.	N.S.

[1] Data given in pounds or numbers per plot.

[2] Treatments: V-Vitavax, C-Captan, T-Thiram,; rates listed are pounds active ingredient/100 pounds seed.

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of
Oregon State University
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