

IRRIGATION OF TOMATOES IN A SINGLE HARVEST PROGRAM

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one week after planting, and a deep irrigation sufficient to completely fill the soil profile was applied after thinning. The following differential irrigation program was then carried out:

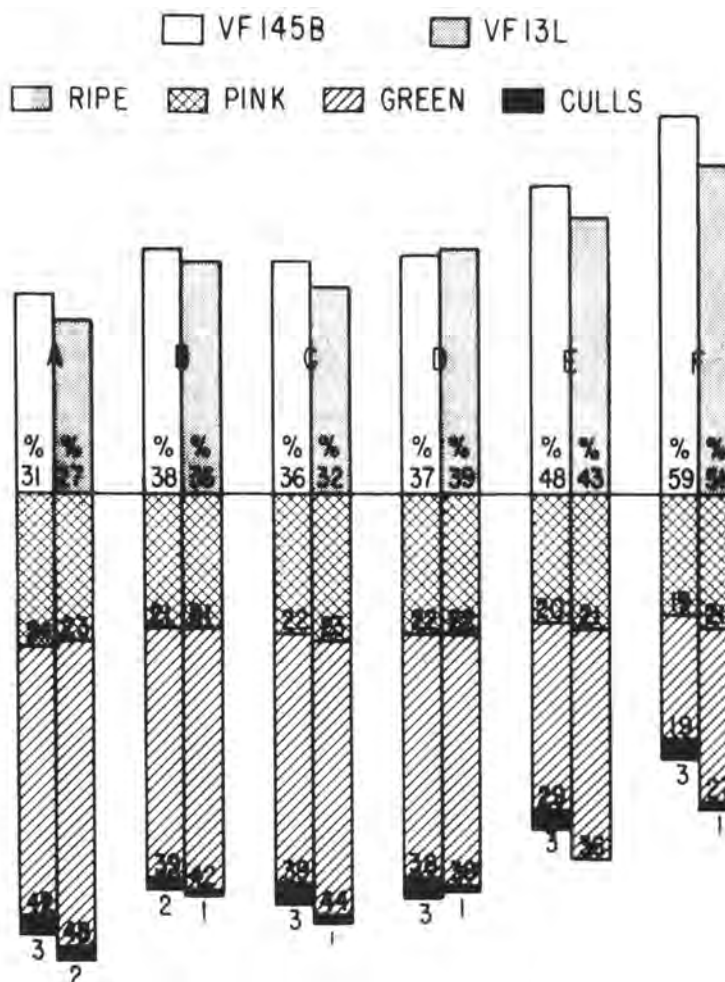
	DATES OF IRRIGATIONS AND IRRIGATION TREATMENTS*					
	A	B	C	D	E	F
	(inches applied)					
July 7	2	2	-	-	-	-
July 14	"	"	-	-	-	-
July 21 (early bloom)	"	"	6	-	6	-
July 28	"	"	-	-	-	-
August 4	"	"	-	-	-	-
August 11 (first pink fruit)	"	"	6	12	-	-
August 18	"	-	-	-	-	-
August 25	"	-	-	-	-	-
September 1	"	-	-	-	-	-
Total amount applied (inches)	18	12	12	12	6	0

* Table includes only irrigations applied following a deep irrigation at thinning time.

Moisture measurements

Soil moisture tension was determined by using radio plug type gypsum blocks installed near the center of the row at depths of 1, 2, and 3 ft in all treatments and at 4 and 6 ft in all but the wettest plot (treatment A). Figure 1 shows graphically the average soil moisture tension in the top 3 ft of soil at different stages of growth for both varieties. Also shown is the soil moisture tension at 4 and 6 ft, which serves as an index of

Figure 2. Effect of irrigation on relative maturity of VF 145 B and VF 13 L tomatoes.



root development and soil moisture use at these lower depths. With variety VF 13 L the average soil moisture tension in the top 3 ft follows a pattern quite similar to results obtained in 1964. In treatments A and B the tension remained below 0.45 bar during the vegetative and green fruit development stages, while in other treatments during this same period, tensions reached a maximum of 1 to 3 bars. Soil moisture tension in the plots of treatments A and B of the VF 145 B tomatoes during this same early period is similar to that in the VF 13 L plots.

Pink fruit

However, in plots of treatments C, D, E, and F of VF 145 B the soil moisture tensions reached at the time of the first pink fruit ranged from about 2 to 7.5 bars indicating a more extensive root development and a higher rate of soil moisture use than the VF 13 L variety. During the fruit ripening period of variety VF 13 L, soil moisture tension in the top 3 ft of soil remained below 0.5 bar in treatment A, ranged from 1.5 to 3 bars in treatments B, C, and D and to nearly 6 and 9 bars in treatments E and F respectively. During this period the soil moisture tension in the top 3 ft of soil for the VF 145 B variety remained below 0.5 bar in treatment A, increased to about 2 to 5.5 bars in treatments B, C, and D and increased to 7 and 11 bars in treatments E and F.

Examination of the soil moisture data at the 4- and 6-ft levels shows that moisture extraction did occur at these depths with both varieties. Soil moisture tension at 4 ft began to increase first in treatments D and F of both varieties about July 21 to 23 (early bloom stage). Tensions at 6 ft began to increase about six days later in the same treatments. The magnitude of soil moisture tensions developed in treatments D, E, and F was greater with the variety VF 145 B than with VF 13 L indicating again that the root system of VF 145 B tomatoes is probably more extensive than VF 13 L.

Crop maturity

Crop maturity was affected by irrigation as shown in figure 2 and results obtained follow the same trend obtained in 1964. The percentage of ripe fruit was progressively reduced with increasing amounts of water applied. Maturity was delayed the most in the treatment where soil moisture was maintained at a high level until harvest. Values shown for percentage of ripe fruit in figure 2 are lower in all cases than those obtained in 1964,

EFFECT OF IRRIGATION ON TOMATOES IN A SINGLE HARVEST PROGRAM
Variety VF 145 B (harvested 9/14/65)

Treatment	Irrigation cutoff before harvest	Mean SMT* at harvest (0-3')	Solids Content		Yield		
			Soluble	Total	Ripe Fruit	Juice†	Edible Solids
	Days	Bars	%	%	tons/A	lbs/A	lbs/A
A	13	0.3	4.22	4.52	23.2	39828	1800
B	34	1.6	4.45	4.75	27.5	47269	2245
C	34	1.9	4.47	4.77	27.8	47788	2279
D	34	1.5	4.90	5.20	28.1	48426	2518
E	55	7.2	4.97	5.27	27.1	46703	2461
F	76	11.0	6.03	6.43	26.0	44986	2892
LSD (5%)			0.25		2.52		

Variety VF 13 L (harvested 9/21/65)							
	Days	Bars	%	%	tons/A	lbs/A	lbs/A
A	20	0.5	3.80	4.10	17.7	30342	1244
B	40	3.2	4.19	4.49	22.4	38455	1726
C	40	2.4	3.87	4.17	21.8	37425	1560
D	40	1.2	4.00	4.30	23.1	39653	1705
E	62	5.9	4.55	4.85	25.2	43319	2100
F	83	9.6	4.77	5.07	24.5	42169	2138
LSD (5%)			0.26		3.50		

* SMT = Soil Moisture Tension.

† Based on 225 gallons of juice per ton of ripe fruit.

due to the influence of moderate summer temperatures on ripening and the inability to delay harvesting to compensate for it.

Yield data are presented in the table, along with the effect of irrigation on the solids content of the fruit—including calculations showing the production of edible solids per acre. Particularly significant is the effect of soil moisture tension during the ripening stage. As the mean soil moisture tension was allowed to increase (gradual drying) prior to harvest, the solids content and the yield of edible solids per acre were increased by the same relative amounts. The one exception to this was in treatment D of both varieties where the solids content of ripe fruit at harvest appears to be correlated more with the higher soil moisture tension reached at the pink fruit stage just prior to an irrigation at that time. As may be seen in figure 1, the soil moisture tension at that time was higher than at harvest time, being 5.4 bars with variety VF 145 B and 2.7 bars with the VF 13 L variety.

Time to harvest

Much attention has been directed to the length of time that should be allowed between the last irrigation and harvest, since it is now generally known that a dry field allows a more efficient operation of mechanical harvesting equipment, and studies have shown that yields of ripe fruit and the solids content may be reduced by excess irrigation during the fruit ripening stage. It is evident from this work that this cut-off period should be early enough to allow the soil in the main root zone to dry to a relatively low level of soil moisture. In terms of soil moisture tension, this would mean a ten-

sion of at least 5 bars, at which point about 75 to 80% of the available soil moisture would have been used up in a medium textured soil. Soil moisture tension as high as 5 to 11 bars at harvest did not necessarily result in a loss in yield of ripe fruit in this single harvest operation since maturity of the crop was hastened and the solids content of the ripe tomatoes was significantly higher. A considerable portion of the ripe fruit in the driest treatment (treatment F) was shriveled, however.

The total potential yield of fruit, particularly developing green fruit, was reduced when soil moisture tension exceeded 5 bars during the ripening stage. The length of time it takes for soil moisture tension to increase to 5 bars in the main root zone following an irrigation may vary considerably, depending upon climate, soil conditions, available moisture in the soil, and the root density of the tomato variety being grown.

Although emphasis has been placed on the length of the irrigation cut-off period before harvest, it seems evident from this work that a period of relatively high soil moisture stress at any time during the fruit ripening phase will exert a favorable effect on fruit quality at harvest, even if the crop is irrigated again before harvest. Increased incidence of fruit cracking (under conditions of high nitrogen) or blossom end rot might occur in some cases with this irrigation regime.

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