

IRRIGATION AND FERTILIZATION MANAGEMENT OF AVOCADO

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The research project continues at the Covey Lane irrigation site in San Diego County. This irrigation project was initiated in the summer of 1992. It is both an irrigation rate and frequency trial on mature 'Hass' avocado trees. The differential irrigation treatments were imposed in November 1992 and will be maintained as much as possible throughout the year. Table 1 lists the 9 irrigation treatments included in the study. The irrigation rate were determined by using the Kc values determined from the Corona Foothill Properties irrigation trial and utilizing both Escondido and Temecula CIMIS data and our own E-pan and atmometer equipment on site. Based on the data that we collected from the transducer equipped tensiometers at the site during the latter half of 1994 and through 1995 we have revised the crop coefficients for the months of August and September (Table 2).

We are taking soil samples twice a year (Fall and Spring) to determine soil pH and electrical conductivity (an indication of salinity), sodium, chloride and potassium. This helps us to monitor the effect of the irrigation treatments on any salinity buildup in the soil profile. The soil sample is broken into 4 subsamples: 0 to 6 inches, 6 to 12 inches, 12 to 24 inches and 24 to 48 inches. Water samples are taken quarterly to monitor water quality. Leaf samples were taken in Fall both 1992, 1993, 1994 and 1995.

In Fall 1992 we established a 3 year girdling project on an adjacent block of trees. Single branches per tree are being girdled either in November, February or Full Bloom. We have replicated each treatment 15 times in a randomized complete block design. We will summarize the results of this secondary project following the 1996 harvest.

Last year we reported on the seasonal changes in soil EC. We have continued to monitor the soil EC and observed similar trends in 1995 as observed previously (data not presented). In summary, the seasonal fluctuation in soil EC is greatest at the shallow soil depths as is the overall readings. It is generally believed that the majority of avocado roots are found in the top 6 inches of soil. Indeed the root sampling which we conducted at the site in September 1995 showed that approximately 87% of the roots could be found in the top 6 inches. Of this nearly 65% of the total roots were found in the 0-3 inch depth. There were no significant differences in root density at any depth between the different treatments. We plan to conduct another root sampling at the close of the study.

Table 3 lists the average leaf levels of sodium and chloride of the various treatments in 1993 - 1995. There were no significant differences between treatments in 1992 prior to

initiation of the treatments. Note that the trees receiving the once weekly irrigation (1x) tended to have lower sodium leaf levels both in 1993 and 1994 but not in 1995. This irrigation treatment also had significantly lower chloride leaf levels in both 1994 and 1995. We also detected significantly higher chloride levels in 1994 and 1995 in the 90% ETc treatment.

Table 4 presents the yield data from the trial through Spring 1995. The 1996 yield data will be collected later this spring. In 1995 we observed a significant linear effect of irrigation treatment (% ETc) on the 1995 yield and the cumulative yield with the trees receiving higher amounts of water yielding greater amounts of fruit. To date, we have not observed a significant effect on yield related to irrigation frequency. The increase in yield attributable to irrigation amount is not due to the fact that the 130% ETc trees are larger. Through Fall 1995 we have not detected any significant differences in tree size based on tree height, canopy volume or trunk circumference.

Table 1. Irrigation treatments at the Covey Lane site.

Irrigation Rate (% ETc)	Irrigation Frequency (times per week)
90	1
90	2
90	7
110	1
110	2
110	7
130	1
130	2
130	7

Table 2. Crop Coefficients being used at the Covey Lane Irrigation Project effective January 1996. These were revised based on tensiometer data collected at the experimental site in 1995.

Month	Kc (OLD)	Kc (NEW)
January	0.40	0.40
February	0.50	0.50
March	0.55	0.55
April	0.55	0.55
May	0.60	0.60
June	0.65	0.65
July	0.65	0.65
August	0.60	0.65
September	0.55	0.60
October	0.55	0.55
November	0.55	0.55
December	0.50	0.50

Table 3. Sodium and chloride levels as influenced by irrigation amount and frequency for 1993 - 1995. Leaves were collected in September of each year.

	Sodium (ppm)			Chloride (%)		
	1993	1994	1995	1993	1994	1995
Irrigation Amount						
ETc						
90%	90	75	78	0.072	0.999	0.442
110%	82	73	68	0.073	0.908	0.399
130%	80	66	75	0.070	0.862	0.385
Irrigation Frequency						
times/week						
1x	73	64	75	0.072	0.874	0.374
2x	95	67	79	0.070	0.907	0.428
7x	84	84	67	0.073	0.988	0.423
Significance^z						
ETc	n.s.	n.s.	n.s.	n.s.	**	*
Frequency	*	***	n.s.	n.s.	*	*
ETc x Freq.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

^z Probability of significant differences at the 5% level (*); 1% level (**) or 0.1% level (***).

Table 4. Yield (kg per tree) as influenced by irrigation amount and frequency. Covey Irrigation Project in San Diego County.

	1993	1994	1995	Cumulative 1993 - 1995
Amount (% ETc)				
90%	16.4	12.0	34.5	62.9
110%	16.9	8.3	40.6	65.8
130%	19.2	14.4	58.7	92.2
<i>Significance</i> ²	n.s.	n.s.	n.s.	n.s.
<i>Linear</i>	n.s.	n.s.	*	*
<i>Quadratic</i>	n.s.	n.s.	n.s.	n.s.
Frequency (times/week)				
1x	21.2	10.4	46.6	78.2
2x	14.2	13.1	47.4	74.7
7x	17.0	11.2	39.8	68.0
<i>Significance</i>	n.s.	n.s.	n.s.	n.s.
<i>Linear</i>	n.s.	n.s.	n.s.	n.s.
<i>Quadratic</i>	n.s.	n.s.	n.s.	n.s.

² Probability of significant differences at the 5% level (*); 1% level (**) or 0.1% level (***).