

Irrigation requirement in olive trees – Article by Goldhamer et al. (selected sections)

IRRIGATION REQUIREMENTS OF OLIVE TREES AND RESPONSES TO SUSTAINED DEFICIT IRRIGATION

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Abstract

Eight irrigation rates were applied to mature olive trees (*Olea europea* cv. Manzanillo) over three seasons in the San Joaquin Valley of California. These levels corresponded to Eto (modified Penman grass reference) crop coefficients (K_c) of 0.16, 0.26, 0.36, 0.46, 0.55, 0.65, 0.75, and 0.85 which resulted in mean seasonal water applications of 232, 338, 424, 599, 729, 838, 945, and 1016 mm, respectively.

Predawn leaf water potential (LWP) measurements suggest that irrigation-related tree water stress occurs with K_c values of 0.55 or less. The most important yield components affected by deficit irrigation were fruit yield and fruit value. Fruit yield ranged from 10500 to 22100 kg/ha for the lowest and highest irrigation rates, respectively. Fruit values for those treatments were 0.328 and 0.558 \$/ha, respectively. There was a strong correlation between revenue and applied water up to about 950 mm. Using two linear expressions to describe this relationship, revenue per unit of applied water was \$0.585/m³ from 250 to 600 mm and \$2.39/m³ from 600 through 950 mm.

Table 1. Operational and orchard performance parameters averaged for 1991 and 1992, years two and three of the study. Values followed by the same letter are not statistically different ($p=0.05$) using Duncan's new multiple range test.

K_c	Applied water (mm)	Fruit load (#/tree)	Fruit yield (kg/ha)	Fruit value (\$/kg)	Revenue (\$/ha)
0.16	232	15700 a	10500 a	0.328 a	3450 a
0.26	338	17800 a	12400 ab	0.300 a	3700 a
0.36	424	25800 b	13100 bc	0.317 a	4170 a
0.46	599	29300 bc	15400 cd	0.316 a	4860 ab
0.55	729	33000 c	17500 de	0.442 ab	7740 b
0.65	838	27000 bc	19700 ef	0.555 b	10900 c
0.75	945	28000 bc	21900 fg	0.615 b	13500 c
0.85	1016	28600 bc	22100 g	0.558 b	12400 c

Table 2 . 1992 predawn leaf water potentials. For each column of daily values, numbers followed by the same letter are not statistically different ($p=0.05$) using Duncan's multiple range test.

Kc	18 Mar	15 Apr	12 May	11 Jun	16 Jul	24 Aug	26 Sep	9 Oct
	MPa							
0.16	-0.94a	-0.62a	-0.75a	-1.03a	-1.62a	-1.70a	-1.68a	-2.11a
0.26	-0.66b	-0.57ab	-0.62b	-0.78b	-1.20b	-1.21b	-1.17b	-1.43b
0.36	-0.41c	-0.55b	-0.49c	-0.65c	-1.12b	-1.08c	-1.00c	-1.15c
0.46	-0.42c	-0.44c	-0.46c	-0.55d	-1.00c	-0.74d	-0.73d	-0.73d
0.55	-0.35cd	-0.36d	-0.37d	-0.47de	-0.64d	-0.62e	-0.58e	-0.50e
0.65	-0.33cd	-0.32de	-0.34d	-0.40ef	-0.45e	-0.40f	-0.36f	-0.32f
0.75	-0.28d	-0.30e	-0.30d	-0.34f	-0.39e	-0.40f	-0.35f	-0.31f
0.85	-0.27d	-0.30e	-0.31d	-0.35f	-0.40e	-0.38f	-0.33f	-0.30f

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