Agricultural Water Management, 24 (1993) 119–131

Water use, wetted soil volume, root distribution and yield of avocado under drip irrigation

N. Michelakis, E. Vougioucalou and G. Clapaki
Institute of Subtropical Plants and Olive Trees, Chania, Crete, Greece

(Accepted 20 April 1993)

ABSTRACT

The effect of three water use (WU) levels corresponding to 0.3, 0.6 and 0.9 Ep (Ep=Evaporation "A" pan) on wetted soil volume, root distribution and yield of avocado cv. Fuerte was investigated over a 5-year period at Chania, Greece.

The average amounts of irrigation water applied annually (in addition to rain) for the three WU levels were 238, 553 and 868 mm, respectively. Soil volumes, with a volumetric soil water content percentage (θ) corresponding to a soil water potential (ψ_s) higher than -0.1 MPa, increased markedly from 0.3 to 0.6 Ep, and slightly from 0.6 to 0.9 Ep WU levels, being 26.3, 41.7 and 52%, respectively. Deep percolation did not occur at 0.3 Ep, was moderate but acceptable at 0.6 Ep, and high at 0.9 Ep.

Root distribution was similar in all treatments. Some 72% of the root system was concentrated in the upper 0.5 m soil layer and within 2 m on either side of the drip line.

Root density (RD) increased greatly from 0.3 to 0.6 Ep, and slightly from 0.6 to 0.9 Ep level. RD in relation to θ did not show any notable difference between WU levels. Root growth rate, estimated by the lateral to main root ratio (r), was higher in a θ range of 20 to 30%, corresponding to a ψ_s range of -0.05 to -0.3 MPa for the soil in the experiment.

Yield at 0.3 Ep was lower than at 0.6 and 0.9 Ep WU levels among which no significant differences were seen. Size of individual fruits and oil content were not significantly different between treatments.

When water saving, deep percolation, wetted soil volume, root development, and yield quantity and quality are taken into account, then a WU level of 0.6 Ep can be considered optimal under the conditions of this experiment.