

The influence of drip irrigation on Coffee arabica L. cultivar Ruiru 11 was studied in a field experiment. Drip irrigation was applied when a soil moisture deficit (SMD) of 100 mm was recorded. Four drip irrigation rates (25, 50, 75 and 100 mm of water) were applied to offset the SMD by 25%, 75% and 100%. These were applied at intervals of 21, 28 and 42 days. The control treatment was unirrigated.

Primary (first order) branch extension growth, stomatal conductance, CO<sub>2</sub> assimilation, leaf water potential, biomass accumulation, root distribution, yield and quality were measured.

The drip irrigated coffee plants had a significantly higher primary branch extension growth rate (8.1 mm wk<sup>-1</sup>), stomatal conductance (0.605 mol m<sup>-2</sup> s<sup>-1</sup>) and leaf water potential at 14.00 h (-1.98 MPa) than the unirrigated plants. The corresponding growth rate, stomatal conductance and leaf water potential in the unirrigated plants were 1.2 mm wk<sup>-1</sup>, 0.368-mol m<sup>-2</sup> s<sup>-1</sup> and -2.67 MPa. Irrigated plants had higher CO<sub>2</sub> assimilation rates in the upper levels of the plant canopy when compared to the unirrigated ones. Root distribution was not significantly influenced by irrigation. However the mean vertical distribution (125 cm) was about half the horizontal distribution (232 cm).

The unirrigated coffee had a total coffee yield of 6142 kg per ha. The 25 mm, 50 mm, 75 mm and 100 mm irrigation rates resulted in yields of 9373 kg, 10531 kg, 10307 kg and 8726 kg per ha respectively. These represented increases of 52.6, 71.5, 67.8 and 42.1% respectively. The results showed that the 50 mm irrigation rate may be optimal. Evidence that dry season water requirements for the cultivar may be met by low irrigation rates at short intervals is presented. The practical implications of the results are discussed.