Water management of olive trees (*Olea europaea* L.) in a hilly environment of Central-South Italy


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Abstract

Mediterranean climate is characterized by dry and hot summer and cold and humid winter. Abiotic stresses combined with climate variability are a limiting factor for quality and yield of agricultural production. Recent previsions of global change climate predict that in Mediterranean region near years 2050 winter precipitation will increase, while summer precipitation will decrease by 10 to 15%. In addition, the agricultural sector should also bear an increase in water rates caused by the increase in demand, energy costs and distribution. This general situation makes crucial to study irrigation scheduling models that allow to avoid water losses and improve water use efficiency. It is recognized that olive tree is resistant to water deficit, but water responses of this species to irrigation is essential to reach high and stable yield. Although, the effects of water stress allow a negative effects not only during the season but also in the subsequent years. Studies demonstrated that irrigation strategies partially satisfying water consumption in fixed phenological stages (RDI) minimize detrimental effect on yield and on olive growing. The present study summarizes field experiment results of five cultivars in a hilly area of south Italy. The aim of the work was to test the hypothesis that irrigation applied from pit hardening to fruit veraison would allow to perform good crop yield.

The field trial was carried out in the period 2006-2007 in a typical area of southern Italy at CNR-ISAFoM experimental farm (Benevento, 41°06’, 14° 43’, 250 m a.s.l.). The orchards was established in 1992 and trees were planted to a density of 555 plant per hectare (6 x 3 m). Five olive cultivars for table consumption and double aptitude were tested in a split plot experimental design with four replicates were tested: Ascolana tenera, Nocellara del Belice, Itrana Maiatica e Kalamata. Four irrigation treatment were applied: a not irrigated control (T0), a treatment fully irrigated during the all season (100% of maximum evapotranspiration, ETc) and two deficit treatments that received 33 and 66% of ETc (T33 and T66) irrigated from pit hardening to fruit veraison. Reference (ETo) evapotranspiration was estimated adopting Penman Monteith model and data were adjusted with a crop coefficient equal to 0.65 and a tree ground coefficient of 0.85. Yield of the two years were off for all cultivars. This behaviour was probably due by the high density of plantation that cause difficulties in air circulation and high humidity in the canopy that allow the presence of pathogen fungi such as cycloconium. In addition solar radiation within the canopy is scarce. Itrana, Maiatica and Nocellara del Belice were the most sensitive to this environment. The plantation density was proposed at field establishment as ‘dynamic’ since after 15th – 18th years of growth one plant on the row should be cut and the final density should become 277 plant ha⁻¹ (6 x 6 m). Beside this consideration, the effect of irrigation was evident. Yield increase with the increase of irrigation level comparing the two deficit irrigation treatments (T33, T66) in the most productive cvs., Ascolana T. and Kalamata, while in Nocellara del B. and Maiatica yield of the irrigated treatments were not significantly different. Itrana did not showed effects of irrigation. The treatment fully irrigated during the all season performed higher yield with respect to the others only for Ascolana T. and Kalamata. The lack of irrigation effects was due to the low productivity of the two experimental years. Yield increase was mainly due to mean fruit weight and fruit number. Plant water status as a function of SWC will be presented.

In conclusion, results imply that a water amount completely replenishing ETc results in higher yield but the seasonal water amount was up to two times compared treatment T66. The training system and the plant density of the orchard should be discussed and revised according the present results.