Super-intensive olive grove and deficit irrigation

Campi P., Gaeta L, Ferrara R., Mastrorilli M., Modugno A.F., Rana G.
pasquale.campi@crea.gov.it
Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria - Centro di Ricerca Agricoltura e Ambiente, Via C. Ulpiani, 5 70125 Bari

Olive activates physiological mechanisms both for drought adaptation and for using efficiently the soil water. The Mediterranean basin is the most important olive area in the world where the traditional cropping system is rainfed. However, also for the Mediterranean olive growers the new frontier is the super-intensive grove, despite it largely depends on irrigation. Due to scarce water supplies, a question arises: are super-intensive olive groves sustainable? The theoretical answer is to match the olive super-intensive system with deficit irrigation strategies.

Regulated Deficit Irrigation (RDI) represents a valuable hypothesis. It entails to supply less irrigation water during specific pheno-phases, when the species tolerates a temporary soil water stress, in other words the plant does experience the soil water stress, however it does not affect final production. In the case of olive, the pheno-phase corresponding to the fruit pit hardening is considered less critical for the soil water shortage. Usually, this stage is 3 or 4 week-long and it happens between July and August, when evaporative demand is high. Therefore, a reduction in water consumption is expected.

This research investigates on the agronomic effectiveness of the RDI strategy to save irrigation water. Soil water content (SWC) dynamics is monitored and consequences on plant water status and yield are analysed.

A field study started in 2019 as part of the M.Ol.T.I. project (funded by MiPAAF). It is still ongoing in a Mediterranean environment (41°01'N, 16°54'E, 118 m a.s.l.) on super-intensive 'Arbosana' olive grove set-up in 2006, with a density of 1667 trees ha-^{1}. Two irrigation regimes are scheduled: full irrigation (FI, total restoration of water consumption); RDI (irrigation withdrawn during pit hardening phase). Available observations from the 2019 survey showed that SWC (in the top 40 cm soil layer), monitored by capacitive probes (10HS Decagon, USA), during the pit hardening (19/07-20/08) was reduced to values close to the wilting point (WP). RDI yield did not reduce (4 kg tree^{-1} in FI *vs.* 3.7 in RDI), notwithstanding the plant water status, monitored through the stem water potential (Ψ), dropped from -10 bar (seasonal value in FI and in RDI when irrigation was supplied) to –22 bars. After the temporary soil water stress in RDI treatment, Ψ values immediately recovered once irrigation supply was restarted. In RDI treatment Ψ values raised back to -10 bar until the end of the experimental survey, without any difference between FI and RDI.

Since it reduces the seasonal volume and it does not affect yield, RDI strategy increases irrigation water productivity. Finally, RDI irrigation seems to contribute to the sustainability even in super-intensive olive system.

Keywords: arbosana, regulated deficit irrigation, soil capacitive probes, stem water potential.