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Soil chemical and biological properties in conventionally irrigated and rainfed olive orchards in South Greece, island of Crete.

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The implementation of olive cultivation techniques in Greece had not been systematically tested under the prevailing Mediterranean conditions. This work introduces, in both conventionally irrigated and rainfed olive orchards, a mixture of old and new techniques in olive orchards, such as wood shredding, returning of Olive Oil Mill Waste Water to the field (with or without composting), modification of flora, introduction of zero tillage, alternative pruning. The aim of this work was to study the effect of irrigation conditions (conventionally irrigated and rainfed fields) on soil properties, in relation to cultivation techniques. This paper presents data on soil's chemical and biological properties, deriving from a soil campaign in a pilot region in South Greece, particularly in the area of Mirabello, prefecture of Lasithi, Island of Crete. The soil campaign took place during the periods of December 2012-February 2013 and fDecember 2014-February 2015. Forty soil parcels with olives (20 irrigated + 20 rainfed) were selected in order to receive the above interventions and measure the results. In each soil parcel six composite soil samples were taken, from 0-10 cm depth at equal intervals along a straight line of the trunk of the tree, to the middle of the distance from the nearest tree of the next tree series. The first three samples were under olive tree canopy. An additional composite sample was taken at depth of 10-40 cm. Moreover, 8 soil profiles in selected fields were sampled up to 150 cm at 10-cm increments, where one or a combination of the above cultivation practices was applied. Soil samples were analyzed for main soil chemical properties (texture, pH, EC, organic matter, humic acids (HA) of fulvic acids (FA), total Nitrogen, inorganic nitrogen (NH4+ and NO_3-), available P, exchangeable K, Ca, Mg) as well as for biological properties (soil basal microbial respiration (BR), microbial biomass C (MB-C)).
The results showed considerable differences in soil properties, associated with the sampling position, soil depth and irrigation conditions. The soil depth and the distance from the trunk of the olive tree had a significant and negative effect on most soil properties, regardless the irrigation regime. The higher values for soil properties were determined in samples taken from points under the canopy, compared to the sampling points outside the canopy. This indicates the positive effect of rhizosphere and the favorable soil moisture conditions under tree canopy on soil microbial activities. Overall soil parcels, mean values of pH, available P, exchangeable cations K, Ca, Mg, total N, HA, FA, and MB-C, were significantly higher in irrigated olive orchards. Unlike the average values of organic matter, the NH4+ and NO_3- were higher in rainfed olive orchards. Moreover, the availability of soil nutrients was favored in irrigated fields, where one or a combination of the above cultivation practices was applied, compared to rainfed fields. The introduction of "alternative" soil nutrient and irrigation management guidelines in olive orchards will enhance the productivity of the soils in the study area.