



Seasonal changes in salinity and sodicity of soils irrigated with treated domestic wastewater

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Semiarid and arid zones are characterized by short wet winters and long dry summers, when most of crop production relies on irrigation. In these areas, treated wastewater (TWW) is a valuable water resource whose use is rapidly expanding. However, the composition of TWW differs from that of freshwater, mainly due to higher salt, sodium and organic matter concentrations. Therefore, its continuous application to the soil could have an impact on soil properties, particularly soil salinity and sodicity. However, these changes could be reverted during the following rainy season, if the amount of rain infiltrating through the soil is enough to leach salts down the profile. In the present study, we analyzed the effects of long-term irrigation with secondary TWW on salinity and sodicity of two contrasting soils under semiarid Mediterranean conditions. Experiments were conducted in two grapefruit orchards, one with a non-calcareous sandy soil (Typic Haploxeralf) and the other with a calcareous clayey soil (Chromic Haploxerert). Two treatments were tested (>7 years): (i) irrigation with freshwater and (ii) irrigation with domestic, secondary TWW. During the duration of the experiment, soil profiles were sampled at regular intervals to a depth of 1.2 m two times each year: i) in spring, before the irrigation season started, and ii) in fall, after irrigation ended and before the rainy season.

The results show that, in general, irrigation with TWW increased soil salinity compared with freshwater in the upper 30 cm of the soil profiles. However, leaching by rainwater resulted in similar salinity values in both treatments after the rainy season. Soil sodicity increased with the irrigation with TWW to a depth 1.2 m in the sandy soil and 0.6 m in the clay soil, but in general, these changes did not disappear during the rainy season. It can be concluded that in semiarid regions with >500 mm annual rainfall, the precipitation can be sufficient to prevent long-term salt accumulation in the root zone in areas irrigated with TWW. However, when TWW sodicity is higher than that of the soil, the use of TWW could induce permanent changes in sodicity, with a potential negative impact on the configuration of soil pore system.