



ESEM results and changes in wettability patterns within soil: three years irrigation with slightly-salted water

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Impacts on soil and aquifer media from the use of non-conventional water (treated wastewater-TWW, desalted) for irrigation have been widely studied in the last years. A number of contributions have focused on the impacts derived from the use of TWW (Assouline and Narkis, 2013; Lahav et al., 2010; Xu et al., 2010).

Changes in soil hydraulic conductivity and clogging processes have been studied in laboratory experiments from soil columns (Lado and Ben-Hur, 2010) and at field scale (Costa, 1999; Minhas et al., 1994). Irrigation with non-conventional water may also lead to the occurrence of contaminants, a major current environmental concern (Valdes-Abellan et al., 2013).

Previous studies have considered impacts in a uniform soil media pore structure; less attention has been paid at a microscopic scale and the influence that high-salinity water may have on wettability of soil. Environmental scanning electron microscopy (ESEM) is a useful technique to be applied in soil science to analyse microscopic changes in soil structure or soil wetting patterns. Research applying this technology for wet systems (Donald, 1998) or porous media (Ali et al., 1995) is available, however as far as we know research on soil impacts due to long term irrigation with saline or non-conventional water are much less common. The dynamic mode of the ESEM allows changes of samples from wet to dry by modifying the water vapour pressure and to observe the wetting and drying patterns and interactions between the solid and liquid phase in the soil (Lourenço et al., 2008). Preliminary results of the study at a microscopic scale of soil samples collected before and after three year irrigation with slightly salted water in an experimental plot setup in semi-arid climatic conditions (Alicante, SE Spain) are presented. We will show the micro-structure of soil and undertake a preliminary investigation of wetting and drying of samples using ESEM techniques

Differences in the water vapour pressure value at which complete saturation is achieved was detected, being lower in the 3-years irrigated samples compared with the initial ones. Besides, velocity in which saturation took place was different: initial samples saturation process were developed very quickly, as triggered by a critical shift in the water vapour pressure value and much gradual process were develop in the 3-years irrigated sample when saturation started earlier.