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Long term effects of treated wastewater irrigation on calcisol fertility: A case study of Sfax-Tunisia

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ABSTRACT

The use of treated wastewater (TW) for irrigation is increasingly being considered as a technical solution to minimize soil degradation and to restore nutrient content of soils. Indeed, TW usually contain large amounts of nutrient elements. The objective of this study is to evaluate the impact of long-term irrigation by TW on soil fertility under real field conditions. In the vicinity of the city of Sfax, a semi-arid region, a calcisol field has been irrigated for more 15 years with organic sodic TW; soil was modeled at three different depths (0 - 30, 30 - 60 and 60 - 90 cm) and along soil pits in the TW irrigated zone and in a nearby non-irrigated zone (control). Several parameters have been measured: soils pH, CEC, exchangeable cations, nitrate and ammonia, total contents of nitrogen, phosphorus and other essential macro and micro nutrients, electrical conductivity, soil organic carbon and dissolved organic carbon. C/N ratio and SUVA were calculated for each soil layer. The calculation of the isovolumic mass balance on soil profile scale was used to measure macro and micro nutrients supply. The TW irrigation has led to important supply in organic carbon (+100%), phosphorus (+80%) and in most essential nutrients (N, Mn, Zn). Due to the high rate of irrigation and low CEC of the studied soil, the added nutrient cations and nitrate are removed with leaching waters compared to the non-irrigated control soil. Moreover, Sfax ' s TW bring about important amounts of salts and Na. Therefore the beneficial addition of nutrients could quickly be inhibited by the excessive supply of salts and available nitrogen. Apart from future crops production risk, groundwater degradation quality and soil fertility will be endangered over the long term.

KEYWORDS

Arid Region; Wastewater; Irrigation, Fertility; El Hajeb-Sfax

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