

	Title: Impact of Treated Grey Water on Physical and Chemical Soil Characteristics
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Abstract:

The purpose of this work was to provide information about soil irrigated with treated grey water in the semi arid Mediterranean region of Palestine. Soil samples were collected from three home gardens in Billin Villages irrigated with treated grey water over different periods of as long as 15 years. Soil samples were collected at two depths of 30 and 60 cm, and during wet and dry seasons. The collected soil samples were analysed for various physical parameters (permeability, porosity and bulk density) and chemical parameters (like Zn, Mn, Cu, Fe, pH). The results revealed that seasonal variation influences soil quality when irrigated with treated grey water. There was no noticeable accumulative negative impact on soil quality due to irrigation with treated grey water after a period of as long as 15 years. Soil pH remained within the normal range of 6.5-8 with an apparent decrease during dry season suggesting acid leaching during wet season. Soil Fe content was almost doubled during dry season as compared with wet season (from about 15,000 mg/kg to 30,000 mg/kg) at 60 cm depth, but no difference was noticed at 30 cm depth. This reveals Fe washing during the wet season to almost Fe content in blank soil. Cu and Zn in soil were not influenced by treated grey water irrigation; admitting Cu and Zn were below detection limit in the irrigation treated grey water. Soil permeability decreased during dry season especially at 60 cm depth ($7.72E-8$ m/s) but recovered during wet season to a value of ($4.15E-7$ m/s) that is even better than that of the blank soil ($1.10E-8$ m/s) Worth mentioning that permeability coefficient remained in the moderate range defined by FAO (10^{-6} - 10^{-8} m/s) in the all tested soil samples. The grey water SAR was in the range of (5.2 – 7.8) which is below the recommended values by the Palestinian and the Jordanian standards. Since soil maintained its original permeability after being irrigated with treated grey water for around 15 years, this promotes the adoption of the recommended SAR values by the Palestinian and the Jordanian standards in the Mediterranean region (with wet and dry seasons). Cl⁻ accumulated during dry season at the depth of 60 cm, but not at 30 cm, and then washed out during the wet season to recover again to similar concentration as of the blank soil. Noting that Cl⁻ in the irrigation treated grey water was within the standard value (350 mg/l). Mn concentration in soil increased during dry period at 30 and 60 cm depths, and recovered to normal blank value during wet season. Based on the overall results of this research, it can be concluded that reusing treated grey water for irrigation is environmentally sound with respect to soil quality in Palestine.