



Effects of treated wastewater irrigation on contents and dynamics of soil organic carbon and microbial activity

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In many arid and semi-arid regions, the demand for freshwater as drinking water and other domestic uses is constantly growing due to demographic growth and increasing standard of living. Therefore, less freshwater is available for agricultural irrigation and new water sources are needed. Treated wastewater (TWW) already serves as an important water source in Jordan, the Palestinian Territories and Israel. Related to its high loads with nutrients, salts and organic materials within its use as irrigation water major effects on the soil physical and chemical properties can occur, in the worst case leading to soil degradation.

In an ongoing study we are investigating the effects of TWW irrigation on agricultural soils in the region. Here we present results from analyses of total soil carbon contents and qualities in soils irrigated with freshwater and TWW. Furthermore microbiological parameters were investigated as microbial biomass, microbial activities and enzyme activities. In several sites, subsoils (50-160 cm) from TWW irrigated plots were depleted in soil organic matter with the largest differences occurring in sites with the longest TWW irrigation history. Laboratory incubation experiments with additions of ^{14}C -labelled compounds to the soils showed that microbial activity in freshwater irrigated soils was much more stimulated by sugars or amino acids than in TWW irrigated soils. The lack of such "priming effects" (Hamer & Marschner 2005) in the TWW irrigated soils indicates that here the microorganisms are already operating at their optimal metabolic activity due to the continuous substrate inputs with soluble organic compounds from the TWW. Apparently, this higher microbial activity is causing an increased depletion of soil organic matter, which may have negative long-term effects on soil quality.