



Changes in chemical properties of soils irrigated with treated wastewater of different qualities under semiarid and arid conditions

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Irrigation with treated wastewater (effluent) is becoming an extended practice in many parts of the World, because it allows to reduce the pressure of human activities on freshwater resources, and to avoid disposing wastewater in sensitive ecosystems. Moreover, the nutrients that effluent contains constitute an added value that can result in an increase of the productivity of the crops. However, effluent irrigation can be detrimental for crops and environment due to the higher sodicity, salinity, and concentrations of organic matter, nutrients and heavy metals of effluent compared to freshwater. Changes in soil salinity and sodicity as a result of effluent irrigation depend on the type of soil and the dominant climatic conditions. In semiarid areas, effluent irrigation can increase salinity and sodicity in the soil profile according to the salt concentration and SAR of the effluent. However, when the amount of rainfall is high to allow leaching of the soil profile, the salts accumulated during the irrigation are leached from the root zone, returning the salinity values to those prior to the irrigation. In arid regions, which are characterized by low annual rainfall, high evapotranspiration, and soils with naturally high salinity and sodicity, the effects of effluent irrigation on these properties were different. In this area, the effluents reclaimed the irrigated soils, and this reclamation was more intense when the quality of the effluent was higher. The increase of the organic matter load of the effluent resulted, in general, in inconsistent results in the organic matter content of the topsoil. The N-NO₃ and P-PO₄ concentrations were higher and the N-NH₄ concentrations lower in the profiles of effluent- than in the freshwater-irrigated soils. The fate of nutrients in the soil profile as a result of long-term irrigation with effluents is highly dependent on the mobility of each nutrient, its evolution in the soil, and the amount of rainfall after the irrigation than can leach the nutrients from the soil profile. The effect of effluent irrigation on the accumulation of heavy metals in the soil depended on the soil and the type of heavy metal. Some elements, like B, show a higher concentration in the effluent irrigated soils than in the freshwater irrigated ones.