Graywater Reuse: a Sustainable Water Management Strategy and its Effects on Soil Properties

Masoud Negahban Azar[1], Sybil Sharvelle, Larry Roesner and Chris Olson
Department of Civil and Environmental Engineering, Colorado State University

Abstract. One of the new approaches to sustainable water management, which is gaining popularity, is graywater reuse for residential landscape irrigation. However, limited scientific data is available on the fate of graywater chemical and microbiological constituents in the environment and for the safe operation of graywater irrigation systems. Graywater irrigation may result in negative impact on soil properties, increased level of pathogens and potential groundwater contamination. The main objective of this study is to elucidate the information gap on the fate and occurrence of graywater chemical constituents and pathogens and their long-term potential impacts on soil quality, because of its application for residential landscape irrigation, on households with existing graywater irrigation systems. Soil samples were collected at four different households where graywater has been applied for irrigation for more than five years in Arizona, California, Colorado, and Texas. Soil cores were taken at depths of 0-15, 15-30, and 30-100 cm separately in both an area irrigated with graywater as well as a control area with analogous soil and landscaping that irrigated with fresh water in each site for quantification of soil physical and chemical properties, antimicrobials, and surfactants. Soil samples were analyzed for pH, electrical conductivity, organic matter, total C, total N, extractable NH_4-N, NO_3-N, P, effective cation exchange capacity, sodium adsorption ratio (SAR) and widely used surfactants including linear alkyl benzene sulphonates, alcohol ethoxylates, and alcohol ether sulphates. In addition, a single ring infiltration test was performed in each site to evaluate the possible changes in soil infiltration rate. Results fills a part of the knowledge gaps related to changes in soil properties, accumulation of these organic chemicals, their effects on soil chemistry and probable groundwater contamination.

[1] Department of Civil and Environmental Engineering,
Colorado State University, Fort Collins, CO 80523;
Phone (970) 491-8314; e-mail: masazar@engr.colostate.edu