



## **Long-term irrigation with treated wastewater: effects on the hydraulic properties of a clay soil**

Gopali Bardhan, David Russo, and Guy Levy

Agricultural Research Organization, Inst. of Soil, Water and Environmental Sciences, Bet Dagan, Israel  
(vwguy@volcani.agri.gov.il)

Treated wastewater (TWW) is an important water resource, especially in semiarid and arid regions. However, there are some concerns that irrigation with TWW could lead to degradation of soil physical and hydraulic properties. Our objective was to evaluate the effects of long-term ( $\geq 15$  y) irrigation with secondary TWW on some basic and hydraulic soil properties of a clay soil. Undisturbed soil samples (cores) were taken to a depth of 4.5 m (in sections of 0.5 m) over a diagonal cross section of a five year old orchard irrigated with TWW. Samples were taken from five sites within the tree rows (i.e., representing soil directly affected by TWW; referred to as “within rows”) and four sites between the rows of trees (i.e., the control treatment representing soil that was not directly subjected to the irrigation water; referred to as “between rows”). Soil analyses included an array of basic properties, determination of a continuous particle size distribution and measurement of the saturated hydraulic conductivity (HC). The latter two were used for the computation of soil characteristic curve,  $\Theta(\psi)$ , and the unsaturated HC curve,  $K(\psi)$ . The results showed that irrigation with TWW had insignificant effects on bulk density, moisture content, cation exchange capacity, pH and exchangeable sodium percentage (ESP), but caused a reduction in the saturated HC,  $K_s$ . The computed  $\Theta(\psi)$  curve at a given soil depth, averaged over the different sites, was similar for the TWW-irrigated samples and the control ones. On the contrary, the computed  $K(\psi)$  curve at a given soil depth, averaged over the different sites, for the TWW-irrigated samples were lower than those for the control samples at matric potential  $> -100$  cm ( $=pF < 2$ ); similar  $K(\psi)$  values were noted at  $pF > 2$  for the two treatments. Possible reasons for the observed differences in the hydraulic properties between the TWW-irrigated samples and the control ones are discussed.