Impact of wastewater irrigation on the soil, yield and quality of agricultural crop under arid environment.


Abstract:

Field experiments were carried out over two consecutive seasons (2011 and 2012) at an agricultural site in the western region of Saudi Arabia, to study the effect of wastewater irrigation on the yield, toxic metals, and fecal coliform bacteria of white radish crop. Six different wastewater qualities were prepared by diluting various percentages of the treatment plant’s effluent with local groundwater (LGW). The crop water requirement for white radish was calculated by Penman-Monteith equation for dry land condition and supplied daily by two drip irrigation systems; surface and subsurface. Root yield, irrigation water use efficiency (IWUE), fecal coliform, and content of toxic metals in the plant and soil were determined at the end of each growing season. Results indicated that the highest root yield/ha, and IWUE were obtained from the treatments of 60T (60% wastewater mixed with 40% LGW) and 100T (100% wastewater). Due to the relatively early cultivation in the second growing season, the total yield/ha and IWUE were higher than that of the first season. On the other hand, fecal coliform bacteria count and toxic metals increased systematically in the plant and soil as the quantity of wastewater in the irrigation water increased. Notably, the concentrations of toxic metals in the plant and soil were less than that of the cytotoxic standards declared by WHO-FAO (2007) and EU (2002). In conclusion, the best treatments that produced the highest yield and IWUE with minimal microbial contamination were 60T and 100T suggesting a safer use, better performance and considerable LGW conservation.

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