Impact of Wastewater Irrigation on Soil Quality and Productivity of Tuberose (Polianthes tuberosa L. cv. Prajwal)

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Abstract : A greater volume of wastewater generate from urban areas in India. Due to the adequate availability, less energy requirement and nutrient richness, farmers of urban and peri-urban areas are deliberately using wastewater to grow high value vegetable crops. Wastewater contains pathogens and toxic pollutants, which can enter in the food chain system while using wastewater for irrigating vegetable crops. Hence, wastewater can use for growing commercial flower crops that may avoid food chain contamination. Tuberose (Polianthes tuberosa L.) is one of the most important commercially grown, cultivated over 30, 000 ha area, flower crop in India. Its popularity is mainly due to the sweet fragrance as well as the long keeping quality of the flower spikes. The flower spikes of tuberose has high market price and usually blooms during summer and rainy seasons when there is meager supply of other flowers in the market. It has high irrigation water requirement and fresh water supply is inadequate in tuberose growing areas of India. Therefore, wastewater may fulfill the water and nutrients requirements and may enhance the productivity of tuberose. Keeping in view, the present study was carried out at WTC farm of ICAR-Indian Agricultural Research Institute, New Delhi in 2014-15. Prajwal was the variety of test crop. The seven treatments were taken as T-1. Wastewater irrigation at 0.6 ID/CPE, T-2: Wastewater irrigation at 0.8 ID/CPE, T-3: Wastewater irrigation at 1.0 ID/CPE, T-4: Wastewater irrigation at 1.2 ID/CPE, T-5: Wastewater irrigation at 1.4 ID/CPE, T-6: Conjunctive use of Groundwater and Wastewater irrigation at 1.0 ID/CPE in cyclic mode, T-7: Control (Groundwater irrigation at 1.0 ID/CPE) in randomized block design with three replication. Wastewater and groundwater samples were collected on monthly basis (April 2014 to March 2015) and analyzed for different parameters of irrigation quality (pH, EC, SAR, RSC), pollution hazard (BOD, toxic heavy metals and Faecal coliforms) and nutrients potential (N, P, K, Cu, Fe, Mn, Zn) as per standard methods. After harvest of tuberose crop, soil samples were also collected and analyzed for different parameters of soil quality as per standard methods. The vegetative growth and flower parameters were recorded at flowering stage of tuberose plants. Results indicated that wastewater samples had higher nutrient potential, pollution hazard as compared to groundwater used in experimental crop. Soil quality parameters such as pH EC, available phosphorous & potassium and heavy metals (Cu, Fe, Mn, Zn, Cd. Pb, Ni, Cr, Co, As) were not significantly changed whereas organic carbon and available nitrogen were significant higher in the treatments where wastewater irrigations were given at 1.2 and 1.4 ID/CPE as compared to groundwater irrigations. Significantly higher plant height (68.47 cm), leaves per plant (78.35), spike length (99.93 cm), rachis length (37.40 cm), numbers of florets per spike (56.53), cut spike yield (0.93 lakh/ha) and loose flower yield (8.5 t/ha) were observed in the treatment of Wastewater irrigation at 1.2 ID/CPE. Study concluded that given quality of wastewater improves the productivity of tuberose without an adverse impact on soil quality/health. However, its long term impacts need to be further evaluated.