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The Influences of Produced Water Irrigation on Soil microbial succession and Turfgrass Grass Establishment in Qatar

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The Influences of Produced Water Irrigation on Soil microbial succession and Turfgrass Grass Establishment in Qatar Sameera S. Shaikh, Mohammed H. Abu-Dieyeh*, Fatima A. Al Naemi, Talaat Ahmed, and Mohammad A. Alghouti Department of Biological and Environmental Sciences, College of Arts and Sciences, Qatar University. *Corresponding author: dandelion@qu.edu.qa Abstract: Water scarcity around the world has necessitated the use of alternative water resources such as wastewaters, for irrigation purposes. Landscaped areas and turf grass systems provide varied environmental benefits including phytoremediation, erosion control and mitigation of heat island effects. They also provide safe, shady and cool places for athletic activities, exercise, and provide area for outdoor gatherings. Use of wastewater for turfgrasses has been conceptualized in the last decades and applied in various parts of the world. In this study, we attempted to use produced water (PW) to irrigate two turfgrass species, Cynodon dactylon and Paspalum sp., which are grown in local parks, green spaces and roadsides in Doha, Qatar. Effect of PW irrigation on established grasses, microbial succession, heavy metal accumulation and germination tests for weeds and turf grass seeds were investigated in greenhouse and field experiments. The two species of grass tested - C. dactylon and Paspalum sp. depicted different tolerance capacities towards PW. C. dactylon showed lower tolerance while Paspalum sp. depicted better tolerance capacity towards PW. C. dactylon grown from seeds under greenhouse conditions were not able to tolerate more than 30% concentration of PW. In comparison to tap water irrigated turfgrass, Paspalum sp. was found

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to accumulate higher concentrations of V and Pb in shoots and Cr, Ni and As in roots. For soil microbial succession studies, results from greenhouse experiment, using Cynodon dactylon turfgrass and after 14-weeks of produced water irrigation regimes, showed a significant reduction in bacterial colony forming units (CFU) at all produced water treatments compared with tap water irrigation. However, a significant increase through time in CFU occurred in all treatments. It was observed that PW irrigation caused changes in fungal species present in PW irrigated soil. The study of fungal succession in soil showed presence of certain species in 10%PW-30%PW treated soil that were absent in soil treated with tap water. Based on germination tests it was recommended that irrigation with PW be performed after turf grass establishment. Studies on weed germination suggested that PW could discourage growth of weeds - Amaranthus viridis and Launaea mucronata while promote growth of Chloris virgata. Based on the study conducted, it is suggested that PW could be used as alternative water resource to grow some species, but only after further research is conducted on the long term to assess any environmental toxicity. Key words: Waste water; Produced water; Turfgrass; Arid land; soil microbiota; salinity stress.

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