

Temporal Effects on Chemical Composition of Treated Wastewater and Borehole Water Used for Irrigation in Limpopo Province, South Africa

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Abstract : Increasing incidents of drought spells in most Sub-Saharan Africa call for using alternative sources of water for irrigation in arid and semi-arid regions. A study was conducted to investigate chemical composition of borehole and treated wastewater from different sampling disposal sites at University of Limpopo Experimental Farm (ULEF). A 4 × 5 factorial experiment, with the borehole as a reference sampling site and three other sampling sites along the wastewater disposal system was conducted over five months. Water samples were collected at four sites namely, (a) exit from Pond 16 into the furrow, (b) entry into night-dam, (c) exit from night dam to irrigated fields and (d) exit from borehole to irrigated fields. Water samples were collected in the middle of each month, starting from July to November 2016. Samples were analysed for pH, EC, Ca, Mg, Na, K, Al, B, Zn, Cu, Cr, Pb, Cd and As. The site × time interactions were highly significant for Ca, Mg, Zn, Cu, Cr, Pb, Cd, and As variables, but not for Na and K. Sampling site was highly significant on all variables, with sampling period not significant for K and Na. Relative to water from the borehole, Na concentration in wastewater samples from the night-dam exit, night-dam entry and Pond16 exit were lower by 69, 34 and 55%, respectively. Relative to borehole water, Al was higher in wastewater sampling sites. In conclusion, both sampling site and period affected the chemical composition of treated wastewater.

Keywords : irrigation water quality, spatial effects, temporal effects, water reuse, water scarcity

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