

Assessing toxicity of inland surface waters impacted by industrial wastewater released from an export processing zone located near Kelani River basin using physico-chemical analysis and a plant based bioassay

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In Sri Lanka, industrial effluent discharge to inland surface waters is regulated based on targeted physico-chemical characteristics. No attention has been given for assessing toxicity of the effluents to the biological systems. Present study was carried out to assess the potential toxicity of effluents discharged from the common wastewater treatment plant in an industrial zone located near the Kelani River basin into a freshwater stream and the downstream tributaries impacted with the discharges using physico-chemical analysis and a plant based bioassay with *Allium cepa* (common onion). Surface water samples were collected from the effluent receiving canal (Menikagara ela), canal confluence, upstream and downstream of Maha ela (a tributary of Kelani River) and downstream of Kelani River at Biyagama and upstream of Kelani River at Ruwanwella (Reference site) on three occasions in 2015. Physico-chemical characteristics of water samples were determined using standard analytical methods. Toxicity assessment of the surface waters was carried out by *Allium cepa* bioassay with aged tap water as the negative control following standard protocols. Of the seven sampling sites tested, the highest pH, temperature, salinity, conductivity, total dissolved solids, biochemical oxygen demand, chemical oxygen demand, nitrate, dissolved phosphate, oil and grease, spectral coefficients for color, and heavy metal levels were recorded from the effluent receiving canal while relatively lower values were recorded in the reference site and downstream of Kelani River. Exposure of *Allium cepa* bulbs to water collected from the effluent receiving canal resulted in statistically significant root growth retardation, mito-depression and nuclear abnormalities induction in the root tip cells signifying the presence of cyto-genotoxic contaminations in the effluent receiving canal ($p < 0.05$). Overall results of physico-chemical characterization and *Allium cepa* bioassay indicate that the quality of water in the effluent receiving canal (Menikagara ela) and the canal confluence in Maha ela need further improvements considering ecological/human health. Further investigations with frequent sampling events are warranted to verify the pollution loads from the industrial zone effluents in to the drinking water extracting points of the Kelani River.

Keywords: Bioassay, toxicity, cyto-genotoxicity, industrial effluents, Kelani River