

Assessing toxicity of selected textile industry effluents reaching Kelani River using a plant based bioassay

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Textile industry effluents that are discharged in high volumes into inland waters may contain complex mixtures of toxic substances that could pose health impacts to biota inhabiting receiving waters. Conventional effluent quality assessments such as physico-chemical characterization may not be adequate to evaluate their biological effects. In the present study, potential toxicity of selected textile industry effluents discharged into Kelani River were assessed by a plant based bioassay using *Allium cepa* (onion) as the test organism. Effluents were collected from the discharging points of two textile industries in three sampling occasions covering mostly dry periods. Onion bulbs were exposed to the effluents under undiluted and diluted (1:8) conditions using aged tap water as the dilution media. Toxicity endpoints were root growth, mitotic index, occurrence of chromosomal aberrations and nuclear abnormalities. *A. cepa* root tip cells exposed to undiluted effluents from both industries caused significant ($p < 0.05$) root growth inhibition, mitotic depression compared to that of the controls along with a significant ($p < 0.05$) induction in the occurrence of condensed nuclei at each sampling occasion indicating cytotoxic effects. Moreover, undiluted effluents significantly ($p < 0.05$) induced chromosomal abnormalities with further induction in micronuclei in the root tip cells indicating genotoxicity. Exposure of onion bulbs to the 1:8 diluted effluents also showed significant alterations of toxicity end points depending on the effluent type and sampling occasion. The results revealed that 1:8 dilution was not adequate to eliminate the cytotoxicity/genotoxicity induced by the effluents completely. Physico-chemical characterization of the effluents showed that heavy metal levels generally comply with the national tolerance limits for effluent discharge into surface waters. However, color measurements and chemical oxygen demand levels did not comply with the tolerance limits in most of the cases indicating that highly oxidizable organics including textile dyes might have contributed to the observed toxicity. Present study showed the necessity of incorporating bioassays into effluent monitoring programs for more realistic effluent quality assessments, considering ecosystem and public health. This study was funded by the National Research Council research grant 11-11 and National Science Foundation equipment grant RG/2011/EQ/16.

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