Occurrence, Distribution and Ecological Assessment of Polycyclic Aromatic Hydrocarbons in Surface Waters of Narok and Bomet Counties, Kenya

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Abstract

The growth in the number of sources of polycyclic aromatic hydrocarbons (PAHs) in developing nations poses a great concern on the presence of these pollutants leading to exposure of ecologies. The Narok and Bomet Counties of Kenya have witnessed an increase in charcoal burning activities and vehicular emissions. Some of these PAH sources are located near water bodies, which is a concern as PAHs are toxic to aquatic organisms and people. This study evaluated the occurrence and concentrations of PAHs in surface waters of the two Counties which allowed fora preliminary eco-toxicity assessment thereof. Grab sampling was done in eight regions of the two Counties based on their proximity to PAH sources. In-situ analysis of physicochemical properties was conducted followed by extraction of the water samples via solid phase extraction, followed by GC-MS analysis. Seven US Environmental Protection Agency (US EPA) priority PAHs were detected. The concentrations of these PAHs varied between 1.84 µg/L (naphthalene) to 31.42 µg/L (benzo[a,h]anthracene). The majority of the PAHs from Narok County were from pyrogenic sources while those from Bomet were from petrogenic sources based on PAH diagnostic ratios. The surface waters were significantly polluted with anthracene, benzo[a]pyrene and dibenzo[a,h]anthracene with risk quotients above 1.0 in the surface waters and were found to be hazardous, with hazard quotients above 10.0, thus indicating potential environmental risks. The findings indicate the need for stringent measures to be put in place to mitigate the risks posed by these PAHs to people, livestock, wildlife and aquatic organisms who rely on these waters in Narok and Bomet Counties.

Keywords: PAHs, eco-toxicity, pollution, hazardeous