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Assessment of Dioxin Concentration in Soil and Edible Plants Around Industrial Sites in Koko Town, Southern Nigeria.

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Abstract

Dioxins are a class of persistent organic pollutants with increasing global prevalence and deleterious effects on the environment and human health. However, studies on the distribution, bioaccumulation, and health effects associated with dioxin in environmental media and food products remain low in developing economies. This study evaluated dioxin concentrations in soil and five vegetables and medicinal plants around industrial sites in Koko town, Delta State, Nigeria. Samples of soil and plant tissues were extracted for the various dioxin analytes using the Soxhlet method and analysed with GC-MS. The mean concentration of dioxin in soil was 2.937ppb, and that for plants was 2.864ppb. These values are higher than the permissible limits for dioxin congeners in soil and plants respectively. The bioaccumulation factor of dioxin in plants was in the order of *Pueraria montana* (60.75), *Ceiba pentandra* (8.91), *Chromolaena odorata* (1.29), *Musa sp.* (0.83), and *Vermonia amygdalina* (0.33). However, the edible plants fell within the estimated daily intake of 0.03mg kg⁻¹ and hazard ratio of 1.0 as stipulated by USEPA, indicating no immediate health risk for people consuming vegetables in the community.

Keywords: risk assessment, persistent organic pollutants, vegetables contamination, bioaccumulation factor, Niger Delta

Introduction

Dioxins are a group of organic contaminants that belong to the dirty dozen, which are of global concern due to their deleterious effects on the environment and human health (Mahfouz *et al.*, 2020). They are highly toxic, chemically stable, lipophilic, and they take time to degrade in the environment (Aganbi *et al.*, 2019). They occur naturally in low concentrations in soil mainly from the accretion of deposits from volcanic eruptions and forest fires, which can infiltrate the food chain (Schmitz *et al.*, 2011). Usually, dioxins have no common uses but are by-products of burning fossil fuels and other industrial processes by petrochemical industries (Alwyn and Jerzy, 2021). Also, they accumulate over time in the food chain