



Levels, Distribution and Risk Assessment of Polycyclic Aromatic Hydrocarbons in Varieties of Cereal in Yobe State, Nigeria

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ABSTRACT

Cereal (corn, guinea corn and millet) samples from Bade and Karasuwa Local Government Area, Yobe State, Nigeria were collected for analysis of PAHs using GC/MS. The highest total mean concentration value of PAHs (1.56×10^{-6} mg/kg) was observed in corn from Mashayan Bululu agricultural location, while millet from Wachakal Ngurodi agricultural location shows the lowest total concentration value of 7.93×10^{-10} mg/kg. The levels of all the sixteen PAHs in the cereal samples were below the maximum allowable concentrations (MACs). Data obtained from cancer risk assessment in cereal samples were below the regulatory standard cancer risk values of 10^{-5} . The highest average daily dose values in cereals from all the six agricultural locations were recorded in guinea corn from Mashayan Bululu agricultural location, while the lowest average daily dose values were observed in millet from Wachakal Ngurodi agricultural location in Bade and Karasuwa Local Government areas respectively. The non-carcinogenic PAHs through the consumption of corn, guinea corn and millet from the study agricultural locations produced hazard quotient and hazard index of less than 1, which is the level described by USEPA as having no appreciable risk for the development of non-cancer health effects. Results from ILCRs was less than 10^{-4} and shows no health risk for now. However, continuous monitoring of PAHs in the cereals is necessary to identify the fate of PAHs and their effects on the residents that depends on these cereals as food.

1. Introduction

Polycyclic aromatic hydrocarbons (PAHs) consist of two or more fused rings and are organic in nature. These compounds are toxic when in contact with human, aquatic life and to benthic organism and also in the presence of ultraviolet light the compound become more toxic. PAHs by nature are organic compound that do not undergoes biodegradation and exist in the environment for decades and can further course potential toxic effect to the environment. Literature have showed that the accumulation of PAHs by plants in soil is by absorbed through translocation or plant uptake. The absorption of PAHs by plant in soil is possible through the solubility, concentrations, water, types of soil and the environment [1]. PAHs are of environmental concern and have been identified to course cancer and mutation, and their sources and been identified in many study to originate from pyrogenic and petrogenic origin [2,3,4].

Bade and Karasuwa, whose headquarters are Gashua and Jajimaji respectively, are Local Government Areas in Yobe State situated in the North eastern part of Nigeria. Whereas Bade has an approximate area of 1,986 km² and a population of 125,000 according to 2006 census, Karasuwa has an approximate area of 1,162 km² and a population of 106,992. The two Local Government Areas are approximately 40 kilometers apart and are about 90 kilometers from Damaturu, the State Capital. Both of these Local Governments are on the Komadugu River a few miles below the convergence of the Hadejia River and the Jama'are River. In the northern region of Nigeria rainfall is less, and the study area fall within this region, and to meet up with crop production the Hadijia and Jama'are River is used for irrigation of crop. These Hadijia and Jama'are River have attracted many farmers to make used of the water for irrigation purposes. The Hadejia and Jama'are River received water from the highly industrial city of Kano and Jos which is formed by

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