AN ASSESSMENT OF PERSISTENT ORGANIC POLLUTANTS (POPS) INDICATOR LEVELS IN DRINKING WATER FROM MUBI-NORTH, GIREI AND MAYO-BELWA LOCAL GOVERNMENT AREAS IN ADAMAWA STATE

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ABSTRACT

The assessment of persistent organic pollutants (POPs) indicator levels in drinking water from Mubi-north, Girei and Mayo-belwa local government areas in Adamawa was carried out in three sampling point for each local government. A total of 63 samples were collected during the rainy season in August-October 2018 and during the dry season, 63 samples were equally collected from January-March 2019. Composite sampling method was employed and the samples Areas were coded, labelled, sealed and preserved. Analog grade reagents were used throughout. The water samples collected were analyzed using standard procedures. Generally, the respective values of POP recorded during the rainy season are higher than their value recorded in dry season both in well and borehole water, across the three Local Government Areas. The analysis of variances on the differences among persistent organic pollutants recorded during rainy and dry season across the respective well and borehole water in the three selected Local Government Areas are significant difference at p<0.05. however, all the POPs recorded both in the rainy and dry seasons across the well and borehole water were within the tolerable limits of 1μg/l for human consumption and 0.5μg/l for children toys set by FEPA and EU.

Keywords: Assessment, persistent organic pollutants, indicator, drinking water

INTRODUCTION

Many people treat the ocean like a sink, considering it a final resting place for pollutants, but some of these pollutants can find their way into our seafood," [1]. Maintaining a supply of pure water for ever increasing population is already a daunting challenge all over the world while the organic contaminants are aggravating the challenges further [2]. Hence, there is need for clear understanding of the classes of organic compounds, which find their way into the freshwater system, their sources, and their transformation through physicochemical and biological processes in the freshwater system to control their entry and undesired transformation
coupled with the numerous health effects they pose to humans and aquatic life. Persistent organic pollutants (POPs) are a class of highly hazardous chemical pollutants that are recognized as a serious, global threat to human health and to ecosystems. POPs are substances that specifically remain intact for exceptionally long periods of time (many years); become widely distributed throughout the environment as a result of natural processes involving soil, water and, most notably, air; accumulate in living organisms including humans, and are found at higher concentrations at higher levels in the food chain; and are toxic to both humans and wildlife processes [4].

POPs get into water in both urban and agricultural settings because they tend to attach to soil particles and, thus, moves into surface-water bodies from runoff. Can also migrate with groundwater flows. Since groundwater often discharges into surface water, such as through stream banks into rivers, there is a concern about POP concentrations in groundwater affecting the water quality of surface water. POPs have the potential to harm humans and other organisms even at concentrations that are commonly found in ordinary foods. There is good medical evidence linking the following human illnesses and disabilities to one or more of the POPs: Cancers and tumors including soft tissue sarcoma, non-Hodgkin’s lymphoma, breast cancer, pancreatic cancer and adult-onset leukemia [2]. The primary aim of this study therefore is to investigate the persistent organic pollutants (POPs), present in water samples obtained from some selected Local Government Areas of Adamawa State.

MATERIALS AND METHOD

Area of Study

The study Areas for this research covered the following Local Government Areas in Adamawa State: Girei, Mayo-Belwa and Mubi-North - north. Adamawa State is located at the Northeastern part of Nigeria and lies between latitude $7^\circ$ and $11^\circ$, North of the equator and between longitude $11^\circ$ and $14^\circ$ East of the Greenwich meridian.
Sampling

Composite sampling was adopted in all the study Areas. Water samples from the study Areas were collected using amber glass bottles sterilized with distilled water from 21 sampling points in the three Local Governments under study, mixed thoroughly to form a composite sample for replicate analysis. The composite water samples were pre-filtered through 0.45μm fiber glass filters (Whatman) to remove suspended material and then preserved by the addition of concentrated H₂SO₄ to prevent biological activity after which, samples were kept in the refrigeration at a regulated temperature [2].
Sample extraction procedure

Samples extraction method by [5] was adopted. Extraction of Water samples were done by taking 200 mL of each sample and 100 mL of n-hexane in a separating funnel and shaking several times. The extraction procedure was repeated thrice. The organic layers were collected and passed through anhydrous sodium sulphate to remove water content. The collected fraction was reduced to 1 mL on a rotary evaporator. 2 mL of acetonitrile was then added, and samples were filtered through syringe of 0.22 μm prior to analysis. Analysis of organic pollutants (POPs) in water samples were studied using high performance liquid chromatography (HPLC).

Data analysis

Method validation for this study was maintained at LSD ±5% and percentage recoveries were in the range of 85 -115%. Data obtained was subjected to analysis of variance (ANOVA) using SPSS version 22 to determine the differences in the concentration of each of the organ chlorine pesticides residue in each sample analyzed.

RESULTS AND DISCUSSION

The results on the respective mean concentration of Persistent Organic pollutants found in the respective well and borehole water during the rainy and dry seasons are presented in Figure 1-8 for Mubi-North, Girei and Mayo-Belwa Local Government Areas.

Figure 1: Mean Concentration of Aldrin in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)
Figure 2: Mean Concentration of alpha-BHC in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)

Figure 3: Mean Concentration of Endrin in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)
Figure 4: Mean Concentration of Dieldrin in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)

Figure 5: Mean Concentration of Endosulfan I in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)
Figure 6: Mean Concentration of Endosulfan II in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)

Figure 7: Mean Concentration of Heptachlor in Drinking Water (Well & Borehole) in Mubi-North, Girei and Mayo-Belwa Local Government Areas (Rainy & Dry Seasons)
Discussion

Analysis of organic pollutants (POPs) in water samples were studied using HPLC. From the results obtained, both the well and borehole water from study areas have presence of POPs such as aldrin; alpha-BHC, Endrin, dieldrin, Edosulfan I, Endosulfan II, Heptachlor and methoxychlor, which are higher in the rainy season than dry season. Generally, the respective values of POP recorded during the rainy season are higher than their value recorded in dry season both in well and borehole water, across the three Local Government Areas. Also, the analysis of variances. The differences among persistent organic pollutants recorded during rainy and dry season across the respective well and borehole water in the three selected Local Government Areas are significant difference at p<0.05.

CONCLUSION

The values of persistent organic pollutants recorded in drinking water during rainy and dry season across the three Local Government Areas are as follows: aldrin (well water rainy & dry): Mubi-North >Mayo-Belwa>Girei. borehole water (rainy & dry: Girei >Mayo-Bewla> Mubi-North);

REFERENCES

1. Nicole Jawerth, 2017. How Do Ocean Pollutants Make Their Way into Our Seafood? Scientists Look For Answers with Nuclear Technology


