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EXTENDED ABSTRACTS

Bioaccumulation of Total Hydrocarbon Content by Three Mangrove Species (Rhizophora, Laguncularia, Avicennia) in the Niger Delta, Nigeria

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ABSTRACT

Mangroves are often described as resilient and persistent to external perturbations such as changes in tidal surge, high salinity, low oxygenand hydrocarbon pollution. Mangroves can survive low to medium oil spillages and sometimes major spillages. This is because of their adaptation to grow in difficult and polluted environment. Mangrove forest encounters numerous natural (e.g., tsunami, global warming, and hurricane) and anthropogenic (e.g., invasive species, hydrocarbon pollution and deforestation) effects. The reason for these impacts is because of their growth in the interface between the land and the sea. They are the source and sink of heavy metals and hydrocarbons that flow from land and sea. Mangroves are complex and are biodiversity hotspot and provide over 30 ecosystem services. The ability of heavy metals and hydrocarbons to circulate within mangrove environment has been studied.

Okrika sampling site (4°43'N and 7°05') is close to a major refinery that supplies petrochemical products and crude oil abroad via a jetty (Figure 1). It has rich supply of mangrove forest, which is made up of invasive nypa palm (Nypafruticans). The mangrove forest in this location is divided into two areas by an access road (~5 wide) running through the middle which leads from the refinery to the jetty. These features created a partitioning of the mangrove forest into two separate regions. Detail description of the study area is found. Buguma, the second study area is a coastal community (4°45'N and 6°53'E) that has rich amount of mangroves forest. It has lesser oil and gas exploratory activity (Figure 1). The sampling site is close to a crude oil well head, which had its last spillage in 2010. It has a large population of red, black and white mangroves.

Results of the multiple treatments were analyzed with one-way Analysis of Variance (ANOVA) in R environment, and significant ANOVAs were followed up with Tukeys HSD (Honestly Significant Difference) post hoc test for multiple comparisons. Bar graphs were plotted to illustrate the significance and differences in THC concentrations.

There was high concentration of THC in mangrove leave as compared to other parts because the leaves serve as excretory organ for expelling toxic materials absorbed from the soil. This occurs through yellowing and defoliation of leaves that have high concentration of pollutants. Other parts of the plant like the stem, seed and root do not have the property of falling off from the mangrove tree as often as the leaves. However, the seeds fall off during the reproductive cycle of the plant.

This study showed that higher productivity and litter fall in red mangroves is a mechanism to counter the effect of total hydrocarbon pollution in a polluted mangrove forest. In line with this ability, red mangroves seedlings can be used for bioremediation of polluted site since they serve as sink to pollutants. High THC in seeds of mangrove can lead to mutation and poor growth of mangrove. The consumption of red mangrove seeds by the West African Red mangrove crabs (Goniopsispelii) portends danger for other organisms in the food chain due to biomagnification of metals, which might be inimical to human health if consumed. Future studies will consider the relationship of THC concentration in mangrove parts to soil THC, as well as other organisms in the food chain e.g., crabs, periwinkle and fish that feed on mangrove litter on forest floor. This study is significant because it provides data for biomonitoring of THC concentration in mangrove parts and other forest dwelling organisms to prevent increase in toxicity level that is inimical to humans if they feed on sea food.

Keywords: Hydrocarbon pollution; Rhizophora species; Mangroves; Biomagnification; Bottom up; Food chain

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