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Determination of total hydrocarbons levels in some marine organisms from some towns within the Rivers State of Nigeria.

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ABSTRACT: The total hydrocarbon (THC) content of three marine organisms; Periwinkles (*Pachyelina aurita*), mussels (*Mylitus edulis*) and mangrove Oysters (*Cassostrea gasar*) from polluted and unpolluted (i.e. control) sampling stations in parts of the Niger Delta area has been assessed. Statistical results revealed that the THC levels in periwinkles, mussels and mangrove oysters in polluted areas vary significantly at 95% confidence level from those from the control station. The results also show that the ability to accumulate total hydrocarbons varies with each organism investigated. Oysters were observed to accumulate the highest concentration of THC while periwinkles were the least. @JASEM

The occurrence of crude oil in the Niger Delta with its concomitant petroleum industrialization has resulted in the generation of enormous waste products most of which are not efficiently disposed of (NAS 1985). Some of the serious environmental problems that have arisen in the marine environment as a result of the activities of up and down stream petroleum industries include,depletion of marine organisms, destruction of algae and some planktons as well as the interference with spawning areas on the sea bed. Many marine organisms act as biomonitors in their environment (Foulkes, 1990). Some, like the periwinkles (*P. aurita*), mangrove oysters (*C. gasar*) and mussels (*M. edulis*) are preferred pollution biomonitors because apart from being sedentary or bottom feeders, they are good accumulators of heavy metals and polycyclic aromatic hydrocarbons PAH (Costlow, 1969; Goldberg, 1975; Morse et al. 1985; Rainbow and White, 1989 and Wilson et al 1992).

Among the hydrocarbons which are components of crude oil are the PAHs (which have been identified to be predominant in Nigerian crude oil) some of which are known to be toxic and carcinogenic (Costlow 1969 and Grimmer, 1983) and fall within the priority list of the Federal Ministry of Environment, Nigeria. The toxic PAHs include benzo (a) pyrene, acenaphthene, acenapathylene, fluorine, phenanthrene, naphthalene, pyrene and fluoranthene. In addition to toxicity, some of these polycyclic aromatic hydrocarbons cause tainting of seafood. (Connell and Miller 1981). The biosynthesis of PAHs by organisms and their detection in the tissues of some marine fish and shell-fish from a wide variety of different unpolluted habitats have also been reported (Constlow, 1969).

The aim of this work is therefore to report our findings on the levels of total hydrocarbons in three marine organism (periwinkles, oysters and mussels) in both polluted and unpolluted areas of the Niger Delta of Nigeria with a view to determining their suitability for human consumption.

MATERIALS AND METHODS

Samples of periwinkles, oysters and mussels were randomly collected from the creeks of Onne and Bakana representing areas more susceptible to pollution as a result of high industrial activities. A second set of samples of periwinkles, oysters and mussels were also randomly collected from the creeks of Bodo representing an area that is considered reasonably pollution-free with little or no industrial activities. Onne is about 40km from Bodo and about 30km from Bakana. After thorough washing with water, the samples were boiled to remove the edible tissues from the shell. The tissues were dried in the oven to constant weight after which they were ground to powder form and stored in sample bottles.

10ml toluene was added to 1g each of the powdered periwinkle, oyster and mussel tissues contained in volumetric flasks. The flasks were shaken vigorously in turn and allowed to settle for about 15 minutes. This procedure was repeated again and the supernatant layer from each flask was filtered into test tubes. The absorbances of the samples were read at 420 nm wavelength using absorption spectrophotometer against pure toluene as blank. 10 absorbance measurements wee taken for each se of sample in polluted or unpolluted area.

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RESULTS AND DISCUSSION

Table 1 indicates that the marine organisms found at Onne and Bakana have higher total hydrocarbon content (THC) values than the corresponding ones at Bodo the control site. This means that the organisms found at Onne and Bakana have accumulated more hydrocarbons, indicating a higher level of pollution in these areas.

Onne and Bakana represent towns where there are a number of petroleum and allied industries while Bodo represents a town with no such industries. Hydrocarbons are not biodegradable and are therefore transported into the tissues of these organisms via water intake. Statistical analysis reported on Table 2 confirms that there is significance difference between the level of THC in marine organisms found at polluted area (Onne ad Bakana) and unpolluted area (Bodo). This supports earlier observation.

Table 1. Total hydrocarbon content of samples from polluted and control site of the study area.

Organism	Concentration, mg/g					
	Bakana		Onne range		Control site Bodo	
	Range	Mean x	Range	Mean x	Range	Mean x
Periwinkles	9.47 – 9.99	9.73	10.06 – 10.81	10.44	5.09 - 6.12	5.61
Mussels	15.56 -7.05	16.31	17.46 -18.41	17.94	11.01-12.11	11.56
Oysters	25.04-26.09	25.57	26.20 - 27.29	26.75	12.02-12.92	12.47

Recommended WHO value; 0 – 0.01mg/g

Table 2. Statistical evalution of variability of polluted and control sites for sites (i) and (ii)

Bakana Site (I)

Organism	Std. deviation (mg/g)	Std. deviation (mg/g) Control	Degree of freedom(n-1)	F- values calculated	F- values at 95%	Observation
Periwnkle	0.210	0.344	9	2.67	3.18	Significant difference
Mussels	0.495	0.332	9	2.23	3.18	Significant difference
Oyster	0.1095	0.098	9	1.11	3.18	Significant difference

Onne (II)

Organism	Std. deviation (mg/g)	Std. deviation (mg/g) control	Degree of freedom(n-1)	F_{cal}	F_{tab}	Observation
Periwinkles	0.253	0.344	9	1.36	3.18	Significant difference
Mussels	0.345	0.332	9	2.28	3.18	Significant difference
Oyster	0.328	0.098	9	1.11	3.18	Significant difference

Examination of the tables 1 and 2 further shows that the ability of these marine organisms to accumulate total hydrocarbons THC varies and follows the order: Oysters > Mussels > Periwinkles. This order is explained by the fact that Oysters are sedentary and grow on mangrove roots, pillars of bridges and on any permanent structure in the marine environment (Patricio, 2002). Consequently, when spillage occurs during oil exploration or transportation, oysters get more direct contact with the spill during their filter feeding process thus accumulating more hydrocarbons. In contrast, mussels and periwinkles which are found on sea bed are bottom feeders and tend to accumulate hydrocarbons less because hydrocarbons take longer time to sink to the river bed by gravity than to spread by tidal waves.

Significant levels of total hydrocarbons are observed even in the marine organisms from the control site. For instance oysters and periwinkles from Bodo accumulated 12.47mg/g and 5.61mg/g of THC respectively and this result is consistent with the fact that some marine organisms can biosynthesize polycyclic aromatic hydrocarbons (PAH) (Costlow 1969).

Conclusion: It has been shown that these marine organisms found within these selected polluted towns in the Niger Delta region accumulate appreciable amount of total hydrocarbons at various level. The level of THC in these marine organisms are high considering the recommended value from WHO which is from 0 – 0.001mg/g for human consumption will be known.

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