

## Organochlorine Pesticides Content Determination of Atuh Wetland Ugilimai for Pen Aquaculture in Schools: As A Tool for Revolution Education in Nigeria

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### Abstract

This study investigated the organochlorine pesticides content of Atuh Wetlands for its suitability for pen aquaculture in schools. The study answered 3 research questions and tested a hypothesis. To achieve these, the research area Atuh Wetlands was mapped out into 5 research block and water samples were collected from 5 spots in each research block with plastic sampling bottle bulked, a composite drawn fixed with  $\text{HNO}_3$  and stored in Ice cooled box for laboratory analysis. The analytical standards adopted were America Public Health Association (APHA) and American Society for Testing and Material (ASTM) Standard and the analytical instrument used in the determination of the pesticide was AAS GBC Model Senso A.A. Australia. The mean results of the organochlorine pesticides obtained were  $\alpha\text{HCH}$ ,  $0.78 \pm 0.1 \mu\text{g/l}$ ,  $\beta\text{HCH}$   $2.44 \pm 1.60 \gamma\text{HCH}$ ,  $1.46 \pm 0.17$ ,  $\text{gHCH}$ ,  $2.32 \pm 0.17 \mu\text{g/l}$  and heptachlor;  $0.73 \pm 0.1 \mu\text{g/l}$ . The mean results of the organochlorine pesticides in Atuh wetland water were subjected to test of significance with ANOVA with numerator 4 and denominator 20 at 0.05 level of significance. The F. ratio calculated value was 5.42 while the F ratio critical value was 3.14 thus rejecting  $H_0$ . The study recommends that pen aquaculture should not be practiced in Atuh Wetlands Ugilimai, the pollution source point should be identified and stopped, decontamination and remediation should be carried out in Atuh Wetland Ugilimai to improve its health status for enhanced ecosystem services.

**Keywords:** Agriculture Revolution, pen-aquaculture, organochlorine pesticides bioaccumulation human health.

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### I. Introduction

A nation's economic growth and sustainability require well-articulated revolution in various sector of the economy beginning with educational sector. Revolution according Charles (2016), Eric (2018) is a fundamental and complete change in administrative policy. It is a total turn around for an improved efficiency of a process or product. (Jewel 2017, Brandwell 2018), Revolution is a movement, action or activity that is designed to make a major change for better service delivery (Christopher 2016, Zack 2017) Noel (2018) Bedford (2019) opined that revolution is a sudden change, a turn around, a repudiation of old method or process for a better one. For Brandson (2020) revolution is a sweeping transformation of a process for an enhanced satisfaction; any action taken or implemented to cause a fundamental change in policy or policy implementation or process (Davidson 2019). Tedd (2020) submitted that for country to achieve reasonable economic growth, there must be revolution in the primary sectors such as education.

Orelope (2012) Sobunmi (2012) stated that Nigeria education system requires revolution to make it more functional and technology oriented. This stand point was reiterated by Ocheje (2010) and Olotu (2012) that revolution is required in Nigeria school curricular for the inclusion of technical and vocation education and training to make the recipients job creators rather than seekers. This was succinctly put by Ajisegiri (2012) that education revolution is very pertinent in Nigeria to make the curricular more manipulative and psychomotor based where more emphasis will be placed on what you can do with your hands and not what you can recite from your head. Technical and vocational education will empower the youths, create jobs eradicate hunger and curb human insecurity (Koye 2010, Adekola 2012).

The federal government in apparent response to the calls for inclusion of technical and vocational education in Nigeria education curricular, in 2013 embarked on a seemingly revolution in education sector with the introduction of trade/entrepreneurship curricular in 34 skills areas including Fishery (aquaculture). The philosophy of the trade curriculum as espoused by Nigeria Educational Research and Development Council (NERDC) (2013) is that at graduation, the recipients of the trade curriculum in Fishery would have acquired enough skills to earn living as fish farmers to and eradicates poverty and hunger and engenders youths employment (NERDC 2013).

Nigeria youths unemployment rate according to National Bureau of Statistics (NBS) (2020) was 21.7 percent at the second quarter of 2020. International Labour Organization (ILO) (2019) puts Nigeria youth unemployment at 30.1 percent while trading economics.com (2019) stated that 25.4 percent of Nigeria youths are without jobs. Fish is a vital component of human dietary regime. It contains protein, carbohydrate, minerals, vitamins and healthy fat (Ajuziam, 2019). Fish provides cheap protein for the rural poor (Ogana, 2018). Nigerians annual fish demand is 2.7 million metric tonnes while its local production is 850,000 metre tonnes (Adesina 2014, Audu 2016) over 120 billion naira is spent annually on fish importation (Tijani 2020, Ruwani 2020) United State Agency for International Development (USAID) (2019) puts the value of Nigeria fish importation at 976 million USD. Importation leads to job loss in importing country and job creation in the country of import (Oteriba 2019, Nwankwo 2019).

Youths are enjoined to take aquaculture to create jobs and eradicate unemployment and curb insecurity (Kalgo 2018, Osazuwa 2019). Togun (2018) Asuquo (2019) advised youths to adopt pen aquaculture practice due to its low investment capital outlay. Pen aquaculture is the practice of culturing fish within an enclosure in an existing body of water with in all sides procted except the bottom (Dahiru 2015, Yohana 2016), Zuru (2019) counseled that water analysis should be conducted on the body of water to be utilized for pen aquaculture for the presence of toxicants to avoid substance bioaccumulation and biomagnification. Pollutants that may be present in the water include furans, dioxins polychlorinated biophonyls (PCBs) microplastics heavy metals, pesticides such as organophosphates, carbomates and organochlorines. Bala (2016) Jita (2017) defined bioacummulabin as the penetration of the substances in the aquatic environment into organisms tissues while bioimagination is the tendency of the substance to multiply rapidly in the tissues of the organisms (United State Environment protection agency 2012). Organochlorines are compounds containing carbon and chlorine atoms that are used in pesticide formulation. (Atshana & Atshana 2016). The effects of organochlorine in humans include infertility in males and females, cancer endomereiosio and so on (Agency for Toxic Substance and Diseases Registry) (ATSDR, 2012). Wetlands are ecosystems that hold water permanently or temporary for three to six months in a year (USEPA 2016).

It is against these backdrops that this study on the organochlorine pesticides determination of Atuh wetlands Ugiliamai became imperative.

The purpose of this study therefore is to access the concentrations of organochlorine pesticides in Atuhs wetland Ugiliamai for pen aquaculture in schools as a revolution in as education. The organochlorine pesticides investigated are, alpha lindane ( $\alpha$ HCH) beta lindane ( $\beta$ HCH) delta lindane ( $\gamma$ HCH) gama lindane ( $\delta$ HCH) and heptachlor.

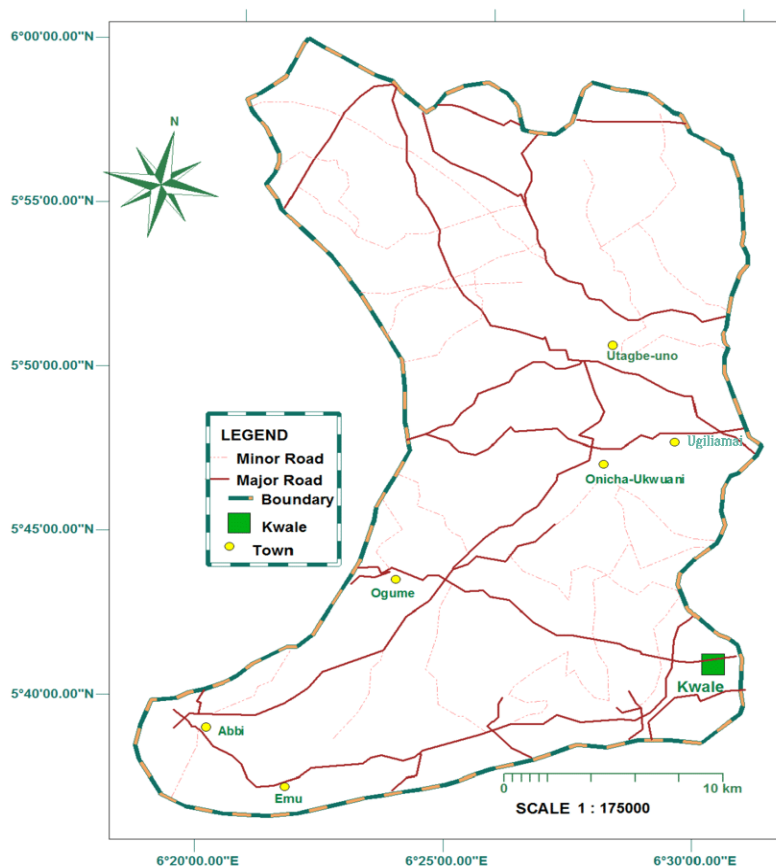
This study was guided by research questions as follows;

1. What are the concentrations of organochlorines pesticides viz  $\alpha$ HCH,  $\beta$ HCH,  $\gamma$ HCH,  $\delta$ HCH and heptachlor in Atuh wetland Ugiliamai.
2. Are the concentrations of the organochlorine pestidces within the maximum allowable concentrations for organochlorines pesticides in water as stipulated by WHO (2014)?
3. Can pen aquaculture be practiced in Atuh Wetland Ugiliamai.

The study was guided by hypothesis as follows;

Ho: There is no significant difference between the organochlorine pesticide concentrations in Atuh Wetland Ugiliamai and WHO maximum allowable concentrations for organochlorine pesticides in water.

**Study Area**



**Figure 1: Map of Ndokwa West showing Ugiliamai**

Source: Ezeomodo & Egware, (2018).

Ugiliamai is one of the 5 quarters that make up Onitsha Ukwani in Ndokwa West Local Government Area. It lies with the geographical coordinates of 6° 833' N and 6° 400' E with a population of 33,214 inhabitants (2016 National Population Commission. Population estimate). Ugiliamai people are farmers however some are artisans and petty traders. Atuh wetlands is at the southern flank of Ugiliamai and it is the main cesspool of a agricultural wastes through flash floods and runoffs.

**II. MATERIALS AND METHODS**

The research area Atuh Wetlands Ugiliamai was mapped out into 5 research blocks (Adegbola 2016, Abdulwaheed, 2012). From each of research blocks, water samples were collected with clean plastic sampling bottle tied to a graduated string at 10cm depth and covered subsurface. The samples from each block were bulk, a composite drawn and fixed with nitric acid HNO<sub>3</sub> and stored in an ice cooled box for analysis. The analytical standards adopted for the analysis were America Public Health Association (APHA) and Society for Testing and Material (ASTM) standards and the analytical instrument deployed for determination of the organochlorine pesticides is atomic absorption spectrophotometer model GBCsenso A. A. Australia.

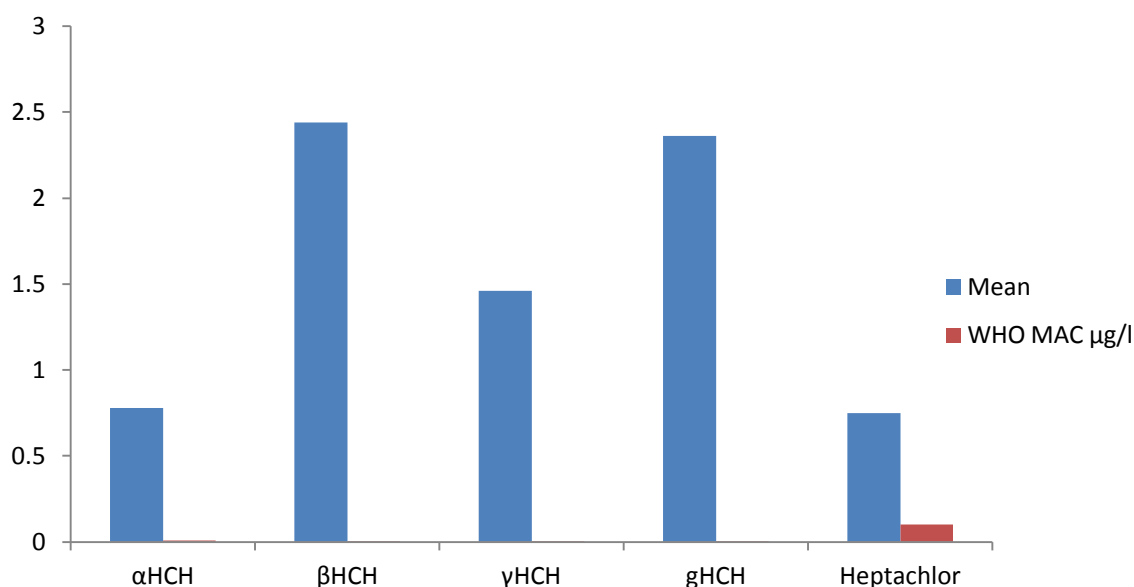
**III. RESULTS**

The results of the analysis of the organochlorine pesticides content of Atuh Wetland Ugiliamai are as in Table 1.

Table 1: Results of the organochlorine pesticide content of Atuh Wetland Ugiliamai and WHO maximum allowable concentration in µg/l.

Parameters	A	B	C	D	E	$\bar{x}$	SD	WHO MAC µg/l
αHCH	0.92	0.76	0.82	0.64	0.77	0.78	0.01	0.01
βHCH	2.24	2.62	2.44	2.56	2.32	2.44	1.50	0.005
γHCH	1.32	1.76	1.42	1.34	1.47	1.46	0.17	0.005
gHCH	2.02	2.42	2.42	2.38	2.38	2.36	2.32	0.005
Heptachlor	0.32	0.47	0.98	0.96	0.94	0.75	0.31	0.1

The mean results of the organochlorine pesticides were presented graphically as in Figure 2.



**Figure 2:** Mean results of the organochlorine pesticides content of Atuh Wetland and WHO MAC in µg/l.

The mean results of the organochlorine pesticide content of Atuh Wetland Ugiliamai were subjected to test of significance with analysis of variance (ANOVA) with numerator 4 and denominator 20 at 0.05 level of significance. The F ratio calculated value was 5.42 while F ratio critical value is 3.14 thus rejecting H<sub>0</sub>.

#### IV. DISCUSSION OF FINDINGS

Economic growth, development and sustainability of a country requires revolution in ailing sector of the economy to remain at par with other nations of the world. Revolution in agriculture aquaculture has been seen as a veritable tool for heighten economic growth and development especially aquaculture deploying pen aquaculture. Good quality water is a factor in aquaculture hence the study. The analysis of water of Atuh Wetland Ugiliamai revealed varying concentrations of organochlorine pesticides. The mean concentration of αHCH the analysis revealed is 0.78µg/l. The WHO maximum allowable concentration for αHCH in water is 0.01µg/l. The concentration of αHCH in Atuh Wetland Ugiliamai is higher than WHO acceptable limit. A similar result of increased αHCH has been reported by Omilabu (2018) in Ogun River Ogun State. Ojuoye (2017) however reported a dissimilar result of αHCH in Ominla River in Osun State. The mean concentration of βHCH the analysis showed is 2.44Ug/l, while the WHO maximum allowable concentration of βHCH in water is 0.05µg/l. The βHCH in Atuh Wetland Ugiliamai is higher than the acceptable limits. High concentration of βHCH has been reported by Clarke (2016) at Olomoge Lagoon Lagos. The mean concentration of γHCH in Atuh Wetland Ugiliamai the analysis revealed is 1.46 µg/l. The WHO maximum allowable concentration for βHCH in water is 0.005Ug/l. The concentration of γHCH in Atuh Wetlands is higher than the allowable limits. This result is distinct from the reports of Ozah & Ukpe (2017) at Ashaka Wetlands, Ashaka Delta State. It is however similar to the report of Nwokocha (2015) who reported high γHCH in Oji River Enugu State Nigeria. The mean concentration of gHCH in Atuh Wetland the analysis divulged is 2.32µg/l. The WHO maximum allowable limit for gHCH in Water is 0.005 µg/l. The mean concentration of gHCH is higher than the stipulated limit. High concentration of gHCH was reported by Ojodu & Olasupo (2018) in Ose River Ondo State Achinike (2019) also reported high concentration of gHCH in Njaaba River Imo State. The analysis of heptachlor content of Atuh Wetlands showed that the mean concentration of heptachlor is 0.13µg/l. The WHO maximum allowable concentration for heptachlor in water is 0.1ug. The concentration of heptachlor in Atuh Ugiliamai is higher than the acceptable limit for heptachlor in water recommended by WHO (2014). This report of high heptachlor is similar to the reports of Olawole (2016) in Asa River Kwara State, it is also similar to the reports of Olaitan (2016) in Erinle River Osun State and Ogwu (2020) in Okumesi River Amai.

#### V. CONCLUSION

Economic growth and development of a nation demand that some radical decisions be made in the policy formulation which will turn around the fortunes of the country for the good of its citizens. Trade/entrepreneurship curricular and implementation in 34 skills which includes Fishery was a revolution designed to make Nigeria self-sufficient in fish production, empower the recipients, eradicate poverty, and

hunger and ensure food and human security. Aquaculture pen culture requires good quality water and that was the mandate of this study. The result of the study showed that Atuh Wetlands Ugiliamai is highly contaminated with the organochlorine pesticides investigated so the adoption of pen aquaculture may not be practicable in its present pollution status.

## VI. RECOMMENDATIONS

Sequel to the findings of this investigation, the study recommends thus;

1. Pen aquaculture should not be practiced in Atuh Wetland because of its pollution status.
2. The source of the pollution should be identified and discontinued.
3. Decontamination of Atuh Wetland is highly recommended to improved its pollution status

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