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Residues Analysis of Organochlorine Pesticides in Water, Fish and Sediment Samples from River taraba at Bali, Taraba State, Nigeria.

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Abstract
The study was conducted to assess the levels of organochlorine pesticide residues in river taraba, have been investigated using water, sediment and fish species to find out the extent of pesticide contamination and accumulation in the river. Total of fourteen (14) organochlorine pesticide residues were analysed which include Delta lindane, Alpha Lindane, Beta Lindane, Gamma Lindane, Heptachlor, Aldrin, Heptachlor Epoxide, Endosulfan I, Endosulfan II, P'P-DDE, P'P-DDD, P'P-DDT and Methoxychlor. The water sample was subjected to liquid-liquid extraction method while the fish and the sediment samples were subjected to soxhlet extraction. The extracts were later analysed for organochlorine pesticide residues using Gas-Chromatography coupled with mass spectrometer (GC-MS). The study has revealed that the level of pesticides residues in water was less than that of fish and sediment which was also below the WHO/FAO values. In the sediment sample, high concentration of pesticide residue was recorded in Aldirin (166.02 ppm), follow by Endrin (4.33 ppm) and Beta-lindane (3.84 ppm).The Endrin recorded high in C. gariepinus (3.53 ppm) follow by Endosulfon II (2.36 ppm) also in C. gariepinus and Aldrin recorded the concentration of 2.36 ppm in Mormyrusrume. The lowest pesticide residues was recorded in p,p'-DDD (0.02 ppm), p,p'-DDT (0.03 ppm), Methoxychlor (0.03 ppm) and Heptachlor epoxide (0.02 ppm). These values were recorded low in all the three fish species and the sediment samples collected.High concentration of pesticide residues in fish may pose a great danger when these fish are being consumed over time. Regular monitoring is therefore required to control the levels of pesticide residues in the water bodies. The measurement of the fish showed that C. gariepinus had the highest average length of 17.65 cm, and average weight of 210.32 g. Mormyrusrume had the medium average length of 15. 55 cm, and average weight of 209.96 g. Tilapia zilli was the least species of fish sample with a length of 10.98 cm and average weight of 98.61 g.The water quality parameters of the river were also studied. The temperature of 29.89^{o}C was recorded, pH value of 9.45, Conductivity value of 40.17, DO value of 5.82 and TDS of 2.33

Keywords; *Pesticides; Residues; Organochlorine; river taraba, Pollution.*

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I.INTRODUCTION

Pesticide is any substance or mixture of substances that is used for or intended for preventing, controlling, repelling or destroying any pest. Pesticides include herbicides for destroying weeds and unwanted vegetation, insecticides for controlling insects, fungicides used for preventing the growth of molds and mildew and any other substances with the similar usage (Neil, 2015).Variousfarming, fishing and municipal activities are taking place near the band of river Bali could bring about water quality problems and disruption in fish (Abu-Hilal,1993).Pesticides constitute one of the most hazardous groups of contaminants (Vega et al. 2005), posing potential risk to humans and other life forms (Jeyakumar*et al*. 2014).Thus, deaths and chronic diseases worldwide are sometimes reported to have resulted from pesticide poisoning (Rigotto*et al.* 2013). The occurrence of pesticides residue, especially organochlorines (OCs) in the environment is a great worry due to their tendency for long-range transport. Also their capacity to bioaccumulate in food chain poses a threat to human health and the environment(Chau 2005; Zhou *et al*. 2006; Pandit*et al*. 2006; Guo*et al*. 2008).Pesticides enter and pollute the environment in a number of ways, including application through agriculture, accidental spillage or through the unauthorized dumping of pesticide products or their containers (Cox, 2002).

Chlorinated organic pesticides are very stable in both fresh and salt water and are resistant to photo degradation (Abu-Hilal&Badran, 1990). They will disappear from the water with secondary mechanisms such as, absorption on sediment, biological breakdown by microflora and fauna, and absorption by fish through gills, skin and feeding. They are poorly hydrolyzed and slowly biodegrades in environment. Therefore, these

compounds are persistent in food chains and are readily accumulated in animal tissues. Fish absorb these compounds directly by water or by ingesting contaminated food. In particular, Organochlorine insecticides are highly stable under different environmental conditions and persistent nature and chronic adverse effects on wildlife and humans (Abu-Hilal, 1987).

Contamination of water bodies for example is a major concern for fish and other aquatic organisms which are the major sources of protein (Essumang and Chokky 2009). Accumulation of pesticides in these organisms has become a serious public health issue worldwide. Fish are used extensively for environmental monitoring because they concentrate pollutants directly from water and diet, thus enabling the assessment of transfer of pollutants through the food web (Bruggeman 1982; Fisk et al. 1998; Lanfranchi et al. 2006; Das et al. 2002).Fish occupy different habitats in the ecosystem and have different feeding behaviours, thereby exhibiting different profile of accumulation of contaminants such as pesticides. For example, benthic fish species are considered more prone to contamination (Yim*et a*l. 2005; Wei *et al*. 2014) as they tend to accumulate sediments bound contaminants than pelagic fish (Qadir and Malik 2011; Ccanccapa*et al*. 2016). When large animals feed on these contaminated organisms, the toxins are taken into their bodies moving up the food chain in increasing concentration in a process known as bio magnifications (UNEPA, 2007).

The accumulation of pesticides in the sediments is because of some physicochemical parameters such as P^H which have direct influence in the solubility of these pesticides in water (Swati, 2015). Sediments also serve as an important sinks and remobilization of contaminants in aquatic system. The sediments act as secondary contamination source after water in the ecosystem and are the principal reservoirs of environmental pesticides representing a source from which residues can be released to the atmosphere, ground water and taking up by living organisms (Walley*et al*., 2006).

Many pesticides achieve their intended use of killing pests by disrupting the nervous system, like DDT have a wide range of potential health effects. They may cause physical irritation to the skin as well as acts as carcinogens, endocrine disruption and nervous disorder (USEPA, 2000).

The historical background of pesticides used in agriculture dated back to the beginning of agriculture itself and it became more pronounced with time due to the increased pest population parallel with decreasing in soil fertility (Muir *et al*,. 2002). The used of modern pesticides in agriculture and public health is dated back to the 19^{th} century when the German Scientists Ziedler synthesise the dichlorophenyltrichloroethane (DDT) as the first important synthetic organic pesticides in 1873 (Othmer 1996). About 28 years ago, it was also estimated that each year about 500 million people were affected by water-borne or associated diseases and as many as 10 million of these die (Abera, 2011). Recently WHO reports that about 80 % of all human illnesses in the developing world are caused by biological contaminations.

Despite the good results of using pesticides in agricultural and public health as described, their use is usually accompanied with deleterious environment and public health effect. Pesticides hold a unique position among environmental contaminants due to their high biological activity and toxicity. Although some pesticides are selective in their mode of operation, their selectivity is only limited to test animals. Thus pesticides can be described as biocides (have the ability of harming all forms of life other than target pest). Since 1950, the use of pesticides has increased. 50 folds and 2.5 million tons of industrial pesticides are now used annually (Farag, 2011).

II. MATERIALS AND METHOD

Study Area

The Study area and sample collection Sampling sites were selected based on the criterion of easy accessibility, an abundance of local fish species and perennial nature of the lakes and river. The study was carried out inriver taraba at Bali local Government Area of Taraba State, Nigeria. Bali lies between latitude 7^o46 N and 7^o54 N of the equator and longitude 10 $^o30$ E and 11^o 00 E of the prime meridian (Topographic sheet, 1968). It is found in dry guinea savannah. It is among the largest local Government in Taraba State, with an estimated land area of 11,540 km^2. Based on the results of the 2006 National Population Census, Bali local Government had a population of about 211,024 persons (NPC, 2006). It has a tropical climate marked by two seasons; dry and rainy seasons. The rainy season starts around April and ends November occasionally, with 1350 – 1500mm rainfall annually.

Sample Collection

Water sample was collected in 2.5 L plastic bottles (thoroughly cleaned with soap and rinsed with acetone) and covered with screwed caps from different locations at appropriate depth and turbulent midstream positions of water bodies. The sample was preserved after collection in ice to minimize degradation of pesticide, stored at 4 ^oC until extraction. Sediment samplewere taken from positions where a fine-texture substrate deposition takes place. The upper 2cm of the bed sediment was collected with a Teflon coated spoon, stored in aluminium containers at -20 0C in the laboratory until analysis. Fish identified and selected for this project are

tilapia (Tilapia zilli), Catfish (Clariassp), and Mormyrids (Mormyrusrume). The fish samples were collected using standard procedures as described by Welz and Sperling (1999). The fish Samples were collected randomly from fishermen catches at the landing sites between 9:00am – 11:00am.The measurements of the total length (cm) of each fish was taking from the tip of snout (mouth close) to the end of caudal fin using meter rule, body weight (g) was measured using electronic digital balance and the condition factor of individual fish sampled were recorded. The samples were then dissected and their organs (kidney, gills and muscles) were separated. The organs were oven dried and pounded into fine powder; and kept in a plastic container for analysis (Ayelojа*et al*., 2014).

Sample Preparation and Extraction

Water samples was shaken well and filtered through Whatman filter paper No.1 to remove suspended materials. Sediment sample was air dried and then sieved through a 250 µm stainless steel mechanical shaker. Fish samples were thawed, cleaned with distilled water and scales sloughed off. Muscle tissues was dissected, minced into smaller pieces and homogenized. Extraction of pesticide residues in fish, water and sediment samples was done according to the method developed by Therdteppitak and Yammang (2002),Mathur et al., (2003) and (Okoya*et al.,* 2013)with some modifications.

Extraction of pesticide residue in water sample

According to the method byOkoya*et al.,* (2013),About 50 ml n-hexane was introduced into a 1 L separating funnel containing 100 ml of filtered water sample. The mixture was shaken vigorously for 5 min and allowed to settle. After complete separation, the organic phase was be drained into a 250 ml conical flask while the aqueous phase was re-extracted twice with 50 ml of n-hexane. The extracted organic phase was combined and dried by passing through a glass funnel packed with activated anhydrous sodium sulfate. The organic fraction was then concentrated to near dryness using vacuum rotary evaporator at 40 °C.

Extraction of pesticide residues in sediments

According to the method by (Okoya*et al*., 2013),ten (10.0) g dry sediment sample was transferred into an extraction thimble. Pesticide residues in sediments were extracted with 150 ml of n-hexane/acetone mixture 4:1 v/v for 6 h using soxhlet extraction. The extract was then concentrated to near dryness using vacuum rotary evaporator at 40 °C. Each extract wasdissolved in 10 ml of n-hexane and subjected to clean-up.

Extraction of pesticide residues in fish

According to the method by (Okoya*et al.,* 2013)**,** Ten (10.0) g of homogenized fish sample was placed into a 100 ml conical flask and 20.0 g of activated anhydrous sodium sulfate was added and mixed thoroughly. Then 30 ml of 2:1 (v/v) hexane/acetone mixture was added and thoroughly mixed by shaking. The sample was then sonicated for 20 min using Bransonic Ultrasound Sonicator. The supernatant was filtered into a 250 ml round bottom flask. The extraction was repeated twice and all the supernatants combined and concentrated at 40 °C to near dryness using a Vacuum Rotary Evaporator.

Sample clean- up

Sample clean- up Approximately 2.5 g of activated silica gel was weighed and parked into a glass column which has been plugged with glass wool and 1.0 g of anhydrous sodium sulfate. About 10 ml n-hexane was used to wet and rinse the column. The extract was then transferred into the column and eluted with 20 mL portions of hexane/acetone mixtures. The eluates was collected into a round bottomed flask and then concentrated to dryness. The residues was then be dissolved in 2 mL of ethyl acetate and placed in a GC vial for gas chromatograph analysis.

GC Analysis

The GC analysis of the organochlorine pesticide residues was conducted using a model 2010 Shimadzu GC equipped with an EC. Separation was done on an SGE BPX-5 of 60 m capillary column with 0.25 mm internal diameter and 0.25 µm film thicknesses, equipped with 1 m retention gap. The oven temperature was programmed as follows: initial temperature was set at 90 °C for 3 min and ramped at 30 °C/min to 200 °C for 15 min and then to 265 °C at a rate of 5 °C/min for 5 min then to 275 °C at the rate of 3 °C/min and allowed to stay for 15 min. The injector setting is a pulsed splitless mode with a temperature of 250 °C at a pressure of 1.441 bar. Pulsed pressure was 4.5 bar, pulsed time 1.5 min, purge flow of 55.4 mL/min with a purge time of 1.4 min. The detector temperature was 300 °C. Nitrogen was used as carrier gas at a flow rate of 30 mL/min. A Varian CP-3800 GC equipped with a Combi PAL Auto sampler was used to measure levels of the pesticide residues. The column used was a 30 m × 0.25 mm internal diameter fused silica capillary coated with VF-1701 (0.25 µm film). The oven temperature was programmed as follows: initial temperature was set at 65 °C for

2 min and ramped at 25 °C/min to 210 °C for 6 min and then to 230 °C at 20 °C/min and allowed to stay for 20 min. The injector setting is a pulsed splitless mode at a temperature of 230 °C. The detector temperature was 250 °C in "constant makeup flow" mode. Helium gas was used as carrier gas at a flow rate of 2 mL/min.

III. RESULT AND DISCUSSION

Result

The tables below are the results of the organochlorine pesticide residues analysis in water, sediments and the three fish species samples collected from river taraba, Bali. The results are measured and presented in concentration (ppm).

Table I Concentration (ppm) of pesticide residues in water samples sites at river taraba

Pesticides residues	Types of residue	Molecular Formula	R.T. (min)	Concentration (ppm)
Delta.-Lindane	Insecticide	$C_6H_6Cl_6$	5.353	0.05
Alpha.-Lindane	Insecticde	C_6H_6Cl	5.856	0.09
Beta.-Lindane	Insecticide	$C_6H_6Cl_6$	6.028	0.22
Gamma.-Lindane	Insecticide	$C_6H_6Cl_6$	6.560	0.03
Heptachlor	Insecticide	$C_{10}H_5Cl_7$	6.594	0.01
Aldrin	Herbicide	$C_{12}H_8Cl_6$	7.333	0.55
Heptachlor epoxide	Insecticide	$C_{10}H_5Cl_7$	0.000	N.D.
Endosulfan I	Insecticide	$C_9H_6Cl_6O_3S$	8.643	0.05
p,p'-DDE	Insecticide	$C_{14}H_8Cl_4$	9.175	0.01
Endrin	Insecticide	$C_{12}H_8Cl_6O$	9.387	0.04
Endosulfan II	Insecticide	$C_9H_6Cl_6O_3S$	9.787	0.29
p,p'-DDD	Insecticide	$C_{14}H_{10}Cl_4$	9.936	0.01
p,p'-DDT	Insecticide	$C_{14}H_9Cl_5$	10.508	0.02
Methoxychlor	Insecticide	$C_6H_{15}Cl_3O_2$	11.504	0.01

Table 2: Concentration (ppm) of pesticide residues in Tilapia fish from river taraba

Pesticides residues	Types of residue	Molecular Formula	R.T. (min)	Concentration (ppm)
Delta.-Lindane	Insecticide	$C_6H_6Cl_6$	5.359	0.28
Alpha.-Lindane	Insecticde	C_6H_6Cl	5.828	0.45
Beta.-Lindane	Insecticide	$C_6H_6Cl_6$	6.028	0.82
Gamma.-Lindane	Insecticide	$C_6H_6Cl_6$	6.549	0.51
Heptachlor	Insecticide	$C_{10}H_5Cl_7$	6.743	0.06
Aldrin	Herbicide	$C_{12}H_8Cl_6$	7.333	0.38
Heptachlor epoxide	Insecticide	$C_{10}H_5Cl_7$	7.991	0.02
Endosulfan I	Insecticide	$C_9H_6Cl_6O_3S$	8.637	0.20
p,p'-DDE	Insecticide	$C_{14}H_8Cl_4$	9.095	0.06
Endrin	Insecticide	$C_{12}H_8Cl_6O$	9.467	0.21
Endosulfan II	Insecticide	$C_9H_6Cl_6O_3S$	9.787	1.91
p,p'-DDD	Insecticide	$C_{14}H_{10}Cl_4$	9.913	0.03
p,p'-DDT	Insecticide	$C_{14}H_9Cl_5$	10.497	0.03
Methoxychlor	Insecticide	$C_6H_{15}Cl_3O_2$	11.481	0.04

Table 3: Concentration (ppm) of pesticide residues in Cat from river taraba

Pesticides residues	Types of residue	Molecular Formula	R.T. (min)	Concentration (ppm)
Delta.-Lindane	Insecticide	$C_6H_6Cl_6$	5.353	0.11
Alpha.-Lindane	Insecticde	C_6H_6Cl	5.856	0.37
Beta.-Lindane	Insecticide	$C_6H_6Cl_6$	6.028	0.32
Gamma.-Lindane	Insecticide	$C_6H_6Cl_6$	6.571	0.66
Heptachlor	Insecticide	$C_{10}H_5Cl_7$	6.755	0.04
Aldrin	Herbicide	$C_{12}H_8Cl_6$	7.332	1.11
Heptachlor epoxide	Insecticide	$C_{10}H_5Cl_7$	7.968	0.11

Endosulfan I	Insecticide	$C_9H_6Cl_6O_3S$	8.637	0.38
p,p'-DDE	Insecticide	$C_{14}H_8Cl_4$	9.095	0.38
Endrin	Insecticide	$C_{12}H_8Cl_6O$	9.461	3.53
Endosulfan II	Insecticide	$C_9H_6Cl_6O_3S$	9.793	2.39
p,p'-DDD	Insecticide	$C_{14}H_{10}Cl_4$	9.942	0.20
p,p'-DDT	Insecticide	$C_{14}H_9Cl_5$	10.480	0.26
Methoxychlor	Insecticide	$C_6H_{15}Cl_3O_2$	11.504	0.37

Table 4: Concentration (ppm) of pesticide residues in Mormyrids from river taraba

Pesticides residues	Types of residue	Molecular Formula	R.T. (min)	Concentration (ppm)
Delta.-Lindane	Insecticide	$C_6H_6Cl_6$	5.359	0.08
Alpha.-Lindane	Insecticde	C_6H_6Cl	5.851	0.46
Beta.-Lindane	Insecticide	$C_6H_6Cl_6$	6.057	0.21
Gamma.-Lindane	Insecticide	$C_6H_6Cl_6$	6.572	0.38
Heptachlor	Insecticide	$C_{10}H_5Cl_7$	6.778	0.03
Aldrin	Pesticide	$C_{12}H_8Cl_6$	7.316	2.36
Heptachlor epoxide	Insecticide	$C_{10}H_5Cl_7$	7.991	0.03
Endosulfan I	Insecticide	$C_9H_6Cl_6O_3S$	8.626	0.60
p,p'-DDE	Pesticide	$C_{14}H_8Cl_4$	9.089	0.09
Endrin	Insecticide	$C_{12}H_8Cl_6O$	9.456	0.67
Endosulfan II	Insecticide	$C_9H_6Cl_6O_3S$	9.770	1.33
p,p'-DDD	Insecticide	$C_{14}H_{10}Cl_4$	9.913	0.02
p,p'-DDT	Insecticide	$C_{14}H_9Cl_5$	10.491	0.08
Methoxychlor	Insecticide	$C_6H_{15}Cl_3O_2$	11.510	0.24

Table 5: Concentration (ppm) of pesticide residues in sedimentfrom Bali river

Pesticides residues	Types of residue	Molecular Formula	R.T. (min)	Concentration (ppm)
Delta.-Lindane	Insecticide	$C_6H_6Cl_6$	5.353	0.08
Alpha.-Lindane	Insecticde	C_6H_6Cl	5.782	1.06
Beta.-Lindane	Insecticide	$C_6H_6Cl_6$	6.039	3.84
Gamma.-Lindane	Insecticide	$C_6H_6Cl_6$	6.589	0.59
Heptachlor	Insecticide	$C_{10}H_5Cl_7$	6.789	0.10
Aldrin	Pesticide	$C_{12}H_8Cl_6$	7.298	166.02
Heptachlor epoxide	Insecticide	$C_{10}H_5Cl_7$	7.991	0.03
Endosulfan I	Insecticide	$C_9H_6Cl_6O_3S$	8.643	1.60
p,p'-DDE	Pesticide	$C_{14}H_8Cl_4$	9.095	0.13
Endrin	Insecticide	$C_{12}H_8Cl_6O$	9.478	0.29
Endosulfan II	Insecticide	$C_9H_6Cl_6O_3S$	9.759	4.33
p,p'-DDD	Insecticide	$C_{14}H_{10}Cl_4$	9.913	0.28
p,p'-DDT	Insecticide	$C_{14}H_9Cl_5$	10.485	0.27
Methoxychlor	Insecticide	$C_6H_{15}Cl_3O_2$	11.504	0.06

IV. Discussion

The morphometric characteristics such as the average length, average weight and condition factor of the studied fish specieswere measured. The *C. gariepinushad* the highest average length of 17.65 cm, and average weight of 210.32 g. *Mormyrusrume*had the medium average length of 15. 55 cm, and average weight of 209.96 g.*Tilapia zilli* was the least species of fish sample with a length of 10.98 cm and average weight of 98.61 g. The *Mormyrusrume* had highest condition factor of 4.38, follow by *Tilapia zilli*which recorded the K- factor of 4.30 while the *C. gariepinus*had the least K- factor of 3.83. The condition factor (K) gives information on the physiological condition of fish in relation to its welfare. Perry *et al.* (1996) reported that fishes with a low condition index are presumably believed to have experienced adverse physical environment or insufficient nutrition. Bagenal and Tesch (1978) recommended K value range (2.9-4.8) as suitable for matured fresh water fish.. It was observed that the three fish species sampled in this study recorded varying condition factors, all the samples shows slight increases in K – value. Also, all of the fish species sampled in this present study had condition factors >1, and were within the normal ranges as recommended by Ujjania*et al*. (2012) who stated that

condition factor greater or equal to one is good, indicating a good level of feeding, and proper environmental condition.

The water quality parameters of the river were also studied. The temperature of 29.89^{o}C was recorded, pH value of 9.45, Conductivity value of 40.17, DO value of 5.82 and TDS of 2.33. Water quality testing is an important part of environmental monitoring. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well.

A total of fourteen (14) organochlorine pesticide residues were analysed which include Delta lindane, Alpha Lindane, Beta Lindane, Gamma Lindane, Heptachlor, Aldrin, Heptachlor Epoxide, Endosulfan I, Endosulfan II, P'P-DDE, P'P-DDD, P'P-DDT and Methoxychlor. Based on the result of the analysis of the pesticide residue on the water samples collected as indicated in table 1 above, the Endosulfan II (0.29 ppm) was found to be higher in all the water samples, follow by Beta.-Lindane (0.22 ppm) and Alpha.-Lindane m(0.09 ppm). the lowest pesticide residues was recorded in p,p'-DDE, p,p'-DDD, p,p'-DDT and Methoxychlor. The Heptachlor epoxide was not detected in the water sample collected. The result also indicted that the levels of pesticide residues in water are generally lower than that of fish and sediment because these pesticides are lipophilic and are not soluble in water. Also, the concentration of pesticide residue in water was below maximum residue limit (MRL) as compared with FAO/WHO (2009, 2010 and 2021) where the pesticide residue limit ranges from 0.001 to 0.5 ppm.

The result on the fish analysis shows that the concentrations of pesticides residues in fish were found to be higher than that of the water sample. Also, almost all the fourteen (14) organochlorine pesticides analysed were found to presence in the fish samples collected. Based on the result obtained, it was also observed that these concentrations recorded high in *C. gariepinus*, follow by *Mormyrusrume* while the *Tilapia zilli* recorded low concentration of the pesticide residues. The Endrin recorded high concentration of 3.53 ppm in Catfish follow by Endosulfon II which recorded the concentration of 2.36 ppm also in Catfish as shown in table 3 above and Aldrin recorded the concentration of 2.36 ppm in Mormyrid in table 4. The lowest pesticide residues was recorded in p,p'-DDD (0.02 ppm), p,p'-DDT (0.03 ppm), Methoxychlor (0.03 ppm) and Heptachlor epoxide (0.02 ppm). These values were recorded low in all the three fish species collected. Also, the high concentration of pesticide observed in *C. gariepinus* may be attributed to the feeding mode of the fish (Fianto*et al*., 2011). This result is corroborated by Biego*et a*l (2010) who related to habitation and feeding habit of *C. gariepinus*. To an increased concentration of pesticide residues compared with other fish species. Upadhi&Wokoma, (2012), equally adds that pesticides accumulation in was due to their lipid content content; this implies that due to the high lipid content in *C. gariepinus*, more pesticide residues tend to be traped in their lipid stores.

The level of pesticide residues in sediment analysed was higher than that of both the water and fish samples. Also, all the fourteen (14) organochlorine pesticides analysed were deteted in the sediment sample collected as indicated in table 5 above. Aldirn recorded high concentration of 166.02 ppm follow by Endrin which recorded the concentration of 4.33 ppm and Beta-lindane 3.84 ppm. The lowest pesticide residue was recorded in Heptachlor epoxide 0.03 ppm, Methoxychlor 0.06 ppm and Delta- lindane 0.08 ppm. The low level of p,p'-DDE, p,p'-DDD, p,p'-DDT, Methoxychlor and Heptachlor epoxide in the water sample, fish and sediment showed that the farmers around the lakesand rivers do not use them much in their farming activities. However, these organochlorine pesticides were measured high in fish and sediment samples, which is because they are less soluble in water. They, therefore, accumulate in fishes and sediments when they are discharged into water bodies (Wasswa&Kiremire, 2004).The lake sediments act as a sink for the persistent contaminants, whose resuspension during the lake's mixing may increase pesticide bioavailability and accumulation in the fish (Getenga*et al*., 2004). Pesticide pollution to the lake is therefore, likely to pose a danger to both aquatic organisms and humans (Mavura&Wangila, 2014).

V. CONCLUSION

This study has presented information on the different pesticides residues contamination and their levels in water, fish and sediment samples collected from river taraba, Bali, Taraba State. The study has revealed that the level of pesticides residues in water was less than that of fish and sediment which was also below the WHO/FAO values. It was also observed that these concentrations recorded high in *C. gariepinus*, follow by *Mormyrusrume* while the *Tilapia zilli* recorded low concentration of the pesticide residues. The presence of high concentration in fish may pose a great danger when these fish are being consumed over time. Regular monitoring is therefore required to control the levels of pesticide residues in the water bodies.

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