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Determination of the presence of pesticide residue levels in beef, chevon and internal organs of cows slaughtered in Yola Abattoir of Adamawa State, Nigeria

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ABSTRACT

This work examines the presence of pesticide residue levels in beef, chevon, and internal organs of cow obtained from Yola Abattoir in Adamawa State, Nigeria. This study was carried out because no such published information is available in this region. Organochlorines and organophosphorus were analyzed in the cow samples using the Quick, Easy, Cheap, Effective, Rugged and Safe (QuEChERS) method of extraction with GC-MS techniques. The residue analysis revealed that beef and chevon samples have no traces of organochlorines while organophosphorus pesticide residues detected were below the threshold level of 0.01 mg/kg. The results got from the animals' intestine showed the presence of chlorpyrifos (0.034 ± 0.001 and 0.027 ± 0.001) in some cow samples above the standard values, whereas, the dichlorvos levels (0.059 ± 0.0014, 0.061 ± 0.0007 and 0.072 ± 0.0014) in some cow samples were below the maximum residual value of 1 mg/kg. The kidney residue revealed that dichlorprifos, diazinon, dimethoate, primi-methyl, and malathion were below the maximum residue limit, MRL (0.001 mg/kg) in the cow samples as chlorpyrifos levels in some cow samples were above the standard value. Residue analysis in the livers also showed the presence of chlorpyrifos at 0.011 ± 0.001, 0.014 ± 0.001, and 0.08 ± 0.001 in some cow samples above the recommended value while dichlorvos (1.012 ± 0.001 and 0.029 ± 0.001) in some cow samples were below the MRL. Residue analysis of all the samples studied shows no trace of organochlorine pesticides. These findings are alarming and pose a potential threat to public health..

1. Introduction

The growing demand for enhanced food production to meet the needs of the global population has led to the use of sophisticated agricultural technology in which pesticides play a crucial role. The need to cultivate land and domesticate animal for food becomes paramount; thus, the challenges of insect infestation, rodents, weeds, fungi, and other organisms play a vital role in diminishing crop productivity and yield. In combating the damages caused by pests, rodents, weeds, and fungi that retard crop yield and animal production, pesticides were developed to destroy, repel or mitigate the effect of pests in the farm. Therefore pesticides were designed to provide and enhance affordable food all year round to meet the demand of consumers[1]. Many pesticides were developed under the secrecy of wartime and with military purpose in mind[2]. As the agriculture production system moves from subsistence to market-oriented large-scale farming, an alarming increase in pesticide usage seem inevitable[3]. Pesticide means any chemical substance or mixture of substances intended for preventing, destroying, repelling or mitigating the effect of the pest on plants and animals and shall include herbicides, insecticides, rodenticides, insect growth regulators used in agriculture, public health, horticulture food storage or chemical substance used for similar purpose. Pesticides are used primarily in agriculture, veterinary, domestics, and institutions. Toxicity of pesticide is a measure of the capacity of a pesticide to cause injury; it is a property of the chemical itself. These include substances with high toxic effects and persistence in the environment[4]. Pesticide residues in livestock generally accumulate in two ways, either applied to animals as an insecticide-impregnated ear tag, spray, self-treatment back rubber, dust bags, injectable or through pesticide spray on crops and fodder.

These compounds are primarily designed to kill insects, fungi, weeds, and are toxic and also deliberately released into the environment. These pesticidal properties are unique and constitute a threat to man's health and environment[5]. Pesticide exposure may be via inhalation, dermal or oral route. Several studies have shown that children have high concentration because of their body weight[6]. Pesticide storage, handling, and usage are fraught with problems of undesirable side effects and food chain involvement. A natural survey by the US Geological Survey found pesticide residue in every stream monitored[7]. Pesticide residue is present in more than 70% of fruits and vegetables, more than 60% of wheat samples and 99% of milk sample

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analyzed in United State Department of Agriculture[8]. Also for the pesticide to be effective against the pest, they must be biologically active or toxic. Livestock reared on pesticides contaminated soils, crops and fodders may accumulate considerable pesticide residue in edible tissues. According to industrial estimate, insecticide usage has high growth potential in Nigeria as the use of agriculture pesticide is markedly low at 0.25 Kg/ha as against 0.54 Kg/ha in India, 3.7 Kg/ha in the USA and 2.7 Kg/ha in China[9]. Notwithstanding, the fact that overall consumption in Nigeria is lower than that used in developed countries of the world, there is a wider spread of pesticide poisoning among animals and products preserved with a pesticide such as grains, beans, fruits, vegetables, etc. Few studies have shown the presence of pesticides residues in fruits and vegetables in some developing countries such as Islamabad[10], pesticide residues in vegetable from Karachi and in the various tissue of fish in the local lakes[11].

Furthermore, pesticide residue also accumulates on cropland soil[12]. Animal accumulates this substance from contaminated feed and water. Also due to the lipophilic nature of these pesticides, milk and other fat-rich materials are the key items for their accumulation[1]. Therefore, an indirect source of pesticides accumulation can be represented by animal-derived products. Humans ultimately consume such pesticide contaminated animal foods, and consequently, these toxicants represent a serious risk for human health. To avoid the toxic health hazards, it is necessary to determine the level of pesticides in edible tissue like meat, liver, intestine, and kidney of common food animal (Cow) which are probably reared where pesticides are used in the environment.

The indiscriminate or proliferation and usage of pesticide in agriculture, domestic, veterinary and institutions have brought about the increased consumption or their intake in crops and meat consumed. This has grown over the years in Nigeria to about several thousand folds from 30 metric ton (MT) in 1977 to 20,000 MT in 2003 – 2005. To this end, there are some uninvestigated cases of threat to public health constituted by pesticide poisoning from milk, meat and other fat-rich organs of animal: liver, intestine, and kidney. Despite the use of pesticide in agriculture and a residential environment, few studies have measured children exposure levels some have focused on residual pesticide level in agriculture products. There are little or no published studies identified to date that examined pesticide residue of meat products, its common hazards and environmental control policy through continuous supervision and monitoring of this pesticide in water, sediments and the environment in the northeast region of Nigeria. These increase in the proliferation and use of pesticide in agriculture produce, residential areas and the predisposing causes of pesticide usage; poisoning and its prevalent health hazard rekindled the quest for this research work.

2. Materials and methods

2.1 Materials

The equipment and apparatus used for the analysis include the following, acetonitrile, magnesium sulphate and sodium chloride (all pesticide grades) were obtained from Sigma Aldrich, USA. Other materials include distilled water, polythene zipper bag, electric chopper, and centrifuge.

2.2 Methods

2.2.1 Study Area

This research work was carried out at Yola Abattoir in Yola North, Adamawa State, Nigeria. Naturally, this region is abundantly blessed with nomads who are predominantly peasant farmers. However, due to an increased need for food as a result of the growing population of the state and for financial gains, the people have accepted mechanized and agrochemical farming.

2.2.2 Sample Collection

The beef and chevon of 10 different cows were collected along with their intestine, kidney, and liver. A total of eighty (40) samples were collected/purchased within two months (March and April 2017). The samples were packed in polythene bags and transported to the laboratory for analysis.

2.2.3 Extraction of pesticide residue in meat/ organs

The meat, chevon along with their intestine, kidney and liver samples were collected and labeled as C_1M, C_1I, C_1K, C_1L, C_2M, C_2I, C_2K, and C_2L accordingly. About 10 g of the beef sample was weight chopped, and the homogenized ground beef was transferred into a 50 mL centrifuge tube. The sample was extracted using 2 mL water and 10 mL acetonitrile (ACN), followed by vigorous shaking for 1 minute. 4 g $MgSO_4$ and 1 g NaCl were also added and vigorously shaken for 1 minute. After that, the sample was transferred to the centrifuge for 3 minutes at 4000 rpm where 1 mL aliquot of the supernatant (top layer) was taken for dSPE cleanup. Other samples were sequentially treated accordingly.

2.2.4 dSPE Cleanup

The cleanup was when 1 mL aliquot of supernatant was transferred to a 2 mL dSPE cleanup tube that contains 150 mg of magnesium sulfate, 50 mg PSA sorbent, and 50 mg C_{18} sorbent (p/n 186004830). The content was shaken vigorously for 1 minute, and a portion of the supernatant was transferred to the LCMS Certified Vial for GC/MS analysis.

2.2.5 Experimental Analysis

The analysis was carried using 1 mL aliquot of the supernatant which was transferred into a certified vial for gas chromatography-mass spectrometry where the Pesticides (organochlorides and organophosphorus) residue level in samples was determined with GC condition: system – Agilent 7890A agilent technologist inert MSD 5975CM Column; Agilent J and W GC columns HP-5MS30(M) 0.250 DIAM (MM)0.25 film (UM) Temp Limit 60 to 325^0C gas – helium, flow. The software CSW 32 was used to the obtained peak of height and area under the curve.

2.2.6 Statistical Analysis

The analysis of all the animal's samples was carried out using the software CSW 32 for the GCMS instrumentation, the peak height, area under the curve and the type of pesticide used was obtained. Statistical Packages for Social Sciences (SPSS) was used to arrive at the mean and standard deviation.

3. Results and discussion

3.1 Pesticide residue levels of the animal samples

The pesticides (organochlorines and organophosphorus) residue levels were analyzed in beef, chevon, intestine, kidney and liver of 10 different cows within the span of March and April 2017 as presented in Tables 1 to 10 and some selected GC-MS Spectrometry at the appendices which revealed no organochlorines in beef and chevon samples in all the animals. Organophosphorus residue level, of some selected data from

Tables 1 to 10 showed that chlorpyrifos was above the maximum residue limit (MRL) of (0.001 mg/Kg) in virtually some of the animals' intestine (0.034 ± 0.001), (0.031 ± 0.001) (0.027 ± 0.001), (0.021 ± 0.001) and (0.023 ± 0.0014). Dichlorvos were detected in the kidney of the animals below the MRL value of 1 mg/Kg; (0.059 ± 0.0014), (0.050 ± 0.0007), (0.061 ± 0.0007), (0.043 ± 0.0014), (0.072 ± 0.0014) and (0.031 ± 0.001). Analysis in the livers also showed the presence of chlorpyrifos at (0.011 ± 0.001), (0.014 ± 0.001), (0.08 ± 0.001) above the recommended value while dichlorvos (1.012 ± 0.001), (0.027 ± 0.001), (0.029 ± 0.001) and (0.037 ± 0.001) below MRL established by the international health regulation agencies. Other organophosphates found below the threshold level of 0.001 mg/Kg were anthracene, chlorpyrifos, dichlorvos, dichlorpyrifos, diazinon, dimethoate, primifos-methyl, and malathion. This analysis revealed the preferences of pesticide to the internal organs: intestine, kidney, and liver in the animals. The preferences to the internal organs are mostly in the goats than the cows due to the body size and weight of the animals as can be deduced from the exposure of this pesticide in the literature.

3.1.1 Pesticides residue levels of cow 1 samples

Table 1 shows the cow 1 samples and the mean ± S.D values (mg/kg) of pesticide residues levels analyzed. The values indicate, no traces of organochlorine pesticide was detected while the organophosphates pesticide residues are below the detection limit of (< 0.001 mg/Kg) in the entire cow samples analyzed. This implies that the values obtained are below the maximum residue limit (MRL) established by the United States Food and Drugs Administration (USFDA).

Table 1: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 1 samples

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochloride pesticide detected

The absence of these pesticides could be attributed to the following, the environment where pesticides are not use; no leaching of pesticides through soil to groundwater that may also contaminate drinking water sources of the animals, instrumental error which may have to do with faulty equipments (e.g use of a leaking burette in volumetric analysis), method error or procedural error that has to do with undetected impurities in reagents, interfering substances in a sample, non-stoichiometric nature of the weighing form of a precipitate encountered in analysis, negligence of the small titrant volume that reacts with the indicator in calculation in a titration process, the minute solubility of the precipitate on extensive washing leading to negative error, insufficient washing which may not remove all contaminants on the precipitate, result in a positive error.

Another attribute to none detectability of the pesticide residues could be due to, personal error or operative error which arises mainly from operators showing some personal prejudices and preferences in the analysis which might lead to an error. An example is the habitual filling of the calibrated volumetric glassware above the indicated mark; operators with blurred vision for color changes are prone to introduce errors in the visual titration. The variability in replicate analysis, irregular and unpredictable forms of observation affect the accuracy that might be achieved from this study. Indeterminate errors result in variability in the replicate analysis, irregular and unpredictable. Other factors may be attributed to none detectability of this study might be a gross error which has to do with the carelessness in the analytical procedure, improper recording of analytical data, results, and errors in calculations. The errors affect accuracy and provide results that are precise but not accurate.

The organophosphates (OPPs) are widely used to control pests and microorganism in the household, public health, stored products and have been shown to have toxic effects on human and animals. OPPs are poisonous and usually are not persistent in the environment as the OCPs. The organophosphates affect the nervous system by disrupting the enzyme that regulates acetylcholine, a neurotransmitter. OPPs are widely employed both in natural and synthetic applications because of the ease with which organic groups can be linked together. Several studies on both human and animals provide strong evidence of its toxic potential to exposure of OPPs as a possible human carcinogen and toxic to birds by the U.S.

Organochlorine (OCC) pesticides are class of nonpolar toxic compounds classified as dichlorodiphenylethane cyclodienes and chlorinated benzenes. Several studies on human and animals proof the existence of toxic potential of exposure to OCPs. The health and environmental effects associated with OCPs include reproductive failures, birth defect, endocrine disruption properties; human data also indicate possible disruption in semen quality, menstruation, gestation length and duration of lactation.

3.1.2 Pesticide residue levels of cow 2 samples

Table 2 show cow 2 samples and the mean ± S.D values (mg/Kg) of pesticide residue levels analyzed. The values indicate no traces of organochlorine pesticide was detected while, the organophosph0rus pesticide residues of Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, primifos-methyl, malathion and chlorpyrifos are below the detection limit of (< 0.001 mg/Kg). This indicates that pesticides of this nature are not used in the environment. However, Dichlorvos pesticide residues are detected at mean ± S.D values of (0.059 ± 0.0014) in the intestine and (1.021 ± 0.0007) in liver respectively. This indicates that the concentrations of the pesticide residues in the intestine are below the MRL value in the intestines as compared with the liver which is slightly higher than the MRL value of 1.00 mg/Kg established by USFDA. This implies that these pesticides are used in the environment or possibly through contamination of the fodder with pesticides as well as the uptake of this pesticide in soil, vegetables, fodder, and herbage produced in these regions by these animal's samples. Dichlorvos is insecticide used on crops, stored products, and animals. It is also used as an insecticide for slow release on pest-strips for pest control in homes. Acute (short-term) and chronic (short-term) exposure of humans to dichlorvos result in the inhibition of an enzyme, acetylcholinesterase, with neurotic effects including perspiration, vomiting, diarrhea, drowsiness, fatigue, headache, and at high concentrations, convulsions, and coma.

A study by the National Toxicology Programme (NTP) reported an increased incidence of tumors of the pancreas, mammary glands and forestomach in animals. In 1995 USEPA proposed cancellation of dichlorvos for all home use, and for

many commercial and industrial uses due to its effect on humans and the animals. Africa has therefore been suggested as a highly relevant area for increased research activities to established possible links between the increasing numbers of unexplained cancer cases and expose to anthropogenic chemical pollutants in the air, water, soil, sediments, and food. Some developing countries are still using organochlorine and organophosphorus pesticides for agricultural and public health purposes to prevent the spread of mosquitoes. These pesticides are used in developing countries such as Nigeria due to lack of appropriate regulatory control and management on the production, trade, and use of these chemicals.

Table 2: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 2 samples

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	0.059±0.0014	< 0.001	1.021±0.0007
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection limit 0.001
No trace of organochlorin pesticide detected

3.1.3 Pesticide residue levels of cow 3 samples

The Table 3 shows cow 3 samples and the mean ± S.D values (mg/Kg) of pesticide residues levels analyzed. The values indicate, no traces of organochlorine pesticides were detected while; the organophosphorus pesticide residue levels of Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, primifos-methyl, and malathion are below the detection limit of (< 0.001). This indicates that organophosphates pesticides are not used in the environment. Chlorpyrifos and Dichlorvos are detected in the intestine and liver. The mean ± S.D of the pesticides are; (0.034 ± 0.0007), (0.011 ± 0.001), (0.061 ± 0.0007) and (0.027 ± 0.001) respectively. From the Table 3, the concentration of Chlorpyrifos in the intestine are above the MRL values of 0.1 mg/Kg, which is about 340% increase in intestine whereas, the liver concentration was found to be slightly above the MRL value of 0.01 mg/Kg, which is about 110% increase in the liver. The results indicate the levels of contamination by chlorpyrifos in the intestine and liver analyzed. However, Dichlorvos concentration in both the intestine and liver are below the MRL values of 1.00 mg/Kg with less than 6.1% and 2.7% respectively. This indicates no level of contamination by Dichlorvos in the intestine and liver of cow 3 analyzed.

The chlorpyrifos detected in this study are many times more than the MRL value established by USFDA. In some studies conducted in milk, the main pesticide pollutant was chlorpyrifos[13], and its contamination ranged from 5 to 18 mg/Kg. In bioaccumulation experiments, fish meat was detected to accumulate chlorpyrifos up to 5.9 ng/g[14]. However, the concentration of dichlorvos remains the same seasonally in muscle, kidney, liver, and lung samples of cattle[13]. The Detectability of dichlorvos pesticides could be attributed to its wide use as an insecticide and ectoparasite on livestock[13] .

The result obtained from this study shows that chlorpyrifos was found to be 110% of the analyzed samples and its detected value was many times more than the MRL value established by USFDA. The health and environmental effects associated with OCPs include reproductive failures, birth defect, endocrine disruption properties; human data also indicate possible disruption in semen quality, menstruation, gestation length and duration of lactation.

Table 3: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 3 samples

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	0.034±0.0007	< 0.001	0.011±0.001
Dichlorvos	< 0.001	0.061 ±0.0007	< 0.001	0.027±0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection limit 0.001
No trace of organochlorin pesticide detected

3.1.4 Pesticide residue levels of cow 4 samples

Table 4 shows Cow 4 samples and the mean ± S.D values (mg/Kg) of pesticide residues analyzed. The values indicate that no traces of Organochlorine pesticide was detected while, the Organophosphosphorus pesticide residue levels of Anthracene, Chlorpyrifos, Dichlorpyrifos, Diazinon, Dimethoate, Dichlorvos, Primifos-methyl, Malathion are below the detection limit of (< 0.001 mg/Kg). This indicates that pesticides of this nature are not used in the environment. This implies that the values obtained are below the Maximum Residue Limit (MRL) established by the United States Food and Drugs Administration (USFDA). The absence of these pesticides could be attributed to the following; a systematic error which affects accuracy and provides results that are precise but not accurate.

Table 4: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 4 sample

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochlorin pesticide detected.

3.1.5 Pesticide residue levels of cow 5 samples

Table 5 shows Cow 5 samples and the mean ± S.D values (mg/Kg) of pesticide residues analyzed. The values indicate no traces of organochlorine pesticide was detected while, the

organophosphates pesticide residues of Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, primifos-methyl, and Malathion are below the detection limit of (< 0.001 mg/Kg). This indicates that pesticide residues of this nature are not used in the environment for agriculture and domestic activities. The most frequent occurring pesticides in this present study are chlorpyrifos and dichlorvos which are also detected in the intestine and liver of cow 5. The mean ± S.D of the pesticides are; (0.027 ± 0.0007), (0.014 ± 0.001), (0.072 ± 0.0007) and (0.029 ± 0.001) respectively. From the Table 5, the concentration of Chlorpyrifos in the intestine is above the MRL values of 0.1 mg/Kg, which is about 270% increase in intestine whereas, in the liver, it was found to about 140% increase in cow 5. The results indicate the levels of contamination by chlorpyrifos in the intestine and liver analyzed. However, dichlorvos concentration in both the intestine and liver are below the MRL values of 1.00 mg/Kg with less than 7.2% and 2.9% respectively. This indicates that no level of contamination by dichlorvos in the intestine and liver of cow 5 analyzed. The chlorpyrifos detected in this study are many times more than the MRL value established by USFDA. See appendices.

Table 5: Concentration (mg/kg) of organophosphorus pesticide residues in cow 5 sample

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	0.027±0.0007	< 0.001	0.014±0.0014
Dichlorvos	< 0.001	0.072±0.0014	< 0.001	0.029±0.0007
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochlorine pesticide detected

3.1.6 Pesticide Residues Level of Cow 6 Samples

Table 6 shows Cow 6 samples and the mean ± S.D values (mg/Kg) of pesticides residue levels analyzed which indicate no traces of organochlorine pesticides presence while; the organophosphates pesticide residues are below the detection limit of (< 0.001 mg/Kg) in the entire cow samples determined. This implies that the values obtained are below the Maximum Residue Limit (MRL) established by the United States Food and Drugs Administration (USFDA). The absence of these pesticides could be attributed to the following, the environment where pesticides are not use; no leaching of pesticides through soil to groundwater that may also contaminate drinking water sources of the animals, instrumental error which has to do with un-calibrated apparatus and faulty equipment, method error or procedural error that has to do with undetected impurities in reagents, interfering substances in a sample, non-stoichiometric nature of the weighing form of a precipitate encountered in analysis.

Another attribute to none detectability of the pesticide residues could be due to, personal error or operative error which arises mainly from operators showing some personal prejudices and preferences in the analysis which might lead to an error. The variability in replicate analysis, irregular and unpredictable forms of observation affect the accuracy that might be achieved from this study. The last factor that may be attributed to below detection limit of these studies might be a gross error which has to do with the carelessness in the analytical procedure, improper recording of analytical data and results and errors in calculations.

However, the fact that the presence of organophosphorus was below the threshold level their effects cannot be overemphasized as the organophosphorus pesticides (OPPs) are widely used to control pests and microorganism in the household, public health, stored products and have been shown to have toxic effects in humans and animals.

Table 6: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 6 samples

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochlorin pesticide detected.

3.1.7 Pesticide residues level of cow 7 samples

Table 7 shows Cow 7 samples and the mean ± S.D values (mg/Kg) of pesticide residues levels which are analyzed. The values obtained indicate no traces of organochlorine pesticide was detected while, the organophosphates pesticide residues of Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, primifos-methyl, and malathion are below the detection limit of (< 0.001 mg/Kg). This shows that organophosphorus pesticides are not used in the environment. However, chlorpyrifos and dichlorvos pesticide residues are detected at mean ± S.D values of (0.011 ± 0.0014), (1.009 ± 0.0007), (0.052 ± 0.0014) and (0.019 ± 0.001) respectively. This indicates that the concentrations of the pesticide residues of chlorpyrifos in the intestine and liver are above the MRL value of 0.01 mg/Kg. The dichlorvos is considerably below the MRL value of 1.00 mg/Kg with a percentage decrease of 5.2% and 1.9%. This may imply that chlorpyrifos pesticides are used in the environment or contamination of the fodder where these animals are feed.

Other reason may be attributed to the uptake of these pesticides in soil, vegetables, fodder, and herbage produced in this region (northeast) of Nigeria. Dichlorvos is insecticide used on crops, stored products, and animals. It is also used as an insecticide for slow release on pest-strips for pest control in homes. Acute (short-term) and chronic (short-term) exposure of humans to dichlorvos result in the inhibition of an enzyme, acetylcholinesterase, with neurotic effects including perspiration, vomiting, diarrhea, drowsiness, fatigue, headache, and at high concentrations, convulsions, and coma. No information is available on the reproductive, developmental, or carcinogenic effect of dichlorvos on humans according to the Environmental Protection Agency (EPA)'s Integrated Risk Information System (IRIS) 1999. A study by the National Toxicology Programme (NTP) reported an increased incidence of tumors of the pancreas, mammary glands and forestomach in animals. In 1995, EPA proposed cancellation of dichlorvos for all home use, and for many commercial and industrial applications due to its effect on humans and the animals. However, the fact that the presence of organophosphorus was below the threshold level their effects

cannot be over emphasized as the organophosphorus pesticides (OPPs) are widely used to control pests and microorganism in the household, public health, stored products and have been shown to have toxic effects in human and animals.

Table 7: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 7 sample

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	0.011±0.0014	< 0.001	0.009±0.0007
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	0.052 ± 0.0014	< 0.001	0.019 ± 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection limit 0.001
No trace of Organochlorine pesticide detected

3.1.8 Pesticide residues level of cow 8 samples

Table 8 shows cow 8 samples and the mean ± S.D values (mg/Kg) of pesticide residue levels analyzed. The table shows no trace of organochlorine pesticide residues in the cow 8 samples analyzed. While, organophosphorus pesticides residues, with particular emphasis to chlorpyrifos and dichlorvos, are detected in the intestine, and liver in the ranged of (0.012 ± 0.0014), (0.007 ± 0.0007), (0.048 ± 0.0014) and (0.023 ± 0.0007) respectively. This indicates that organochlorine pesticides are not used in an environment where these animals are obtained. The organophosphorus pesticides are often used by rural farmers and in domestic activities and institutions as insecticides. The uses of organophosphorus as insecticide may be attributed to the presence of pesticides in the analyzed sample. The table indicates the concentration of pesticide levels of dichlorvos at significantly below the MRL value of 1.00 mg/Kg, with 4.8% and 2.3% less respectively. These data further show no level of contamination by dichlorvos in the samples analyzed, while in the other pesticide, chlorpyrifos the value is above the recommended value of MRL 0.01 mg/Kg with a percentage increase of 120% and 70%. The concentration of Anthracene, Diazinon, Dimethoate, Primifos-methyl, and Malathion are below trace level of detection limit.

Table 8: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 8 sample

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	0.012± 0.001	< 0.001	0.007±0.0007
Dichlorvos	< 0.001	0.048±0.0014	< 0.001	0.023 ± 0.0007
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	<0.001

GC/MS Acqmethod pesticide
Detection limit 0.001, No trace of organochlorin pesticide detected.

3.1.9 Pesticide residues level of cow 9 samples

Table 9 shows cow 9 samples and the mean ± S.D values (mg/Kg) of pesticide residue levels analyzed. The values indicate no traces of organochlorine pesticide was detected while; the organophosphates pesticide residue levels of Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, Primifos-methyl, Malathion and Chlorpyrifos are below the detection limit of (< 0.001 mg/Kg) . This indicates that organophosphorus pesticides are not used in the environment. However, Dichlorvos pesticide residues are detected at a mean ± S.D values of (0.039 ± 0.0014) in the intestine and (0.081 ± 0.0007) in liver respectively. This indicates that the concentrations of the pesticide residues in the intestine and liver are below the MRL value of 1.00 mg/Kg. This implies that these pesticides are used in the environment or possibly through contamination of the fodder with pesticides as well as the uptake of this pesticide in soil, vegetables, fodder, and herbage produced in this region (northeast) of Nigeria.

Dichlorvos is insecticide used on crops, stored products, and animals. It is also used as an insecticide for slow release on pest-strips for pest control in homes.

Table 9: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 9 samples

Pesticide	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	0.039±0.0007	< 0.001	0.081±0.0014
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochlorin pesticide detected.

Acute (short-term) and chronic (long-term) exposure of humans to dichlorvos result in the inhibition of an enzyme, acetylcholinesterase, with neurotic effects including perspiration, vomiting, diarrhea, drowsiness, fatigue, headache, and at high concentrations, convulsions, and coma. No information is available on the reproductive, developmental, or carcinogenic effect of dichlorvos on humans according to the Environmental Protection Agency (EPA)'s Integrated Risk Information System (IRIS) 1999. A study by the National Toxicology Programme (NTP) reported an increased incidence of tumors of the pancreas, mammary glands and forestomach in animals. In 1995, EPA proposed cancellation of dichlorvos for all home use, and for many commercial and industrial uses due to its effect on humans and the animals.

3.1.10 Pesticide residue levels of cow 10 samples

Table 10 shows Cow 10 samples and the mean ± S.D values (mg/Kg) of pesticides residue levels which indicate no traces of organochlorine pesticides presence while the organophosphates pesticide residues are below the detection limit of (< 0.001 mg/Kg) in the entire cow samples determined. This implies that the values obtained are below the Maximum Residue Limit (MRL) established by the United States Food and Drugs Administration (USFDA). The absence of these pesticides could

be attributed to the following, the environment where pesticides are not use; no leaching of pesticides through soil to groundwater that may also contaminate drinking water sources of the animals, instrumental error which has to do with un-calibrated apparatus and faulty equipment, method error or procedural error that has to do with undetected impurities in reagents, interfering substances in a sample, non-stoichiometric nature of the weighing form of a precipitate encountered in analysis.

Another attribute to none detectability of the pesticide residues could be due to, personal error or operative error which arises mainly from operators showing some personal prejudices and preferences in the analysis which might lead to an error. An example is the habitual filling of the calibrated volumetric glassware above the indicated mark; operators with blurred vision for color changes are prone to introduce errors in the visual titration. The variability in replicate analysis, irregular and unpredictable forms of observation affect the accuracy that might be achieved from this study. Indeterminate errors result in variability in the replicate analysis, irregular and unpredictable. Another factor may be attributed to none detectability of this study might be a gross error which has to do with the carelessness in analytical procedure or improper recording of analytical data.

Table 10: Concentration (mg/Kg) of organophosphorus pesticide residues in cow 10 samples

Pesticide type	Beef	Intestine	Kidney	Liver
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001
Chlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorvos	< 0.001	< 0.001	< 0.001	< 0.001
Dichlopyrifos	< 0.001	< 0.001	< 0.001	< 0.001
Diazinon	< 0.001	< 0.001	< 0.001	< 0.001
Dimethoate	< 0.001	< 0.001	< 0.001	< 0.001
Primifos-methyl	< 0.001	< 0.001	< 0.001	< 0.001
Malathion	< 0.001	< 0.001	< 0.001	< 0.001

GC/MS Acqmethod pesticide
Detection Limit 0.001
No trace of Organochlorin pesticides was detected.

Other attributes to none detectability of the pesticide residues could be due to, personal error or operative error which arises mainly from operators showing some personal prejudices and preferences in the analysis which might lead to an error. The variability in replicate analysis, irregular and unpredictable forms of observation affect the accuracy that might be achieved from this study. The last factor that may be attributed to below detection limit of this study might be a gross error which has to do with the carelessness in the analytical procedure, improper recording of analytical data and results and errors in calculations.

4. Conclusion

The findings of this study show the none detectability of organochlorine pesticide residues in all the samples analyzed whereas, organophosphorus pesticides - Chlorpyrifos and Dichlorvos - concentration are relatively high with chlorpyrifos and low with dichlorvos in the intestine, kidney and liver analyzed respectively. Anthracene, Dichlorpyrifos, Diazinon, Dimethoate, Primifos-methyl, and Malathion are below detection limit or the threshold of MRL. The differences may be attributed to environmental factors or where farmers use these pesticides. Through water and feeds, the animal may have access to the fodder and thus ingested the pesticides. The concentrations of pesticide residue levels of chlorpyrifos in the internal organs are generally higher than the available MRL in the literature. The concentration of Dichlorvos residues is below the detection limit in the animals as established by the United States Food and Drug Administration (USFDA). The concentration of Anthracene, Dichlorpyrifos, Diazinon. Dimethoate, Primifos-methyl, and Malathion in all the samples analyzed were below detection limit while, and this study further revealed that no trace of organochlorine pesticides was detected.

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