



EVALUATION OF ORGANOPHOSPHATE AND ORGANOCHLORINE PESTICIDES IN FIBROUS FEEDSTUFFS IN KIRFI LOCAL GOVERNMENT AREA, BAUCHI STATE

***Muhammad, B., Mai, H. M., Sanusi, M. and Jama'a, N. A.**

Department of Animal Production, Faculty of Agriculture and Agricultural Technology,
Abubakar Tafawa Balewa University, Bauchi

***Corresponding Author's Email:** balamuhdcheiedi@gmail.com, **GSM:** 07035939697

ABSTRACT

The study was conducted to evaluate the chemical pesticide residual concentrations on six crop residues in Kirfi LGA of Bauchi State. The chemicals studied were Organochlorine and Organophosphate while the crop residues were groundnut haulms, cowpea hay, cowpea husk, sorghum chaff, millet chaff and rice straw. Samples were collected from six farming communities of Badara, Wanka, Kafin Iya, Beni Kwagal and Tubule. The samples were prepared and subjected to laboratory analysis to determine the residual concentrations of the pesticides. Data generated were subjected to analysis of variance and means were separated using Duncan's Multiple Range Test (DMRT). Results obtained revealed that location has no influence on the mean concentrations of the two organic compounds (0.42 - 0.57mg/kg). Similarly, no significant difference was found on the overall concentration of the pesticides in the six locations used. However, a significant ($P < 0.001$) difference was found among the 2 pesticides in the six locations with the higher value of 0.63mg/kg for organophosphate and 0.37mg/kg for organochlorine. Both the overall and mean concentrations of the 2 pesticides were significantly ($P < 0.001$) affected within the six crop residues in the six locations with cowpea hay having the highest values (1.05mg/kg) followed by cowpea husk (0.65mg/kg) while the lowest values were obtained on rice straw. The study showed that location has no influence on the residual concentrations and among the six crop residues studied. Cowpea hay and husk contained higher concentrations of the 2 organic compounds. Based on the result of this study, farmers should be informed on the negative effects of these chemical pesticides on humans as well as farm animals' health.

Keywords: Crop, Residues, Concentration, Organophosphate, Organochlorine

INTRODUCTION

The increasing demands for food and vegetables have led to an increased use of pesticides. Pesticides are chemical substances or mixture of chemicals meant for preventing, repelling, killing/destroying, or controlling any pest like insects or other organisms (Pang *et al*, 2016). They are synthetic molecules aimed at being toxic towards fungi, plants, or animals that are detrimental to cultures (Weber *et al*, 2008). Fungicides, herbicides and insecticides have been developed in order to control as specifically as possible these pests in order to protect crops. Nevertheless, these pesticides can be toxic to human and wild fauna (Mwathi and Kimani, 2003). The continue spray of pesticides during various stages of crop growth had provide a potential source of chemicals for food producing animals (UNEP, 2001). Most often farmers use different pesticides to control pest infestations and diseases on their farms without considering the consequences on the health and well been of the consumers. Pesticides used in crops for pest control leave residues in the feed and fodder consumed by animals (Surendranath *et al.*, 2002). Using those chemical sprays raise the concerns that insecticides may be left on crop residues such as cowpea haulms, cowpea husk and groundnut haulms that are often used in feeding ruminant animals which could negatively affect the health of these animals and their consumers (Noble, 2017). They accumulate in the animals either by direct contact with pesticide or by indirect contact with environment (Mannivannan, 2001). Ramesh and Vijayalaxhmi (2002) stated that the source of contamination of feed and fodder may be by direct spraying or by drift from other crops, contamination of soil and water used for fodder production. WHO (2008) described pesticide poisoning as any pesticide-related injury or health effect including systemic and non-systemic effect, resulting from suspected or confirmed exposure to a pesticide.



On the other hand, farm left overs (crop residues) are the main feed stuff for the farm animal especially ruminant species (Amata, 2014). Those unconventional feedstuff are usually cheap and available especially at harvest periods and are used to supplement the costly conventional ones (Aschalew, *at al.*, 2014). The presence of pesticide residues in feed also cause economic losses to the livestock industry and not only affect the health of livestock but also affect the quality of animal products (Prasad and Chabra, 2001). However, when those chemical products are used in accordance with their label directions, any residues present on the grains, crops or pasture will be at a safe level once the withholding period has expired (Dafwa, 2017). Therefore, this necessitate the need to evaluate the residual concentrations of those pesticides on the farm left overs (crop residues) used in feeding livestock.

METHODOLOGY

Study Area

Six farming communities of Badara, Beni, Kafin Iya, Kwagal, Tubule and Wanka wards in Kirfi Local Government Area of Bauchi State were selected for the study.

Experimental Materials

Samples were collected in four replicates from the six most commonly found crop residues (cowpea haulms, cowpea husk, groundnut haulms, millet chaff, sorghum chaff and rice straw) in the six selected villages.

Treatments and Experimental Design

A total of 144 samples were prepared and taken to laboratory for analysis to determine the residual concentrations of the two organic compounds (organophosphate and organochlorine) in a completely randomized design (CRD).

Data Collection and Analysis

Data obtained were subjected to analysis of variance using MINITAB software version 17. Where significant differences were indicated among treatment means, Duncan Multiple Range Test was used to separate them.

RESULTS

Concentration of Pesticides in the Six Locations

The concentration of organophosphate and organochlorine pesticides in the six communities of Kirfi local government area is presented in Table 1. The result showed that location has no significant influence on the concentrations of organophosphate (0.40 vs 0.55mg/kg) and organochlorine (0.44 vs 0.59mg/kg) suggesting the intensity, concentration and number of applications were similar in the study area.

Table 1: Concentration of Organophosphate and Organochlorine in the Six Location of Kirfi L. G. A.

Locations	Organophosphate	Organochlorine (mg/kg)
Badara	0.47	0.51
Wanka	0.49	0.45
Kafin Iya	0.46	0.52
Beni	0.55	0.59
Kwagal	0.52	0.58
Tubule	0.40	0.44
SEM	0.02	0.04
LOS	NS	NS

SEM = standard error of the means, LOS = levels of significance, NS = not significant

The mean concentration of pesticides in the six locations of Kirfi L. G. A. is presented in Table 2. Similarly, the result obtained on the mean concentrations of the 2 pesticides showed that



location has no significant influence with values ranging between 0.42(mg/kg) in Tabule to 0.57mg/kg in Beni.

Table 2: Mean Concentration of Pesticides in the Six Locations of Kirfi L.G.A.

Locations	Concentration (mg/kg)
Badara	0.49
Wanka	0.47
Kafin Iya	0.49
Beni	0.57
Kwagal	0.55
Tubule	0.42
SEM	0.03
LOS	NS

SEM = standard error of the means, LOS = levels of significance, NS = not significant

The mean concentration of organophosphate and organochlorine in the six locations of Kirfi L. G. A. is presented in Table 3. Highly significant difference ($P < 0.001$) existed among the mean concentrations of the two organic compounds (0.63mg/kg and 0.37mg/kg organochlorine).

Table 3: Mean Concentration of Organophosphate and Organochlorine in the Six Locations

Pesticides	Concentration (mg/kg)
Organophosphate	0.63 ^a
Organochlorine	0.37 ^b
SEM	0.01
LOS	***

ab means bearing different superscripts within the column differs (***) = $P < 0.001$

SEM = Standard Error of the Mean, LOS = Level of Significance, NS = Not Significant

The concentrations of organophosphate and organochlorine in the six feedstuffs is presented in Table 4. The results showed that the concentrations of both the organophosphate and organochlorine on the six crop residues. The high ($P < 0.001$) concentration of both compound organophosphate (1.10mg/kg) and organochlorine (1.00mg/kg) were obtained on cowpea hay closely followed by the values observed on cowpea husk (0.70 vs 0.60 mg/kg) for both pesticides while the lowest values of organophosphate (0.03mg/kg) and organochlorine (0.04mg/kg) were found on rice straw.

Table 4: Concentrations of Organophosphate and Organachlorine in the Six Feedstuffs

Feedstuffs	Organophosphate	Organochlorine
Cowpea hay	1.10 ^a	1.00 ^a
Cowpea husk	0.70 ^b	0.60 ^b
Millet chaff	0.23 ^d	0.25 ^d
Groundnut haulms	0.49 ^c	0.49 ^c
Sorghum chaff	0.36 ^c	0.42 ^c
Rice straw	0.15 ^c	0.19 ^d
SEM	0.03	0.04
LOS	***	***

Abc means bearing different superscripts within the column differs (***) = $P < 0.001$

SEM = Standard Error of the Mean, LOS = Level of Significance, NS = Not Significant

The mean concentration of residual pesticides in the six crop residues is presented on Table 5. The results showed that the concentration of the residual pesticides were highly ($P < 0.001$) significant on



the six crop residues studied. Cowpea hay had the highest value of 1.05mg/kg while rice straw had the lowest value of 0.17mg/kg.

Table 5: Mean Concentration of Residual Pesticides in Six Crop Residues

Feedstuffs	Concentration (mg/kg)
Cowpea hay	1.05 ^a
Cowpea husk	0.65 ^b
Millet chaff	0.24 ^d
Groundnut haulms	0.48 ^c
Sorghum chaff	0.39 ^c
Rice straw	0.17 ^c
SEM	0.02
LOS	***

Abc means bearing different superscripts within the column differs (***) = $P < 0.001$

SEM = Standard Error of the Mean, LOS = Level of Significance, NS = Not Significant

DISCUSSION

Results on Table 1 revealed that location has no influence on the mean and overall concentrations of the pesticides in the six locations. Higher values of 0.55 and 0.59mg/kg for organophosphate and organochlorine respectively were obtained in Beni ward and lowest of 0.40 (organophosphate) and 0.44mg/kg (organochlorine) found in Tabule ward. This observation is similar to the report of Prasad and Chabra (2001). Similarly, no significant difference was found in the mean concentration of the 2 compounds in the six locations, highest value of 0.57mg/kg in Beni and lowest value of 0.42mg/kg in Tabule were recorded. This findings is contrary to the report of Amata (2014) who examined the use of un-conventional feed resources (UCFR) for livestock feeding in the tropics. However, a significant ($P < 0.001$) difference on the mean concentrations was found among the 2 pesticides in the six locations with the higher value of 0.63mg/kg on organophosphate and 0.37mg/kg on organochlorine This agree with the work of Cook and Wilson (2017) that worked on the removal of pesticide residues from dairy cattle. Both the overall and mean concentrations of the 2 pesticides among the six crop residues in the six locations were significantly ($P < 0.001$) affected, with cowpea hay having the highest value of 1.10mg/kg organophosphate and 1.00mg/kg organochlorine. This was followed by cowpea husk with 0.70mg/kg organophosphate and 0.60mg/kg organochlorine, while the lowest values of 0.03m and 0.04mg/kg were obtained in rice straw. These results agreed with the report of Erhunmwunse *et al.* (2012) who studied the implications of pesticide usage in Nigeria. The mean concentrations of the 2 organic compounds were found to be highly significant ($P < 0.001$) among the six crop residues with the highest value of 1.05mg/kg closely followed by cowpea husk with 0.65mg/kg and the lowest value 0.17mg/kg obtained on rice straw. This goes with the report of Nag and Raikwar (2011) who studied the persistent organochlorine pesticide residues in animal feeds *et al.* (2002) who reported similar findings on environmental exposure to residues after aerial spraying.

CONCLUSION AND RECOMMENDATION

In conclusion however, the use of pesticides to control pests and other organisms affecting crops contaminates crop residues due to residual concertation which farm animals feed on. The study also concluded that location has no influence on the residual concentrations of the pesticides. Different concentrations were obtained on the crop residues with cowpea hay and husk containing higher concentrations of the 2 organic compounds. Based on the result of this findings, farmers and village extension agents (VEAs) should be trained on the proper applications of all chemicals used in controlling pests as well as other organism. Farmers should be enlightened on the negative effects of these chemicals on humans, farm animals and environmental health.



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