

Toxicity study of pesticide on storage of cereal, Legume and oil seed with regard to storage structures in Ganye, southern Adamawa State- Nigeria

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Abstract:- Food contamination with pesticide is serious hazard that poses great threat to farmers, grain merchants and stake holders of pesticides. The hazardous nature of pesticides inherent toxicity and ability to cause harm makes it mandatory in this study to ensure the safety of human and livestock consumption. Recent incidence of food toxicity in Lagos and Gombi, Nigeria had led to death and hospitalization of many people. In this background, toxicity of pesticide residue dissipation on cereal, legumes and oilseed made simulated storage condition was investigated. Poor storage structures investigated in the study zone had led to famers, grain merchant and stakeholder of pesticides to used banned, overdosed and wrongly approved pesticides. The effect of using toxic pesticide on seed and grain include: germination ability, seeding viability and dietary risk. Available information raised from long term exposure to pesticide in the study zone had led to 164 contracted disease, 103 poison, 101 hospitalized and 28 untimely deaths.

Keywords:- pesticides, cereal, legume, oil seed , storage structures

I. INTRODUCTION

Food contamination with chemical pesticides is a serious hazard that poses great threat to farmers, grain merchants and public health worldwide. (Orhii, 2010)

Pesticides are chemicals used in preventing pest from damaging crop , grains and seed . It is associated with service effects on the human health.

Cereals, legumes, and oil seed are an important part of the human diet, as there are good and inexpensive sources of protein, carbohydrates, deity fibers and oil.

On account of their high nutritive value, they play an important role in ensuring nutritional security especially for the developing countries (chibbars, 2009)

The hazardous nature of pesticide and their inherent toxicity and ability to cause harm makes it mandatory in this study to ensure the safety of farmers, grain merchant and stakeholder of pesticides.

Toxicity could be acute or chronic, ranging from minor discomfort to cancer, endocrine, disruption, organic disorder and other effect which includes:

- (i) Neurological effects such as numbness or weakness of arms, legs, feet's, or hands memory loss and loss of concentration.
- (ii) Reproductive health effect such as alteration in sexual behavior fertility and pregnancy.

Organic disorder which include disruption of activity of organs in the body, eg kidney, liver blood or digestive tract (Orhii 2010)

Keeping in view that cereals, legumes and oil seed, which are commonly called grains are susceptible to pest infestation. They are likely to be contaminated with chemical pesticides which may affect the nutrient value, taste, palatability and food safety. They had been the major crops produced and widely consumed in the study zone:

The are usually stored in sacks, warehouse, roundhut stockpiled and rhumbu with periodically treatment with pesticide to control pest.

It's usually practice to store grain for long term (3-36 months) at ambient temperature where several pesticides are used as insecticides to reduce losses from storage pest.

Many studies had shown that pesticide residue penetrate the grain and accumulate over time. Some studies on pesticide residue dissipation in grain established that during storage, the residue of pesticide were able to penetrate with the grain and accumulate with time (Desmareheher, 1979, Holland et al, 1994, uygun etal, 2005)

Grain treated with chemical pesticide shows presence of bound residue even after fairly long period of storage, contributing to dietary intake of pesticide (Lalah and Wading, 2002).

With particular regard to storage structures, it is used to control the activities of pest and reduce losses of cereal, legume and oil seed. Storage structures are not developed in Nigeria, by estimate up to 30% of food loss and waste is due to poor storage structures. In this study zone, which is located in Sudan Savanna, storage structure that be found include; mud rhumbu, thatched rhumbu and underground pit. (Oumeko ,1996)

A developed storage structure should perform the following functions:

- i. Keep the product cool and dry.
- ii. Provide protection from pest, rodents, termites and birds.
- iii. Adequate facilities aeration and fumigation, where it is necessary.
- iv. It should be suitable to environmental condition.

However, lack of adequate storage structures had led to over dose or wrongly approved pesticides as shown in table1. Farmers stored grain in sacks, warehouse and bagstack with over dose pesticides for commercial purpose and consumption. Even grain is consumed immediately after treatment with pesticide up to expiring date. The focus of this study is to highlight the concern safety of such stored grain for human and livestock consumption.

II. METHOD AND MATERIALS

The study methodology examines recent data on toxic effect of pesticide on storage with view to rationalize the information on current knowledge of using chemicals for grain storage. Relevant information has been extracted from workshop papers, journals and in depth review of pesticide effect data quantified from field survey in September, 2013. Preliminary survey was carried out to investigate the detrimental effect of pesticide. The survey was conducted in six local government areas of southern Adamawa State. The survey was conducted using the method of Investigating Survey Research Approach (ISRA) (Anazodo et al, 1984) Material use for collection of information is structured questionnaires which sought the following information: detrimental effect of pesticide, methods of grain storage and storage structures. The experimental method of handling pesticide is shown in table1.

Table1: Method of handling recommended and approved pesticides in the study zone.

S/N0	Formulation	Active ingredient	Mode of action	Method of treatment	Application rate
1	Liquid	Pirimiphos methyle 250g/ liters	Contact fumigant ingestion	<u>Store fumigation</u> Apply on walls, roof, ceiling & surface	One liter per 500m ²
				<u>Bagged grain</u> Spray on bags	100-200mls in 5 liters of water
2	Liquid	DDVP	Contact stomach poison respiratory	Bagged treatment Fumigate store	4 mls per 300mls of water 500mls in 10liters of water.
3	Dust	Pirimiphos methyle20g/kg	Contact respiratory	Dust on to grain surface and admixture	200-500gram per 1000kg of grain
4	Tablet	Phosphide aluminum	Respiratory metabolic	Place tablet in double envelope & sealed	2-6 tablets per 1000kg or 1-2 tablet per 50kg/ bag.

Source: Sensitization workshop on safe and responsible use of agrochemicals 8th Febuary 2010, Yola Adamawa State – Nigeria.

2.1 Mammalian toxicity of pesticide

Pesticide can enter the human body through inhalation of aerosols, dust and vapor that contain pesticide. It penetrates through oral exposure by consuming food, water and dermal exposure by direct contact. The effects on human health are more harmful base on the toxicity of chemical and length of exposure.

Farm workers and their families experience the greatest exposure to pesticide. Exposure to pesticide can range from mild skin irritation, birth defect, blood and nerve disorder, endocrine disruption and even coma, loss of

reflex. Canadian center for occupational Heat (2010) report that pesticide cause allergic sensitization, cancer, increase rate of breathing, throat and chest pain, even untimely death.

2.2 Methodology of construction of storage structure to reduce grain loss

Most farm produce begins to undergo deterioration as soon as they were harvested. Storage structure control activities of pest and reduce grain losses. About 30% of food produce recorded lose as result of undeveloped and poor storage structure in Nigeria.

The commonly used structure storage in the study is shown fig4_5. Which include mud rhombus, thatched rhombus and under ground pit.

2.3 Requirement for good storage structure

To perform a good function, it must meet the following requirements:

- I. Keep produce cool and dry.
- II. Protect from pest, rodent, mite and birds.
- III. It should have facility for aeration and fumigation.
- IV. It permits cleaning.
- V. It should have facilities for loading and unloading.

2.4 Construction of Rhumbu

The mud rhumbu is a cylindrical structure made of mud. It is constructed in circular or rectangular shape with single apartment or multipurpose apartment. It is supported on pieces of stone, wood or mud pillar about 50cm high. The height of rhombu is 1.5m, about 1m in diameter and maximum capacity of 500-200kg of grain as shown in figure 4_5.

III. RESULT AND DISCUSSION

The result of this study has a large gab exist between farmers, grain merchant, stake holders of pesticides and consumers of grain. It has an emphasis placed on detrimental effect of pesticide with particular regard to storage structures. The resulting residue in food as consumed are toxic to human and livestock.

Table 2: purchase of pesticide for pest control

S/N	Source	Percentage of farmers involve %
1	Open market	84
2	Registered company	2.5
3	Stake holders	7.5
4	Government stores	6.0
	TOTAL	100%

Sources: field survey (2013)

Table2 Indicates probability of purchasing chemical pesticide from open market in the study zone may led to wrought recommended chemicals, owing to 84% of farmers may not buy recommended and approved pesticide for storage, which may indirectly affect human and livestock. It shows that depending on pesticide is speedily increasing as a result of undeveloped storage structure. Orhili P, (2010) reported that there is a rapid annual increase in sales and dependence on pesticide in developing countries as shown in figure 1.

Table3: Pesticide length of exposure to farm workers and families

S/N	Period (yrs)	Percentage of farmers involved %
1	Above 5 yrs	49
2	6-10 yrs	37
3	Above 10 yrs	14
	Total	100

Source: field survey 2013

Field report in table 3 shows that farm workers and stake holders are mostly exposed to detrimental effect of pesticide from 2000-2012 as shown in figure2.

Table 4: Pesticide toxicity on farm workers and stakeholder

S/N	Investigated effect	No of farmers involved
1	Contacted diseases	164
2	Poison	103
3	Hospitalize	107
4	Death	28

Sources: field survey (2013)

As a result of short term exposure to pesticide in table4 shows the detrimental effect on farm workers. However, pesticide enters through skin and breath. World health organization estimated that at least 3 million cases of acute poisoning and 20,000 deaths occur annually due to exposure to pesticide (Orhili Poul, 2010). It was observe in that field survey that farmers and grain merchant are not using personal protecting device while handling pesticide as shown in figure 3.

Table 5: common types of storage facilities in Ganye.

Common types	Capacity	Construction materials	Contacted percentage of farmers %
Rhumbu	5-10 bags	Mud/ thatch	46
Bags	100kg/bag	-	40
Round hut	-	Mud /thatch	7
Air light Bags	150kg/bag	-	7
		Total	100

Table 5 summarizes data of farmers and common types of storage facilities used in Ganye-Nigeria. It was generally observed that 46% of farmer's population use rhumbu and 40% use bags. Most of the farmers used chemicals pesticide and 40% of farmers use herb to repel pest with odor.

Grain storage practices of famers in ganye

The short term storage of grain in rhumbu and bags at ambient temperature is 6-24 months. Farmer's practices short term storage is 72%, estimated percentage of farmers storing threshed sorghum is 22% while 28% farmers stored un threshed.

Long term storage of grain in Nigeria (3-36 months) using advance technology like hermetic storage structure and silo that stay for (3-36 months) (Agbola, 2000) Maize storage for short term, 2-24months is kept in bags or sack. Generally, insect pest are the main problems in storage of grain (Naz et al, 2003).

IV. CONCLUSION

The result of this study shows food poisoning arising from consumption of grain and meals produced from overdose or wrong application of approved pesticides. It has led to serious concern due to health hazard and environmental implication. This situation must be addressed in order to defer it from becoming a public menace.

Farmers, grain merchant and the general public should desist from using banned toxic pesticides. Stakeholders, importers or marketers should desist from using or re-labeling expired chemicals for grain storage.

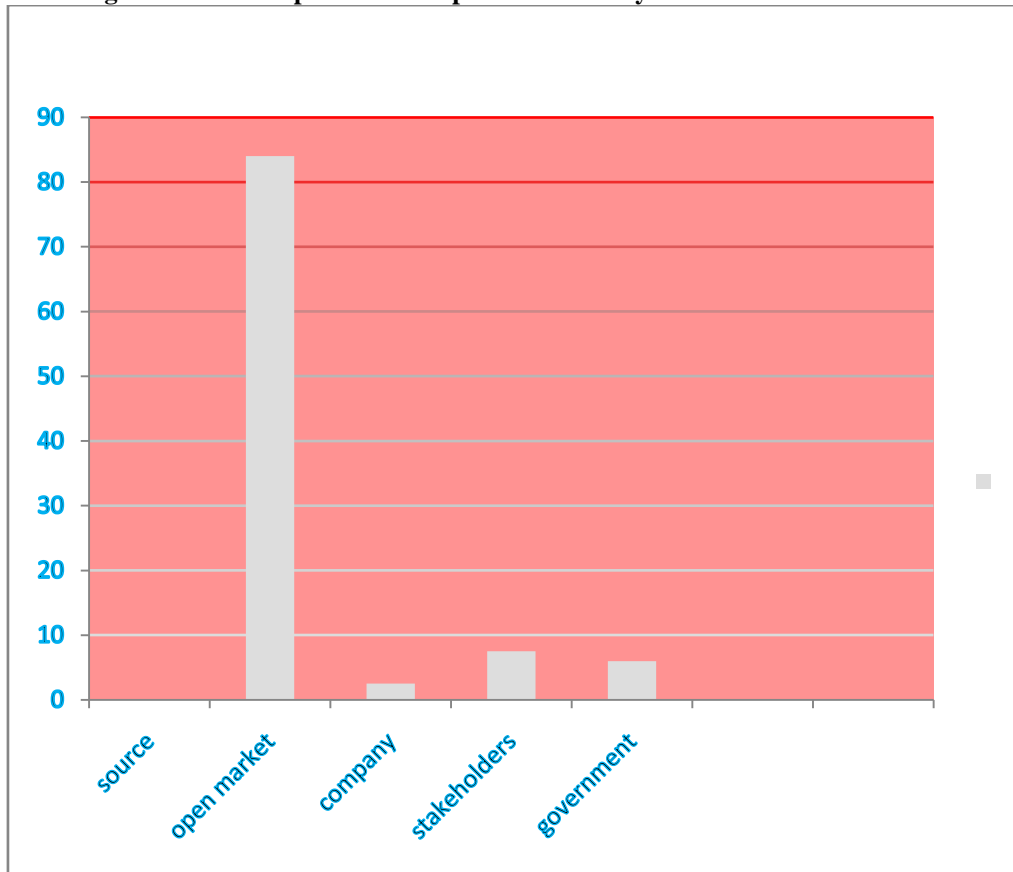
With regard to storage structures government should develop and improve technology to store grain for 1-2yrs without pesticide contermination. development of portables storage structure to some farmers.

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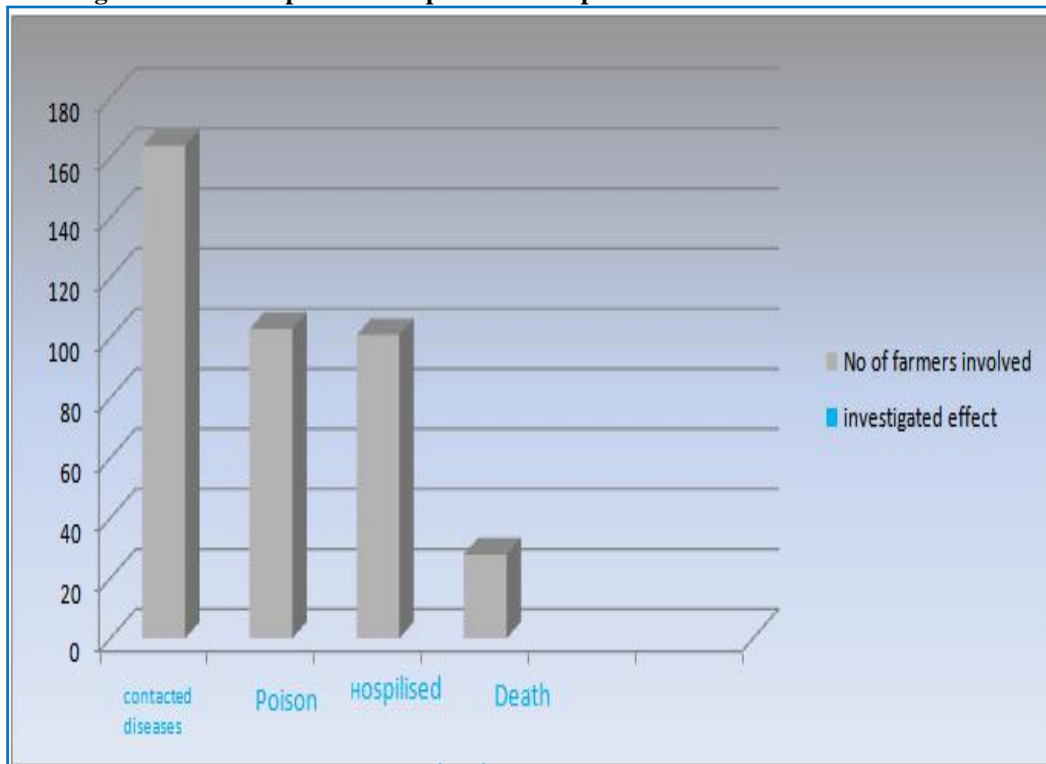
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Fig 1: Sales and dependences on pesticide in Ganye southern Adamawa state



Source: Field survey 2013

Figure 3: Effect of pesticide on pest control operators in southern Adamawa state



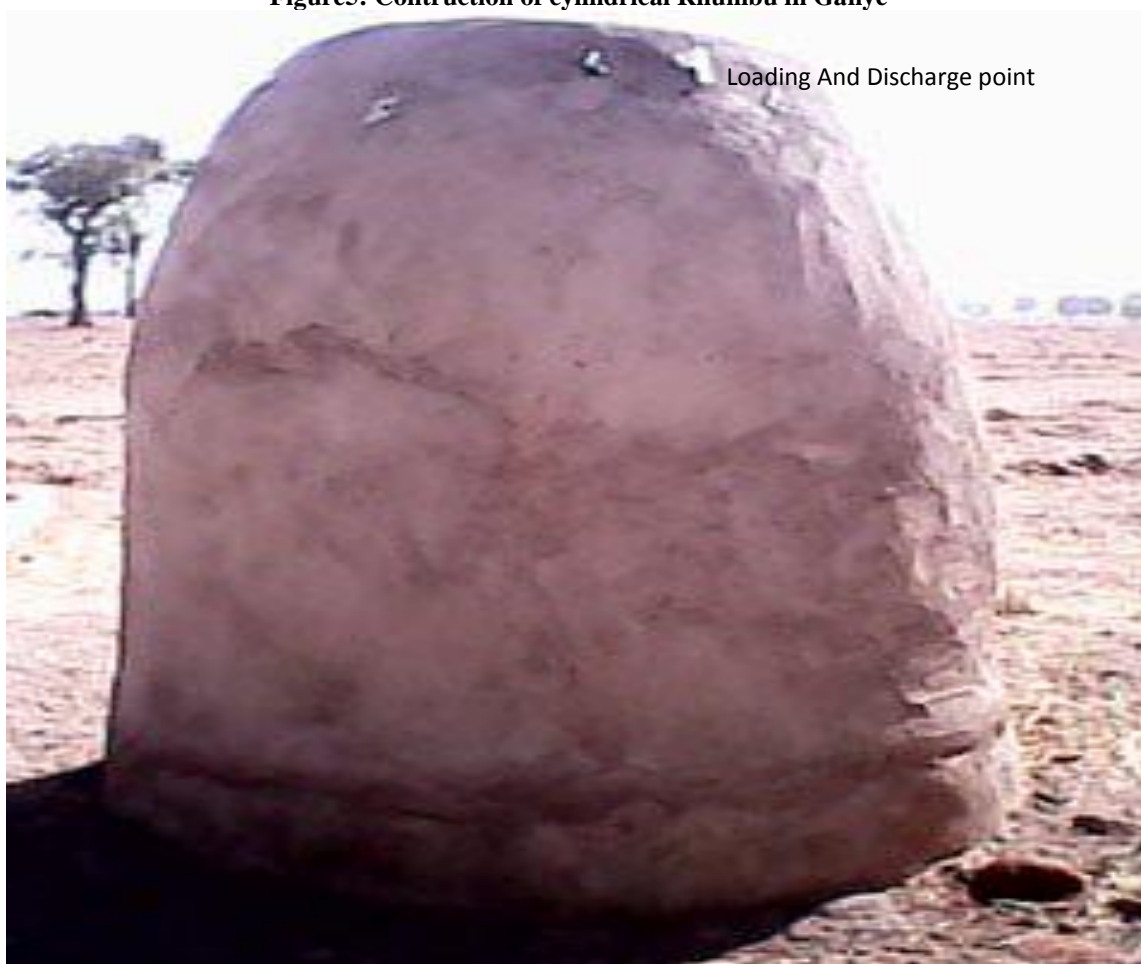
Source: Field survey 2013

Figure4: Construction of rectangular Rhumbum in Ganye



Source: Field survey 2013

Figure5: Construction of cylindrical Rhumbu in Ganye



Source: Field survey 2013