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TOXICOLOGICAL EFFECTS OF TWO INSECTICIDES COMMONLY USED NIGERIA

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ABSTRACT

Insecticides are a class of pesticides designed to control insects. Insecticides like all other pesticides are poisonous or toxic in nature. Sometimes they have been known to go beyond their role by harming other organism called non-target organisms. One way of ensuring that an insecticide is formulated for safety of other organisms is to estimate a safe lethal dose commonly known as LD_{50} (Lethal Dose 50). This is the dose of the pesticide which is designed to control 50% of the pest population for which it is made for. A research was carried out to estimate the LD50 of two commonly used insecticides (RAID and GO-90) in Delta State, Nigeria to determine their LD50 and safety threshold. The results showed that the LD50 of RAID was 1.8ppm and that of GO-90 was 2.25ppm. This indicated that RAID is safer to use than GO-90. This has implication that while we may not be threatened by chemical weapon deployed by terrorists we should avoid undue and misguided exposure to toxic materials such as insecticides to ensure our security and that of our environment.

KEYWORDS: Toxicological Effects of Two Insecticides Commonly Used Nigeria

INTRODUCTION

LD_{50} estimation is an exercise associated with the science of toxicology. The Science of toxicology is based on the principle that there is a relationship between a toxic reaction (the response) and the amount of poison received (the dose) by an organism. An important assumption in this relationship is that there is almost always a dose below which no response occurs or can be measured. A second assumption is that once a maximum response is reached any further increases in the dose will not result in any increased effect. One particular instance in which this dose-response relationship does not hold true is in regard to true allergic reactions. Allergic reactions are special kinds of changes in the immune system; they are not really toxic responses. The difference between allergies and toxic reactions is that a toxic effect is directly the result of the toxic chemical acting on cells. Allergic responses are the result of a chemical stimulating the body to release natural chemicals which are in turn directly responsible for the effects seen. Thus, in an allergic reaction, the chemical acts merely as a trigger, not as the bullet. For all other types of toxicity, knowing the dose-response relationship is a necessary part of understanding the cause and effect relationship between chemical exposure and illness. (Ighere and Adjekukor, 2010)

Insecticides are a group of pesticides. Pesticides are toxic substances. They are important materials in agriculture as well as human dwellings. Various human activities encourage environment conducive to major pest outbreaks. This usually calls for pest control measures; of which chemical approach is easily adopted. Incidentally, the usage of pesticides has its environmental implications which include killing of non-target organisms, producing chronic and acute diseases in man and resistance development by pests. (Fishel, 2005)

One of the ways to ensure the safety of pesticides is to ascertain their $LD_{50.}$ Every pesticide has it acute toxicity. The toxicity of a pesticide is its capacity or ability to cause injury or illness. Acute toxicity of a pesticide refers to the

chemical's ability to cause injury to a person or animal from a single exposure, generally of short duration. Acute toxicity is determined by examining the dermal toxicity, inhalation toxicity, and oral toxicity of test animals. In addition, eye and skin irritation are also examined. Acute toxicity is measured as the amount or concentration of a toxicant— the a.i.— required to kill 50 percent of the animals in a test population. This measure is usually expressed as LD50 (lethal dose 50) or LC50 (lethal concentration 50).Additionally, the LD50 and LC50 values are based on a single dosage and are recorded in milligrams of pesticide per kilogram of body weight (mg/kg) of the test animal or in parts per million (ppm). LD50 and LC50 values are useful in comparing the toxicities of different active ingredients and different formulations containing the same active ingredient *The lower the* LD50 *or* LC50 *of a pesticide product the greater its toxicity to humans and animals.* Pesticides with a high LD50 are the least toxic to humans if used according to the directions on the product label. The chronic toxicity of a pesticide is determined by subjecting test animals to long-term exposure to the active ingredient. This paper is designed to assess the $\mathbf{LD_{50}}$ of two different insecticides commonly used in Delta State, Nigeria with a view to ascertaining their toxicities and their safety to the public that uses them.

MATERIALS AND METHODS

This research work was conducted in Delta State Polytechnic, Otefe-Oghara. The materials used in carrying out the work include the following. Six Conical flasks, Two brands of insecticide namely Raid and GO.90, two deep transparent plastic buckets and a large bale of cotton wool.

Collection of Specimen and Experimental Procedures

Step 1: About one hundred adult mosquitoes were collected as they emerge from their breeding water which was stored in a large conical flask. The collecting conical flask was inverted over the breeder flask. As the adult mosquitoes emerge, they naturally flew upwards into the inverted flask which was there removed and stuffed with dry cotton wool. Two smaller conical flasks were used to collect the emerging mosquitoes; each having about fifty adult mosquitoes.

Step 2: The large plastic buckets were prepared to receive the batches of the adult mosquitoes. The lid if each of them was perforated with nails to allow for ventilation. The holes were made small so that the mosquitoes cannot fly or squeeze through. The buckets were labeled A and B.

Step 3: The mosquitoes were released into the plastic buckets. To do this each of the collecting conical flask was placed inside each of the buckets, and the cotton ball was removed. The lid of each of the buckets was quickly placed to prevent any of the mosquitoes from escaping.

Step 4: The mosquitoes were exposed to the different doses of the insecticides. To do this, two small balls of cotton wool were made. One of them was soaked with a puff (10ppm) of Raid insecticide and then dropped into bucket A. The other one was soaked with just a drop of GO-90 insecticide (10ppm). The experimental set up was observed for five minutes before another cotton wool rolls soaked with two puffs/drops of the insecticides were dropped into the containers. The doses of the insecticides were increased by three and four (30ppm and 40ppm respectively) after ten and fifteen minutes respectively. The mortality rate of the mosquitoes at every stage was recorded for statistical analysis.

RESULTS

The results of the project work showed that the insects were affected by different doses of the Raid insecticides and GO-90 in different ways. The small doses affected the insects minimally and vice versa. Overall, the mosquitoes were

more affected by the Raid at a lower dose than the GO-90. The details of the result are shown in the tables 1 and 2 below.

Table 1: The Effect of Different Doses of Raid and GO-90 Insecticide on Adult Mosquitoes in a Lab Setting

Insecticides	Maximum Dose (Ppm)	Container	Initial Pop	Final Living Pop in Time Frame of Minutes					Mortality
				2	4	5	10	15	
GO-90	40	A	50	47	45	30	24	8	42
Raid	40	B	50	40	32	24	15	15	35

Then determined by lines drawn against XY axes the results showed that the LD50 (1.8ppm) of the insecticide against the two insects were the same. This is shown in Figures 4.1 and 4.2.

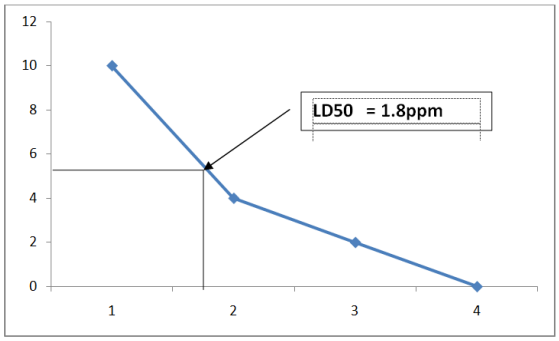

Figure 1: Determination of the LD50 of Raid Insecticide on Mosquitoes in a Lab Setting

Lines drawn against XY axes the results showed that the LD50 (2.5ppm) of the insecticide against the insect was obtained. This is shown in Figures 4.1 below.

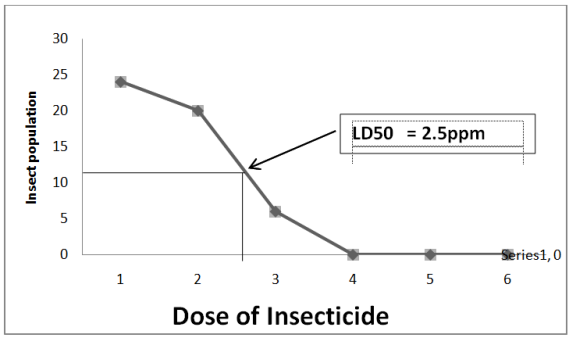

Figure 4.1: Determination of the LD50 of GO-90 Insecticide on Cockroaches in a Lab Setting

4.2 DISCUSSIONS

The research work has shown that the insecticide was toxic to both insects. It exhibited insecticidal effects on the insects. It produced 100% effect on the insects.

Raid is a standardized insecticide. This fact is made clear in the result as it produced the same LD_{50} for both insects. It is said that Pesticides with a high LD_{50} are the least toxic to humans if used according to the directions on the product label. The chronic toxicity of a pesticide is determined by subjecting test animals to long-term exposure to the active ingredient. Any harmful effects that occur from small doses repeated over a period of time are termed chronic effects. Some of the suspected chronic effects from exposure to certain pesticides include birth defects, production

The work has also shown that the toxicity of an insecticide depends on the dose applied as well as the duration of

exposure. This makes it necessary to apply the insecticide sufficiently in homes and also give ample time for exposure if maximum benefits are to be achieved. (Floore, 2002)

CONCLUSIONS

Although, the use of pesticide has many benefits, it is good to also know that there are some negative sides to it. It is therefore necessary to enact and enforce strict laws about the safe use of these toxic materials. This will go a long way to protect wildlife and other non target organisms. In many instances, following the directions on the pesticide label will prevent injury to non target organisms. It has been seen that in areas where this is not done the benefits from pesticides usage has been seen to be outweighed by the risks and harm associated with them. This research work has shown that GO-90 which is a locally made and formulated insecticide is having a higher LD50 than the standardized insecticide such as RAID. This has implication not to over use the products and also to leave the house when it is freshly applied. It also has the implication for us to be selective in the choice and use of insecticides for safety purposes. In this age of security quest, it is necessary for us to pursue security in every sphere of our lives. Undue and misguided exposure to toxic materials is against our security and that of our environment. While we may not be threatened by chemical weapon deployed by terrorists,

5.2 Recommendations

The results of this work have many implications which necessitate some recommendations such as state below.

- GO-90 Insecticide should be used with caution.
- It should be kept out of the reach of children.
- People should buy standardized insecticides. That an insecticide can kill insects does not guarantee its safe uses.
- Regulatory agency such as NAFDAC should monitor what goes into the market in the name of insecticide.
- Insecticides should not be sprayed in poultry, pig pens and other animal facilities when they are in the enclosure.

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