TOBACCO LEAVES AS INSECTICIDE

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by

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APPROVAL SHEET

This research paper hereto entitle:

"Tobacco Leaves As Insecticides"

prepared and submitted by Losañes, Ella Mae T. and Zulla, Mary Janilee C., in partial fulfillment of the requirements in Science Research 2, has been examined and recommended for acceptance and approval.

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ABSTRACT

This study was conducted to determine the pesticidal effect of increasing concentrations of tobacco leaf extracts on three different kinds of garden pests: black beetle, mongo fly, and orange beetle.The extracts tested were 50g of tobacco leaves in 300ml of water, 75 g in 300 ml and 100g in 300ml.

To prepare different concentrations of extracts, shredded tobacco leaves were digested in 300ml of water per treatment and were distilled until a 100 ml of the product was collected from each. The three different concentrations of insecticide were then tested on three garden insects to determine its insecticidal effect. Ten insects with three replicates were used for each treatment.

The result of the study showed that the three concentrations of insecticide were effective in killing the mongo fly and orange beetle while the black beetle was eradicated effectively in this study using the 75g and 100g concentrations and was otherwise when used with the 50g concentration. One Way Analysis of Variance (α 0.5) showed that there is no significant difference in the insecticidal effect of increasing concentrations of tobacco leaf extracts on mongo fly, orange beetle and black beetle.

ACKNOWLEDGEMENT

The researchers would like to express their deepest gratitude to the following people who helped them in making it this far:

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To their parents, for the support, thank you for the constant guidance.

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CHAPTER I

INTRODUCTION

A. Background of the Study

The Philippines is not a very developed country. There has always been a crisis in every aspect. The increase in the prices of all commodities is suffered not only by the poor but has as of lately been affecting also the rich. If the spending pattern of the rich has been slightly affected by the economic crisis, then among the average income families, the crisis has caused life to become a never-ending struggle for survival.

To ease this tight situation, alternatives for commodities are being sought. Consumers are selecting products with the lower price. Some also learn to recycle instead of purchasing new things and also to help in reducing the amount of wastes generated. We produce tremendous amount of wastes everyday and the reduction of these wastes is needed.

The Philippines, aside from fishing, is agricultural in the sense of livelihood. It is rich in land resources and the people's living depends mostly in these lands. But even though we are rich in these kinds of resources, a lot of lands are still left bare and unattended.

A lot of problems have resulted to this. Aside from incorrect farming procedures that leave the land infertile, pests have always bothered the farmers. Although there is a wide range of insecticides available in the market, the farmers

do not always resort to this. It is because of their unattainable prices. An insecticide, which is cheap and ensures the growth of the plants and other organisms, will be very helpful to our farmers.

B. Statement of the Problem

Will different concentrations of tobacco leaf extracts possess insecticidal properties against black beetle, mongo fly, and orange beetle?

C. Objectives of the Study

This paper was conducted with the following objective:

1.) To determine the insecticidal effect of increasing concentrations of tobacco leaf extracts on three kinds of garden pests namely: black beetle, mongo fly and orange beetle.

D. Scope and Limitation of the Study

The study was conducted for approximately two quarters of the school year, from June to October 2003. The insecticidal effect was applied only on three kinds of garden pests: black beetles, mongo flies locally known as *tiyangaw*, and the orange beetle locally known as *baka-baka*. It is also concerned on its effect on the plant in terms of

discoloration (yellowing of the leaves), drying and eventual death only. The product was tested only on its insecticidal and physical properties.

E. Significance of the Study

We produce a tremendous amount of waste everyday. They've become so many as the time progresses that there is now also a problem of disposing these wastes. These wastes have become so many that it produces a lot of problems to the society.

This study aims to help in reducing the wastes that our population generates by using some of these wastes into insecticides that will help in the agricultural aspect of the country. Some of the tobacco needed in the production of the insecticide can be recovered from used cigarettes or used tobacco cigars. The production of wastes cannot be stopped. Instead we should try to lessen it by converting it into other usable things.

Insecticides nowadays are not cheap. Some farmers even decide not to use insecticides because of their unattainable prices. Commercial Insecticides use a lot of other chemicals that may be toxic to the plants and other organisms. On the other hand, Insecticides from tobacco leaves are much cheaper and do not contain chemicals that are as toxic as the ones found in commercial insecticides. This study aims to produce a cheap insecticide that is effective in controlling the pests and also ensures the growth of the plants and other organisms.

F. Definition of Terms

Contact insecticide- This is a group of insecticides classified according to their action to control insect pests. As the name implies, these insecticides exhibit toxicity when insects come in contact with them since they are capable of penetrating into the insect cuticle.

Digestion- It refers to the process of extracting the soluble constituents of a substance by stewing or by the action of certain chemical compounds with or without the presence of heat.

Distillation- It is the process of extracting the spirit or essence of any substance by converting it into vapor, then condensing the vapor back to liquid form.

Insecticide- It refers to any substance or a mixture of substances intended to be used for preventing, destroying and repealing insect pests. Insecticides are classified into two based into their mode of action namely; contact insecticide and systematic insecticide.

Nicotine- A poisonous substance extracted from tobacco leaves.

Steam distillation- It is a simple distillation wherein the vaporization of the charge (cigarette butts and water) is achieved by blowing live steam directly through it. This process has a special value where it is desired to evaporate substance at a temperature lower than the normal boiling point because of heat sensitivity. The physical and chemical properties of nicotine are easily affected by high temperature.

CHAPTER II

REVIEW OF RELATED LITERATURE

Tobacco is a herbaceous plant widely cultivated for its leaves, which are rolled into cigars, shredded for use in cigarettes and pipes, processed for chewing or ground into snuff. Tobacco is also the source of commercial nicotine, a component of many insecticides. Tobacco, *Nicotiana tabacum* is classified in the family *Solanaceae*. (Collier's Encyclopedia,Volume 22)

Nicotine is a liquid alkaloid and an important component of tobacco. When tobacco is smoked, most of the nicotine is either destroyed by heat or lost by vaporization. This is fortunate, ince it is powerful and fast-acting poison. Nicotine is one of the alkaloids most intensively studied by scientists. Its depressant action on vital nerve centers is effectively exploited in the destruction of insect pests: nicotine sulphate is widely used in insecticidal sprays and dusts. In former tmes, tobacco was used extensively in medical practice for its nicotine content (as a strong sedative).

In very small doses nicotine acts as a stimulant but in larger doses it causes depression, nausea, and vomiting. In still larger doses it is a violent poison. Nicotine salts are used as insecticides.

Oxidation of nicotine by concentrated nitric acid produces pyridine-3-carboxylic acid- a compound called nicotinic acid. Nicotinic acid is a vitamin, commonly referred to as NAD^+ (oxidized form). (Miller, Levine)

In plants, alkaloids occur most commonly in the form of their salts: in solution in the cell sap of younger tissues, as in living parenchyma cells, and more commonly stored in the solid state in older tissues, such as bark cells. Although they often occur in greater concentration in one organ than another, they are distributed in all parts of the alkaloid-bearing plant in greater or lesser concentration. Alkaloids probably are formed in the green tissues, such as the leaf, and are then carried in the sap to various parts of the organism, such as bark and seeds, for temporary or permanent storage. In other plants, such as tobacco, alkaloids are synthesized in the roots alone and from there are transported to other parts of the plant. Alkaloid-containing plants generally contain more than a single alkaloid and frequently have 20 to 30 or more alkaloids present.

To extract alkaloids, the granulated dried plant material is usually washed with water containing a small amount of mineral acid. The acid insures the formation of water-soluble salts of the alkaloid. The extract is then made alkaline by adding ammonia water, which precipitates the free alkaloid, and this may then be separated by filtration or more commonly by dissolution in an immiscible organic solvent, such as chloroform or ether. Separation of this solvent and its evaporation leaves behind the alkaloid base, which may then be purified by recrystallization from an appropriate solvent. Frequently the extracts are complex mixtures, and the tedious purification techniques, such as fractional crystallization, selective precipitation, counter-current extraction, or chromatography, must be used in their separation. In the case of volatile liquid alkaloids, such as nicotine, separation is accomplished by steam distillation. (Collier's Encyclopedia Volume 1)

Nicotine is commonly marketed in a mixture containing 40 percent nicotine and infusion of tobacco is employed as contact insecticide against soft-bodied insects. As contact insecticide, nicotine is either extracted from tobacco stem with water or as a commercial preparation. It has the special advantage that it may be used on any foliage without damage and may be added to other sprays without affecting its insecticidal properties. (National Encyclopedia Volume 5)

In the seventeenth century nicotine sulfate, extracted from tobacco leaves, came into use as an insecticide. In the mid-1800s two more natural pesticides were introduced. One was pyrethrum, obtained from the heads of chrysanthemum flowers; the other was rotenone, from the root of the derris plant and other tropical forest legumes. These first-generation pesticides were mainly natural substances borrowed from plants that had been at war with insects for eons.

There are many types of insecticides: Chlorinated hydrocarbons, organophosphates, carbamates, microbotanicals, and botanicals. Botanicals are group of broad-and-narrow-spectrum agents produced naturally by plants, or by chemical modifications of such natural substances. Examples of natural botanicals include rotenone, pyrethrum, and camphor. Synthetic botanicals include several pyrethroids (chemically similar to naturally occurring pyrethrum) and rotenoids (variation of rotenone). Botanicals have low a low persistence (days to weeks), are effective at low dose, do not bioaccumulate, are not biologically amplified, and have low to moderate toxicity for humans. (Miller, G.)

CHAPTER III

METHODOLOGY

A. Materials and Equipment

The following were used in the production of the pesticide:

Tobacco leaves

Distilled water

Analytical balance

Distilling apparatus

Gloves

Sprayer

Hot plate

100-ml capacity flask

small plastic basin

cheese cloth

B. Procedure

B.1 Preparation of the Leaf Extracts

Shredded tobacco leaves were gathered for extraction in the preparation of an inexpensive insecticide. The gathered leaves were weighed into 50-gram, 75-gram, and 100-gram samples. These were placed in different containers. To each container, 300 ml of distilled water were added. The materials were

digested for 20 minutes. The resulting different digests were then distilled until 100 ml of distillate from each sample were collected. The different distillates (50-gram, 75-gram, and 100-gram) were then sprayed three different kinds of garden insects.

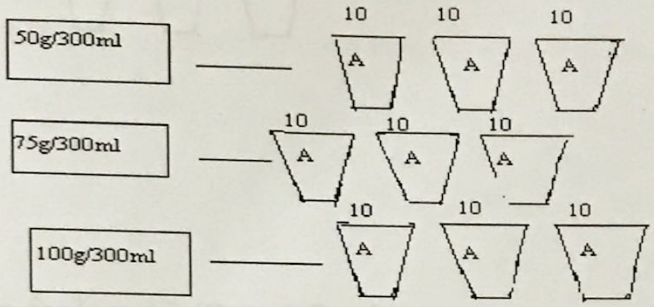

Figure 1. Design for Insect 1 (Black Beetle)

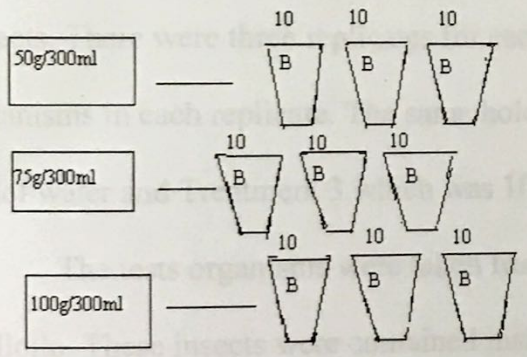

Figure. 2 Design for Insect 2 (Mongo Fly)

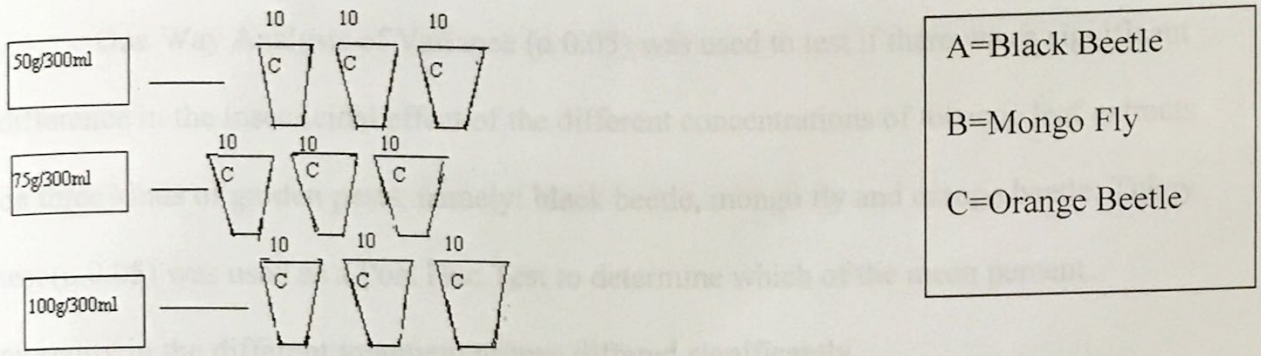

Figure 3. Design for Insect 3 (Orange Beetle)

B.2 Application of Treatment

There were three treatments for this study: Treatment 1 was the 50g of tobacco leaves in 300 ml of water. This was sprayed on three different kinds of garden insects. There were three replicates for each type of organism in each treatment with 10 organisms in each replicate. The same holds for Treatment 2 which was the 75g in 300 ml of water and Treatment 3 which was 100g in 300ml of water.

The tests organisms were taken from a garden in Tubungan, Lambunao province of Iloilo. These insects were contained inside plastic cups with a screen attached to the mouth of the cup for the air to enter and to be able to apply the insecticide while keeping the pests from escaping. The treatments were sprayed on three different kinds of garden insects and the number of dead insects that were killed were counted after 60 minutes after spraying.

B.3 Statistical Test

One Way Analysis of Variance (α 0.05) was used to test if there was a significant difference in the insecticidal effect of the different concentrations of tobacco leaf extracts on three kinds of garden pests, namely: black beetle, mongo fly and orange beetle. Tukey test (α 0.05) was used as a Post Hoc Test to determine which of the mean percent mortality in the different treatment groups differed significantly.

CHAPTER IV

RESULTS AND DISCUSSIONS

This study was conducted to determine the insecticidal effect of increasing concentrations of tobacco leaf extracts on three different kinds of garden pests. The extracts were obtained by distilling 50g, 75g and 100g of tobacco leaves in 300ml of water each. The distillation lasted for an hour and a half in order to have a 100 ml sample for the three different kinds of concentrations. The product of the distillation was a clear liquid for the 50-gram and 100-gram samples. However, the 75-gram sample was light brown in color. The three samples also had very strong smell.

The three concentrations were then sprayed on three different kinds of garden insects with three replicates and with ten organisms for each replicate. The following was the result.

Table.1 Percent Mortality of black beetle in different concentrations of tobacco extracts . Values are mean + sd of 3 replicates (n=3) Means with the same letters are not significantly different.

Concentration	Replicate 1	Replicate 2	Replicate 3	Mean+sd
50g/300ml	30	0	30	20+.0.82a
75g/300ml	100	70	90	86.70+1.24b
100g/300ml	80	70	100	83.30+1.24b

Table.2 Percent Mortality of mongo fly in different concentrations of tobacco extracts . Values are mean + sd of 3 replicates (n=3) Means with the same letters are not significantly different.

Concentration	Replicate 1	Replicate 2	Replicate 3	Mean+sd
50g/300ml	100	100	100	100a
75g/300ml	100	100	100	100a
100g/300ml	100	100	100	100a

Table.3 Percent Mortality of orange beetle in different concentrations of tobacco extracts . Values are mean + sd of 3 replicates (n=3)Means with the same letters are not significantly different.

Concentration	Replicate 1	Replicate 2	Replicate 3	Mean+sd
50g/300ml	100	100	100	100a
75g/300ml	100	100	100	100a
100g/300ml	100	100	100	100a

According to the means, the pesticide had greatest effect on the mongo fly and orange beetle. All these organisms were killed after being sprayed by the three different concentrations of tobacco extracts.

On the other hand, the black beetle was not entirely eradicated by the 50g/ml concentration. According to the means, the 50g concentration had the lowest while both 75g and 100g had higher means. However the 75g concentration mean is 0.34 higher than the 100g concentration mean.

Post Hoc Tests were used to determine if there were any significant difference between the different treatments. The following were the results of the Post Hoc Tests.

Table 4. Post Hoc Tests for Treatment 1

Multiple Comparisons

Dependent Variable: MORT1

	(I) TOBACCO	(J) TOBACCO	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1.00	2.00	-66.6667*	13.053	.005	-106.7158	-26.6176
		3.00	-63.3333*	13.053	.007	-103.3824	-23.2842
	2.00	1.00	66.6667*	13.053	.005	26.6176	106.7158
		3.00	3.3333	13.053	.965	-36.7158	43.3824
	3.00	1.00	63.3333*	13.053	.007	23.2842	103.3824
		2.00	-3.3333	13.053	.965	-43.3824	36.7158

*. The mean difference is significant at the .05 level.

Table 5. Post Hoc Tests for Treatment 2

Multiple Comparisons

Dependent Variable: MORT2

	(I) TOBACCO	(J) TOBACCO	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1.00	2.00	.0000	.000	1.000	.[a]	.
		3.00	.0000	.000	1.000	.[a]	.
	2.00	1.00	.0000	.000	1.000	.[a]	.
		3.00	.0000	.000	1.000	.[a]	.
	3.00	1.00	.0000	.000	1.000	.[a]	.
		2.00	.0000	.000	1.000	.[a]	.

a. Range values cannot be computed.

Table 5. Post Hoc Tests for Treatment 3

Multiple Comparisons

Dependent Variable: MORT2

	(I) TOBACCO	(J) TOBACCO	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1.00	2.00	.0000	.000	1.000	.[a]	.
		3.00	.0000	.000	1.000	.[a]	.
	2.00	1.00	.0000	.000	1.000	.[a]	.
		3.00	.0000	.000	1.000	.[a]	.
	3.00	1.00	.0000	.000	1.000	.[a]	.
		2.00	.0000	.000	1.000	.[a]	.

a. Range values cannot be computed.

Based on the results of the Post Hoc Tests, there was a significant difference between the means of 50g and 75g and between 50g and 100g samples to black beetles. However there was no significant difference between the means of 75g and 100g when sprayed to black beetles. The three concentrations of tobacco leaf extracts did not have significant difference in their insecticidal properties on mongo flies and orange beetles.

The three samples were also sprayed on a garden plant each to determine any effect on the plant. The result showed no negative effect on the plant. The plants didn't die after being sprayed by the different samples and didn't show any discoloration on any part of the plant. The plant didn't show any sign of toxicity after being exposed to the different samples for 24 hours.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Tobacco leaf extracts were obtained by the process of distillation. The distillation produced three samples: 50-gram, 75-gram and 100-gram. The product was tested on both plant and pests. The result showed that the three concentrations of tobacco extracts were effective in eradicating the mongo fly and orange beetle. The black beetle was also eradicated effectively but not entirely by the 75g and 100g and not effectively by the 50g. The statistical tool also showed that there was a significant difference between 50g and 75g and between 50g and 100g when sprayed on black beetles. The three different samples also had no negative effect on the plant.

Although the study produced good results there are still recommendations to improve the study. In this study, a hot plate was used in extracting the nicotine by distillation. It is recommended to use steam distillation instead of other techniques to be prevent the loss of nicotine because nicotine is sensitive to high temperature. The right temperature should also be determined in extracting the nicotine for more desirable effects. In testing the samples, it is recommended to have a wide array of test organisms to really determine the capacity of the products. It is also recommended to test the samples on three different kinds of garden plants to really determine its effect on the plant. Other aspects of the study like the effect of the insecticide on other kinds of organisms can also be studied further for the improvement of this study. Since tobacco leaves is expensive, other parts of the tobacco plant aside from the leaves can also be studied and used to produce improved and cheaper insecticides.

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APPENDIX A

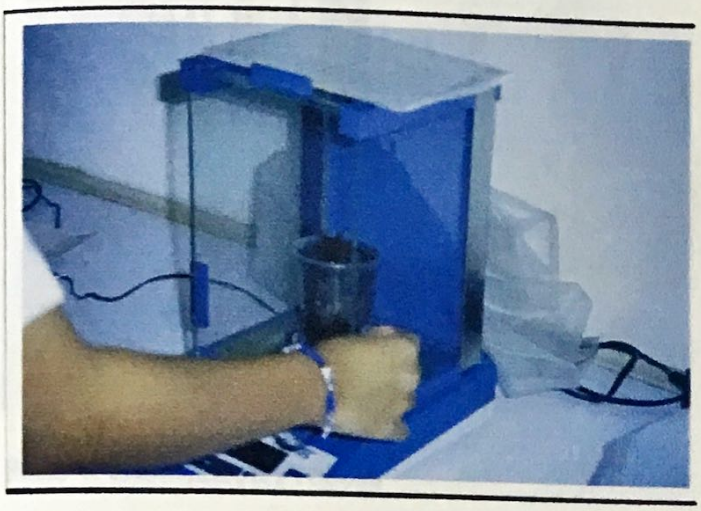

Plate 1. Weighing of the tobacco leaves

Plate 2. Digestion of the tobacco leaves.

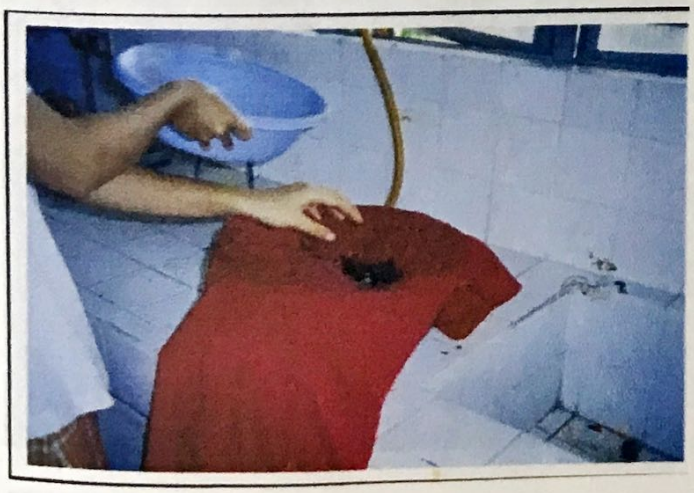

Plate 3. Screening of the tobacco leaves.

Plate 4. Distillation Process

Plate 5. Insecticides produced after the distillation

Plate 6. Treatment 1

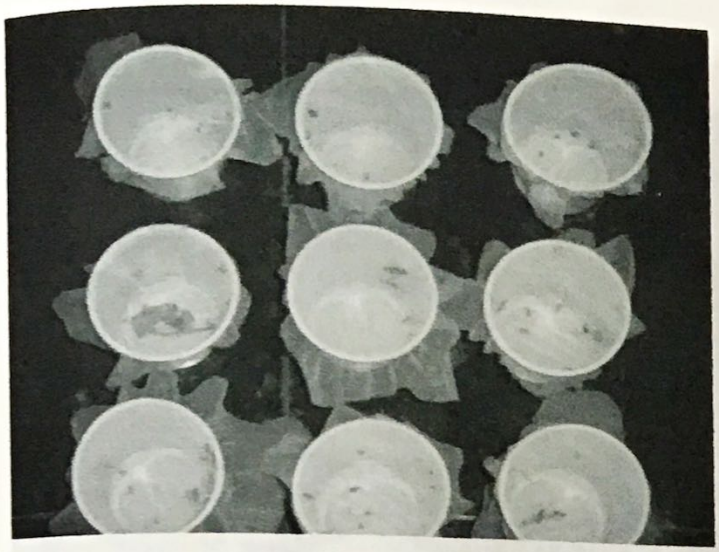

Plate 7. Treatment 2

Plate 8. Treatment 3

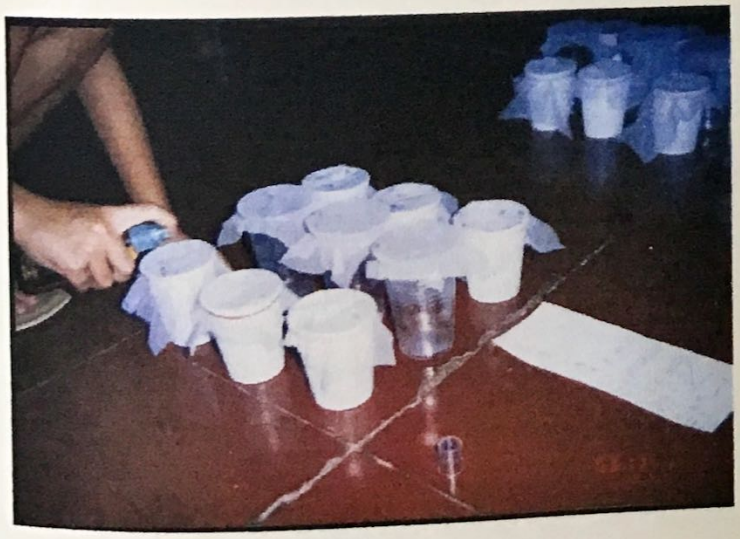

Plate 9. Testing

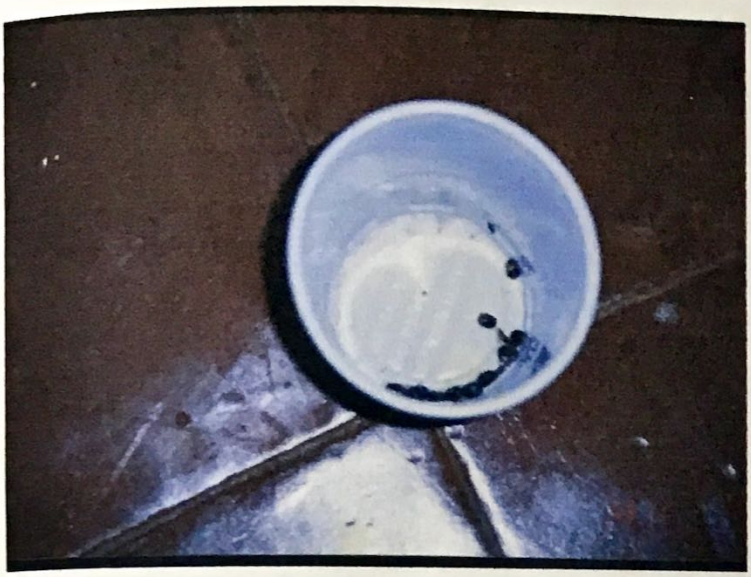

Plate 8. Black Beetle after application of the insecticide