

CASHEW (*Anacardium occidentale*) NUTSHELL ETHANOL EXTRACT IN THE CONTROL OF COCKROACH (*Periplaneta americana*)

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ABSTRACT: *Anacardium occidentale* has been known in tropical countries, a source of staple fruit, especially its edible part, the kernel in the nut. The shell of its nut, are just thrown away. There are studies on its molluscicidal and insecticidal properties, but no study conducted on its potential as the control to the cockroach. This research was undertaken to determine what concentration of the cashew nut shell ethanol extract (CNSEE) will control cockroach. Result of this study is beneficial to rural and urban areas, where cockroaches are abundant. It is most beneficial in places where cashew nutshell is just thrown away, which can be used as a potential source of insecticide from plants. Specifically, this study seeks to find out what best concentration of CNSEE will control cockroach. Experimental research method with four treatments and 80 experimental cockroaches were used. CNSEE was macerated in 95% ethanol. Eighty cockroaches were assigned in four groups/treatments, with 20 cockroaches per treatment. They were exposed to different concentrations as; treatment negative (T-), 0% CNSEE, T1, 25% CNSEE, T2, 50% CNSEE, and T3, 75% CNSEE. Gathered data were analyzed using ANOVA. Findings of the study revealed that highest percentage of mortality after 12 hours observation, was obtained from treatment 3 (75%percent CNSEE). Based on this result Cashew nut shell extract has a significant potential in the control of cockroaches.

Keywords: *Anacardium occidentale*, *Periplaneta americana*

1. INTRODUCTION

Philippines as tropical country is endowed with tropical plants that provide a staple food for its populace. One of the many tropical fruits that had many uses is cashew. Cashew nut is popular in the country as source as nuts which is eaten as fried nuts, sweetened nuts and also used in cake industries and pastries. However, after the removal of the nuts, the shell are just thrown away, since Filipinos believed that there is a toxic component in the oils found in the shell of cashew nuts. The development of botanical pesticide as a possible substitute for chemical pesticide is gaining wide attention [1]. The cashew nut shell liquid (CNSL) is a caustic, vicious, dark liquid and is a natural source of saturated and unsaturated long-chain phenols and constitutes about 25% of the cashew weight and 30% - 35% of the nutshell weight [2]. CNSL whether cold solvent extracted or heat extracted is known to contain anacardic acid, cardol, cardanol and other polymeric materials [3]. This is the pericap fluid of the cashew nut. CNSL is a very important industrial raw material which has got multivarious uses. Besides its industrial use in polymer industry, there is considerable scope for its utilization in the development of drugs, antioxidants and pesticides [4]. Cockroaches are the most common pests found in human dwellings, as well as many other indoor and outdoor urban environments.

Cockroaches and rodents are present in the homes of many urban residents in the United States. Besides causing annoyance and stress, they are sources of allergens [5], and vectors of pathogens [6], that can trigger asthma symptoms sensitized individuals, and they may increase the risk of allergic sensitization [7]. The use of commercial insecticide is common as domestic use. However herbal base insecticide is gaining popularity nowadays, due to minimal harm that it can cause in the environment.

The objective of the study

This study was conducted to determine what concentration of cashew nut shell ethanol extract (CNSEE) can eliminate cockroaches. Result of this study can serve best the people in areas where cockroaches are abundant.

2. EXPERIMENTAL DETILES

A. Materials

Experimental Animals

Eighty cockroaches were used and were assigned in four groups. First group,(T-) 20 cockroaches with 0% CNSEE. The second group (T1) 20 cockroaches, with 25% CNSEE.Third, T2, 20 cockroaches with50% CNSEE and T3, 20 cockroaches with 75% CNSEE. Cockroaches were caged individually in transparent plastic containers with holes as covering. Each treatment/group has 20 samples.

Preparation of Cashew Nut Shell Ethanolic Extract (CNSEE)

Materials used were; Cashew nut shell, 95% ethanol, hammer, chopping board, blender, cheesecloth, Whatman paper no.1, and glass containers for maceration

For Administration of CNSEE/Exposure Technique.

For administration of CNSEE, the following materials were used: Eighty cockroaches, laboratory gown, gloves, masks and surgical cap, holding tray, clean cloth, litmus papers and disposable syringe.

Cages of Experimental animals

This study employed experimental research method, using eighty male cockroaches in the adult stage. Improvised cages with holes were provided.

B. Methods

Preparation of Cashew Nut Shell Ethanolic Extract (CNSEE) and Care of Experimental Animals.

The method was patterned from several studies with modification. Cashew nut shells were sundried for 5 days and crushed by a hammer into small pieces [8,9]. The ratio of cashew nut shells to solvent (95% ethanol) was 1:1.5 w/v. [10]. Then cracked cashew nut shells were soaked in the solvent.

Application of CNSEE/Exposure Technique

The different concentrations of Cashew Nut Shell Ethanolic Extract per treatment were; T1-25%, T2-50% and T3-75%) One half (0.5) ml. extract was taken and applied to the centre of moistened filter paper placed at the bottom of small improvised cage The cage was then turned over during exposure so that the insect will be in contact with the extract

[11]. Each treatment had twenty samples and the cages were kept under observation for 24 hours in the dark environment. The normal, dead and moribund animals were counted from each cage and were recorded every 6 hours observation period. The moribund animals were those color who had not turned totally black like, like the dead but weak

3. RESULTS AND DISCUSSION

Number of Cockroach per Sample, per_Treatment on the Start of the Study

Table 1 shows the number of live cockroaches per sample per treatment. To ensure uniformity and avoid bias in the controlled variables, eighty live male cockroaches were obtained from the same source. The total live cockroaches per treatment was twenty on the result of the study.

Table 1 number of cockroaches per treatment on

Treatment	T-	T1	T2	T3
Number of	20	20	20	20
Total	20	20	20	20
Mean	20	20	20	20

Percentage of Mortality per Treatment Every Six Hours Observation Period

Table 2.a and figure (1) expresses the mortality rate per treatment. Highest mortality rate was observed in treatment 3 with 75% CNSEE (100 % after 12 hours), followed by T2 with 50% CNSEE (100% at 24 hours), treatment 1 with 25% CNSEE (75% at 24 hours), treatment negative with 0%. The result revealed that cockroaches with 75% CNSEE had the highest percentage of mortality Analysis of variance (ANOVA) resulted to a significant difference among treatments with different concentrations of CNSEE. Fisher

Table 2.a. Mortality per treatment every 6 hours observation period

Treatment	T1 -0%	T1 -25%	T2-50%	T3-75%
First 6th	0	50	60	90
Second 6th	0	20	20	10
Third 6th	0	5	10	0
Fourth 6th	0	0	10	0
total	0	75	100	100
Mean	0 ^a	30 ^b	25 ^{cd}	25 ^d

Least significant difference revealed significant difference exists between the control (T-) and treatments with CNSEEE, (T1, T2, and T3) as well as T1 and T2, as indicated by different superscripts in the mean. However, no significant difference, exists between the comparisons of treatment 2 and treatment 3 as indicated in the similar superscripts in treatment means. The result of this study can be supported by the claims of several studies.

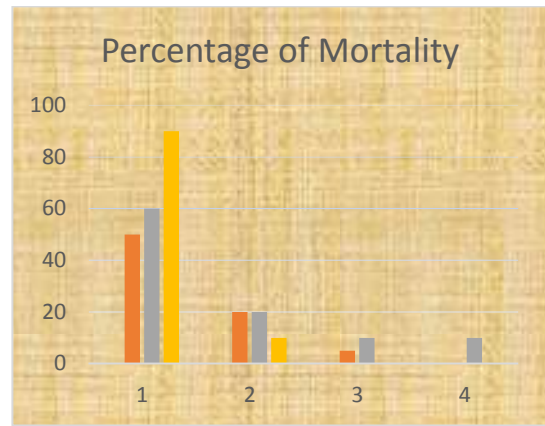


Fig. (1): Mortality Per treatment

Table 2.b. ANOVA for Percentage of Mortality per treatment

SV	SS	df	MS	F	P-value	F crit
Rows	5979.7	3	1993.2	6.10*	0.01	3.86
Colum	1679.7	3	559.9	1.71	0.23	3.86
Error	2939.1	9	326.56			
Total	10598	15				

* Significant at 5%

The study on *A. aegypti* larvae subjected to the highest concentration of anacardic acid showed low resistance, lethargic and immobilized with an overall mortality after 24 exposure of tissue [12,13]. Cashew nut shell was highly toxic to *C. subinnotatus* and achieved 100% insect mortality within 48 hours at 7.5% and 100% mortality within 72% hours at 2.5 and 5.0% concentrations [14].The physicochemical characteristics of CNSL indicate that it is acidic. The reactive nature of CNSL makes it a good constituents material for insecticide formulation CNSL at 6, 8 and 10% treatment levels, as they all have a 100% kill of termites at the 90th minutes for the soldier's caste and 60th minutes for the worker's caste [15]. Zero per cent mortality was recorded in the control cages throughout the exposure period. There is, therefore, an indication that CNSL can control termites.

Behavior of Cockroaches Per treatment

Cockroaches in control (T-) was very active, while those in treatments with CNSEE exhibited very slow movement one hour after exposure to CNSEE inside the improvised cages with CNSEE. Cockroaches in treatments 1, 2 and 3, cockroaches stayed in the area, with no CNSEE, figure.(2). In these treatments, the CNSEE was applied in the litmus papers around the food which were placed at the bottom of the cage (Poison technique). Cockroaches cannot tolerate the acid from CNSEE thus they tried to evade the areas where CNSEE accumulated. Albino rats, observed that Albino rats 24 hours after the administration of extract exhibited behavioral changes like licking, scratching, twitching, tremors, whirling, reactivity to stimuli, cerebral and spinal reflexes, secretions, breath, skin, hair and death [16].

4. CONCLUSION

With the increasing cost of insecticides in the market, herbal insecticides can be used to maximize the benefits that can be derived from indigenous plants. The result of this study expressed that the percentage of mortality of cockroaches increased as the concentration of CNSEE increased.

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Fig. (2). Cockroach evaded the CNSEE Area

encouragement.

5. REFERANCE

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