ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 4, Issue 2, pp: (74-77), Month: April - June 2016, Available at: www.researchpublish.com

Testing the Repellent Property of *Lantana Camara Lin* Aqueous Extract on Some Insect Pests

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Abstract: **The repellent property of *Lantana camara* aqueous extract was tested against two insect pests of cowpea *C. maculatus* and *A. obtectus* and one insect pest of maize *S. zeamais*. The results showed that the extract displayed a mild repellency on *C. maculatus* with mean repellency of 39.9%. *S. zeamais* had mean repellency of 33.3% and *A. obtectus* 24.4%. The extract did not show excellent repellent activities against any of the three test insects as all of them have class repellency of 2 each. Further investigation of the extract should be carried out using other organic solvents on the test insects.**

Keywords: **Repellency, Extract, *L. camara, C. maculatus, A. obtectus, S. zeamais.***

1. INTRODUCTION

Lantana camara is a small perennial shrub which can grow to around 2m in height and forms dense thickets in a variety of environments [Sharma 1981]. It is a widely growing shrub which belongs to the family *Verbanaceae*. The family consists of more than 100 genera and nearly 2600 species. It is a fast growing, low-maintenance plant with wide ecological tolerance. It was reported to be toxic to livestock such as cattle, sheep, horses, dogs and goats [Ross 1999]. *Lantana camara* and *Clerodendrum inerme* powders have shown biopesticidal property and interference with normal metabolic activities in rice moth [Kiran *et al.,* 2010]. Direct insecticidal action of the crude aqueous extract of the plant was indicated when maximum mean mortality of 96.66% was observed in tobacco caterpillar [Pratibha *et al.,* 2011].

Extracts of *L. camara* and *A. indica* have been reported to be effective in the management of *plutella xylostella*, *Brevicoryne brasscae* and *Hellula undalis* on cabbage [Baidoo *et al.,* 2012]. *L. camara* displayed a strong repellent activity for oviposition and a significant larvicidal activity against *Musca domestica* (House fly) [Sohail *et al.,* 2013]. Biological studies by [Zhonglin *et al.,* 2012] showed that the chloroform leaf extract of the plant possessed excellent repellent and moderate toxic and antifeedant activities against eastern subterranean termites.

This study tests and compares the repellent potentials of aqueous extract of *Lantana camara* on three insect pests *Callosobruchus maculatus*, *Acanthoscelides obtectus* and *Sitophilus zeamais.*

2. MATERIALS AND METHODS

Plant Processing: Fresh leaves of *lantana camara* were collected in the month of June 2014. There was no history of chemical applications in that area. The leaves were washed thoroughly with distilled water and shade-dried at room temperature for 4 days. The dried leaves were transformed into fine powder with the aid of wooden pestle and mortar.

Extraction: 100g of the leave powder was macerated in 500ml distilled water, left for 24 hours at room temperature with 6 hours stirring intervals. The mixture was filtered using whatman number 1 filter paper. The filtrate was concentrated at 40˚C under reduced pressure (72 mbar) with a Rotary evaporator and dried. Dried extract was stored in an air tight container at about 4°C up for further use [Kalita *et al.,* 2011].

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Phytochemical Screening: Phytochemical screening of the aqueous leaves extract was carried out using the standard methods of analysis [Sofowora 1993]. The extract was screened qualitatively for carbohydrates, alkaloids, phenolic compounds, saponins, proteins, fats and oils, flavonoids, glycosides and tannins.

The Test Insects: A small population of *C. Maculatus*, *A. obtectus* and *S. zeamais* weevils of both sexes were obtained from an entomology laboratory stock. They were bred under laboratory conditions on diet of the seeds of black-eyed peas *Vigna unguiculata* (obtained directly from their pods) except *S. Zeamais* which were bred on the diet of maize seeds obtained directly from their cobs. They were all reared inside a growth chamber at 27 ± 2° C, with L: D 12: 12 and 70 ± 5% relative humidity. Initially, 50 pairs of the three test insects of 1-2 day-old adults were placed in three separate jars in which two contained black-eyed peas while one contained maize seeds. The jars were sealed and a maximum of 7 days were allowed for mating and oviposition. Then parent stocks were removed and black-eyed peas and maize seeds containing eggs were transferred to fresh black-eyed peas and maize seeds in the breeding jars that were covered with pieces of cloth fastened with rubber bands to prevent the contamination and escape of insects. The progenies of the weevils in the three separate jars were immediately used for the experiment [Rahman and Talukder 2006].

Repellent Activity Test (Bioassay): The method of Talukder and Howse (1993, 1994) for repellence test was employed in this work. Filter papers of 9cm diameter were cut in halves. To one halves were applied plant extracts at 10mg/ml concentration. 1ml of solution was uniformly applied with a pipette in such a way as to have a treated substrate of 0.31mg/cm^2 [Andriana *eta al.*, 2008]. The treated half-cycles were shed-dried allowing the solvent to evaporate. The treated and untreated half-cycles were placed tangentially to each other using a cellulose strip on Petri dishes. 10 adult insects were released into each dish at the centre of the cycle and the surfaces were covered with a muslin cloth in order to enhance adequate aeration and forestall entry of other insects. Three replicates were made for each treatment. The test insects in each half of the filter paper were counted after 0.5, 1, 2, 3, 5 and 24 hours. The data obtained were converted to express percentage repulsion (PR) using the formula;

$$PR\ (\%) = (Nc - 50) \times 2$$

Where Nc = percentage of insects present in the untreated half

Positive values indicate repellency and negative values indicates attractancy. The averages were assigned to different classes below;

Class	Repulsion R (%)
0	>0.01 to <0.1
1	0.1 to 20
2	20.1 to 40
3	40.1 to 60
4	60.1 to 80
5	80.1 to 100

Data obtained were subjected to one way analysis of variance (ANOVA).

3. RESULTS AND DISCUSSION

Phytochemical Screening: Qualitative phytochemical screening of the extract revealed the presence of carbohydrates, alkaloids, phenolic compounds, saponins, flavonoids and tannins. Alkaloids, phenolic compounds and flavonoids appeared in large quantities followed by saponins and tannins. Proteins, glycosides, fats and oils are absent (Table 1).

Table 1: Phytochemical Screening of Aqueous Extract of *Lantana camara*

Phytochemicals	*Lantana camara*
Carbohydrates	+
Alkaloids	+++
Phenolic compounds	+++
Saponins	++
Proteins	-
Fats & Oils	-

Flavonoids	+++
Glycosides	-
Tannins	++

+++ means highly present, ++ means moderately present, + means minutely present and - means absent.

Repellent Activity: The repellent activity of the extract was a bit pronounced on *C. Maculatus* with mean repellency of 39.9%. *A. obtectus* and *S. Zeamais* displayed mean repellencies of 24.4% and 33.3% respectively (Table 2). But all the three test insects have the same class repellencies of 2 which are in contrast with the result obtained by [Pratibha *et al.*, 2011]. This could be attributed to some climatic factors like temperature and relative humidity. Despite the fact that analysis of variance (ANOVA) did not show significant difference between the three treatments, however, the repellent activity of the extract on *C. maculatus* can be said to be effective with the highest percentage repulsion of 73.3 at 24hours. The abundance of alkaloids and other phenolic compounds in the extract might have influenced it to sluggishly repel the insect *C. maculatus*.

The extract showed moderate repellent effect on *S. Zeamais* though not too appreciable even after 24hours. The highest attractancy of the extract was recorded in *A. abtectus* which displayed attractancy of -46.6% at 5hours. The inability of some plant extracts to repel *A. obtectus* was also reported by [Catherine *et al.*, 1994]. A combined negative effect was produced when most of the plants from *T. vulgaris* and *T. serpyllum, M. piperata, R. officinalis, S. hortensis, E. globulus, L. nobilis, O. vulgare*, and *C. nardus* were tested on *A. obtectus*. Results from this research indicated that *L. camara* aqueous extract could be used as a replacement for hazardous synthetic chemicals against grain damaging insects' especially *C. maculatus*. The effects of the plant extract on the specie *A. obtectus* and *S. zeamais* should be further investigated using other solvents.

Table 2: Repellency of *L. camara* Aqueous Extract on the Three Test Insect Pests

	Repellency (%)							Class
Test Insect	**½h**	**1h**	**2h**	**3h**	**5h**	**24h**	**Mean Repellency (%)**	**Repellency**
C. maculatus	13.3	33.3	33.3	46.6	40	73.3	39.9	2
A. obtectus	13.3	20	26.6	20	46.6	20	24.4	2
S. zeamais	20	33.3	33.3	33.3	33.3	46.6	33.3	2

ACKNOWLEDGEMENT

The authors are sincerely grateful to the staff of entomology and chemistry laboratories unit Federal College of Forestry Jos for their immense contributions.

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