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THE TOXICITY EVALUATION OF PREPARED *Lantana camara* EXTRACT AGAINST ADULT COWPEA BRUCHIDS (*Callosobruchus maculatus*) CHRYSOMELIDEA: BRUCHIDEA.

[1]OLADEJO A.O., [1]OLORUNDARE O.O., [2]FRANCIS M. JR. AND [1]OLORI-OKE O.
[1] *Department of Pest Management Technology, Federal College of Forestry, Jos Nigeria* [2] *Forestry Technology,, Federal College of Forestry, Jos.Nigeria*

ABSTRACT

Nigeria is the largest producer and consumer of cowpea in Africa however, Africa cowpea farmers suffer heavy loss as a result of insect pest. This work is therefore aimed at evaluating the effects of prepared Lantana camara extract against adult cowpea bruchids (Callosobruchus maculatus). The work was done in the Entomological Laboratory of the Federal College of Forestry, Jos between June and July, 2019. Different samples of 250g clean dried white cowpea (TVU2027) were placed separately into 1000 mL plastic beakers and different concentrations of Lantana camara extracts [200mg/ml, 100mg/ml, 50mg/ml, 25mg/ml and 0.0mg/ml (as control) labelled T1, T2, T3, T4 and T5 respectively] were applied into each of samples, the mixtures were thoroughly mixed with cowpea seeds. Ten

Introduction:

Cowpea (*Vigna unguiculatus*) is an annual crop, basically grown for its seed (shelled green or dried), in the tropics and sub-tropics for human as well as animals (Diouf 2011). The leaf is also occasionally used as a vegetable and the straw for fodder. Cowpea is rich in plant protains and is found to be the main source of protein to the vegetarian people especially in India, where is referred to as *"poor man's meat*" (Reddy, 2010). Nigeria is the largest producer and consumer of cowpea in Africa. In 2010, Nigeria produced 2.2million metric tons of dried grain out of 5.5 million metric tons global production (ICRISAT/CIAT/IITA, 2011).

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newly emerged Callosobruchus maculatus (about 24 hours old) (ratio1:1) were introduced into each treatments and was covered with a muslim cloth of about 0.02mm held with rubber bands. The treatments were arranged in Complete Randomized Design (CRD) with three replications. Data were collected on dead adult bruchids only at interval of 24 hours for 5 days after the introduction into the treated cowpea seed. Analysis of variance (ANOVA) was used to analyze the transformed data. The result showed a progressive increase in bruchids mortality as the doses of the treatments increased with extended time, the mortality rate of the Cowpea bruchids was also increases with a maximum of 73.33% in 200mg/ml. It could therefore be concluded that the use of Lantana camara at concentration 200mg/ml is recommended for the control of Callosobruchus maculatus.

***Keyworlds**: Lantana camara, Extract, Cowpea grains, Callosobruchus maculatus, Mortality*

However, Africa cowpea farmers suffer heavy loss as a result of pest. Insects are regarded as the most successful arthropods because of their high rates of reproduction and characteristic adaptability to diverse ecological situations. Those species which infest plants have gone through a long period of coevolution with their hosts by adopting a variety of associations with them (Bradley *et al*., 2009). Misra (2014) and Paulraj *et al*. (2017) concluded that the problem of agricultural products in developed world is generally insect pests; they weaken the quality of crops and vegetables commodities and render them unmarketable. Cowpea bruchids remain the major insect pest of economic importance to cowpea seeds. The infestation starts from the field and continues in the storage where the population will build up rapidly causing substantial damage (Carlos, 2000; Spesier *et al*., 2002; Park *et al*., 2003).

As food demand increases, farmers are intensifying on crop production and applying heavy doses of chemical pesticides to solve pest problems without any ecological concern (Amoabeng *et al*., 2016). This often leads to pest resistant, food poisoning and other environmental degradations (Metz,

1991; Etienne, 2007). The threat to cowpea production by cowpea bruchids has made the application of insecticide a compelling routine if high and quality seeds is desired. Insecticides, and generally pesticides are however, with many problems. Studies have shown that pesticides are linked to animal health problems and negative environmental impacts (Macharia *et al*., 2005; Devanand and Rani, 2008; Weinberger and Srinivasan, 2009).

Biopesticides are very important alternatives to the synthetic pesticides and they offer a more sustainable solution to pest control than synthetic alternatives. Several botanicals (most of which usually grown as weeds and are of wide ecological tolerance), have been reported as pesticides, anti-feedants, insect growth regulators and repellents (Ahmed *et al.,* 1994; Day *et al*., 2003). As chemical pesticides are prone to resistance problems, it also has a residual problem which is a matter of significant concern for consumers. However, botanicals are not as effective as chemicals (Gonzalez-Coloma, 2010). One such plant that have potential as a bioinsecticides is *Lantana camara*.

The plants has been reported to have insecticidal, anti-ovoposition, feeding deterrent, growth inhibition and toxic effects on pest insects in the land farm (Ogendo, 2000; Begum *et al*., 2000). This work therefore aimed at investigating the toxicity evaluation of prepared *Lantana camara* extract

against adult cowpea bruchids (*Callosobruchus maculatus*) and the objective is to suggest or recommend it to cowpea farmers.

MATERIALS AND METHODS

Area of Study.

The work was carried out at the Entomological laboratory of Federal College of Forestry, Jos. The College lies around latitude 9^0 57'N and longitude 8^0 54'E in the Northern Guinea Savannah zone of Nigeria with a height of about 1200m above the sea level. The mean annual rainfall for the location ranges between 12000cm and 1250m and the mean temperature of 23^0C – 25^0C as obtained from University of Jos Metrological station.

Collections and Rearing of Cowpea Bruchids.

Dried White Cowpea (TVU2027) free of insect eggs, larvae and pupae were obtained from produce whole sellers at Katako Market of Jos-North Local Government Area, Jos, Plateau State. Parental stock of *Callosobruchus maculatus* were reared and bred under laboratory conditions on the seeds of Cowpea inside a growth chamber at 30±2 ^{0}C and 70±5% RH. Initially, 50 pairs of 1 -2 days old male and female adult bruchids were placed in a jar containing cowpea seeds. The jars were sealed and a maxmum of 7 days was allowed for mating and oviposition. Then parent stocks were removed and Cowpea seeds containing eggs were transferred to fresh Cowpea seeds in the breeding jars covered with muslim cloth of about 0.02mm and held with rubber bands to prevent contaminations and escape of the beetles. The subsequent progenies of the beetles were used for the experiment.

Preparation of *Lantana camara* Plant Extract.

About 1 kg fresh leaves of *Lantana camara* were dried to a constant weight in a drying cabinet at a room temperature. The dried leaves were milled with an electric blender. One litre of petroleum ether was added to the milled leaves in a conical flask, placed on mechanical shaker and shaken for 8 hrs. The extract was filtered under suction and concentrated in a rotary

evaporator in line with Mathur and Kongsdal (2003) extract procedure. The extract was stored in a cupboard away from light until ready to use.

Phytochemical Screening of *Lantana camara.*

Ethanolic extracts of *Lantana camara* were screened for their phytochemical constituents using Harborne (1973) and Trease and Event (1978) extract procedures.

Experimental details.

Different samples of 250g (clean dried white cowpea (TVU2027) free of insect eggs, larvae and pupae) were placed separately into 1000 mL plastic beakers and different concentrations (200mg/ml, 100mg/ml, 50mg/ml, 25mg/ml and 0.0mg/ml as control labelled T1, T2, T3, T4 and T5 respectively) of *Lantana camara* extracts were applied into each of samples, the mixtures were thoroughly mixed with cowpea seeds. Ten newly emerged *Callosobruchus maculatus* of about 24 hours old (ratio1:1) were introduced into each treatments and was covered with a muslim cloth of about 0.02mm held with rubber bands. The treatments were arranged in Complete Randomized Design (CRD) with three replications and the application was done under shaded condition to avoid direct sun light effect.

Data collection.

Data were collected on dead adult bruchids only. The dead adult bruchids were counted within 24, 48, 72, 96 and 120 hours after the introduction into the treated cowpea seed. Dead bruchids were recorded from the treated and the control plots.

Data analysis.

The collected data were subjected to one way analysis of variance (ANOVA) using the General Linear Model (GLM) procedures of SPSS (2019) version 23 and Duncan multiple range test was used to separate the means that are significantly different at $P \leq 0.05$ probability level.

RESULTS

Phytochemical Screening.

The result of phytochemical screening of crude leaf extract of *Lantana camara* revealed the presence of alkaloids, Tannins Flavonoids and Cardiac-glycosides in the plant leaf (Table 1).

Table 1: The Phytochemical constituents of *Lantana camara* leaf extract.

Chemical Constituents	Status
Alkaloids	++
Tannins	+++
Saponins	-
Carbohydrates	+++
Flavonoids	+++
Steroids	-
Anthraquinoids	-
Cardiac-glycosides	++

+++ = Highly Present, ++ = More Present, + = Present, - = Absent.

Saponins Anthraquinoids and Steroids were not detected in the extract. The presence of bioactive compounds like flavonoid and tannin in the plant materials is an indication that it may have some insecticidal potential against agricultural important insect pests. This could probably due to the presence of tannin (table 2) that repelled the bruchids from attacking cowpea grains (Dawit and Bekelle, 2010)

Table 2. The effect of different concentrations of plant extracts on the mortality rate of cowpea bruchids at 24 hours interval up to 120 hours.

Treatment Conc.	Mean Mortality (%)				
	24hrs	48hrs	72hrs	96hrs	120hrs
T1 (200mg/ml)	46.00^{a}	56.00^{a}	60.00^{a}	63.33^{a}	73.33^{a}
T2 (100mg/ml)	30.00^{b}	46.00^{ab}	53.33^{ab}	56.67^{ab}	66.67a
T3 (50mg/ml)	20.00^{bc}	40.00^{ab}	46.67^{bc}	50.00^{b}	53.33^{b}
T4 (25mg/ml)	13.33^{c}	33.33^{b}	36.67^{c}	36.67^{c}	40.00^{c}
T5 (0mg/ml)	0.00^{d}	0.00^{c}	3.33^{d}	6.67^{d}	13.33^{d}
Mean SE±	0.596	0.730	0.558	0.422	0.422

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Mean within a column followed by different letters shows significantly different P≤ 0.05

Table 2 showed the result of the effects of different concentrations of *Lantana camara* plant extracts on the cumulative mortality rate of adult cowpea bruchids at 24 hours interval up to 120 hours. Mortality of up to 46% was observed in treatment one (T1) with 200mg/ml of the extract and 0% mortality in the control (T5) on the first day and as the doses of the treatments increased with extended time, the mortality rate of the Cowpea bruchids was also increases. Highest mortality of 46 and 56% was observed for treatments one (200mg/ml) and T2 (100mg/ml) respectively at 48 hours after application, and 66.67 and 73.33% for the same treatments at 120 hours after application. Treatment 5 (control) had little or no adult mortality of the bruchids from the beginning to the end of the experiment with the highest of 13.33% at the end of the experiment (Table2).

The result of the ANOVA revealed that the effects of the treatment on the adult mortality rate of cowpea bruchids were significantly different in all the durations. The least significant difference for each of the treatments means were calculated and it showed that at 24 hours duration, treatment one (T1) with 46.0% is significantly different from all other treatments with control (T5) having 0.0%. However, treatment 2 and 3 (T2 and T3) are not significantly different but significantly different from T5 (Table 2). Durations 48 hours, 72 hours and 96 hours follow the same trend; but at 120 hours duration, all the treatments were significantly different from each other except treatment one and two (T1 & T2), with T1 having the highest adult mortality of 73.33% followed by T2 with 66.67% mortality and T5 (Control) having the least of 13.33% mortality (Table 2).

DISCUSSION AND RECOMMENDATION

The percentage mortality of Cowpea bruchids in different concentrations of *Lantana camara* leaf extract showed an initial low mortality, these increases as the concentration increases. However, the effectiveness varied

when compared with untreated control this could probably due to the presence of flavonoid an tannin (table 1) that repelled the weevils from attacking cowpea grains (Dawit and Bekelle, 2010).. Analysis of variance showed that there was significance difference among all the treatments at different hours of exposure. However, treatments 5 (control) was significantly different from all other treatments. This study correlate with the work of Ogunsina *et al.,* (2011) that the insecticidal action of hexane extract of *Lantana camara* against cowpea bruchids had positive effects on the mortality of the bruchids. The findings is also in agreement with Grenier, *et al.,* (1997); Pretheep-Kumar and Mohan (2004) who reported mixed milled rice with pea flour extract at 1% concentration had toxic effect on *Callosobruchus maculatus* and also the mortality of insects increase with increase in concentration and numbers of days. Also, this findings is in line with Stoll (2001) who reported that extract of several higher plants have been tested to be effective against insects pests and diseases of various crops on the field and in stored. It could therefore be concluded that the use of *Lantana camara* at concentration 200mg/ml or 100mg/ml is recommended for the control of *Callosobruchus maculatus*. However, T1 (200mg/ml) has the highest percentage mortality of 73.33%.

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