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EFFECT OF BIOPESTICIDE-*LANTANA CAMARA* (L.) ON *ALLOSOBRUCHUS MACULLATUS* (PULSE BEETLE)

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ABSTRACT:
Pesticides are used to kill the pests (harmful insects) in order to prevent the economic loss of the cultivators. The chemical pesticides have adverse effects on human health and on the environment. Biopesticides play a significant role in organic farming and in the integrated pest management (IPM) system. Pesticides of plant origin are a good alternative to the synthetic pesticides. In the present investigation, water extracts and methanol extracts from the leaves of *Lantana camara (L.)* were tested for their insecticidal property on *Callosobruchus macullatus* (Pulse beetle) under laboratory conditions. *C. macullatus* is commonly known as **pulses beetle.** *C. macullatus* is a serious post-harvest pest that attacks the economically important legumes especially pulses. It is a common pest of stored legumes that has a cosmopolitan distribution. Cowpea seed beetles were treated with different concentrations viz. 0.02%, 0.04%, 0.06%, 0.08%, 0.1% and 0.2% of *L. camera* methanol leaf extracts. The conc. 0.02%,0.04%,0.06% did not show any significant mortality against of *C.macullatus* while 0.08% shown high mortality and 0.1% and 0.2% shown total mortality. The conc. of 0.08, 0.1%, 0.5%, 1.0%, 1.5%, 2.0% and 2.5% of *L. camera* water leaf extracts were tested against the *C.macullatus*. 1% and 1.5% shown high mortality while 2.0% and 2.5% of *L. camera* water leaf extract shown total mortality. Thus, at the higher concentration extracts of *L. camera* can act as a potential pesticide.
Keywords: Biopesticide, *Lantana camera*, *Callosobruchus macullatus* (pulse beetle), mortality

INTRODUCTION:

Chemical pesticides have shown adverse effects on human health and domestic animal health (Pimentel *et al.*, 1992). Chemical pesticides suffer from the problems such as pest resurgence, residual toxicity, phototoxicity, environmental hazards and high cost. So, there is need of biodegradable, eco-friendly and inexpensive pesticides. The plant-based pesticides are biodegradable, less toxic to mammals and more selective in action. The advantage of plant-based pesticides is that these pesticides can be easily and cheaply produced by farmers and small-scale industries. Biopesticides play a vital role in organic farming and in the integrated pest management (IPM) system. WHO has given some specific guidelines for the assessment of the safety, efficacy, and quality of botanical biopesticides.

In general, many plants contain wide spectrum of secondary metabolites such as phenols, flavonoids, terpenoids, quinones, tannins, alkaloids, saponins, coumarins and sterols which show variations in their efficacies against pest species. There are thousands of plant species that offer a potential source for future biopesticides. However, the review of literature listed 43 repellent plant species, 21 feeding deterrent plant species, 47 toxic plants, 37 grain protectant plants, 27 reproduction inhibitor plants and 7 plants with insect growth and development inhibitors properties. Therefore, this underlines the need to discover many more novel bio-pesticide compounds from different plant species.

The pesticides cause a colossal loss of the storage food grains and pulses. So there is need of plants pesticides to control these pests. It has been reported that when leaf, bark, seed powder, or oil extracts of plants mixed with stored grains and pulses reduce seed damage rate (*Keita et al.*, 2001). The leaf extracts from *L. camera* exhibits antimicrobial, fungicidal, insecticidal and nematicidal properties (Deshmukh *et al.*, 2011). The pulse beetle, *Callosobruchus maculatus* Fab. (Coleoptera-Bruchidae) is a major pest of economically important leguminous grains, such as cowpeas, lentils, green gram, and black gram (Raja *et al.*, 2000). The larvae of this pest bore into the pulse grain. This makes the pulses unsuitable for human consumption. It also affects the viability of replanting and for the production of sprouts. This is hazardous pests of pulse crops in Asia and Africa under storage conditions (Ajayi and Lale, 2001).

The review of the literature has shown that the sporadic work has been carried out with using the leaf extracts of commonly available plant, i.e., *L. camera* to pulse beetles. The pulse beetles are the serious stored product pest that attacks several economically important pulses. In the present study, an attempt has been made to investigate insecticidal properties of crude aqueous extracts and methanol extracts of leaf powder of *Lantana camara* (L.) on *Callosobruchus macullatus* (pulse beetle).

MATERIALS AND METHODS :

Pest culture: Adults of *Callosobruchus macullatus* (cowpea beetle) were cultured at standard conditions (temperature, 26±2°C; relative humidity, 65±5% and photoperiod, L12:D12). The protocol of insect rearing (Bekele, 1996) was followed. The adult pulse beetles were used during the entire experiments. *C. maculatus* beetles were obtained from an entomology laboratory stock. They were reared and bred under laboratory conditions on diet of the seeds of Black eyed beans (*Vigna unguiculata)* Preparation of plant extracts: Leaves of *Lantana camera* L. (Verbenaceae) were collected, air-dried and a fine powder was made. Water and methanol leaf extracts of various concentrations viz. 0.02%, 0.04%, 0.06%, 0.08%, 0.1% and 0.2% of *L. camera* methanol leaf extracts were made. While the conc. of 0.08, 0.1%,0.5%,1.0%,1.5%, 2.0% and 2.5% of *L. camera* water leaf extracts were prepared. The freshly prepared solutions were used for trials. The distilled water sample was taken **as control. Three replications were made.**

DISCUSSION :

Botanical pesticides have received global attention (Nooshin 2012). *Vitex negundo* extract is effective for controlling *Callosobruchus macullatus* (Rahman and Talukdar, 2006). The higher concentrations of leaf extracts have potential to be used for the management *Callosobruchus macullatus.* The leaves of *Lantana camara* L. contain the major constituent caryophyllene (essential oil). The larvicidal effect of volatile oils of *L. camara* leaf was tested against the maturation of *Musca domestica* L. larvae. In the present investigation the 1.5%, 2.0% and 2.5% of water and methanol leaf extracts shown a significant mortality rate of *Callosobruchus macullatus.* To minimize the severe damage caused by insect pests, the traditional use of plant products, proved to be highly effective against stored-product insects. Application of plant/vegetable oils to grain seeds for storage is an inexpensive and effective technique, and its easy adaptability will give additional advantages leading to acceptance of this technology by farmers. A study to improve the effectiveness of botanical derivatives as insecticides will benefit agricultural sectors of developing countries, as this substance are not only of low cost but also have less environmental impact in term of insecticidal hazard.

Conclusion: The present laboratory investigation showed that *L. camera* leaf water and methanol extracts shown insecticidal property against *Callosobruchus macullatus.* The leaf extracts at their highest doses and longer exposure time shows very high mortality rate. It is evident from observations that the doses of methanol leaf extracts require less concentration doses as compared to water leaf extracts to control *Callosobruchus macullatus.* Thus, the use of *L. camera* leaf extracts needs to be used as biopesticide at the household level as well as farm level after cytotoxicity studies. The use of extracts minimizes the severe damage caused to stored plant products by insect pests. The application of plant extracts to stored legumes is an inexpensive and effective technique. The easy availability of *L. camera* provides additional advantages leading to acceptance of this technology by farmers. This will not only benefit agricultural sectors of developing countries but also an eco-friendly way of controlling pests at the lowest cost.

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Table 1. Mean percent mortality ± SE of adult *Callosobruchus macullatus* exposed to different concentrations of water extracts of *L. camera* leaf after different exposure time.

% conc.	Adult mortality				
	10 min	30 min	1 hr	5h	10 h
0.1%	0.00±0.00	0.00±0.00	0.00±0.00	4.10±1.20	21.0±1.15
0.5%	0.00±0.00	0.00±0.00	4.00±2.00	5.40±3.20	24.10±2.10
1.0%	0.00±0.00	12.0±3.00	29.0±1.00	50.15±2.40	75.0±1.20
1.5%	40.0±2.00	55.0±2.60	70.0±1.50	75.10±1.50	85.0±1.10
2.0%	75.0±2.00	77.0±1.20	96.0±2.10	100.0±0.00	100.0±0.00
2.5%	80.2±1.20	95.0±1.30	100.0±0.00	100.0±0.00	100.0±0.00
Control	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00

From Table no.1 it is evident that 1% and 1.5% water extract of the leaf shows high mortality while 2.0% and 2.5% of water extract of *L. camera* leaf results in 100% mortality of *Callosobruchus macullatus*.

Table 2. Mean percent mortality ± SE of adult *Callosobruchus macullatus* (pulse beetles) exposed to different concentrations of methanol extracts of *L.camera* leaf after different exposure time.

% conc.	Adult mortality				
	10 min	30 min	1 hr	5h	10 h
0.02%	0.00±0.00	0.00±0.00	0.00±0.00	3.50±1.80	11.0±3.20
0.04%	0.00±0.00	1.00±1.00	3.00±2.00	5.50±3.20	15.50±2.30
0.06%	0.00±0.00	12.0±3.00	28.0±2.00	35.25±2.40	42.0±1.30
0.08%	18.0±1.80	35.0±2.60	55.0±1.50	62.0±1.20	85.0±1.30
0.1%	45.0±3.00	60.0±2.20	88.0±2.00	100.0±0.00	100.0±0.00
0.2%	60.0±2.20	75.0±20.0	100.0±0.00	100.0±0.00	100.0±0.00
Control	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00

It is evident from Table no.2. that conc. 0.02%,0.04%,0.06% did not show any significant mortality against of *C.macullatus* while 0.08% shown high mortality and 0.1% and 0.2% shown total mortality.

Fig.1. *C. macullatus* reared on (*Vigna unguiculata)* Fig. 2. *Callosobruchus macullatus*