



## RESEARCH NOTE

### Evaluation of insecticidal properties of rough cocklebur (*Xanthium strumarium* L.) against banana leaf and fruit scarring beetle (*Basilepta subcostatum* Jacoby)

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**ABSTRACT:** Chloroform extract of rough cocklebur (*Xanthium strumarium* L.) was evaluated for its insecticidal properties at the Department of Entomology, Assam Agricultural University, Jorhat, against banana leaf and fruit scarring beetle (*Besilepta subcostatum*). Direct spray method was carried out with different concentrations (7, 5, 3, 2, 1 and 0.5%). Among all the concentrations highest mortality (100.00%) was found at 7.0% after 72 hours. The  $LC_{50}$  value was found to be 1.12% after 72 hours of treatment. Thus, the *Xanthium strumarium* extract has insecticidal potential against the target insect which can be the alternative for synthetic insecticides.

**Keywords:** *Xanthium strumarium*, *Basilepta subcostatum*, insecticidal efficacy,  $LC_{50}$ , Chloroform extract

Banana is one of the most important fruit crops, cultivated across India. Insect pests are one of the major problems in banana cultivation which affects both quality and quantity. In India, more than 15 insect pests attack banana which include insects, mites, mollusks and birds. Among the insect pests, banana leaf and fruit scarring beetle *Basilepta subcostatum* (Jacoby) (Coleoptera: Chrysomelidae) is one of the most economically important pest. Assam and some other parts of India also. The damage caused by this beetle has tremendous influence on both quantity and quality of banana. As it is a serious pest causing scars on the fruits, the fruits affected by this pest have poor market acceptability (Mishra *et al.*, 2015). Among different management practices to control this pest the use of chemical insecticides is common and found to be effective, but the excessive use of chemical pesticide creates many serious threats and ecological problems (Gupta *et al.*, 1997). Botanical plays an important role in agricultural pest management as more than 2000 plant species has been screened for their toxicity against agriculturally important insect pests and found to be suitable not only because of their toxicity but also because of their biodegradable, systemic, ecofriendly and non-toxic nature to natural enemies (Kalita *et al.*, 2016). The mode of action of these botanical pesticides against insect pests are diverse and hence research on the active ingredients, preparation and application, mode of action, toxicity and environmental impact of botanical pesticides are prerequisites for sustainable agriculture (Dolui and Debnath, 2010). Thus, the present study was carried out to evaluate the efficacy of plant extract of *Xanthium strumarium* against the leaf and fruit scarring beetle of banana.

The matured leaves of *X. strumarium* were collected from different locations of Jorhat, Assam for preparation of extract. The leaves were shade dried and powdered by using an electric grinder and passed through a 20 mesh sieve and kept in container. Then the powder was extracted with chloroform using Soxhlet extraction apparatus as described by Bora *et al.* (1999). The extract was dried with rotary vacuum evaporator and dissolved in acetone by w/v basis to make 100% stock solution and stored in a air tight sealed glass bottle at 4°C in refrigerator, which was further diluted serially to obtain desired concentration for subsequent use in the experiment, viz., 7%, 5%, 3%, 2%, 1% and 0.5% for subsequent use in the experiment.

The leaf scarring beetles were collected from Experimental Farm of Assam Agricultural University, Jorhat and the culture was maintained in the laboratory. Fresh banana leaves of 5 cm<sup>2</sup> were placed on petri plates and then adults were released in the petri plates. The rearing plates were kept under controlled conditions where temperature was maintained at 25±2 °C and 70±5 per cent relative humidity (Handique *et al.*, 2015). Withered leaves were replaced with new ones at three days interval following the method of Handique *et al.*, 2015 with slight modification.

From the stock culture, 10 number of healthy *B. subcostatum* were released onto healthy detached matured banana leaves. A final count of them were taken after 4 hours of proper settlement. Each concentration was sprayed on both surfaces of the leaf. The number of live insects were counted at 24, 48 and 72 h after treatments. Each treatment was replicated three times.

The data on mortality were subjected to Abbot's correction (Abbot, 1925) before angular transformation, whenever mortality in the control is obtained. Further, data on per cent mortality were subjected to probit analysis for calculation of LC<sub>50</sub> values by using SPSS computer software package (ver. 12.0).

The present study revealed that the chloroform extracts of *X. strumarium* evaluated against *N. Subcostatum* under laboratory condition showed the lethal effect. Table 1 represents the data on effect of chloroform extracts of *X. strumarium* against *B. subcostatum* and the data revealed that the extract cause highest of 100.00% adult mortality of *B. subcostatum* 7% concentration after 72 hours of treatment as compared to the lowest of 3.33% mortality at 0.5% concentration after 24 hours of treatment. Roy *et al.*, 2014 also evaluated *X. strumarium* against *Callosobruchus chinensis* and found highest of 72.6% mortality with 4% extract at 4 days after treatment. From the Table 2, the LC<sub>50</sub> value of *X. strumarium* was found i.e. 1.12% at 72 hours after treatment. The mortality of

*B. subcostatum* was found increased with an increase in concentration and exposure time. Same kind of results were also observed by Erdogan *et al.*, 2007 against Colorado potato beetle. Gokce *et al.*, 2006 found that extracts of some selected plant including *X. Strumarium* 200 g kg<sup>-1</sup> reduced larval feeding of *Leptinotarsa decemlineata*. Extracts of all species at, Observations of larval behaviour over the first 15 min of exposure to these extracts revealed that the interaction of beetles with leaf tissue was significantly affected by plant extracts.

The present study revealed that among all the concentrations of *X. strumarium* the LC<sub>50</sub> value was found at 1.12% concentration after 72 hours of treatment. Thus present investigation gives a way to reduce the toxic effect of chemical by incorporating the plant extract which are found to be less hazardous and are the important component of the present ecofriendly environment.

**Table 1. Toxicity of solvent extracts of *Xanthium strumarium* on adults of *Nodostoma subcostatum* compared to control**

Conc. (%)	Mortality (Hours after treatment)		
	24	48	72
0.5	3.33 (10.46)	11.53 (19.85)	20.83 (27.15)
1.0	6.67 (14.96)	23.07 (28.71)	33.33 (35.26)
2.0	16.67 (24.09)	34.61 (36.03)	45.86 (42.60)
3.0	13.33 (21.41)	34.61 (36.03)	50.00 (44.99)
5.0	43.33 (41.16)	61.53 (51.66)	91.67 (73.21)
7.0	56.67 (48.82)	84.61 (66.89)	100.00 (90.00)

**Table 2. Insecticidal activity of *Xanthium strumarium* on adults of *Nodostoma subcostatum***

Hours after treatment	LC <sub>50</sub> (Per cent)	(Fiducial limits 95% confidence)	
		Lower	Upper
24	6.73	4.81	12.58
48	2.18	1.74	2.72
72	1.12	0.75	1.49

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