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RESEARCH ARTICLE

LARVICIDAL ACTIVITY OF *IPOMOEA CARNEA* JACE PLANT EXTRACTSAGAINST *SPODOPTERA LITURA* FAB

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ABSTRACT

Larvicidal activity of aqueous and ethanol leaf extracts of Ipomoea carnea were studied against third instar larvae of Spodoptera litura at different concentration (5, 10, 15, 20 and 25 mg/ml). The plant leaves were dried, powdered and extracted in soxhlet apparatus in aqueous and ethanol solvent for 24 hrs. The third instar larvae of S. litura were exposed to various concentration and percent mortality were recorded after 96hrs.
The larvicidal activity of leaves extract of I. carnea were (LD 10= 12.45 mg/ml, LD 50= 22.24 mg/ml) in aqueous and (LD10= 5.62mg/ml, LD 50= 14.69 mg/ml) in ethanol respectively. Results revealed that the mortality was increased with increasing in concentration of the plant extracts. The ethanol solvent extract of I. carnea showed higher larvicidal property against third instars larvae of S. litura. Statistical variance, 95 % confidence limits and regression equations are presented.

Key words: Spodoptera litura, Ipomea carniaand Mortality.

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INTRODUCTION

The tobacco caterpillar, *Spodoptera litura* (Fab.) is one of the serious and dominant polyphagous pestof cotton, soya bean and other major crops which caused much damage and affect agricultural productivity (Balaraju *et al*., 2011). It is also one of the most economically important insect pests of 51 countries including India, Japan, China, and other countries of Southeast Asia infesting 112 species of plants belonging to 44 families including groundnut, cotton, chilly, tobacco, castor and soyabean(Chari and Patel,1983). In India *S. litura* feeds on 74 species of cultivated crops and some wild plants (Rao *et al.*, 2008). The average crop losses worldwide due to pests and diseases are 60% of potential production. Chemical pesticides have been used for many years in controlling pests as they give high mortality rate in less time. The huge amount of synthetic pesticides is applied in the fields of cotton and other economically important crops to protect them from insect attack. However, the indiscriminate use of synthetic pesticides resulted in many problems such as resistance of pest to pesticides, resurgence of pests, elimination of natural enemies, toxic residues in food, water, air and soil which affect human health and disrupt the ecosystem, leading to the threat that their continued use may further harm the environment. With a greater awareness of hazards associated with the use of synthetic pesticides there has been an increase need to explore suitable alternative method of pest control.

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Farmers use different plant material to protect their crops from pest infestation. Natural products in their crude form or plant extract provide unlimited opportunities as biopesticide. In recent years research efforts are reported on development of insecticides of plant origin. Botanical insecticides are ecofriendly and environmentally safer alternative method for crop protection (Mansour *et al*., 201; Kabili *et al*., 2012; Abbad and Basheli, 2013). Plant derivatives are highly toxic to many insect species and more than 2000 plant species are known to possess some insecticidal properties (Kaushik *et al*., 2009). Some of the plants from Meliaceae, Rutaceae, Asteriaceae, Labiatae, Convolvulaceae and Pedaliaceae are promising sources of insecticide based property (Schutterer, 1990, Isman, 1995 Sujatha *et al.,* 2010). Thangarasu *et al.,*(2015), evaluated the role of different extracts of *Abrus precatorius* for their ovicidal activity, oviposition deterrent activity, antifeedant activity and larvicidal activities against various life stages of selected agricultural field pest *S. litura*.This paper reports the resultsof research on the effect of *Ipomoea carnea* plant extracts against the tobacco cutworn, *Spodoptera litura. Ipomoea carnea*is a exotic weed andfound all over in India. It belongs to Convolvulacea. Different extracts of *I. carnea* plant possess anti-bacterial, anti-fungal, anti-oxidant, antimicrobial, anti-cancer, anti-convulsant, immunomodulatory, anti-diabetic, hepatoprotective, anti-inflammatory, anxiolytic, sedative, cardiovascular, Inhibition and wound healing activities (Srivastava and Shukla 2015). Krishna *et al.,* (2013) obtained the biopesticide from agricultural weed against aphids, leaf folder disease, thrips, Japanese beetle and army worm and the cutworm caterpillar.

Several authors studied the larvicidal activity of plant extracts against mosquito (Khatiwora *et al*., 2014; Kuppusamy 1992; Satish kumar and Maneemegalai 2008), leaf folder, *Cnaphalocrosis medinalis* (Agnello *et al.,* 2013). Therefore, the present study was undertaken to evaluate the effect of ethanol and aqueous extracts of *Ipomoea carnea*leaves against the tobacco cut worm, *Spodoptera litura.*

MATERIALS AND METHODS

Plant Collection and Extraction: Leaves of *I. carnea* were collected from local area and were properly identified from taxonomist. The plant waswashed three times in tap water and rinsed with distilled water the excess water was soaked and leaves were separated and dried in shade. The dried leaves material were powdered in domestic grinder and stored in air tight container in refrigerator till further use. From the stock 100 g of powdered was extracted with 500 ml of ethanol and water using Soxhlet apparatus for 24 hrs separately.

Insect Culture: The eggs of *S. litura*(NBAII-MP-NOC-02: *S.litura*) were purchased from National bureau of Agriculture Insect Resources Bangalore and were surface sterilized with 0.02% sodium hypochlorite solution, dried and allowed to hatch. After hatching, the larvae were reared on normal diet withcastor leaf, *Ricinus communis.*Third instars larvae were used forfurther study to minimize handling effects.

Insecticidal bioassay: Third instars larvae of *S. litura* were used for the insecticidal assay. Fresh Castor leafwas taken in each acrylic plastic jar and was exposed to several doses of ethanol and aqueous extracts of *Ipomoea carnea*. The dose was prepared by mixing the extract with respective solvent and was sprayed on castor leaves. One jar of control containing only fresh castor leaf sprayed with respective solvent was maintained. The treated castor leaves were allowed to evaporate the solvent. 10 newly emerged III instars larvae were released in each experimental and control acrylic plastic jar containing castor leaves. Three replications were conducted. The percent mortality was calculated after 96 h and the observed data was subjected to probit analysis (Finney, 1947; Busvine, 1971).

RESULTS

The toxic effect of *I. carnea* leaves extracts was evaluated against *S. litura*. The number of dead *S. litura* was counted after 24, 48, 72 and 96 h at different (5, 10, 15, 20, and 25 mg/ml) doses of ethanol and aqueous crude extract. The total percent mortality was observed after 96 h then the corrected mortality was calculated using Abotts formula and the results are presented. The results showed that, the mortality increases with increase in concentrations of all doses (Figure and Tables). The results of probit analysis for the estimation of LD_{10}, LD_{50}, variance, 95% confidence limits and regression

Table 1. Percent mortality of *Spodoptera litura* treated with leaf extracts of *Ipomoea carnea*

Sr. No.	Dose in mg/ml	No. of insects used	Mortality after 96 hrs. (Ethanol)	Mortality after 96 hrs. (Aqueous)
1.	Control	10	-	-
2.	5	10	10	-
3.	10	10	30	-
4.	15	10	40	20
5.	20	10	70	40
6.	25	10	80	60

Table 2. LD_{10}, LD_{50} values with variance, 95% confidence limits and probit analysis parameters for larvae of *Spodoptera litura* after 96h of treatment

Solvent	LD_{10}	LD_{50}	Variance	95%CL		Regression equations	$\chi 2$
				Lower	Upper		
Ethanol	5.620	14.69	0.0039544	1.04385	1.29035	Y=3.071x+1.4123	1.9175
Aqueous	12.45	22.24	0.001999	1.2595	1.4348	Y=4.5288x+1.1242	0.1587

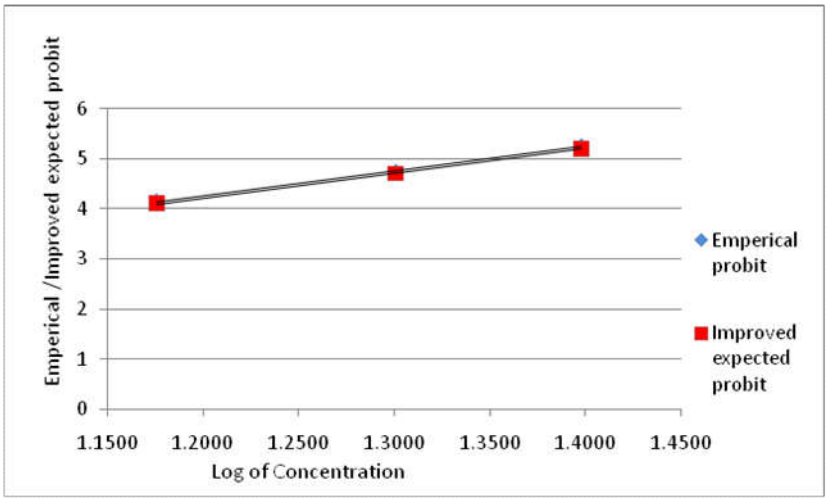

Fig.1. Regression and provisional lines for *Spodoptera litura* exposed to aqueous leaf extract of *Ipomea carnea* after 96 h

equation at 96h for the mortality of third instar larvae of *S. litura* are presented in Table – 2. The insecticidal bioassay inethanol solvent extracts of *Ipomia carnea,* LD_{10}=5.620 mg/ml and LD_{50} = 14.69 mg/ml and in aqueous extract of *I. carnea*, LD_{10} = 12.45 mg/ml and LD_{50} = 22.24mg/ mlrespectively. Among the various estimate of regression based probit analysis, the $\chi 2$ values for the regression coefficients showed homogeneity to the data.

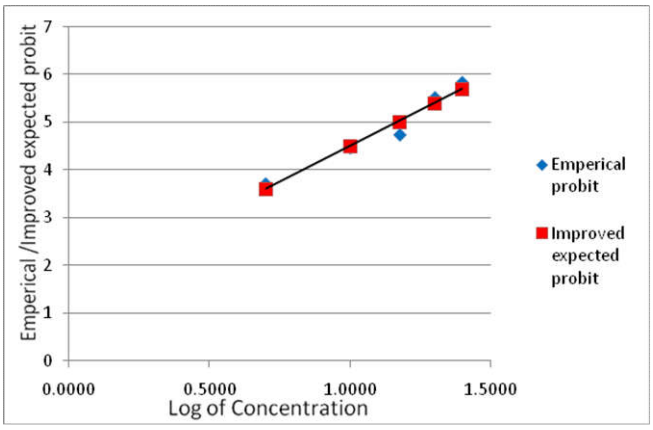

Fig. 2. Regression and provisional lines for *Spodoptera litura* exposed to ethanol leaf extract of *Ipomea carnea* after 96 h

DISCUSSION

Spodoptera litura is one of severe agricultural pest. In insect-plant interactions, insects often have unique adaptation to their host plants in locating and selecting the plants by the use of chemical, visual and mechanical cues (Schoonhoven *et. al*., 1998).According to Mustaparta., (2002), unsuitable plants are avoided by detection of other chemical cues; such chemical substances may have repellent or toxic properties against insects.Based on this principle, botanical pesticides are invented and utilized for control of insect pests. Crude extracts from the leaf, stem, root and seeds of various plant species have been reported to possess antifeedant, insecticidal, and/or growth inhibitory properties Ekesi. (2000).

Hummeland Isman., (2001) reported that synergistic effects of complex mixtures (crude extracts) of phytochemicals are also thought to be important in plant defenses against insect herbivores. In the present investigation, the toxicity of ethanol and aqueous extract of *Ipomea carnia* was tested against *S. litura*. In our study mortality increased with increase in concentration at all the doses upto 96 hrs of exposure. Similar to the present investigation, several studies documented the insecticidal activity of *Ipomoea carnea* on different pests. Khatiwora *et al*., 2014showedlarvicidal activities of *Ipomoea carnea* stem extracts against mosquito species *Aedes aegypti* and *Culex quinquefasciatus*. The results indicate that ethyl acetate, acetone and methanol extracts of *Ipomoea carnea* show significant larvicidal activity while hexane is found to be inactive. Agnello *et al*., (2013) observed dose dependent antifeedent activity of *Ipomoea carnea* againstLeaf folder (*Cnaphalocrosis medinalis*). 50% ethanol extract of aerial parts of *I.carnea*was used for anti-feedant activity. They found that 500 and 1000 ppm of the extract have significant anti-feedant activity on leaf folder. 100% Ethanol fraction showed prolonged anti-feedant as well as lethal effect on rice leaf folder. The fraction was effective at low concentrations of 100 ppm.

Ipomoea carnea weed plant will go a long way as local resource base-non- chemical tool in the integrated pest management in rice crop. In many countries, plant derived products are being used by the farmers from ancient times and it triggered the scientists to search for eco-friendly insecticides from plant kingdom. Several hundred plants have been reported as insect repellents, antifeedants, attractants, insecticides, ovicides and oviposition deterrents (Arnason *et al*., 1992; Ewete *et al*., 1996). Antifeedants offer first line of crop protection against notorious insects. According to Isman., (2002) any substance that reduces food consumption by an insect can be considered as an antifeedant or feeding deterrent. In general, antifeedants have profound adverse effects on insect feeding behavior was reported by Hummel. (2001).

Due to the toxic effect of ethanol extract of *I. carnea* maximum number of treated larvae diedin comparisons to other solvents used in the present investigation. Similarly, Leatemia and Isman., (2004) reported that high concentrations of extracts caused high mortality of larvae even though only very small portions of the leaf discs were consumed they also reported that crude extracts of plants often consist of complex mixtures of active principles.Telang., (2003) reported that Apart from insecticidal activities, larval-pupal intermediates, pupal and malformed insects are formed, and these unhealthy adults were short lived and infertile. Isman., (2002) reported that botanical antifeedants and insecticidal agents can play a significant role as part of an Integrated Pest Management. The finding of the present investigation revealed that, the leaf extract of *Ipomoea carnea* posseses remarkable insecticidal activity against *Spodoptera litura*. The LD_{10}=5.620 mg/ml, LD_{50}=14.69mg/ml in ethanol and LD_{10}=12.45 mg/ml, LD_{50}=22.24mg/ml in aqueous is reported. The study needs further investigation to find out active ingredients responsible for insecticidal properties of *Ipomoea carnea* and to reach any final recommendations.

Conclusion

The result of this study has confirmed that the *Ipomoea carnea* have explored the potential biopesticide and plant protecting activity against cut worm, *Spodoptera litura*.

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