

STUDY ON BIOPESTICIDAL ACTIVITY OF *IPOMEA CARNEA* *JATROPHA CURCAS* AND *CALOTROPIS GIGANTEA* AGAINST LEAF FOLDER (*Cnaphalocrosis medinalis*)**X.Agnello.J.Naveen*¹, C.Deepa, K.K.Kavitha and M.Jegadeesan****Department of Environmental and Herbal sciences,****Tamil University, Tanjavur-10*****Corresponding Author Email: agnello.naveen18@gmail.com****ABSTRACT**

The present study is aimed at identifying pest management potentials of certain locally available non-economical weed plants namely *Ipomea carnea* and *Jatropha curcas* commonly found in waste lands. Pest resurgence, pesticide residue on the produce and a widespread increase in the development of insecticide resistance are inherent contraindications associated with chemical toxicants. The above weed plants were studied for their antifeedant efficiency against rice pest namely the Leaf folder (*Cnaphalocrosis medinalis*). 50% Ethanolic extract of aerial parts of *I.carnea* was used for Pesticidal (anti-feedant) activity. 500 and 1000 ppm of the extract was found to 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. *Ipomea carnea* weed plant will go a long way as local resource base-non- chemical tool in the integrated pest management in rice crop.

KEY WORDS

Ipomea carnea, paddy, leaf folder, and antifeedant efficiency

INTRODUCTION

Agricultural production in India has not been rising as expected since 1989, inspite of pesticide consumption increasing at 12% per annum. One single pest, *Cnaphalocrocis medinalis* (Heliothis) is responsible for around 15% of these lose. As per the opinion of various experts, this situation has been caused by indiscriminate use of chemical pesticides which has resulted in development of alarming resistance in pests to pesticides. Apart from this, there is resurgence of minor pests and thus many of them have become major pests. Rejections of Indian agricultural exports by western countries are more than Rs. 1000 crores per annum. This is mainly because of very high pesticides residue contents in them. Among the various insect and pests damaging paddy crop, the leaf folder, *Cnaphalocrocis medinalis* Guen. (Family-Pyrrautidae, Order-Lepidoptera) is one

of the most regular pests of paddy in middle Gujarat region. Earlier the pest was considered as minor, but now it has assumed the status of major pest in Gujarat. Patel *et al.* (1986) estimated the losses caused by paddy leaf folder to grain and straw was 63.34 and 7.60 % respectively in Gujarat. It causes heavy losses at the early earing stage, medium at tillering stage and low at the milky seed stage (Pandya *et al.* 1994).

Over dependence on chemical pesticides has led to replacement of most of the natural enemies of insect pests leading to development of biological vacuum in the existing rice ecosystems. Pest resurgence, pesticide residue on the produce and a widespread increase in the development of insecticide resistance are other inherent contradictions associated with chemical toxicants (Mehrotra, 1989; Reddy and Singh, 1998) *Ipomea*

carnea is a native of South America and available in all states of India due to its adaptation to the Indian climate condition. *Ipomea carnea* is an exotic weed in Chattisghara, India and few decades back it was introduced as Green Mannure Crop. This non woody plant can grow in temperate and tropical climatic condition. It is frequently found in plains and low lands near water sources. It belongs to convolvulaceae. (Vishali *et al.* 2009) With the above background the present work was undertaken with a view to screen locally available and unutilized or underutilized medicinal plants against a common crop pest. The pest leaf folder, is a major pest attacking rice field, *Ipomea carnea*, *Jatropha curcas*,

MATERIALS AND METHODS

Fresh aerial parts of *Ipomea carnea* were collected and dried in shade for 4 days and then powdered. Extracts of aerial parts of *Ipomea carnea* was prepared by the method of Ramakrishnan and Mohandas (1996).

The test insects used were the rice leaf folder *Cnaphalocrocis medinalis* Guen. Used in the studies Plant species explored for insect control properties were the common weed. Some herbaceous plants are collected from surrounding Thanjavur area for the study. Plant names are *Ipomea carnea*, *Jatropha curcas*, *Calotropis gigantea*. The herbage were shade dried for about two weeks, made into powder using electrical blender and used for solvent extraction or stored in airtight thick polythene bag under refrigeration. A 200 mesh metal sieve was used to obtain fine powder of the plant material.

Preparation of solvent extract

The solvent used were based on elute of different polarities from three plant can be fractionated in different solvents. Solvents used were alcohol and water. The powdered herbage (83 g) was extracted in by soaking method. Powder was soaked in 500ml of solvent for 12 h in an airtight container. After 12 h, the solvent was drained filtered through a filter paper. The individual fractions were evaporated to dryness using vacuum evaporator. The resulted solvent residue was weighted and diluted in 100ml emulsified aqueous medium to obtain test concentrations of 1000, 500, and 100 ppm.

Bioassay

(i) Antifeedant and growth regulatory effect against rice leaf folder

The antifeedant effect of extracts was studied by 'leaf dip assay'. Fresh paddy leaves measuring 15 cm length were dipped in the test tube (100,500 and 1000 ppm) and after 10 min shade drying the leaves was arranged in Petri dish (25 cm dia). Freshness of the treated leaves was maintained by placing wet cotton swab on the cut ends and by placing a 25 cm dia. moist tissue paper on the basal plate. In each petridish a total of five treated leaves with one leaf folder larva each petridish a total of five treated leaves with one leaf folder larva each were taken. There were two replication for each treatment. After 24 h exposure the individual leaves were removed and the areas were fed by the caterpillar was measured by using graph method.

The growth regulating effect of the extract was assessed by larvae to feed on freshly treated leaves (100 ppm) for 48 h in two replications. After the experimental period the larvae were transferred to untreated leaves and reared continuously till pupation and subsequent adult emergence. Growth regulatory effect was monitored by taking observations such as larval mortality at 24 h, for this purpose pre-starved fourth larvae were released on leaf treated with 100 ppm of the extract Extent of leaf damage on 24 h and 48 h exposure was also recorded

Step 1: Antifeedance efficiency (AE): antifeedance efficiency of a particular treatment is based on area fed in the untreated situation. It is the percent area protected over control in respect of a particular treatment and was computed by subtracting the percent area protected over control from 100.

$$\text{Percent protection over control} = \frac{\text{Area fed in a particular treatment}}{\text{Area fed in control}}$$

RESULT AND DISCUSSION

The Antifeedant activity of *I. carnea* *J. curcas* and *C. gigantea*

The antifeedant effect of *I. carnea* *J. curcas* and *C. gigantea* was observed and tabulated in Table- 1. The measured leaf area feed by leaf folder was

comparatively higher in water extract of *C. gigantea*. Lower value of leaf area in *J. curcas* and *I. carnea* was observed in playing higher Antifeedant activity. In control, the observed leaf area feed by the leaf folder was above 500% than that in all other treated leaves of *I. carnea*, *J. curcas* and *C. gigantea*.

All concentrations of 100% EtOH, (1000ppm, 500ppm, 100ppm) extract of *I. carnea* treated rice leaves were not at all Feed by the larvae. Rice leaf folder feeding leaf area was 0.160, 0.376 and 0.457mm² respectively (1000ppm, 500ppm, 100ppm) on 50% of EtOH extract of *I. carnea*. In water extract (1000ppm, 500ppm, 100ppm) leaf area fed by folder was 0.715, 0.580 and 1.910 respectively. Antifeedant activity of the three extracts of *I. carnea* was in the following order 100% EtOH > 50% EtOH > water extract. Maximum Antifeedant activity was observed on 1000ppm concentration.

In *J. curcas* 100% EtOH, extracts (1000ppm and 500ppm concentrations) of *J. curcas* treated leaves were not at all feed by the larvae. Rice leaf folder feeding leaf area was 0.093 mm² on 100% EtOH extract of (100 ppm concentration) *J. curcas*. The leaf area feed by the leaf folder was 0.0953, 0.145 and 0.198 mm² respectively on 50% EtOH extract of *J. curcas* in all the three test concentrations. The leaf area feed by the leaf folder was 1.060, 1.076, and 0.093 respectively on water extract of *J. curcas* (1000ppm, 500ppm and 100ppm).

All concentrations of 100% EtOH, (1000ppm, 500ppm, 100ppm) extract of *C. gigantea* treated leaves were fed by the leaf folder was measured and shown in (Fig.1) Rice leaf folder feeding leaf area was 0.560, 0.615 and 0.930 mm² respectively on 50% ETOH extract of *C. gigantea* (1000ppm 500ppm and 100ppm). In water extract of all three concentration leaf area feed by the leaf folder was 1.560, 1.715 and 1.945 mm² respectively.

The effect of *I. carnea* solvent extracts on growth and development of *C. medinalis*

The effect of *I. carnea* solvent extracts on growth and development of *C. medinalis* was observed in Table-10. The mortality percentage on exposure (hr) in 100% EtOH extract of *I. carnea* was 100% mortality observed in 12 hr in all the three test concentrations. In 50% EtOH extract of *I. Carnea* was 100% (1000ppm), 5% (500ppm) and 18% (100ppm) on

12 hr. 95% (500ppm) on 24 hr. In water extract of *I. Carnea* the mortality was observed on 24. Mortality observed after pupa formation (48 hr) in control.

The mortality percentage on exposure (hrs) in 100% EtOH extracts of *J. curcas* in all the three concentrations (1000ppm 500ppm and 100ppm) was noted in Table-11. The observed mortality % was 20 (1000ppm), 12 (500ppm) and 8 (100ppm) on 12 hrs. In water extract of *J. curcas* the mortality was observed on 24. The effect of *C. gigantea* solvent extracts on growth and development of *C. medinalis* was observed and tabulated in Table-12. The mortality % of 100% EtOH extract of *C. gigantea* in 1000 ppm was higher than in 100 ppm on 12 hr. In water extract the mortality was noted after pupa formation.

Among the three different solvent extracts screened, 100% EtOH extract gave maximum antifeedant efficiency. In EtOH extract 1000 ppm concentration was most effective. A protein inhibitor and poisonous compound, Swainsnine was isolated from *I. carnea* (Yagita and Saksela, 1990). This compound together with bitter alkaloid would be essential for antifeedant activity against rice leaf folder. Antimicrobial activity of metal complexes prepared from the leaf proteins of *I. carnea* were reported (Hueza et al, 2003). In the view of the above facts, leaves of *I. carnea* have been examined for fatty compounds composition. The mortality percentage on exposure (hr) shows the plant *I. carnea*, have lower mortality percentage of exposure. Further isolation, identification and purification of compounds responsible for antifeedant activity against rice leaf folder need to be studied further. The various properties of weed plants should be studied, from the result can be increased the antifeedant activity of the plant materials as pesticides. Combination of two or more plant materials has good Pesticidal activity.

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Plate 6: control (active feeding)



Plate 7: Rice leaves treated with extract of *I. carnea* 100% EtOH (100ppm)
Leaf folder - 100% Mortality (12 hrs)



Plate:-8 Rice leaves treated with extract of *J. curcas* 100% EtOH (1000ppm)
Leaf folder - 100% Mortality (12 hrs.)



Plate:- 9 Rice leaves treated with extract of *C gigantea* 100% EtOH at 1000ppm.
Leaf folder - 100% Mortality (12 hrs.)



Plate:-10 Rice leaves treated with Water extract of *I carnea* at 1000ppm,
Leaf folder - Mortality (48 hrs)



Plate:- 11 Rice leaves treated with Water extract of *J. curcas*
Leaf folder - Mortality (48 hrs)



Plate-1: control paddy (leaves active feeding -*Cnaphalocrocis medinalis*)



Plate:-2Rice leaves treated with Water extract of *I. carnea* at 1000ppm,
Leaf folder - Mortality (48 hrs)

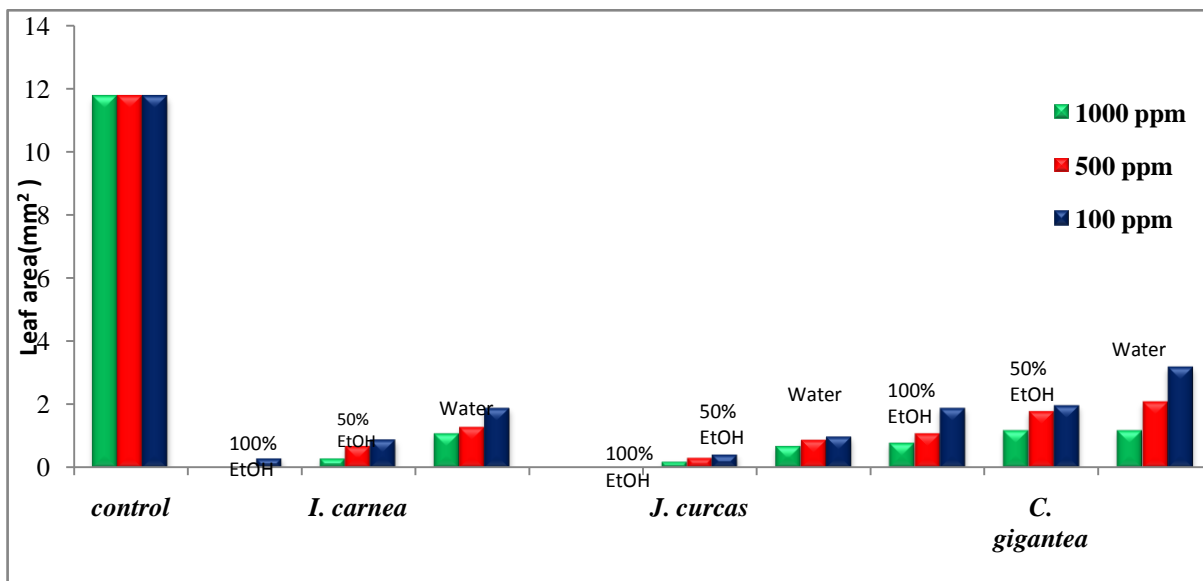


Fig.1 Antifeedant effect of *I. carnea*, *J. Curcas* and *C.gigantea* on Rice Leaf Folder *C.medinalis*- (Leaf area fed (mm²)).

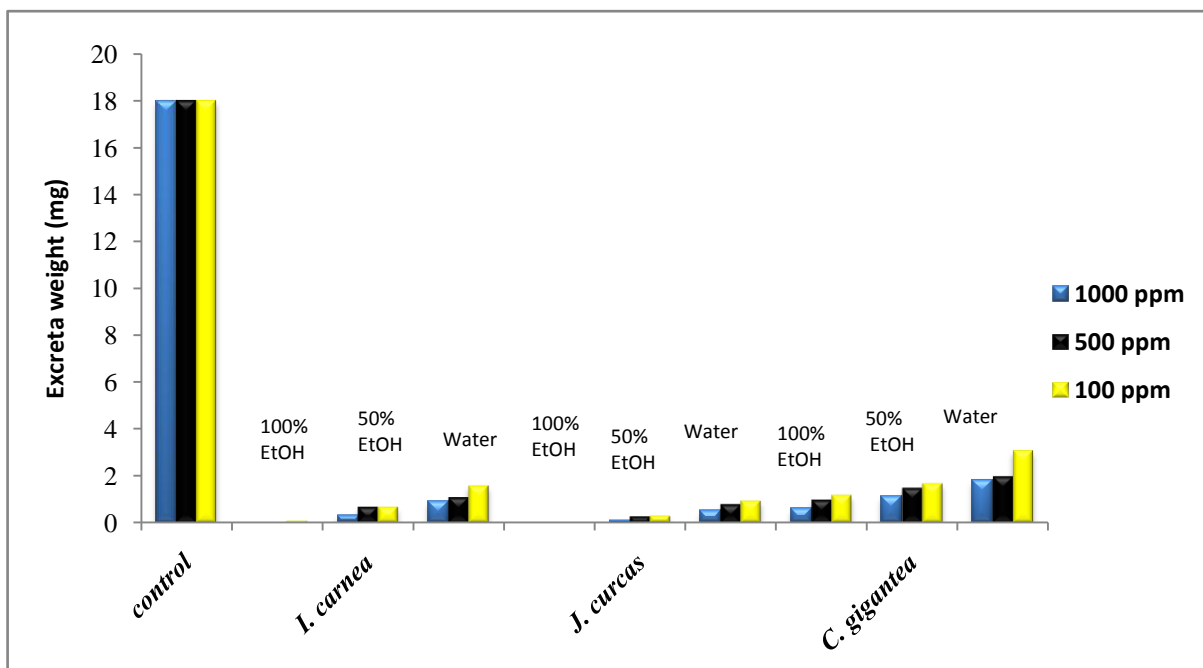


Fig -2: Excreta Weight (mg)

TABLE 1. Antifeedant effect of *I. carnea*, *J. curcas* and *C. gigantea* on Rice Leaf Folder *C.medinalis*.

Plant Species	Solvent	Area Feed (mm ²)		
		1000ppm	500ppm	100ppm
<i>I. carnea</i>	100% EtOH	–	–	–
	50% EtOH	0.160	0.376	0.457
	water	0.715	0.580	1.910
<i>J. curcus</i>	100% EtOH	–	–	0.093
	50% EtOH	0.095	0.145	0.198
	water	1.025	1.095	1.146
<i>C. gigantea</i>	100% EtOH	0.060	0.076	0.093
	50% EtOH	0.560	0.615	0.930
	water	1.560	1.715	1.945
Control	11.75			

TABLE 2 Effect of *I. carnea* solvent extracts on growth and development of *C.medinalis*

Plant Name	Solvent		Mortality percentage on exposure(hours)				
			Hours			Pupa formation (%)	
			12 hr	24 hr	48 hr	No of pupa formed	Death at pupation
<i>I.carnea</i>	100% EtOH	1000ppm	100%			–	–
		500ppm					
		100ppm					
	50% EtOH	1000ppm	100%			–	–
		500ppm	5%	95%			
		100ppm	18%	82%		–	–
	water	1000ppm		6%	94%	–	–
		500ppm		12%	88%	–	–
		100ppm		5%	94%	–	–
Control					100%		

TABLE- 3. Effect of *J. curcas* solvent extracts on growth and development of *C.medinalis*

Plant Name	Solvent		Mortality Percentage on exposure(hours)				
			Hours			Pupa formation (%)	
			12 hr	24 hr	48 hr	No of pupa formed	Death at pupation
<i>J. curcas</i>	100% EtOH	1000ppm	100%			–	–
		500 ppm					
		100 ppm					
	50% EtOH	1000ppm	20%	80%		–	–
		500 ppm	28%	72%			
		100 ppm	8%	92%			
	water	1000ppm		22%	78%	–	–
		500 ppm		20%	80%	–	–
		100 ppm		16%	84%	–	–
Control					100%	–	

TABLE-4. Effect of *C. gigantea* solvent extracts on growth and development of *C. medinalis*

Plant name.	solvent		Mortality Percentage on exposure(hours)				
			Hours			Pupa formation (%)	
			12 hr	24 hr	48 hr	No of pupa formed	Death at pupation
<i>C.gigantea</i>	100% EtOH	1000ppm	100%			–	–
		500 ppm	90%	10%			
		100ppm	22%	78%			
	50% EtOH	1000 ppm	20%	80%		–	–
		500 ppm	12%	88%			
		100ppm	8%	92%			
	water	1000 ppm			100%	–	–
		500ppm				100%	
		100 ppm				100%	
Control					100%	–	



***Corresponding Author:**
E-mail: agnello.naveen18@gmail.com