

Effect of *Eclipta alba* on loss of fecundity and phagodeterancy of *Callosobruchus maculatus* (FAB.)

R.K. Diwan and R.C. Saxena

Received on : 10-12-2008

Revised on : 12-01-2009

Accepted on : 25-02-2009

Abstract

Eclipta alba, which is herbaceous plant, has shown phagodeterant activity, equally good as insect sterilitant. Three different concentrations of the plant extract in petroleum ether and acetone showed loss in fecundity and fertility in *Callosobruchus maculatus*, a serious stored pest of green gram. The detail phytochemistry of chemosterilant is still in progress.

Keywords:- *Callosobruchus maculatus*, *Eclipta alba*, Fecundity, Fertility, Plant extract

Introduction

Bruchus are the most important stored grain pest of pulses which causes loss to the national economy, also impaired the quality of the seeds. Several workers have reported phagodeterant, repellent and insecticidal activity of plant extract. Prominent among them are, Rathore and Sharma (2002), Jha (2008) Manohar and Yadav (1990), Baby (1994) and Dwivedi and Bhati (2006). Pulses, which are essential constituents of human diet, suffered severely from the stored grain pest *Callosobruchus maculatus*. The present paper reports the loss of fecundity and fertility caused by the extract of *Eclipta alba* to the *Callosobruchus maculatus*.

Materials and Method

Rearing of bruchus:- The initial culture of experimental insect *Callosobruchus maculatus* was obtained from laboratory stock. The insect were reared in the pre-sterilized jars containing disinfected green gram seeds in a glass jar (15.5 x 10.5 cm) under controlled conditions (Temp. $26 \pm 1^\circ\text{C}$ and Rh60 \pm 5%) in the insectary at pest control research laboratory, Vidisha.

Author's Address

Pest Control and Ayurvedic Drug Research Laboratory S.S. L. Jain P.G. College, Vidisha (M.P.)



Experimental design:- For this experiment, the newly emerged adult female beetles were separated and 1 μ l dose of the extract was applied topically to them. They were released in the petri dishes containing 20 gm. treated seeds. Untreated males of the same age in 1:1 ratio were introduced into the same petridishes for observing mating behavior. The oviposition, rate of egg laying (Fecundity) and percent of hatching (Fertility) rates were observed. Parallel controls were maintained throughout the course of experiment. Visual observations were noticed on the behavioral responses of bruchus due to the effect of plant extracts as well as laboratory cultured normal ones. All the experiments were conducted in the insectary maintained at ad libitum.

Plant material:- *Eclipta alba*, which is commonly known as 'Bhangra' grows plentifully in the moist places throughout India. This is medicinal plant, which is used as purgative, hepatoprotective and against liver and spleen enlargement. The plant was collected locally; shed dried and powdered material was Soxhlet extracted in petroleum ether and acetone. Purification and characterization of the crude extract was done using column chromatography and TLC techniques. Three different concentration of the plant extract were used against 10 pairs of adult bruchus in glass jar tied with muslin cloth.

Results and Discussion

The present study recorded the effect of petroleum ether and acetone extract of *Eclipta alba* on the fecundity and fertility of *Callosobruchus maculatus* for this experiment newly emerged adult beetles were separated and 1µl of each concentration is applied topically and then they were released in the glass jars containing 20 gm. seeds of green gram, i.e. *Phaseolus mungo*. Untreated males of the same age in 1:1 ratio were introduced in the same jars. Oviposition, egg laying (fecundity and percentage of hatching (fertility)) was observed and the results are shown in Table 1. From the results, it is quite clear that 1.5% concentration caused complete loss in fecundity and fertility to beetle extract of *Eclipta alba* against *Callosobruchus maculatus*. In other two concentrations, a dose dependent loss in fecundity and fertility was noticed that egg laid by the females succeeded in hatching out in adult stage. However, effect on subsequent metamorphosis was not observed.

Plant extract have shown promising results on variety of insects. The plant extracts species specific may act as insecticidal, growth inhibitor, anti-ovipositional and phagodeterrent. The present paper reports, the loss in fecundity and fertility of *Callosobruchus maculatus* adult beetle when treated with three different doses of petroleum ether and acetone of *Eclipta alba* the plant material was focus quite effectively at five concentrations. The finding of present study is quite comparable with that of Sangappa(1977) reported, the protection of red gram seed against *Callosobruchus chinensis* by several vegetable oils. Saxena and Yadav (1983) have studied the effect of extract of the lowers of *Delonix regia* on the reproduction of *Triboleum castaneum* and concluded that the suppresses fecundity and fertility of *Triboleum castaneum*. This is agreement with results of *S. indicus* extract when tested against LC₅₀ concentration resulted in complete inhibition in fecundity and fertility of

Callosobruchus chinensis and *Callosobruchus maculatus*.

Table 1: Effect of *Eclipta alba* extracts on fecundity and fertility of *Callosobruchus maculatus*

Concentration %	Name of extract					
	Petroleum ether			Acetone		
	Average no. of egg laid	% of hatching	GI	Average no. of egg laid	% of hatching	GI
5	21	82.53	3.05	18	82.14	3.04
1	9	71.42	2.64	9	77.77	2.88
1.5	-	-	-	-	-	-
Control	98	98.71	3.65	98	98.71	3.65

Note: 10 paired of adult beetles were taken in each treated group. Results are the average of three replicates.

Similarly, Chander and Ahmed (1986), studied the efficacy of oils from medicinal plants as protectants of green gram against pulse beetles *Callosobruchus chinensis* and opined that oils of *Acorus calamus*, *Curcuma amada* at 0.25 and 0.5 ml/Kg. Significantly, reduced the expected adult emergence. Oils of *Carum copticum*, *Nigetta sativa* and *Bassia longifolia* had no effect on the adult emergence. Chellayan and Karnavar(1990), observed the influence of neem kernel extract against *Trogoderma gramurum* and stated that the extract caused reduction in fecundity and fertility at 10-100µg concentration. Similarly, Dixit and Saxena(1990a,b) observed that plant extract of *Adhatoda vasica* and *Azadirachta indica* inhibited the fecundity and fertility of *Callosobruchus maculatus*.

Acknowledgement

Authors are thankful to the Dept. of Higher Education Govt. of M.P. One of the authors R.C.Saxena expresses thanks to the U.G.C. Regional Office, Bhopal, for financial assistance as minor research project.



References

- Baby, J.K., 1994. Repellant and phagodeterrent activity of *Sphaeranthus indicus* extract against *Callosobruchus Chinensis*. *Proceeding of the 6th International working conference on stored product protection*, 2: 746-748.
- Chander, H. and Ahmed, S.M., 1986. Efficacy of oils from medicinal plants as protectant of green gram against the pulse beetle *Callosobruchus Chinensis*. *Entomon.*, 11: 21-28.
- Chellayan, S. and Karanvar, G.K., 1990. Inhibition of ovarian development by neem kernel extract in *Trogode granarnum*. *J. Anim. Morphol Physiol.*, 37(1&2): 109-112.
- Dixit, O.P. and Saxena, R.C., 1990b. Antiovipositional effect of *Adhatoda vasica* leaf extract against two species of *Callosobruchus chinensis* Geobias *News Reports* 9: 76-77.
- Dixit, O.P. and Saxena, R.C., 1990a. Insecticidal activities of *Premina Integrefolia* against *Callosobruchus chinensis*. (Coleoptera Bruchidae). *Pesticides*, 24(1): 29-31.
- Dwivedi, S.C. and Bhati, Padam Chand, 2006. Antifeedent properties of four-plant extract against pulse beetle *Callosobruchus chinensis* (L.). *National Journal of life Science*, 3(2): 159-162.
- Jha, A.N., Shrivastava, Chitra and Mishra S.K., 2008. Weight loss in cowpea cultivars to *Callosobruchus maculatus* (FAB.) in storage conditions. *Indian Journal of Entomology*, 70(2): 181-183.
- Manohar, O.S. and Yadav, S.R.S., 1990. Laboratory observation on relative resistance and susceptibility of some cowpea cultivars to pulse beetle, *Callosobruchus maculatus* Fab. (Col.Bruchidae) *Indian journal of Entomology*, 52(2): 180-186.
- Rathore, Y.S. and Sharma, V., 2002. Management of bruchid infestation in pulses. In *proceeding of pulses for sustainable Agriculture and National Security* (eds. Masood Ali, S.K. Chaturvedi and S.N. Guha) Indian Society of pulses research and development. Indian Institute of Pulses Research, Kanpur, Uttar Pradesh. pp: 136.
- Sangappa, H.K., 1977. Effectiveness of the oils as surface protectants against the bruchids, *Callosobruchus chinensis* L. infestation on red gram. *Mysore J. Agri. Science*, 11: 391-397.
- Saxena, S.C. and Yadav, R.S., 1983. Efficacy of new indigenous plant extract as disruptor of insects reproduction and growth. *Proc. Int. Con. Nat. Prod. Regulator Inse. Repro. Growth* R.R.L. Jammu (India): 37.

