Research Article

EFFICACY OF SOME PLANT EXTRACTS AGAINST EPILACHNA BEETLE (*Henosepilachna vigintioctopunctata* (F) (COLEOPTERA: COCCINELLIDAE)

S.N. Das[1*], Soumyesh Mandal[2] and M.L. Chatterjee[3]
[1],[2]Agricultural Training Centre/ State Agricultural Management and Extension Training Institute, Ramakrishna Mission Ashrama, Narendrapur, Kolkata, West Bengal– 700 103, INDIA
[3]School of Crop Protection, College of PGS, Central Agricultural University, Meghalaya- 793103, INDIA
**Corresponding author's E-mail: sourenks@gmail.com*

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ABSTRACT
In a laboratory experiment, six plant products were evaluated for their toxicity to control the effect of adult epilachna beetle on brinjal. Among them, parashi showed lowest LC_{50} value (0.34109), followed by oleander (0.34610), ramtulshi (0.35135), neem (0.48600), marigold (0.73190) and custard apple (0.79220) after 120 hours of treatment. The order of relative toxicity was found in the following way: parashi > oleander> ramtulsi> neem> marigold> custard apple.

INTRODUCTION

Naturally available plant products may play an important role to replace or minimize the excessive use of pesticides as they constitute a rich source of bioactive components (Wink, 1993). A number of plant products or botanicals with a series of important properties such as insecticidal, antifeedent, repellent, growth inhibitory, chitin synthesis and environmental friendly nature etc attracted the attention of researchers in the direction of pest control programme (Swaminathan *et al.*, 2010, Ghosh and Chakraborty, 2012). People are used to burn dried leaves of eucalyptus in rural areas to keep away the mosquitoes. As these easily biodegradable botanicals possess more than one active component, there will be less chance of development of resistance. In the present investigation six different types of plant products were evaluated in the laboratory for their toxicity to control the effect of epilachna beetle (*Henosepilachna vigintioctopunctata)* in brinjal.

MATERIALS AND METHODS

To develop environment friendly pest control system, six plants *i.e.* custard apple, oleander, parashi, neem, ramtulsi and marigold which have reference in the literature and being used traditionally by common folk, were selected. Among them, *Cleistanthus collinus* (common name: parashi) widely found by the road side and ponds in Bankura and Purulia districts of West Bengal has shown significant medical importance.

Oleander (*Nerium indicum* L.) popularly known as Kalke, which has white or yellow flower, is an evergreen shrub with milky juice. It is an ornamental plant with medicinal value cultivated in gardens and homes. The other four plant species along with oleander used in the trials were collected from the medicinal garden of Ramakrishna Mission Ashrama, Narendrapur, Kolkata-700 103, West Bengal.

Preparation of the extract

The leaves of six different plant species collected from two sources (Bankura and Narendrapur) were dried under shade at room temperature and powdered by using a mixer grinder. About 50 gms of crushed powder derived from each plant species were put in a conical flask filled with 100 ml methanol. It was kept for two days and was regularly shaken for extraction of the toxicants of the leaves in methanol solution. After 48 hours, the extracts were decanted out and were dried in vacuum desiccators. The dried extract was scrapped out with the help of a sharp blade and weighed. About

0.125, 0.25, 0.50, 0.75 and 1.0 gm of scrapped dried materials were dissolved in each 100 ml of water to get the desired concentrations of extracts of 0.125%, 0.25%, 0.50%, 0.75% and 1.0% respectively.

Rearing of a epilachna beetle

The adult epilachna beetles were collected from the brinjal field of Agricultural Training Centre, Ramakrishna Mission Ashrama. The adults were reared in laboratory at the temperature range of 28 ± 2 °C and at 70-75 % relative humidity for bioassay study.

Insect bio assay

To evaluate the insecticidal activity, the herbal extracts having the above mentioned concentration, were topically applied on fresh brinjal leaves in the petri dishes (9 cm diameter) along with epilachna beetle. One millilitre (ml) each of plant extracts having five different concentrations (0.125, 0.25, 0.50, 0.75 and 1.0 %) were sprayed with the help of a micropipette syringe. After 24 hours of treatment, untreated fresh leaves were supplied to the larvae to feed them everyday up to 120 hours. Each treatment was replicated four times for every plant extract. One control experiment for each test was set without spraying of plant extracts (only water) to assess natural mortality.

Moribund insects were taken as dead insects. The mortality data were analysed by Probit analysis originally designed by Finney (1971) using MSTAT statistical package programme. Before analysis, mortality data were corrected by Abbots (1925) formula as the following

Percentage of corrected mortality

$$= \frac{\text{Observed mortality} - \text{Control mortality}}{100 - \text{Control mortality}} \times 100$$

RESULTS AND DISCUSSION

The results of the Probit analysis for the estimation of LC_{50}, with their fiducial limits, heterogeneity , regression equation, relative toxicity and order of relative toxicity at 120 hours after treatment on adult epilachna of six plant extracts are presented in Table -1. From the table and Fig 1, it is observed that Parashi and Custard apple recorded lowest (0.34109) and highest (0.79220) LC_{50} values and also showed highest and lowest relative toxicity. The Chi-square values of different plant extracts after 120 hours of treatment were significantly different at 5% level of probability.

The values of relative toxicity of different plant extracts have been calculated by taking the highest LC_{50} of plant extracts as unity. Among the plant extracts tested Parashi showed lowest LC_{50} value (0.34109) followed by Oleander (0.34610), Ramtulsi (0.35135), Neem (0.48600), Marigold (0.73190) and Custard apple (0.79220) against epilachna beetle. The order of relative toxicity of six plant extracts were Parashi> Nerium> Ramtulsi> Neem> Marigold> Custard apple.

From the above Probit results, it was clear that all the tested plants were more or less effective for controlling epilachna beetle but Parashi was the most effective one. Prakash and Rao (1997) indicated the larval mortality of Coleopteran Sawtooth grain beetle (*Oryzaephilus surinamensis* L.) using the extract of *Cleistanthus collinus* (Karada) in methanol @ 20 ml/100 g. It showed the same results with the leave extracts of parashi in the present investigation.

Saxena and Sharma (2005) carried out an experiment on insecticidal activity of *Nerium indicum* leaves extracts against first instar of *Henosepilachna vigintioctopunctata*. Mondal and Ghatak (2007) also reported that the use of aqueous seed extracts of *Annona squamosa* (5ml/L), *Azadirachta indica* (6ml/L) reduced population build up of *Henosepilachna vigintioctopunctata* infesting cucumber up to 53.24% and 41.67% . Those results had shown similar findings and confirmed the insecticidal activity of the plant along with the findings of others studies conducted in the past to establish the effectiveness of Neem, Oleander and Custard apple plant extracts against various coleopteran beetle (Bhargava and Meena, 2000 and Upasani *et al*., 2003).

The effect of plant extracts of Ramtulsi and Marigold against epilachna beetle could not be compared with others as enough study was not made with these plants. However, it was quite apparent that Ramtulsi and Marigold plant extracts had shown good insecticidal properties and maintain third and fifth position with respect to relative toxicity among the test plant products.

CONCLUSIONS

The findings of the present investigation indicate that six botanical derivatives might be useful as insect control agents. Among them Parashi and Oleander were comparatively more potent in reducing adult epilachna beetle. Moreover, the technology of application of plant extracts against epilachna may easily be accepted and adopted by the farmers if effective techniques are standardized. The traditional use of aqueous extracts of plant products will be highly effective against insect pests to minimize the severe damage caused by them.

Table 1. Estimated LC_{50} value, fiducial limit, regression equation , heterogeneity (χ^2) and order of relative toxicity for the methanolic extracts of six plant species at 120 HAT

Plant Extracts	Heterogeneity (χ^2)	Regression equation	LC_{50}	Fiducial limit	Relative toxicity	Order of Relative toxicity
Neem	1.099	Y = 5.18432 X + 1.62460	0.48600	0.42537 0.53687	1.63004	4
Oleander	10.314	Y = 3.23482 X + 1.4905	0.34610	0.00486 0.55927	2.28893	2
Ramtulsi	2.675	Y = 3.79713 X + 1.72489	0.35135	0.25536 0.42422	2.25473	3
Parashi	4.768	Y = 2.89792 X + 0.71577	0.34109	0.46817 0.65257	2.32255	1
Custard apple	17.824	Y = 3.23451 X + 0.32722	0.79220	0.30697 1.14950	1.00000	6
Marigold	6.198	Y = 4.06394 X + 0.55085	0.73190	0.54452 0.89370	1.08238	5

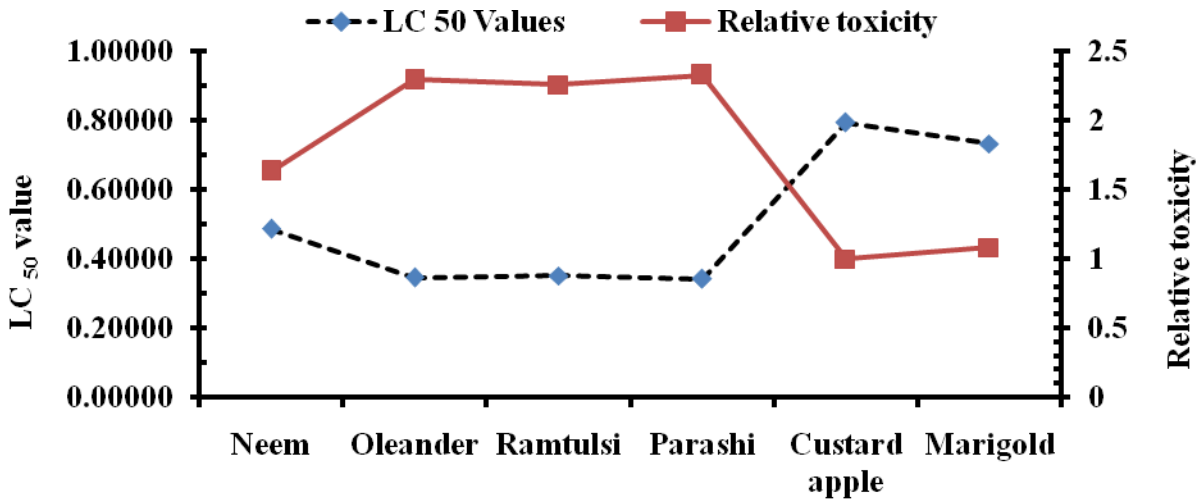

Fig-1: LC_{50} values and relative toxicity of six plant extracts at 120 HAT

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