Asian Journal of Agriculture & Life Sciences Vol. 2(3), July 2017:36-39

Website: www.crsdindia.com/ajals.html e-ISSN: 2455-6149

ORIGINAL ARTICLE

Effectiveness of *Plumbago zeylanica* Extracts Against Shisham Defoliator- *Plecoptera reflexa* (Lepidoptera: Noctuidae)

K.P. Singh[1], M. Faisal[2] and Mohd. Yousuf[1]

[1] Entomology Division, Forest Research Institute, Dehradun (UK)- 248006

[2] Advance Institute of Science & Technology, Selaqui, Dehradun (UK)- 248011

Email: singhkp@icfre.org

Received: 10th Feb. 2017, Revised: 19th April 2017, Accepted: 21st April 2017

ABSTRACT

Plecoptera reflexa (Lepidoptera: Noctuidae) is a serious defoliator of shisham. Two extracts, PZM and PZA were found effective for the control of shisham defoliator, out of four extracts (PZPE, PZA, PZM and PZW) of Plumbago zeylanica. Bioassay experiments of effective extracts were carried out using 0.0625, 0.125, 0.25, 0.50, 1.00, 1.50 and 2.00% concentrations. PZM and PZA provided 66.67±0.69 and 63.33±0.75% larval mortality at 2.00% concentration after 72 hrs of exposure against the 3rd instar larvae of P. reflexa.

Key words: *Plecoptera reflexa, Plumbago zeylanica, Delbergia sissoo, Noctuidae*

INTRODUCTION

The genus *Dalbergia* includes over hundred species, out of these, 27 species are represented in India. The most common species is *Dalbergia sissoo* Roxb (Shisham). It is extensively cultivated throughout India (Troup, 1921). The heartwood is extremely durable, and is very resistant to termites. Sissoo wood makes excellent cabinet, furniture, veneers timbers and charcoal for heating and cooking. Leaves and young shoots of sissoo are an important winter fodder. The insect species associated with this tree species belonging to various category include 64 defoliators, 39 borers of living trees, freshly felled and stored timbers, 24 sap suckers, 11 root feeders, 7 bark feeding insect and 10 flower, fruit and seed insects. Out of these, *Plecoptera reflexa* is one of the important defoliator cause severe havoc to the plants and appears in outbreaks (Beeson, 1941). In northern India, both defoliators are controlled by unlimited use of insecticides leading to several health and environmental hazards. These insecticides are not target specific, broad spectrum and develop resistance to insecticides.With a greater awareness of hazards associated with the use of synthetic organic insecticides, there has been an urgent need to explore suitable alternative products for pest control. Therefore, the present work was initiated to study the effectiveness of different extracts of *Plumbago zeylanica* for the control of shisham and poplar defoliators.

MATERIAL AND METHODS

SURVEY, COLLECTION AND REARING OF INSECT:

Field surveys of Barkot, Lachhiwala, Jhajra, Kalsi ranges of Dehradun Forest Division; Chhichrauli and Yamunanagar (Haryana); Bahadrabad, Biharigarh (Haridwar) and FRI campus Dehradun were conducted for the collection of different stages of shisham defoliator- *P. reflexa*. Mature and immature stages of the defoliator were collected in the morning hours in plastic containers, open end covered with muslin cloth tied with rubber band. The collected stages of defoliators brought from the field in the laboratory for rearing and to maintain the laboratory culture for lay down a series of experiments. Larvae of *P. reflexa* were reared in glass and wooden cages with fresh leaves of shisham. The emerged moths of *P. reflexa* were released in wooden glass cages (60x60x90 cm) having fresh foliage of shisham for egg laying.

COLLECTION OF PLANTS MATERIAL:

Leaves of *P. zeylanica* were collected in an around Dehradun. The collected leaves were allowed to air dry under shed at room temperature. The dried leaves ground to powder in grinder for extraction in different selected solvents.

ISOLATION OF EXTRACTS:

Extraction of 780 g powdered plant material of *P. zeylanica* was carried out in the Chemistry Division, FRI using soxlet apparatus. Plant material of *P. zeylanica* was extracted in petroleum ether, acetone, methanol and water sequentially. The moisture free yield percentage obtained 1.7, 2.5, 5.9 and 16.5% in different solvents respectively. The extracted extracts were PZPE, PZA, PZM and PZW.

PZPE mean leaves of *P. zeylanica* extracted in petroleum ether.
PZA mean leaves of *P. zeylanica* extracted in acetone
PZM mean leaves of *P. zeylanica* extracted in methanol
PZW mean leaves of *P. zeylanica* extracted in water

TESTING OF ISOLATED EXTRACTS:

Experiments were carried out to evaluate the larval mortality of different extracts -PZPE, PZA, PZM and PZW on the 3rd instar larvae of *P. reflexa* at 1% concentration. Twenty numbers of larvae of *P. reflexa* were taken from the culture and released in glass jars with fresh leaves of shisham treated with 1% of above extracts. Observations on the mortality of larvae were recorded after 24, 48 and 72 hrs of exposure. The moribund larvae were considered as dead. The percent mortality of larvae was calculated by using the formula:

$$\text{Percent mortality} = \frac{\text{No. of larvae dead}}{\text{No. of larvae released}} \times 100$$

RESULTS AND DISCUSSION

Observation recorded in Table 1 showed that there was no larval mortality of *P. reflexa* at 1% concentration of PZPE extract, after 24 hrs. After 48 hrs the mortality status was increased to 13.33±2.58% which remained the same after 72 hrs of observation. PZPE extract provided less mortality as compared to LC50 hence taken as not effective. There was no larval mortality in control. 1% concentration of extract PZA caused 46.67±1.83% larval mortality of *P. reflexa* after 24 hrs and no further mortality occurred after 48 hrs. After 72 hrs the mortality status was 53.33±0.82%. The average larval mortality after 72 hrs was 53.33±0.82% and considered as effective extract. There was no larval mortality in control. 1% concentration of extract, PZM caused 60% larval mortality of *P. reflexa* after 24 hrs.of exposure. No further mortality occurred after 48 and 72 hrs. After 72 hrs the mortality status was 60.00% and considered as effective extract. No larval mortality occurred in control. 1% concentration of PZW extract showed no larval mortality of *P. reflexa* all through the course of observation after 72 hrs. There was no larval mortality in control.

Table 1: Larval Mortality of *P. reflexa* at 1% Concentration of *P. zeylanica* Extracts

Chemical Extract		Mortality after			Effective or not effective
		24 hrs	48 hrs	72 hrs	
PZPE	Avg.	0.00	13.33	13.33	Not effective
	SEM±	0.00	2.58	2.58	
	Control	0.00	0.00	0.00	
PZA	Avg.	46.67	46.67	53.33	effective
	SEM±	1.83	1.83	0.82	
	Control	0.00	0.00	0.00	
PZM	Avg.	60.00	60.00	60.00	effective
	SEM±	0.00	0.00	0.00	
	Control	0.00	0.00	0.00	
PZW	Avg.	0.00	0.00	0.00	Not effective
	SEM±	0.00	0.00	0.00	
	Control	0.00	0.00	0.00	

Table 2: Bioassay of effective extracts of *P. zeylanica* against larvae of *P. reflexa* after 72 hrs

Effective Extracts		Doses percentage						
		0.0625	0.125	0.25	0.50	1.00	1.50	2.00
PZA	Avg.	0.00	3.33	13.33	33.33	53.33	56.67	63.33
	SEM±	0.00	0.00	1.83	0.91	0.75	0.82	0.75
	Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PZM	Avg.	0.00	6.67	16.67	36.67	60.00	63.33	66.67
	SEM±	0.00	1.83	1.29	0.91	0.00	0.75	0.69
	Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Fig. 1-4: (**1).** Collected Leaves of *P. zeylanica* (**2).** Collection of Mature & Immature Stages of Shisham Defoliator (**3).** Rearing of *P. reflexa* **(4).** Exposure of Different Concentrations of Extracts

It was also observed that out of four extracts only two extracts PZA and PZM were found effective for the control of larvae of *P. reflexa* after 72 hrs of exposure, therefore, the bioassay of these effective extracts was carried out under laboratory condition. Bioassay observations in Table 2 showed that PZA and PZM extracts at 0.0625, 0.125, 0.25 and 0.50% caused less larval mortality in *P. reflexa* after 72 hrs as compared to LC50. At 1% concentration PZA extract caused 53.33±0.750% larval mortality of *P. reflexa* after 72 hrs. At 1.5% concentration 56.67±0.82 % larval mortality of *P. reflexa* was observed after 72 hrs of exposure. At 2% concentration the mortality status of larvae of *P. reflexa* was 63.33±0.75%. There was no larval mortality in control. In case of PZM extract, 1% concentration provided 60.00% larval mortality of *P. reflexa* after 72 hrs of exposure. 1.5% concentration of PZM extract caused 63.33±0.75% larval mortality of *P. reflexa*. 2.00% concentration of PZM extract caused 66.67±0.69% larval mortality of *P. reflexa* after 72 hrs of exposure. There was no larval mortality in control. It was also concluded that PZM at 2%

concentration after 72 hrs provided maximum larval mortality (66.67±0.69%) and considered the most effective extract for the control of larvae of *P. reflexa*. Similar type of work was carried out by various workers. Gupta and Joshi, 1995 tested seed extracts of neem and *Pongamia pinnata*, leaf extracts of *Aloe vera, Annona squamosa, Calotropis* and *Vitex negundo* for their feeding inhibition properties against the leaf defoliators of Shisham, Bamboo, Teak and *Ailanthus indica.* Extracts of *Aloe vera*, *Azadirachta indica* (neem), seed extracts of *A. indica* and *P. pinnata* were found to be effective against above defoliators. Bhandari, *et. al.* 1988 observed that methanol extractives of neem seed found effective against poplar defoliator, *P. cupreata* for their antifeedant activity. Ahmad, *et. al.* (1991) recorded that extract of *Acorus calamus*, *Lantana camara* var. *aculeata, Adhatoda vesica* and *Melia azedarach* were effective in killing of *Ailanthus* web worm, *Atteva fabriciella.* Meshram, (2000) tested crude extracts fresh leaves of 14 plants against larvae of *Dalbergia sissoo* to evaluate their antifeedent and insecticidal activity and it was observed that *Melia azadarach* followed by *Eucalyptus hybrid* and *Pongamia pinnata* were found effective in decreasing order to control the damage due to larvae of *Plecoptera reflexa*.

REFERENCES

1. Ahmad M., Gupta B.K. and Bhandari R.S. (1991); Efficacy of some plant extracts against *Ailanthus* Webworm, *Atteva fabriciella*. Ind. Journal of Forestry, 14(1): 5-7.
2. Beeson C.F.C. (1941): The ecology and control of the forest insects in India and neighbouring countries. Govt. of India. Publ. 767 pp.
3. Bhandari R.S., Lal J., Ayyar K.S. and Singh P. (1988): Effect of neem seed extractives on poplar defoliator *Pygaera cupreata* in Laboratory. Indian Forester, 114(11): 790-795.
4. Gupta B.N. and Joshi K.C. (1995): Evaluation of some biopesticides against forest insect pests. Journal of Tropical Forestry, 11(1): 51-57.
5. Meshram P.B. (2000): Antifeedant and insecticide activity of some medicinal plant extracts against *Dalbergia sissoo* defoliator *Plecoptera reflexa* Guenee (Lepidoptera: Noctuidae). Indian Forester, 126(9): 961-965.
6. Troup R.S. (1921): *The Silviculture of Indian Trees*. Vol. IV Leguminosae. Manager of Govt. of India Press. Nasik, Controller of Publication, Delhi (Revised Edition, 1983) 342 pp.