Stage specific vulnerability of the laboratory populations of *Lipaphis erysimi* (kaltenbach) to some convential insecticides

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Abstract

Insect susceptibility is inversely proportional to the physiological state of the tested individuals. The present study investigates the instar differences in insecticide receptiveness of *Lipaphis ersimi* (Kaltenbach) populations. The results indicate an increased vulnerability of latter instars as comparison to earlier ones. These results show the disagreement to past studies. The reasons for this vagueness are also explained.

Introduction

The mustard aphid, *Lipaphis erysimi*, is a major insect pest in *Brassica* crops across northern India and the adjoining states (Prasad, 1988; Singh & Sachan, 1995). Nymphs and adults principally feed on tender shoots, but they can also feed on other parts except old stems. Occasional feeding on older leaves was also noticed.

The potential for a population of Lipaphis erysimi to build up in mustard may be greater that expected if crop behind schedule. The use of insecticides in management of *Lipaphis elysimi* could be an adequate measure to reduce the impacts of this insect. The purpose of our study was to determine the controlling potential of different conventional insecticides.

Materials and Methods

Bioassays were conducted with 1st, 2nd, 3rd and 4th instar nymphs of *Lipaphis elysimi* to determine whether or not the insect vulnerability to different insecticides varies with nymphal age. Lipaphis erysimi was reared using the technique described by Sumati (1985). Before experimentation, nymphs were maintained on fresh pod in an incubator at 22±1 ^{0}C temperature, 60% r. h. and a photoperiod of 12L: 12D. first instars were used immediately after fresh laying. The bioassay procedure described below was the same for each instar tested.

Stock solutions of insecticides were made by using micropipette. In the present bioassay, seven concentrations were tested, each concentration being 1: 1 0 of the preceding one (Bushvine, 1971), along with an untreated control. All solutions were made in doubled distilled water. The final solutions was then poured into 5 Petri-dishes (12.5×1.5 cm) corresponding to each concentration and control, with the help of atomizer. Once the solution was dried, 10 nymphs of Lipaphis erysimi was placed in each Petri-dish, which was closed with a lid. Insect were incubated at 22± 1 °c temperature, 60% r. h. and 12L: 120 photoperiod. Three bioassay replicates were made on 3 consecutive days and these tests were repeated over 5 populations. Larval mortality was evaluated after 72 hours. LC_{50} values were determined using pro bit analysis.

During statistical analysis, one instar was considered as one treatment. Each treatment had three replications and LC_{50} data recorded above were subjected to complete randomized block design.

Results

The bioassay results demonstrate that all the insecticide under investigation was found toxic to Lipaphis erysimi. Nymphs that are died from the uptake of insecticides were degenerated with the time, and had not showed any activity on slight touch since two hours of their introduction into the contaminated Petri dishes. These observations were similar for each instar tested. In contrast, control nymph developed normally and exhibited low mortality rates (Table1).

Discussion

The LC50 values for each instar were consistent among different populations signifying that the population of Lipaphis erysimi was homogeneous in its response to different insecticides during the experimental period. Also, the dissimilarity in response of all larvar instars of *Lipaphis erysimi* to test insecticides under investigation, as revealed by LC_{50} values and slopes, demonstrated that larval age have strong influence on insect susceptibility. This is contrast with Beegle et al. (1981) and Trudel et al. (1997) who observed no significant differences between LC_{50} values for various instars of *Trichoplusia ni* (Hubner) and *Dioryctria abietivorella* (Grote), respectively. It is well documented in toxicological literature that insect susceptibility decreased (LC_{50} increased) in later stages of developments but in contrast to this, in the present investigation we found an increase in susceptibility. This exaggeration in defenselessness may be because of increase in possibility of exposure in later stage individuals that have an increase in movement and surface area exposed in later instars. Our experiment revealed the toxicity pattern at constant temperature, but field studies are necessary to validate these concluding bioassay results.

Conclusion

The results indicated that an increased vulnerability of latter instars as comparison to earlier ones. These results show the disagreement to past studies.

Table l: Toxicity of different insecticides to various life-stages of *Lipapltis erysimi.*

Insecticide	Life stage	Number	Mortality in control	Slope		LC_{50} value mg [a.i.]/ liter	
				Mean	Significance	Mean	Significance
Malathion	1st Instar	210	0	0.588	**CD**	8.70	**CD**
	2nd Instar	210	0	0.589	0.264	6.88	I.] 8
	3rd Instar	210	0	0.477	**Sem**	4.56	**Sem**
	4th Instar	210	0	0.568	0.084	3.15	0.38
Adult (Apterae)		210	0	0.508		1.49	
Oichlorvos	1st Instar	210	0	0.500	**CD**	8.33	CD
	2nd Instar	210	0	0.482	0.272	6.51	1.35
	3rd Instar	210	0	0.518	**Sem**	5.16	**Sem**
	4th Instar	210	0	0.610	0.865	4.21	0.43
Adult (Apterae)		210	0	0.573		1.50	
Endosulfan	1st Instar	210	0	0.482	**CD**	48.90	CD
	2nd Instar	210	0	0.724	0.311	32.22	8.54
	3rd Instar	210	0	0.575	**Sem**	24.25	**Sem**
	4th Instar	210	0	0.627	0.099	15.35	2.71
Adult (Apterae)		210	0	0.601			
Chlorpyriphos	1st Instar	210	0	0.614	**CD**	7.34	**CD**
	2nd Instar	210	0	0.440	0.182	3.23	1.48
	3rd Instar	210	0	0.509	**Sem**	2.61	**Sem**
	4th Instar	210	0	0.487	0.058	1.87	0.47
Adult (Apterae)		210	0	0.530		1.54	

LC_{50} values of the various insecticides are presented in Table 1. Highly significant difference was observed for LC_{50} values among different instars with same insecticide. There were no significant differences for slopes between different instars tested.

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