OnLine Journal of Biological Sciences 2 (10): 679-681, 2002
ISSN 1608-4127

Effectiveness of Three Chemical Insecticides in Controlling Epilachna Beetle, *Epilachna dodecastigma* Muls

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Abstract: The effectiveness of different concentrations of rison 60 EC (0.12, 0.20, 0.24%), decis 2.5 EC (0.0125, 0.025, 0.05%) and sunsulfan 20 EC (0.08, 0.10 and 0.15%) were tested on the mortality (%) of different larval instars and adult of *Epilachna dodecastigma* Muls. under the laboratory conditions. Thirty days old ribbed gourd, *Luffa acutangula* (L.) plant was used as the experimental crop. Among three chemical insecticides decis showed the highest toxicity which was followed by sunsulfan and rison. The concentration levels of 0.05% decis, 0.15% sunsulfan and 0.24% rison were the most effective against different stages of larvae and adults of *Epilachna dodecastigma*.

Key words: Chemical insecticides, mortality, *Epilachna dodecastigma*

Introduction

Epilachna beetle, *Epilachna dodecastigma* Muls. is fairly common in Bangladesh and causes a serious damage to vegetable crops specially curcurbits. Infestation period of this insect pest varies from season to season but the peak is generally found in July to August. Both larvae and adults are injurious and feed on the lower epidermal tissues of the leaves by scraping.

Incase of severe infestation the plants completely dry up. Growth and development of the plants are greatly impaired and final yield is markedly reduced (Alam, 1969, Rajagopal and Trivedi, 1989). In a vegetable field pests are usually controlled through cultural, mechanical, biological and chemical methods. Indiscriminate and frequent use of insecticides in the vegetable crops has resulted many side effects and limitations specially development of pest resistance, environmental contamination, residual effects to the consumer, destruction of beneficial insects etc. (Metcalf and Luckmann, 1978). Although at present, the emphasis of pest control is on the minimum use of chemical insecticides and maximum use of other regulatory mechanism, despite that chemical control is still a very common practice to the farmers in the developing countries like Bangladesh because of its quick and obvious action (Saeed *et al.*, 1998; Mall *et al.*, 1998; Gupta and Dorga, 1996). On the other hand the ever-increasing development of modern insecticides has contributed to a great extent in controlling many important insect pests. The use of insecticides could be more effective when selection of chemicals, doses, methods and time of application are properly followed. So this study was undertaken to determine the effectiveness of three chemical insecticides with three doses against *E. dodecastigma*.

Materials and Methods

To evaluate the effectiveness of three chemical insecticides on Epilachna beetle, *Epilachna dodecastigma* Muls., experiments were conducted in the Laboratory of Department of Entomology, Bangladesh Agricultural University, Mymensingh, during June to September, 2001. The experiment was laid out in completely randomized design (CRD).

Ribbed gourd plant, *Luffa acutangula* (L.) was used as the experimental crop. Seedlings of ribbed gourd were grown in the polythene bag and 30 days aged seedlings were used for experimental work. In order to meet the supply of the test insect i.e. *Epilachna dodecastigma*, a large number of larvae and adults were reared in the laboratory. Fresh and healthy ribbed gourd leaves were supplied to the insects regularly as food. As experimental specifications, following three chemical insecticides were tested with three doses;

Rison 60 EC (Diazinon) @ 0.12, 0.20 and 0.24%
Decis 2.5 EC (Deltamethrin) @ 0.0125, 0.025 and 0.05%
Sunsulfan 20 EC (Carbosulfan) @ 0.08, 0.10 and 0.15%

Among them rison and decis belonged organophosphorus and sunsulfan was organocarbomate group.

To evaluate the effectiveness of rison, decis and sunsulfan at their designated doses, 30 days aged ribbed gourd plants with insects (larvae or adult) were caged (one seedling in one cage) and sprayed separately with different doses of insecticides using hand sprayer. During application of insecticides care was taken to avoid spray drift on adjacent cage and the whole plant was thoroughly covered by spray solution. After spraying of each insecticide the sprayer was washed and cleaned properly. Before each application, the sprayer was calibrated in order to maintain the proper dose without wastage of insecticides. Control treatment was done side by side for each instar separately. Data on the larval and adult mortality (%) were recorded after 12, 24, 48 and 72 h after spraying by using the following formula:

$$\text{Mortality (\%)} = \frac{\text{Dead insect}}{\text{Total number of insect per cage}} \times 100$$

The data were analyzed using analysis of variance (ANOVA). The significance of difference between doses were determined using LSD (Gomez and Gomez, 1984).

Results and Discussion

Effect of rison on the mortality (%) of different larval instars of *E. dodecastigma*: It was observed that there was a significant difference in effectiveness of different concentrations of rison 60 EC at all the time intervals. Result indicates that the lowest mortality occurred from 0.12% and the highest from 0.24% (Table 1). Larval mortality proportionally increased with the increase of level of concentration and time after spraying. The increase of larval mortality due to the application of increased level of concentration might be associated with the larval immaturity i.e. lack of larval resistance against insecticides. The findings of these studies are almost similar with the findings of Surjeet *et al.* (1998). Results clearly showed that there was no significant difference between the concentration of 0.20 and 0.24% for controlling the different instars of epilachna beetle. So, the use of concentration of 0.20% could be intelligent and judicious decision because of high pest mortality, less cost involvement and environmental hazard.

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Table 1: Mortality (%) of first , second, third and fourth instar larvae of *E. dodecastigma* sprayed with different concentration of rison 60 EC

	Mortality (%) at different hours after spraying															
	First instar larva				Second instar larva				Third instar larva				Fourth instar larva			
Conc. (%)	12	24	48	72	12	24	48	72	12	24	48	72	12	24	48	72
0.12	27.01b	68.89b	75.55b	82.01b	24.01a	50.01b	62.17b	70.12b	22.17b	35.55b	42.22b	65.01b	17.12b	25.51b	35.0b	53.01b
0.20	36.18a	82.22a	91.11a	96.0 a	34.27b	65.57a	75.12a	85.17a	26.19a	55.11a	64.11a	75.21a	28.01a	44.01a	57.01a	67.17a
0.24	40.14a	84.42a	93.33a	99.01a	40.19c	70.25a	80.01a	90.18a	35.01a	60.0a	71.01a	80.12a	30.17a	48.17a	62.19a	75.01a
Level of significance	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01
LSD	4.90	7.70	8.90	5.19	5.01	6.14	7.12	6.95	4.90	7.70	8.19	6.11	4.01	6.13	6.01	9.12

Table 2: Mortality (%) of adult of *E. dodecastigma* sprayed with different concentration of rison 60 EC

	Mortality (%) at different hours after spraying			
Concentration (%)	**12**	**24**	**48**	**72**
0.12	**14.12b**	**24.45b**	**33.11b**	**50.19b**
0.20	**25.17a**	**40.22a**	**53.33a**	**62.12a**
0.24	**28.12a**	**48.01a**	**60.22a**	**70.01a**
Level of significance	**0.05**	**0.01**	**0.01**	**0.01**
LSD	**4.01**	**9.12**	**8.80**	**9.12**

Table 3. Mortality (%) of first , second, third and fourth instar larvae of *E. dodecastigma* sprayed with different concentration of decis 2.5 EC

	Mortality (%) at different hours after spraying															
	First instar larva				Second instar larva				Third instar larva				Fourth instar larva			
Conc. (%)	12	24	48	72	12	24	48	72	12	24	48	72	12	24	48	72
0.0125	25.18b	60.15b	75.55b	80.12b	20.19c	50.17b	65.12b	72.17b	15.11b	34.17b	38.19b	40.19b	11.01b	21.14b	30.10b	b
0.025	27.13b	63.17b	79.15b	84.89b	23.13b	54.14b	68.12b	75.01b	17.22b	36.10b	42.17b	44.49b	13.45b	24.45b	33.21b	38.49b
0.05	33.01a	82.22a	90.01a	95.50a	30.12a	70.14a	80.12a	85.15a	27.17a	48.12a	65.19a	72.17a	19.78a	32.12a	46.79a	60.41a
Level of significance	0.05	0.05	0.05	0.05	0.05	0.01	0.05	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01
LSD	4.01	5.81	6.14	5.89	4.01	6.17	5.95	6.80	4.56	5.85	6.57	8.81	4.67	5.79	5.89	7.70

Table 4: Mortality (%) of adult of *E. dodecastigma* sprayed with different concentration of decis 2.5 EC

	Mortality (%) at different hours after spraying			
Concentration (%)	**12**	**24**	**48**	**72**
0.0125	**14.12b**	**24.45b**	**33.11b**	**50.19b**
0.025	**25.17a**	**40.22a**	**53.33a**	**62.12a**
0.05	**28.12a**	**48.01a**	**60.22a**	**70.01a**
Level of significance	**0.05**	**0.01**	**0.01**	**0.01**
LSD	**4.01**	**9.12**	**8.80**	**9.12**

Table 5: Mortality (%) of first , second, third and fourth instar larvae of *E. dodecastigma* sprayed with different concentration of sunsulfan 20 EC

	Mortality (%) at different hours after spraying															
	First instar larva				Second instar larva				Third instar larva				Fourth instar larva			
Conc. (%)	12	24	48	72	12	24	48	72	12	24	48	72	12	24	48	72
0.08	35.01b	45.12b	73.31b	82.34b	28.45b	55.45b	65.45b	75.01b	25.12b	41.15b	57.13b	65.47b	20.12b	34.08b	50.11b	59.45b
0.10	37.17b	48.76b	76.49b	85.54b	31.45b	59.45b	68.74b	79.14b	28.15b	44.78b	60.12b	68.12b	22.75b	39.70b	53.50b	61.98b
0.15	55.51a	71.41a	90.12a	95.54a	40.12a	70.14a	80.15a	88.74a	38.12a	60.12a	71.84a	75.01a	31.18a	52.47a	65.40a	71.01a
Level of significance	0.05	0.05	0.05	0.05	0.05	0.01	0.05	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01
LSD	3.65	4.41	5.55	6.54	4.01	5.43	7.77	7.98	3.89	4.79	5.70	7.78	4.31	5.48	6.69	4.12

Table 6: Mortality (%) of adult of *E. dodecastigma* sprayed with different concentration of sunsulfan 20 EC

	Mortality (%) at different hours after spraying			
Concentration (%)	**12**	**24**	**48**	**72**
0.08	**13.01b**	**26.67b**	**33.33b**	**42.12b**
0.10	**15.15b**	**30.15b**	**37.15b**	**45.15b**
0.15	**25.45a**	**48.84a**	**60.15a**	**74.49a**
Level of significance	**0.05**	**0.01**	**0.01**	**0.01**
LSD	**3.65**	**5.55**	**6.47**	**5.19**

Means in a column followed by different letter (s) are significantly different

Effect of rison on the mortality (%) of adult *E. dodecastigma:* Mortality percentage of adult epilachna beetle was significantly influenced by different concentrations of rison. From Table 2 it is clear that mortality percentage increased with the increase of level of concentrations. Among three doses the concentration 0.24% was the most effective although 0.20 and 0.24% were statistically similar. As there are no statistical difference between the concentrations 0.20 and 0.24%, so the use of concentration level 0.20% will be more judicious and intelligent. It is also revealed that the mortality percentage proportionally decreased up to adult which might be associated with the insect maturity. These findings are in close agreement with the findings of Mall *et al.* (1998).

Effect of decis on the mortality (%) of different larval instars of *E. dodecastigma:* A significant effect of different concentrations of decis was found on the mortality of different larval instars of *E. dodecastigma* (Table 3). It is revealed that larval mortality increased with increasing level of concentrations and hours after spraying. The present findings also showed that the concentration 0.0125 and 0.025% did not differ significantly from the standpoint of larval mortality but 0.05% differed significantly from the rest two doses. These findings are closely related with the findings of Mohasin and De (1994). So these findings suggested that treatment concentration 0.05% will be more effective for controlling the Epilachna beetle.

Effect of decis on the mortality (%) of adult *E. dodecastigma*: Results showed that the mortality of adult Epilachna beetle was significantly influenced by different level of concentration of decis (Table 4). These studies also revealed that the concentration 0.0125 and 0.025% had same statistical effectivity on the mortality percentage but the concentration 0.05% differed significantly from the rest two doses. The adult mortality was relatively less than different instar of larvae. It might be associated with high resistance of the adult. These findings are not similar with the findings of Thomas and Jacob (1994). They found that there are no significant difference among the concentration 0.0125, 0.025 and 0.05%.

Effect of sunsulfan on the mortality of different larval instars of *E. dodecastigma:* Different concentrations of sunsulfan exerted a significant effect on the mortality percentage of different larval instars of Epilachna beetle (Table 5). It was revealed that the concentration 0.15% had the highest mortality percentage and the concentrations 0.08 and 0.1% were statistically same. The present studies also showed that mortality percentage gradually decreased with the increase of larval maturity and partially support the findings of Singh *et al.* (1994).

Effect of sunsulfan on the mortality of adult *E. dodecastigma*: The highest mortality was recorded from the concentration level 0.15% and the lowest from 0.08% which was statistically similar with 0.1%. It is revealed that the mortality percentage increased with the increase of concentration level. The increase of mortality percentage due to the application of increased level of sunsulfan might be associated with the stimulating effect of higher toxicity. These findings are closely associated with the findings of Reddy (1994).

From the above experimental results it is clear that the different concentration of chemical insecticides has a great effect on the mortality of *E. dodecastigma*. The low doses will not be effective against mortality and the high doses will create a many environmental hazards and also increase the cultivation cost. So finally it could be suggested that rison 60 EC at the concentration of 0.24%, decis 2.5 EC at the concentration of 0.05% and sulsunfan 20 EC at the concentration of 0.15% were the most effective and judicious doses in controlling *E. dodecastigma*.

References

Alam, M.Z., 1969. Insect pests of vegetable and their control in East Pakistan. Agril. Inf. Serv. Department of Agriculture, R.K. Mission Road, Dhaka, Bangladesh, pp: 149 .

Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedures of Agricultural Research. 2nd edn. John Wiley and Sons, New York, pp: 680.

Gupta, P.R. and G.S. Dorga, 1996. Sensitivity of stages of development of *Epilachna dodecastigma* Fab. to topical application of diflubenzuron and penfluron. Rev. Agril. Entomol., 84: 151.

Mall, N.P., R.S. Pandey and S.K. Singh, 1998. Evaluation of insecticides emulsion and dust formulations for suckings and leaf feeding pests on brinjal. Rev. Agril. Entomol., 86: 305-306.

Metcalf, R.L. and W.H. Luckmann, 1978. Introduction to Insect Pest Management. John Wiley and Sons, New York., pp: 235-273.

Mohasin, M.D. and B.K. De, 1994. Effect of insecticides in controlling *Hensoepilachna vigintioctopunctata* Fab. (Coleoptra: Coccinellidae) on potato in the plains of west Bengal. Entomol. Abst., 25: 111.

Rajagopal, D. and T.P. Trivedi, 1989. Status of bioecology and management of Epilachna beetle, *Epilachna vigintioctopunctata* Fab. (Coleoptera: Coccinellidae) on potato in India. Tropic. Pest Manage., 35: 410-413.

Reddy, A.V., 1994. Evaluation of certain new insecticides against the foliar insect pest bittergourd (*Momordica charantia*). Rev. Agril. Entomol., 84: 265.

Saeed, M.Q., M. Shahid and H. Gul, 1998. Efficacy of different insecticides against *Epilachna* sp. and their most preferred host plants. Rev. Agril. Entomol., 86: 101.

Singh, A.K., S. Sharma and S. Enteshamuddin, 1994. Effect of Diazinon, Malathion and B.H.C. on body protein and amino acids of *Epilachna dodecastigma* Fab. (Coleoptera: coccinellidae) adults. Entomol. Abs., 25: 48.

Surjeet, K., K. Jitende, S. Kumar and J. Kumar, 1998. Baselin data for malathion and endosulfan against Epilachna beetle in H.P. Himachal. J. Agril. Res., 22: 51-57.

Thomas, C. and B. Jacob, 1994. Bioefficacy of carbofuran against the epilachna beetle, *Hensoepilachna* 28-*punctata* Fab. infesting bittergourd (*Momordica charantia* L.) under field and laboratory conditions, Indian J. Entomol., 53: 435-441.