Journal of Entomology and Zoology Studies
Available online at www.entomoljournal.com
JEZS Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(6): 541-543

Received: 04-09-2017
Accepted: 05-10-2017

Atanu Seni
Orissa University of Agriculture and Technology, AICRIP, RRTTS, Chiplima, Sambalpur, Odisha, India

Bhima Sen Naik
Orissa University of Agriculture and Technology, AICRIP, RRTTS, Chiplima, Sambalpur, Odisha, India

Correspondence
Atanu Seni
Orissa University of Agriculture and Technology, AICRIP, RRTTS, Chiplima-768025, Sambalpur, Odisha, India.

Bio-efficacy of some insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) (Hemiptera: Aphididae)

Atanu Seni and Bhima Sen Naik

Abstract
Laboratory bioassay of eight insecticides namely Chlorpyriphos 20 EC, Ethiprole+ imidacloprid 80 WG, Pymetrozine 50 WP, Lamda cyhalothrin 4.9 CS, Imidacloprid 30.5 SC, Acephate 95 SG, Thiacloprid 240 SC and Fipronil 5 SC was conducted in the Regional Research and Technology Transfer Station (OUAT), Chiplima, Odisha against mustard aphid, *Lipaphis erysimi* (Kalt.) using leaf dip method in Feb-March, 2016. Among insecticides, chlorpyriphos 20 EC was the most toxic (LD_{50} 5.38 ppm) followed by imidacloprid 30.5 SC (LD_{50} 22.14 ppm), ethiprole+ imidacloprid 80 WG (LD_{50} 22.94 ppm), thiacloprid 240 SC (LD_{50} 27.17 ppm), pymetrozine 50 WP (LD_{50} 25.59 ppm), Lamda cyhalothrin 4.9 CS (LD_{50} 31.34 ppm), acephate 95 SG (LD_{50} 111.22 ppm), fipronil 5 SC (LD_{50} 234.15 ppm).

Keywords: Bioassay, chlorpyriphos 20 EC, insecticides, LD_{50}, mustard aphid

1. Introduction

Rapeseed-mustard is the third important oilseed crop in the world after soybean (*Glycine max*) and palm (*Elaeis guineensis* Jacq.) oil [6]. Among the different edible oilseed cultivated in India, rapeseed- mustard (*Brassica* spp.) contributes 28.6% in the total production of oilseeds. In India, it is the second most important edible oilseed after groundnut sharing 27.8% in the India's oilseed economy [6]. India contributes 28.3% in world acreage and 19.8% in world production. India produces around 6.7 mt of rapeseed-mustard next to China (11-12 mt) and EU (10–13 mt) with significant contribution in world rapeseed-mustard industry [6]. But its production is hampering by infestation of many insect pests. Nearly 38 insect pests are known to be associated with rapeseed-mustard crop at different stages in India [3]. Among them mustard aphid, *Lipaphis erysimi* (Kalt.) is the key pest in all the mustard growing regions of the country. Nymphs and adults of the mustard aphid suck cell sap from the leaves, inflorescences and immature pods resulting into poor yield. It is also found that they prefer flowers to leaves for feeding [15]. Large colonies can cause the plants to become deformed and the leaves curled, shriveled and yellowed [8]. They also produce a large amount of honey dew which facilitates the growth of the fungus that makes the leaves and pods dirty appearance [1]. *Lipaphis erysimi* causes 35.4 to 96 % yield loss, 30.9 per cent seed weight loss and 2.75 per cent oil loss [2, 3, 12, 14]. Mustard aphids have the capability to increase their population and spread rapidly within very short span of time in favourable environmental condition. For this, other control measures except chemical control is time consuming [12]. So, chemical control is the last resort to check the aphid population within short period of time. Keeping in view, the present study was aimed to evaluate the efficacy of certain new and conventional insecticides against this pest in order to monitoring insecticide resistance and to identify the potential molecules for developing proper management strategy against this pest.

2. Materials and Methods

The present experiment was conducted in the Regional Research and Technology Transfer Station (OUAT), Chiplima, Sambalpur, Odisha during February-March, 2016.

2.1 Source of the insecticides

Commercial formulations of Chlorpyriphos 20 EC (Sumitomo Chemical India Pvt. Ltd.), Ethiprole+ imidacloprid 80 WG (Bayer Crop Science Ltd), Pymetrozine 50 WP (Syngenta Korea Ltd.), Lamda cyhalothrin 4.9 CS (Safex Chemicals [India] Ltd.), Imidacloprid 30.5 SC

(Coromandel Agrico Pvt. Ltd.), Acephate 95 SG (Rallis India Ltd.), Thiacloprid 240 SC (Bayer India Ltd.) and Fipronil 5 SC (Makhteshim- Agan India Pvt. Ltd.) were obtained from respective principal manufactures. The proprietary products were used to prepare stock solution in distilled water from which further concentrations were prepared subsequently by serial dilution (six to eight different concentrations were used for bioassay). Each treatment including untreated control was replicated thrice.

2.2 Bioassay test
2.1.1 Leaf dip method
Laboratory bioassay was done by leaf dip method [9], unsprayed mustard leaves were taken and after washed in fresh water those leaf discs were dipped in the test solutions for 5 minutes with gentle agitation. Then they were placed on tissue papers for drying. On drying, these were placed in petri dish and petioles of the leaves were wrapped by water-soaked cotton. On each leaf disc, 20 aphids (3rd to 4th instar) taken from unsprayed mustard field were placed with a fine camel hair brush and the test containers were covered with lid.

2.1.2 Data analysis
The responses (mortality) of aphids were recorded after 24 hours post-exposure period. The mortality data were subjected to log-dose probit analysis to generate estimates of a lethal concentration. Probit analysis and lethal concentrations were calculated according to Finney's method by using Polo plus software. This type of bioassay provides an exposure that is more similar that the insects would experience under field conditions.

3. Results and Discussion
The LD_{50} value can be used to establish as baseline susceptibility of a target insect population(s). Among different tested insecticides, chlorpyriphos 20 EC was the most toxic with the lowest LD_{50} 5.38 ppm to mustard aphid, *L. erysimi* followed by imidacloprid 30.5 SC (LD_{50} 22.14 ppm), ethiprole+ imidacloprid 80 WG (LD_{50} 22.94 ppm), thiacloprid 240 SC (LD_{50} 27.17 ppm), pymetrozine 50 WP (LD_{50} 25.59 ppm), Lamda cyhalothrin 4.9 CS (LD_{50} 31.34 ppm), acephate 95 SG (LD_{50} 111.22 ppm), fipronil 5 SC (LD_{50} 234.15 ppm). Very few literatures on insecticide toxicity to mustard aphid are available in terms of median lethal dose. Gavkare *et al.*, [4] studied the relative toxicity of some insecticides to apterous adults of the green peach aphid, *Myzus persicae* (Sulzer) using leaf dip method of bioassay in Palampur, Himachal Pradesh and found that based on LC_{50} values, thiamethoxam 25 WG was observed to be the most toxic insecticide to the aphid with LC_{50} of 4.1 ppm followed by imidacloprid 17.8 SL (4.5 ppm), lambda cyhalothrin 5 EC (15.4 ppm), fipronil 5 SC (16.5 ppm), acetamiprid 20 SP (17 ppm) and malathion 50 EC (362.2 ppm). Nidhi *et al.*, [10] also studied the laboratory bioassay of six insecticides namely oxydemeton methyl, thiamethoxam, imidacloprid, acetamipirid, spiromesifen and chlorfenapyr was done against the green peach aphid, *M. persicae* on capsicum and found that imidacloprid was the most toxic (LC_{50} 8.87 ppm) followed by acetamiprid (10.72 ppm), chlorfenapyr (12.98 ppm), thiamethoxam (48.75 ppm), spiromesifen (87.10 ppm) and oxydemeton methyl (338.02 ppm). Sinha *et al.*, [16] found that chlorpyriphos 20 EC was very effective for controlling mustard aphid and giving the maximum yield. Mandal *et al.*, [7] studied the efficacy of different insecticides for the management of mustard aphid on rapeseed in field and found that chlorpyriphos 20 EC was most effective followed by chlorpyriphos+ cypermethrin 55 EC, thiamethoxam 25 WG and imidacloprid 17.8 SL for aphid management but highest yield was recorded from chlorpyriphos+cypermethrin followed by thiamethoxam, chlorpyriphos and imidacloprid treated plot. Kantipudi *et al.*, [5] reported that maximum control of mustard aphid was found with the application of thiamethoxam 25 WDG @100 g/ha followed by imidacloprid 17.8 SL @ 150 ml/ha in field. Patel *et al.*, [11] conducted a field study at Pantnagar (India) to determine the effectiveness of seven insecticides *viz*., quinalphos 25 EC, thiamethoxam 25 WG, malathion 50 EC, fenvalerate 20 EC, chlorpyrifos 20 EC, dimethoate 30 EC and imidacloprid 17.8 SL against mustard aphid and observed that thiamethoxam was the most effective among the seven insecticides showing the minimum numbers of *L. erysimi* followed by imidacloprid and dimethoate. Seni and Sahoo, [13] observed that after 24 hours, chlorpyriphos 20 EC (LC50 21 µl/l) and thiamethoxam 25 WG (LD50 44 mg/l) were the most toxic and Buprofezin 25 SC (LC50 1000 µl/l) was the least toxic among the insecticides tested in bioassay test of papaya mealybug, *Paracoccus marginatus*. The value of this data can be used in future for monitoring surveys or for the immediate purpose of comparing the current results to that of a previously determined LD_{50} to determine the susceptibility of the target insects has shifted or not. The LD_{50}s can also be used to examine seasonal changes in insecticide susceptibility or compare responses among species or insecticide [9].

4. Conclusion
Thus, the present study revealed that among all the tested chemicals chlorpyriphos 20 EC, imidacloprid 30.5 SC, ethiprole+ imidacloprid 80 WG, thiacloprid 240 SC, pymetrozine 50 WP and Lamda cyhalothrin 4.9 CS may be recommended for effective management of mustard aphid, *L. erysimi* in mustard crop and the value of LD_{50} of different insecticide against mustard aphid be used in future for monitoring of any resistance development in aphid population.

5. Acknowledgement
The authors are highly thankful to Orissa University of Agriculture and Technology, Bhubaneswar for financial assistance.

Table 1: Dosage mortality response and LD_{50} values of different insecticides for *L. erysimi* after 24 hours of exposure

Insecticide	Heterogeneity	Slope±SE	LD_{50} (ppm)	Fiducial limits	Relative toxicity
Chlorpyriphos 20 EC	0.02	1.797± 0.359	5.38	4- 8	43.52
Ethiprole+ imidacloprid 80 WG	0.25	4.568± 1.048	22.94	19- 30	10.21
Pymetrozine 50 WP	1.10	2.372± 0.413	25.59	13- 43	9.15
Lamdacyhalothrin 4.9 CS	0.36	2.160± 0.531	31.34	21- 72	7.47
Imidacloprid 30.5 SC	0.68	2.341± 0.415	22.14	16- 31	10.57
Acephate 95 SG	0.02	5.219± 1.415	111.22	91-153	2.10
Thiacloprid 240 SC	0.48	2.650±0.476	27.17	21- 37	8.62
Fipronil 5 SC	0.45	4.804± 1.027	234.15	191- 292	1

6. References

1. Awasthi VB. Introduction to General and Applied Entomology. Scientific publisher, Jodhpur (India), 2002, 266-71.
2. Bakhetia DRC, Arora R. Control of insect pests of toria, sarson and rai. Indian Farming. 1986; 36(4):41-44.
3. Bakhetia DRC, Sekhon BS. Insect pests and their management in rapeseed-mustard. Journal of Oilseeds Research. 1989; 6:269-73.
4. Gavkare O, Kumar S, Sharma N, Sharma PL. Evaluation of some novel insecticides against *Myzus persicae* (Sulzer). The Bioscan. 2013; 8(3):1119-1121.
5. Kantipudi RK, Sachan SK, Singh DV. Bio-efficacy of some new insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) and their effect on *Coccinellid* population in rapeseed mustard. Vegetos. 2013; 26(1):159-163.
6. Shekhawat K, Rathore SS, Premi OP, Kandpal BK, Chauhan JS. Advances in Agronomic Management of Indian Mustard (*Brassica juncea* (L.) Czernj. Cosson): An Overview. International Journal of Agronomy, 2012. Article ID 408284, pp- 14. doi:10.1155/2012/408284.
7. Mandal D, Bhowmik P, Chatterjee ML. Evaluation of new and conventional insecticides for the management of mustard aphid, *Lipaphis erysimi* Kalt. (Homoptera: Aphididae) on rapeseed (*Brassica juncea* L.). The Journal of Plant Protection Sciences. 2012; 4(2):37-42.
8. Metcalf RL. Destructive and Useful Insects Their Habits and Control. McGraw-Hill Book Company; New York, San Francisco, Toronto, London. 1962, 1087.
9. Miller AL, Tindall K, Leonard BR. Bioassays for Monitoring Insecticide Resistance. Journal of Visualized Experiments 2010; 46:e2129, doi:10.3791/2129.
10. Nidhi R, Rajpal S, Sharma PL. Evaluation of some insecticides against the green peach aphid, *Myzus persicae* (Sulzer) (Hemiptera: Aphididae). Indian Journal of Entomology. 2013; 75(2):113-17.
11. Patel S, Yadav SK, Singh CP. Bio-efficacy of insecticides against *Lipaphis erysimi* (Kalt.) in mustard ecosystem. Journal of Entomology and Zoology Studies. 2017; 5(2):1247-1250.
12. Sahoo SK. Incidence and management of mustard aphid (*Lipaphis erysimi* Kaltenbach) in West Bengal. The Journal of Plant Protection Sciences. 2012; 4(1):20-26.
13. Seni A, Sahoo AK. Efficacy of certain insecticides on papaya mealybug, *Paracoccus marginatus* Williams & Granara de Willink (Hemiptera: Pseudococcidae). Journal of Entomology and Zoology Studies. 2015; 3(4):14-17.
14. Singh PK, Premchand. Yield loss due to mustard aphid, *Lipaphis erysimi* (Kalt.) in Eastern Bihar Plateau. Journal of Applied Zoological Research. 1995; 6:97-100.
15. Singh SR, Narain A, Srivastava KP, Siddiqui JA. Fecundity of Mustard Aphid of Different Rapes and Mustard Species. Indian Oilseeds Journal. 1965; 9(3):215-219.
16. Sinha RP, Kumari K, Singh SN. Relative efficacy and persistence of toxicity of insecticides against mustard aphid. Indian Journal of Entomology. 2001; 63(2):186-91.