Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(3): 626-629

Received: 16-03-2017
Accepted: 17-04-2017

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# Efficacy of four different insecticides with different mode of action against canola aphid (*Lipaphis erysimi*) under field condition

**Saboor Ahmad, Asad Aftab, Muhammad Altaf Sabri, Ayesha Ghazal, Zia Ullah, Muhammad Irfan Ahmad, Hazrat Bilal, Muhammad Mohsin and Samina Iqbal Naz**

**Abstract**
The studies were conducted to determine the efficacy of four insecticides, imidacloprid (Confidor 200 SL) @ 150 ml/acre, acetamiprid (Mospilan 20 SP) @ 80g/acre, carbosulfan (Advantage 20 EC) @ 300 ml/acre and thiamethoxam (Actara 25 WP) @ 24g/acre with different mode of actions were tested against mustard aphid (*Lipaphis erysimi* Kalt.) in the field of canola crop at Entomological Research Area of University of Agriculture Faisalabad during 2013-14. The data was recorded pre and post (24 hrs, 48 hrs, 72 hrs and 1 week) treatment. Results showed that all the four insecticides, viz., imidacloprid (Confidor 200 SL) @ 150 ml/acre, acetamiprid (Mospilan 20 SP) @ 80 g/acre, carbosulfan (Advantage 20 EC) @ 300 ml/acre and thiamethoxam (Actara 25 WP) @ 24 g/acre, Advantage 20 EC (carbosulfan) @ 300 ml/acre gave satisfactory results as compared with control. But statistically highest population reduction was found with the application of Advantage 20 EC (carbosulfan) @ 300 ml/acre while the lowest population reduction was found with Mospilan 20 SP (acetamiprid) @ 80 g/acre. It is concluded that all insecticides were effective statistically against the *Lipaphis erysimi* (Kalt.) need to be tested on different cultivars of rapeseed mustard.

**Keywords:** Insecticides, canola crops, major pest, *Lipaphis erysimi*, population

## 1. Introduction
Oilseed cruciferous crops are the plants species from the genus Brassica belonging to the family Cruciferae [1]. All these crops are called repeseed-mustard in vernacularly language and are traditionally grown as the major group of winter oilseed crops under irrigated and natural rain fed areas of the Pakistan [2]. Pakistan produces only 25% edible oil of their requirement. Cotton contributes upto 60% while mustard and rapeseed contribute up to 17% in domestic oil production [3]. Among these crops canola quality rapeseed, *Brassica napus* L. is the main edible oil crop in the world. *B. napus* and *B. campestris* are preferred as edible oil because of low concentration of glucosinolate and erucic acid contents [4]. Its production in Pakistan is as low as compared to other *Brassica* growing countries. There are a number of factors for the low productivity; lack of production technology, use of low farm inputs, non-availability of proper marketing and absence of effective policy making at the government level. However, the insect pests attack can be attributed as the major constraint influencing oilseed production, especially rapeseed- mustard yield in India [5], Brazil [6] and Pakistan [7]. Worldwide, twenty-one insect species attack on the canola [8, 9] and the canola aphid, *Lipaphis erysimi* Kaltenbach (Aphididae: Homoptera) is the most serious pest of canola [10]. Amongst the various insect pests invading these crops, *Lipaphis erysimi* (Kalt.), is considered to be the most important insect pest which is responsible for a yield loss ranging from 35.4 to 96 percent depending upon seasons [11]. Aphid's attack causes about 30-35% losses in the *Brassica* crop [12]. Mustard aphid present throughout the year in the field and its population reaches to peak during December to February, which is the main growing period of mustard [13].The damage is caused by both the nymphs and adults that are feeding in large numbers often covering the entire surface of flower buds, shoots and pods [14]. They cause reduction in chlorophyll which results in curling and change in the colour leaves by sucking sap from leaves, shoots and inflorescence. Consequently growth of plants, flowers development and pods are also badly affected or even it may results in death of the plant [15]. Heavy yield losses to rapeseed and

mustard by *L. erysimi* have been reported in Pakistan [16].The *Lipaphis erysimi* (Kalt.) is also known to transmit about 10 plant viruses which are non-persistent that includes cabbage black ring spot and mosaic diseases of turnip radish and cauliflower [17]. Generally aphids require a very short time to complete their generation as well as their rate of fecundity is so much high which ultimately cause extremely large amount of economic damage and yield loss [18,19]. Efforts are being carried out to keep the population of the aphid below economic threshold level by using different control measures but chemical control is considered best as it is economical and gives quick results in reducing the population of the pest. More than 90% mortality of aphids is possible by use of insecticides but the population attains similarity under treated and untreated field within a period of 2 to 3 weeks due to high rate multiplication and to avoid the economic damage [20, 21]. Therefore successfully controlling of canola aphid insecticides should be applied at suitable dose and at right time. Taking into account all the problems related to *Lipaphis erysimi* Kalt., the current study was conducted to evaluate the most suitable insecticides which are safer and the most effective to control canola aphid and as a result, save the crop from its damage. Different insecticides viz., amidacloprid (20 SP), acetamiprid (20 SL), thiamethoxam, Endosulfan were used for the control of mustard aphid, *Lipaphis erysimi* (Kalt.) in field condition.

## 2. Materials and Methods

The present study was conducted at Entomological Research Area of the University of Agriculture, Faisalabad during 2013-2014. Seeds of canola variety Faisal Canola were sown in an area of 216″ × 198″ and 15 plots each having area of 40″ × 18″ size plots following Randomized Complete Block Design (RCBD) design with three replications. Fertilization and other intercultural operations were done uniformly for raising the crop as per recommendation of present project of the University of Agriculture, Faisalabad. The present experiment was designed to ascertain the efficacy of different insecticides against Canola aphid, *Lipaphis erysimi* (Kalt.). Four insecticides viz., imidacloprid (Confidor 200 SL) @ 150 ml/acre, acetamiprid (Mospilan 20 SP) @ 80 g/acre, carbosulfan (Advantage 20 EC) @ 300 ml/acre and thiamethoxam (Actara 25 WP) @ 24 g/acre were sprayed against canola aphid in field condition while water was used in the control condition (Table 1). All the four insecticides were applied with power machine and calibration was done before spray application. The data were recorded before 24 hours, 48 hours, 72 hours and one week after spray on per shoot basis from 5 randomly selected plants from each plot. Then these five randomly selected plants were tagged and data was obtained from these randomly selected tagged plants after 24 hours, 48 hours, 72 hours and then after 7 days (168 hours) of the spray application [22, 23].

**Table 1:** Information of the insecticides with different mode of action used against *Lipaphis erysimi*

| Common Name | Trade Name | Formulation | Group | WHO Hazard classification | IRAC group | Dose/ Acre | Mode of Action |
|---|---|---|---|---|---|---|---|
| Acetamiprd | Mospilan | 20 SP | Neonicotinoids | iii | 4A | 80 g/acre | (Nicotinic acetylcholine receptor (nAChR) competitive modulators) |
| Imidacloprid | Confidor | 200 SL | Neonicotinoids | ii | 4A | 150 ml/acre | (Nicotinic acetylcholine receptor (nAChR) competitive modulators) |
| Carbosulfan | Advantage | 20 EC | Carbamates | ii | 1A | 300 ml/acre | Acetylcholinesterase (AChE) inhibitors |
| Thiamethoxam | Actara | 25 WP | Neonicotinoids | iii | 4A | 24 g/acre | Nicotinic acetylcholine receptor (nAChR) competitive modulators |

### 2.1 Statistical analysis

Data were analyzed through analysis of variance and means were matched by the Student-Newman-Keuls Test at 0.05 by using SPSS software [24] and the significance of difference was sorted out by applying DMR Test after analysis of variance as given by Steel and Torrie [25].

## 3. Results

The present study was carried out regarding efficacy of different insecticides, viz., $T_1$ (Actara 25 WP) @ 24 g/acre, $T_2$ (Advantage 20 EC) @ 300 ml/acre, $T_3$ (Confidor 200 SL) @ 150 ml/acre and $T_4$ (Mospilan 20 SP) @ 80 g/acre. The above mentioned insecticides were sprayed at their field recommended doses under field conditions. The data regarding the population of canola aphid were recorded before 24 hours and after 24 hours, 48 hours, 72 hours and 7 days of insecticidal treatments, respectively.

**Table 2:** Population of canola aphids, *Lipaphis erysimi* (Kalt.) on canola after 24, 48, 72, and 168 hours (7 days) of the spray.

| Name of Insecticides | | Dose/acre | Comparison of Means on different time intervals | | | | |
|---|---|---|---|---|---|---|---|
| | | | Time | | | | |
| Trade name | Common name | | Before 24 hrs. of Spray | After 24 hrs. of Spray | After48hrs. of Spray | After72hrs. of Spray | After 1week of spray |
| $T_1$Actara(25 WP) | Thiamethoxam | 24 g/acre | 40.66 a | 70.94 b | 76.52 b | 77.53 b | 63.49 b |
| $T_2$Advantage (20 EC) | Carbosulfan | 300ml/acre | 40.00 a | 80.50 a | 86.17 a | 83.73 a | 74.18 a |
| $T_3$Mospilan (20 SP) | Acetamiprid | 80 g/acre | 41.33 a | 63.66 c | 71.66 b | 63.33 c | 58.75 c |
| $T_4$Confidor (200 SL) | Imidacloprid | 150ml/acre | 41.00 a | 60.63 c | 64.76 c | 59.01 c | 54.17 d |
| $T_5$ Control | | | 40.33 a | 7.74 d | 6.97 d | 6.19 d | 6.97 e |

The mean values showing common letters do not differ significantly.

The results showed that the population of aphids did not vary before 24 hours of spray (Table 2). Their values were statistically non-significant (40.66a, 40.00a, 41.33a, 41.00a and 40.33a respectively. After 24 hours of the spraying the highest percent reduction of aphid infested plant was observed in the Advantage (80.50a) treated plot followed by Actara (70.94b), Mospilan (63.66c) while Confidor (60.63) showed lowest percent reduction of aphid infested plants, the significant differences of reduction on the aphid infested plants were found in treated plots. The average aphid infested plants (%) in control treatment was (7.74d) after 24 hours of treatment. After 48 hours of the spray application highest aphid population reduction (86.17a) was recorded in the Advantage treated plot whereas the lowest aphid population reduction (64.76 c) was observed in Confidor treated plots, which are significantly different from each other. However, in Actara and Mospilan mean value were observed as 76.52 b and 71.66 b respectively, these values were non-significantly different from each other. Maximum population of *Lipaphis erysimi* (Kalt.) was observed in control treated plot was 6.97d after 48 hours of the spray application. The mean value of aphid population reduction were 77.53b, 83.73a, 63.33c, 59.01c and 6.19d was observed in treated plot with Actara, Advantage, Mospilan, Confidor, and Control respectively after 72 hours of spraying respectively. The current study results indicated that maximum population was observed in control treated plot where no insecticide was applied and minimum population was observed in the plots treated with Advantage while after 7 days of the spraying Actara, Advantage, Mospilan, Confidor and Control treatment showed statistically significant result having mean values 63.49b, 74.18a, 58.75c, 54.17d and 6.97e respectively.

## 4. Discussion

The efficacy of four different insecticides was considered to be the direct reflection of their means presenting the population reduction of canola aphids. So, the higher mean values of the treatments showed the higher population of aphids and lower mean value of the treatments showed the lower population of the canola aphids, *Lipaphis erysimi* (Kalt.). All insecticides were statistically difference and had significant impact on aphid population when compared with control plot. On numerical basis, maximum population reduction was observed in $T_2$ with Advantage 20 EC @ 300 ml/acre and proved more effective insecticide against canola aphid, *Lipaphis erysimi* Kalt. as compared with other insecticides followed by $T_1$ with Actara 25 WP @ 24 g/acre, $T_3$ with Confidor 200 SL @ 150 ml/acre and $T_4$ with Mospilan 20 SP @ 80 g/acre. The results were in agreement with the Mustafa [26] and Udeen and Narang [27] where Advantage as most effective insecticide among five insecticides used for the control of aphids on *Brassica* while Mustafa [28] concluded Confidor 200 SL as the most effective insecticide against aphids on *Brassica* followed by Advantage 20 EC. In the present studies, Confidor 200 SL was the third most effective insecticide after Actara 25 WP. However, the results are not in agreement with Chinnabbai *et al*., [29] who concluded from their experiment that acetamiprid gave the most effective control against mustard aphid, *Lipaphis erysimi* Kalt. and caused 84.87% population reduction followed by imidacloprid which caused 75.32% population reduction in aphid population. Basit [30] found Confidor 200 SL as the best insecticide to control aphids on *Brassica*. Mustafa [31] found resulted that Actara and Mospilan applications showed higher mortality of aphids as compared to other insecticides and Syed *et al*, [32] also concluded that confidor @ Actara gave lowest population when compared with other insecticides. Many researchers reported the chance of resistance against conventional insecticides. As present study concluded that all the insecticides were effective statistically and can be used in mosaic manner of application to avoid the resistance problem, as there insecticides have different mode of action.

## 5. Conclusion

The present study investigations demonstrated that all the insecticides were significantly effective and keep the aphid population under the thrush hold level. These insecticides have different mode of action which will very helpful in planning future Integrated Pest Management Programmed and keep them as part of chemical control to avoid resistance and cross-resistance, which ultimately result in better and healthy crop production and increase the GDP of the country.

## 6. Acknowledgement

The authors are really gratified to Department of Entomology, University of Agriculture, Faisalabad for providing all facilities to conduct the experiment at Entomological Research Area of the University of Agriculture, Faisalabad.

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