Research Article

Evaluation of Insecticides for the Management of Mustard Aphid (*Lipaphis erysimi* Kalt.)

Sikander Ali[1], Muhammad Kamil Malik[1], Muhammad Zubair[1*], Muhammad Jawad Saleem[2], Kanwal Hanif[2] and Saira Azmat[3]

[1]Oilseeds Research Institute, Ayub Agricultural Research Institute, Faisalabad, Pakistan; [2]Entomological Research Institute, Faisalabad, Pakistan; [3]Agriculture Extension, Faisalabad, Pakistan

Abstract | Brassica crops are being widely promoted as a matter of crop diversification. Significant emphasis is being laid upon saving the crop from insect pests infestation. Scientists are continuously striving their best for improving the quality of the produce. Therefore, the present study was conducted during 2014-15 to evaluate the efficacy of different insecticides against the mustard aphid; responsible for huge yield losses in *Brassica juncea*. Maximum mortality of mustard aphid was caused by nitenpyram (96.24%) followed by carbosulfan (94.69%) and pyriproxyfen (90.85%). Results of these three insecticides were not significantly different from each other but were different from thiamethoxam which showed least mortality (71.65%). Nitenpyram, carbosulfan and pyriproxyfen can be included in integrated pest management strategies to control mustard aphid as alternatives to each other with the aim of evasion from development of resistance against these insecticides in mustard aphid.

Received | April 18, 2019; **Accepted** | June 21, 2019, 2019; **Published** | June 29, 2019
***Correspondence** | Muhammad Zubair, Oilseeds Research Institute, Ayub Agricultural Research Institute, Faisalabad, Pakistan; **Email:** chzubair92@gmail.com
Citation | Ali, S., Malik, M.K., Zubair, M., Saleem, M.J., Hanif, K. and Azmat, S. 2019. Evaluation of insecticides for the management of mustard aphid (*Lipaphis erysimi* Kalt.). *Journal of Innovative Sciences*, 5(1): 12-15.
DOI | http://dx.doi.org/10.17582/journal.jis/2019/5.1.12.15
Keywords | *Brassica juncea*, Pyriproxyfen, Nitenpyram, Carbosulfan, Mustard aphid

1. Introduction

Pakistan produces only 25% of the domestically required edible oil. Oil obtained from brassica contributes only 17% to the total national requirement. (Siraj *et al*., 2018). Oil crops are on their way to gain the status of main crops as government has prioritized the incentives on Brassica crop (Anonymous, 2018). However, insect pests; cabbage butterfly, pea leaf miner, shield bug and mustard aphid *(Lipaphis erysimi*) are important biological constraints causing considerable losses in crop yield. Mustard aphid *(Lipaphis erysimi*) is held responsible for causing severe losses (96%) and also decrease the quality of the produce (Bakhetia, 1986, Rohilla *et al*.,1987; Bakhetia and Sekhon, 1989, Singh and Sachan, 1994, Singh and Prem-chand, 1995, Sharma and Kashyap, 1998, Singh and Sharma, 2002). Mustard aphid may also cause decline in oil contents for about 15% (Verma and Singh, 1987). Efforts are being made to develop a concrete strategy to keep mustard aphid population below economic threshold level to obtain higher yield. About 90% mustard aphid population can be controlled through chemical means as these ensure the control of insect pests. In a period of 2-3 weeks after insecticide treatment, the mustard aphid population reaches around the same number as recorded before treatment because of its higher rate of reproduction, (Singh *et al*., 1983; Amer *et al*., 2009). It is need of the hour to use the most

effective insecticides to save the crop from yield and quality losses. This study was designed to identify the most suitable insecticide among the commonly used insecticides to effectively control the mustard aphid.

2. Materials and Methods

Khanpur Raya; a widely sown variety was obtained from the Oilseeds Research Institute, Ayub Agricultural research Institute, Faisalabad and was sown at farm area of the same Institute during crop growing season 2014-15. Recommended and standardized agronomic practices during the whole growing season were carried out as and when required. Data for mustard aphid was recorded on five randomly selected plants at top 10 cm of the central shoot (Khan *et al.*, 2017). Tested insecticides were applied in three replicates (Table 1). Five plants from each treatment were randomly selected, tagged and insect population was recorded. Insect population was recorded before application. After the application of treatments, data were recorded at 24-hour, 48-hour and 72-hours time intervals. The experiment was repeated thrice to minimize possible error. Percentage mortality of mustard aphid was calculated by using the formula:

$$\text{Mortality (\%)} = \frac{\text{Pre} - \text{Treatment Population} - \text{Post} - \text{Treatment Population}}{\text{Pre} - \text{Treatment Population}} \times 100$$

The relevant data was tabulated and analyzed by using Statistix 8.1 software, analysis of variance was constructed and treatments' mean comparisons were made.

Table 1: Information about evaluated insecticides

S. No	Insecticide	Brand Name	Formulation	Dose/acre
1	Pyriproxyfen	Bruce	10.8 EC	500 ml
2	Nitenpyram	Pyramid	10 AS	200 ml
3	Carbosulfan	Advantage	20 EC	500 ml
4	Thiamethoxam	Actara	25 WG	10 gram
5	Control	Untreated		

3. Results and Discussion

Analysis of Variance (ANOVA) indicated that significant results were obtained as P value was zero. Results obtained after 24 hours of treatment revealed that maximum mortality was observed in case of nitenpyram followed by pyriproxyfen and carbosulfan which were statistically similar as they shared same letter when mean wise comparisons were made. Minimum mortality was found in case of thiamethoxam all the time when the mortality data were recorded.

Khan *et al.* (2017) claimed that pyriproxyfen showed 86% and 87% mortality after 24 and 48 hours of treatment which are relatively below than the percent mortality found during the present study which are 88% and 89% respectively. After 72 hours of treatment, mortality percentage is quite similar in both the studies as (Khan *et al.*, 2017) claimed 91.6% mortality while during the present study mortality was 90.85%. It can be admitted that pyriproxyfen has almost same control percentage for the control of mustard aphid.

Mortality percentage in case of carbosulfan recorded after 24 hours (87.96%) and 48 hours (91.34%) of treatment is significantly lower than reported by (Siraj *et al.*, 2018) which are 91.80% and 94.30% respectively. Mortality percentage showed by carbosulfan after 48 hours of treatment shares two letters collectively which represents that carbosulfan has no significant difference with other insecticides after 48 hours of treatment but to some extent. It is noteworthy to mention here that percent mortality observed after 72 hours of treatment (94.69%) during present study was observed after 48 hours of treatment (94.30%) as claimed by (Siraj *et al.*, 2018). This variation might be due to the environmental conditions which might have favored the insect for its population buildup.

Results recorded after 48 and 72 hours of treatment expressed that maximum mortality (93% and 96%) respectively was observed in case of nitenpyram. These results somehow are different from the results of (Khan *et al.*, 2017) who witnessed 96% mortality even after 48 hours of treatment and it was almost same after 72 hours of treatment. Results of (Babar *et al.*, 2013) are in difference with the claims of present study as their claim is that nitenpyram is the least effective insecticide against sucking insect pests.

Thiamethoxam showed minimum percent mortality even after 72 hours of treatment (71.65%). Results of the present study significantly differ from the findings of (Mandal *et al.*, 2012) who observed 90% mortality after 24 hours of treatment. Results of the present study are also in difference with the claims of (Sohail *et al.*, 2011) who found that mortality after 3 days of

treatment was 32.43%. This difference might be due to the difference in insecticide formulation and dose rate.

However, it can be observed (Table 2) that mortality caused by pyriproxyfen, nitenpyram and carbosulfan after 72 hours of treatment was not significantly different.

Table 2: Mortality of Mustard aphid at various time intervals.

Insecticides	Population before treatment	Mortality percentage		
		24 HAT*	48 HAT*	72 HAT*
Pyriproxyfen	452.73	88.45b	89.66b	90.85a
Nitenpyram	282.13	90.99a	93.01a	96.24a
Carbosulfan	286.41	87.96b	91.34ab	94.69a
Thiamethoxam	334.41	54.30c	64.53c	71.65b
Control	333.01	-10.11d**	-21.72d**	-37.06c**

*HAT: Hours after Treatment of respective insecticide; **: Negative sign indicates the relative increase in insect population; Means sharing similar letter are not significantly different from each other at P<0.05.

Conclusion

In conclusion, nitenpyram showed maximum mortality of mustard aphid followed by carbosulfan and pyriproxyfen, respectively. These was no significant difference in percent mortality caused by these three insecticides. This favors the claim that these insecticides can be used as alternatives in integrated pest management strategies to effectively control mustard aphid. Additionally, the chances of resistance development in mustard aphid to any particular insecticide will be minimized.

Author's Contribution

Sikander Ali designed and supervised the study. Muhammad Kamil Malik and Muhammad Jawad Saleem wrote the manuscript. Muhammad Zubair statistically analyzed and compiled the data as well as submitted the manuscript. Kanwal Hanif and Saira Azmat proofread the final manuscript.

References

Amer, M., Aslam, M., Razaq, M. and Afzal, M. 2009. Lack of plant resistance against aphids, as indicated by their seasonal abundance in canola, *Brassica napus* L. in Southern Punjab, Pakistan. *Pakistan Journal of Botany*. 41(3): 1043-1051.

Anonymous. 2018. Status of Oilseed crops in Pakistan.

Babar, T.K., Karar, H., Saleem, M., Ali, A., Ahmad, S. and Hameed, A. 2013. Comparative efficacy of various insecticides against whitefly, *Bemisia tabaci* (genn.) adult (Homoptera: Aleyrodidae) on transgenic cotton variety bt-886. *Pakistan Entomologist*. 35(2): 99-104.

Bakhetia, D.R.C. and Sekhon, B.S. 1989. Insect pests and their management in rapeseed-mustard. *Journal of Oilseeds Research*. 6(2): 269-99.

Bakhetia, D.R.C. 1986. Pest management in rapeseed and mustard. *Pesticides*. 20(5): 32-38.

Khan, M.M., Akhtar, I. and Shah, S.W.H. 2017. Efficacy of different insecticides against aphid on *Brassica juncea*. *Journal of Zoology*. 19: 95-100.

Mandal, D., Bhowmik, P. and Chatterjee, M.L. 2012. 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*. 4(2): 37-42.

Rohilla, H.R., Singh, H.K., V.K. Kalra. and Kharub, S.S. 1987. Losses caused by mustard aphid, *Lipaphis erysimi* K. in different Brassica genotype. *Proceedings of the International Rapeseed Congress, Poland*. p.46.

Sharma, P.K. and Kashyap, N.P. 1998. Estimation of losses in three different oil seed Brassica crops due to aphid complex in Himachal Pradesh (India). *Journal of Entomology Research*. (22): 22-25.

Singh, B., Singh, R. and Mahal, M.S. 1983. Assessment of loss in yield of *Brassica juncea* by Mustard Aphid (*Lipaphis erysimi*) Kalt. Timing and duration of infestation. *Indian Journal of Ecology*. 11: 139-145.

Singh, C.P. and Sachan, G.C. 1994. Assessment of yield losses in yellow sarsoon due to mustard aphid, *Lipaphis erysimi* (Kalt). *Journal of Oilseeds Research*. 11: 179-84.

Singh, P.K. and Premchand. 1995. Yield loss due to mustard aphid (*Lipaphis erysimi*) K. in Eastern Bihar Plateau. *Journal of Applied Zoology Research*. 6: 97-100.

Singh, Y.P. and Sharma, K.C. 2002. Integrated approach to manage the mustard aphid Mustard Aphid (*Lipaphis erysimi*) K. (Homotera:

Aphididae) in oilseed Brassica crops-a review. *Journal of Amphibiology*. 16:77-88.

Siraj, A., Cheema, S.A., Zubair, M., Abbas, Q., Bashir, M.R., Malik, K., Aslam, A. and Maan, N.A. 2018. Comparative efficacy of different insecticides against mustard aphid in *Brassica juncea*. *International Journal of Entomology Research*. 3(3): 34-37.

Sohail, K., Jan, S., Shah, S.F., Ali, H., Israr, M., Farooq, M., Jan, S., Arif, M. and Ahmad, B. 2011. Effect of different chemical pesticides on mustard aphid (*Lipaphis erysimi*) and their adverse effects on ladybird beetle. *Sarhad Journal of Agriculture*. 27(4): 611-615.

Verma, S.N. and Singh, O.P. 1987. Estimation of avoidable losses to mustard by the aphid, *Lipaphis erysimi* in Madhya Pradesh. *Indian Journal of Plant Protection*. 15: 87-89.