Punjab Univ. J. Zool., Vol. 32 (2), pp.245-249, 2017

ISSN 1016-1597(Print)
ISSN2313-8556 (online)

Original Article

Efficacy of malathion and carbosulfan against crop invadedaphid types *Aphis craccivora* (Koch) and *Aphis gossypii* (glover) on bean and brinjal plants

Muhammad Khalil Ahmad Khan[1*], Muhammad Zafar[2], Munazza Perveen[3], Munir Ahmad[3], Asia Iqbal[4], Asmatullah[3]

[1]*Department of Zoology, Government Dyal Singh College, Lahore.*
[2]*Post –Graduate Department of Zoology, Government Emerson College, Bosan Road, Multan*
[3]*Department of Zoology, University of the Punjab, Lahore*
[4]*Department of wild life and fisheries university of veterinary and animal sciences Lahore.*

Article history
Received: Sep. 25, 2017
Revised: December 12, 2017
Accepted: December 13, 2017

Authors' Contribution
MKAK, MZ, MP, MMU, AI: conducted experiments and draft manuscript. **A:** supervise the research

Key words
Malathion
Carbosulfan
Aphis craccivora
Aphis gossypii

Abstract
In this study, indirect application of two important insecticides *viz.,* malathion and carbosulfan against two important crop infesting aphid species *Aphis gossypii* (Glover) and *Aphis craccivora* (Koch) were reared on brinjal and bean plants respectively. In the laboratory, the vegetable plant leaves being applied by residual film technique with tested Aphid population. The most toxic insecticide was found to be malathion with LC_{50} as 20.11 µg cm^{-2} for *A. craccivora* and 25.28 µg cm^{-2} for *A. gossypii* while carbosulfan was found to be least toxic with LC_{50} as 312.80 µg cm^{-2} for *A. craccivora* and 322.25 µg cm^{-2} for *A. gossypii* respectively. No significant heterogeneity was to be found.

To cite this article: KHAN, M.K.A., ZAFAR, M., PERVEEN, M., AHMAD, M., IQBAL, A. AND ASMATULLAH, 2017. Efficacy of malathion and carbosulfan against crop invaded aphid types *Aphis craccivora* (Koch) and Aphis gossypii (glover) on bean and brinjal plants. *Punjab Univ. J. Zool.,* **32**(2): 245-249.

INTRODUCTION

Insecticides are known as the most important chemicals which control the insects and are responsible for the welfare of human population. In agricultural side insecticides are to be a regular component of most systems. During the last few years the chemical control of insect pests has attracted a good information of the Government of Pakistan and become "green revolution" and to meet the various challenges of ever increasing population in the country. That is why in Pakistan the use of insecticides has increased manifold. Many different types of insecticides like organophosphates (Mustafa, 1998), pyrethroids (Parasad, 1992) and organochlorides (Bakhetia *et al.,* 1986) have been used for the control of aphids. Cereals, oilseed, legumes and other crops are damaged by Aphids either direct feeding or through pathogen transmission. A few varieties of Aphid-resistance crops are available in market now a days. Crop growers in Australia spray prophylactic to control aphids but in this method non target organisms are affected and insecticidal resistance is developed in aphids (Edwards *et al*., 2008).

Aphids which are known as soft-bodied and small insects have considerable type of morphological polymorphism, such as females and a late (winged) adults, apterous (wingless) and intra-species colour variation etc.Aphididaefamily feeds on multiple crops and is one of themost diverse groups except those who feed onlyone kind of crop. (Lu *et al.,* 2008; Farag and Gesraha, 2007; Von Dohlen *et al.,*

248-PUJZ-71025290/17/0245-0249
*Corresponding author:kkzoologist@yahoo.com

2006). The Aphid feeding habits determine the source sink relationship in plants. (Girousse *et al.,* 2005). The fungal growth on aphid honey dew, and the transfer of adenoviruses is due secondary pathogen infection (Liu and Yue, 2001; Bridges *et al.,* 2001; Gray and Gildow, 2003; Rana, 2005). The measureable economic loss is due to the diverse feeding behavior of Aphids, abruptly effect the plant fields particularly damage their foliage (Lane and Walters, 1991; Blackman and Eastop, 2000). The economic importance is due to aphids are because many diseases of plants are caused by plant virus. Their salivary secretions cause the galls on stem, root and either on leaves. Curling and quilting of the leaves are due to removal of plant sap. The primary growth of young shoot, leaves and growth of fungus being inhibited by the secretion of honey dew (Toper Kaygm *et al.,* 2008).

Pesticide control under outbreak condition will be the first line of action against pest. This control possibly causes 92% mortality of aphid population, but there is the attainment of similar population under both untreated and treated fields within the duration of 3 to 4 weeks due to high risk factors of proliferation (Sing *et al.,* 1984). For measuring various levels of toxicity of insecticides, within the different periods of times, the efficacy is being observed by using different residual assays (Busvine, 1980). Aphids which are taken up insecticide under direct application through investigation or by contact with a treated surface or as vapor agent. Most of the times, all these techniques are used but some researcher used other techniques like isolated methods (Devonshire and Rice, 1988).

The current experiment residual film technique (RFT) , indirect type of application was used to assays with two insecticides; viz. malathion and carbosulfan on most important aphid species, *Aphis craccivora* (Koch) and *Aphis gossypii* (Glover) which allow to cover leaf surfacesuniformly.

MATERIALS AND METHODS

Sample Collection

Mustard aphid samples were collected from the field near Multan (Pakistan). Aphid population of *Aphis craccivora* and *Aphis gossypii* were reared on bean and brinjal plants respectively $LC_{50}$of aphid population was recorded in plant exposed with malathion and carbosulfan. Aphid population of *Aphis craccivora* and *Aphis gossypii* were reared on bean and brinjal plants respectively.

Dose preparation and administration

In the laboratory by handling leaves with test aphid population of the vegetable plants, residual film technique (Busvine, 1971) was used with the application of acetone, insecticides (malathion and carbosulfan) were diluted serially and then fixed volume of 0.1ml of each solution of insecticide was applied on the surface of circular leaf about 2.5cm, which was previously placed on a Petridish of about 10cm in diameter. Four doses with three replications of each insecticide were to be tested. These doses were 442.44, 360.23, 266.50, 175.03 µg cm^{-2} for carbosulfan (92% technical) and 54.83, 38.60, 22.23, 8.11 µg cm^{-2} for malathion (96% technical). A separate vehicle control group was also maintained in the laboratory in which only acetone solution of 0.1 ml volume was dropped on the surface of the leaf. Petiole of the leaf, with the application of cotton bud was wrapped. Mortality of aphids after 24 hours of treatment was noted.

Statistical analysis

By using Abbott's formula (Abbot, 1925) corrected mortality (%) was analyzed and calculated. From mortality data, with the help of computer software developed in the Department of Environmental and Agricultural Science, University of Newcastle Upon Tyne, UK, probit regressions were estimated with the help of probit analysis of Busvine (1971).

RESULTS AND DISCUSSION

Table I shows the LC_{50}, 95% confidence limits, regression equations and chi-square values. Malathion was found to be most toxic with LC_{50} as 312.80 and 322.25 ug $cm^{-2}$for *A. craccivora* and *A. gossypii* respectively while carbosulfan was found to be least toxic having LC_{50} as 20.11 and 25.28 ug cm^{-2} for *A. craccivora* and *A. gossypii* respectively. In all cases of the experiment, no significant heterogeneity was to be found. The toxic effects of eight different types of insecticides on *Aphis gossypii* were reared on musk melon were observed by Pareek and Kavadia (1988). Glasshouse population of *A. gossypii* on chrysanthemum used by Furk and Vedjhi (1990) to test primicarb (900 mg a.i/l), it resulted in

100% mortality of susceptible and resistance of aphid population was 0% to 22%. In the laboratory Kerns and Gaylor (1992 ab) used cypermethrin (2.5ppm), dicrotophos (16ppm) and sulprofos (820ppm) insecticides on *A. gossypii* on cotton leaf disc.

Detailed studies about the toxic effect of carbosulfan after one day of insecticide application mortality of *Brevicoryne brassica* (Linn.) in treated plots was found to be non-significant but it was highly significant in control groups (Aslam *et al.,* 2001). Our results are matched with the results of Nucifora (1998) when applied malathion and carbosulfan on *Aphis craccivora* and *Aphis gossypii* with plants showed highly and least toxic respectively. A number of insecticides such as methyl-demeton (0.09%), dimethoate (0.03%), fenthion (0.72%), disulfan (0.08%), carbaryl, formation and thiometon as foliar sprays used against aphid population on mustard grave resulted in 58.2 to 92.6 percent mortality after 72 hours of treatment when these are compared with check 13.5% (Sharma and Joshi, 1972). 92.58% and 90.70% reduction in aphid population in mustard was observed after the application of cartap hydrochloride (Padan 10G) and monocrotophos (Hussain and Begum, 2000). By the use of probit analysis the LC_{50} of these two insecticides ware calculated and compared with each other. These comparisons indicate that individual effects carbosulfan is better than in combined form. There will be highest mortality rate when exposed with organophosphate (Gaurav and Udean, 2004; Rohilla *et al.*, 2004).

LC_{50} values of different insecticides against *Aphis craccivora* and *Aphis gossypii* indicate that carbosulfan was least effective as compared to that of malathion which was highly toxic (Geol and Sachan, 2002). In some studies on aphid population of the vegetableplants, cypermethrin was found to be most toxic with LC_{50} as 14.30 µg cm^{-2} for *L. erysimi* and 14.12 µgcm^{-2} for *M. persicae* (Zafar *et al.,* 2015).

Table I: LC_{50}, 95% confidence limits and regression equations of malathion and carbosulfan insecticides on *Aphis craccivora* (Koch) and *Aphis gossypii* (Glover) species on bean and brinjal plants after 24 hours of application.

Name of insecticide	Aphid species	LC_{50} ug cm^{-2}	95% confidence limits		Regression equation	x^2 at 2df
			Lower	Upper		
Malathion	*A. craccivora*	312.80	227.00	375.66	Y=-3.707203+2.888572	0.06
	A. gossypii	322.25	229.24	385.72	Y=-5.505855+3.488283x	0.73
Carbosulfan	*A. craccivora*	20.11	15.66	18.70	Y=0.03453118+3.24464x	2.18
	A. gossypii	25.28	16.78	20.22	Y=0.5026782+2.75206x	4.38

CONCLUSION

In the present studies, malathion offered better results as compared to that of carbosulfan.

REFERENCES

ABBOTT, W.S., 1925. A method of computing the effectiveness of a insecticide. *J. Econ. Entomol.* **18**: 265-267.

ASLAM, M., RAZAQ, M., ISLAM, Z.U. AND ANJUM, S., 2001. Efficacy of different insecticides for the control of *Aphid Brevicoryne brassicae* (Linn.) (Homoptera: Aphididae) on canola, *Brassica napus* (L.). *J. Res. Sci.,* **12**(2): 163-166.

BAKHETIA, D.K.C., BRAR, K.S. AND SEKHON, B.S., 1986. Bio-efficacy of some insecticides for the control of mustard aphid, *Lipaphis erysimi* (Kalt) on rapeseed on mustard. *Indian J. Entol.,* **48**(2): 137-143.

BLACKMAN, R. L. AND EASTOP, V. F., 2000. Aphids on the World is crops: An identification and Information Guide, 2nd Ed. John Wiley and Sons Ltd., Chichester 466pp.

BRIDGES, M., JONES, M.E., BONES, A.M., HODGSON, C., COLE, R., BARTLET, E., WALLSGROVE, V., KARAPAPA, K. V., WALTS, N. AND ROSSITER, J.T., 2001. Spatial organization of the glucosinate myrosinase system in brassica specialist aphids is similar to

that of the host plant. *Proc. R. Soc. Lond. Ser. B* **233**: 1-5.

BUSVINE, J.R., 1980. Recommended methods for measurement of pest resistance to pesticides. FAO Plant production and protection paper No. 21, Rome.

BUSVINE, J.R., 1971. A critical review of the techniques for testing insecticides. Common Wealth Agricultural Bureaux, London. 345pp.

DEVONSHIRE, A.L. AND RICE, A.D., 1988. Aphid bioassay techniques in: aphids, their biology, natural enemies and control. (Eds. A.K. Minks, and P. Harrewijn), Elsevier, Amsterdam. 2B: 119-128.

EDWARDS.O. R, FRANZMANN B., THACKRAY D., AND MICIC, S., 2008. Insecticide resistance and implications for future aphid management in Australian grains and pastures: a review. *Australian J. Exp. Agri.,* **48**(12): 1523-1530.

FARAG, N.A. AND GESRAHA, M.A., 2007. Impact of four insecticides on parasitoid wasp, *Diaertiella rapae* and its host aphid, *Brevicoryne brassicae* under laboratory conditions. *Res. J. Agri. Biol. Sci.,* **3**(5): 529-533.

FURK, C. AND VEDJHI, S., 1990. Organophosphorus resistance in *Aphis gossypii* (Homoptera: Aphidadae) on chrysanthemum in UK. *Annu. Appl. Biol. Sci.,* **3**(5): 529-533.

GEOL, R. AND SACHAN, G.C., 2002. Insecticide resistance in mustard aphid *Lipaphis erysimi* (Kaltenbach) (Homoptera: Aphididae). *J. Aphidol.* **16**: 9-13.

GIROUSSE, C., MOULIA, B., SILK, W. AND BONNENNAIN, J.L., 2005. Aphid infestation causes different changes in carbon and nitrogen allocation in alfa alfa stems as well as different inhibitions of longitudinal and radial expansion. *Plant Physiol.,* **137**:1474-1484.

GRAY, S.M. AND GILDOW, F., 2003. Luteovirus-Aphid Interactions. *Annu. Rev. Phytophatol.,* **41**: 539-566.

HUSSAIN, M. AND BEGUM, M., 2000. Comparative efficacy of some foliar and granular insecticides against mustard aphid, *Lipapphis erysimi* (Kalt.). *J. Agric. Res.,* **38**(3): 239-244.

KERNS, D.L. AND GAYLOR, M.J., 1992a. Insecticide resistance in field populations of the cotton aphid (Homoptera: Aphidade) *J. Econ. Entomol.,* **85**: 1-8.

KERNS, D.L. AND GAYLOR, M.J., 1992b. Sublethal effects of insecticides on cotton aphid reproduction and color morph development. *South west. Entomol.,* **7**: 245-250.

LANE, A. AND WALTERS, K.F.A., 1991. Effect of pea aphid (*Acyrthosiphon pisum*) on the yield of combining peas. *Aspects Appl. Biol.,* **27**: 363-368.

LIU, T. AND YUE, B., 2001. Comparison of some life history parameters between alate and apterous forms of turnip aphid (Homoptera: Aphidadae) on cabbage under constant temperatures. *Fla. Entomol.,* **84**: 239-242.

LU, W.N., WU, Y.T. AND KUS, M.H., 2008. Development of species–specific primers for the identification of aphids in Taiwan. *Appl. Entomol. Zool.,* **43**(1): 91-96.

MUSTAFA, G., 1998. Efficacy of some foliar insecticides against aphid on *Brassica* crop. *Annual report Ayub Agric. Res. Ins.,* **10**(2): pp.106-107.

NUCIFORA, S., 1998. Imidaclopird against aphids on citrus. L'imidaclroprid nella lotta contro gli afidi dagli agrumi. *Atti, Giornate Fitopatalogiche, Scicli e Ragusa,* 3-7 meggio, 185-190.

PARASAD, S.K., 1992. Relative efficacy of some synthetic pyrethroid and phosphaamidon against the mustard aphid, *Lipaphis erysimi*. *Ann. Agric. Res.,* **13**(2): 137-140.

PAREEK, B.I. AND KAVADIA, V.S., 1988. Insecticidal control of melon aphid, *Aphis gossypii* Glover on musk melon. *Entomon.,* **13**: 13-15.

RANA, J.S., 2005. Performance of *Lipaphis erysimi* (Homoptera: Aphididae) on different Brassica species in a tropical environment. *J. Pest. Sci.,* **78**: 155-160.

ROHILLA, H.R., BHATNAGAR, P. AND YADAV, P.R., 2004. Chemical control of mustard aphid with newer and conventional insecticides. *Indian J. Entomol.,* **66**(1): 30-32.

SHARMA, T.C. AND JOSHI, F.L., 1972. Efficacy of different insecticides against mustard aphid *Lipaphis erysimi* (Kalt.) *JNKVV Res. J.,* **6**(1): 53-54.

SING, B., SINGH, R. AND MAHAL, M.S., 1984. Assessment of loss in yield of *Brassica juncea* by *Lipaphis erysimi* (Kalt.). III

Timing and duration of infestation. *Indian J. Econ.,* **II**(1): 139-145.

TOPER KAYGM, A., COTA, F. AND GORUR, G., 2008. Contribution to the aphid (Homoptera: Aphididae) species damaging on woody plants in Bartin, Turkey, *Intl. J. Natural Eng. Sci.,* **2**(1): 83-86.

VON DOHLEN, C.D., ROWE, C.A. AND HEIE, O.E., 2006. A test of morphological hypotheses for tribal and subtribal relationships of *Aphidinae* (Insecta: Hemiptera: Aphidinae) using DNA sequences. *Mol. Phylogenet Evol.,* **38**: 316-329.

ZAFAR, M., KHAN, M.K.A. AND ASMATULLAH, 2015. Efficacy of cypermethrin, bifenthrin and azadirachtin against crop infesting aphid species of *Lipaphis erysimi* (Katenbanch) and *Myzus persicae* (Sulzer) on cauliflower andpotato plants. *Punjab Univ. J. Zool.,* **30**(1): 007-009.