Journal of Biological Control, 30(1): 11-14, 2016

Research Article

Influence of two acaricides on survival of predator *Blaptostethus pallescens* (Poppius) (Hemiptera: Anthocoridae)

KIRANDEEP KAUR and RABINDER KAUR*
Department of Entomology, Punjab Agricultural University, Ludhiana - 141 004, Punjab, India
**Corresponding author E-mail:* rebakaur@yahoo.com

ABSTRACT: Experiments were conducted to find out the influence of two acaricides (Propargite and Ethion) on survivability of an anthocorid predator, *Blaptostethus pallescens* (Poppius) when exposed at different time intervals under laboratory conditions. In present investigation, the second instar nymphs of *B. pallescens* were exposed to propargite @ 300 ml/acre and ethion @ 450 ml/acre for different time intervals using two methods of treatment *viz*; leaf disc and foliar spray method. Both the acaricides had adverse effect on the survival of the predator but the effect of ethion was faster as compared to propargite. When exposure time for ethion treatment was increased from one to six hours, the mortality of second instar nymphs increased from 0.10 to 86.00 per cent. On the other hand, in case of propargite, the mortality was 0.10 per cent at 1 hour interval and gradually increased with increase in exposure time, up to 20 per cent at 48 hours of exposure. Second instar nymphs were released on potted plants showed higher rate of mortality after the foliar spray of acaricides as compared to those in leaf disc where corrected per cent mortality of ethion treated nymphs was 10.96 per cent at one hour of exposure and it became almost 100 per cent at six hours of exposure or above. Similar trend was followed in case of propargite where mortality was 6.97 to 75.5 per cent, when exposure time increased from one hour to 12 hours. Thus both acaricides were found to be unsafe to *B. pallescens.*

KEY WORDS: Acaricides*, Blaptostethus pallescens* (Poppius), ethion, mortality, propargite

(Article chronicle: Received: 14-11-2015; Revised: 03-02-2016; Accepted: 26-02-2016)

INTRODUCTION

Brinjal or eggplant (*Solanum melongena* Linnaeus) is an important solanaceous crop of sub-tropics and tropics, being grown extensively in India, Bangladesh, Pakistan, China and the Philippines with a production of 418.41 lakh tonnes worldwide. In India, brinjal is severely attacked by two spotted spider mite *Tetranychus urticae* Koch, particularly during spring-summer and post-rainy seasons (Gupta 1985; Singh and Mukherjee 1991). Due to the economic losses caused by spider mites, management tactics need to be established to keep population levels under the economic threshold of infestation. This practice should be based on Integrated Pest Management (IPM) including spraying pesticides, using biological control agents and/or resistant varieties.

Ethion is an organophosphate compound chemically known as O, O, O', O'-tetraethyl S, S'-methylene bis (phosphorodithioate) and was reported as potential acaricide in 1955 and act as both insecticide and acaricides (Jeppson *et al.,* 1975). It was reported to be effective against adults of *Teteranychus telarius* Linn infesting apple (Dickinson 1958; Goyal and Bath 1967). Tewari (1983) reported effective suppression of *Shizotetranychus andropogoni* Hirst with 0.02 percent ethion.

Propargite (2-(4-tert-butyl phenoxy) cyclohexyl prop-2-ynyl sulfite) is another non systemic acaricide whose effectiveness on *T. urticae* has been reported by Gough (1990) on roses. Swart *et al.* (1990) and Wilson *et al.* (1995) have also reported propargite as best treatment against *T. urticae* on cotton.

Although these acaricides have been reported to have promising role in the management of *T. urticae*, for the successful management of two spotted spider mite, the IPM module should include pesticides and bioagents which are compatible with each other.

Naturally occurring bioagents that offer control of pests in brinjal crop are spiders, dragonflies, ladybird beetles and predatory mites. Anthocorids, also known as pirate bugs, belonging to order Hemiptera and family Anthocoridae are other potential predators of sucking pests like thrips, aphids and mealy bugs. In the Mediterranean Basin and sub-Saharan Africa, several anthocorid species have been reported as important natural enemies in various cropping systems (Hernandez and Stonedahl 1999). One of these species of interest is *Blaptostethus pallescens*, a subtropical species which has been reported to prey on number of lepidopteran pests and sucking pests such as aphids and spider mites (Tawfik and El-Husseini 1971). In India, Ballal *et al.* (2009, 2012) and Kaur *et al.* (2012) indicated the predatory potential of *B. pallescens* on cotton mealy bug (*Phenacoccus solenopsis* Tinsley) and papaya mealy bug (*Paracoccus marginatus* Williams and Gronara de Wilink) and spider mite (*T. urticae*) of okra and brinjal. To check the compatibility of *B. pallescens* with ethion and propargite, the present study was undertaken to investigate the influence of these two acaricides on the survival of this predator, with the aim to develop an IPM programme which should include safer acaricides and potential bioagents for the management of *T. urticae*.

MATERIAL AND METHODS

Studies on influence of acaricides (propargite and ethion) on survival of anthocorid bug were conducted in the Biocontrol Laboratory, Department of Entomology, Punjab Agricultural University, Ludhiana. To study the influence of acaricides on *B. pallescens,* two acaricides namely propargite @ 300 ml/acre and ethion @ 450 ml/acre recommended for the management of *T. urticae* were selected. This experiment was carried out by applying following two methods of treatment.

Leaf disc method

The leaf discs of brinjal were treated with recommended acaricides namely propargite and ethion water respectively, by dipping them in acaricide solution. After shade drying, the treated leaves were placed in Petri dish with lid and sufficient numbers of individual of *T. urticae* along with twenty nymphs of *B. pallescens* released on the treated leaves. The control treatment was done by treating brinjal leaves with distilled water.

Foliar spray method

Brinjal plants grown in the earthen pots and infested with spider mites were taken and twenty nymphs of *B. pallescens* were released on the infested plants. The plants were then sprayed with above mentioned recommended dose of each acaricide. The control potted plants were sprayed with water.

The number of dead nymphs of *B. pallescens* was recorded after 1, 3, 6, 12, 24 and 48 hours of treatment. There were five replications for each treatment of acaricides. The whole data recorded in the experiment were compiled and analyzed statistically to check the significance of the data in complete randomized design (CRD).

RESULTS AND DISCUSSION

Effects of acaricides (propargite @ 300 ml/acre and ethion @ 450 ml/acre) were tested on second instar nymphs of *B. pallescens* and their mortality was observed at different time intervals i.e. 1, 3, 6, 12, 24 and 48 hours by using leaf dip method and foliar spray method. In case of leaf disc method, ethion showed maximum adverse effect on the survival of second instar nymphs as compared to propargite at each time interval of exposure (Table 1) i.e. the number of dead nymphs were more in case of ethion as compared to propargite treatment. When exposure time for ethion treatment was increased from 1 to 6 hours, the per cent mortality of second instar nymphs increased from 0.10 to 86.00 percent and upon further extension of exposure time to 12 hour and above, there was almost 100 percent mortality. On the other hand, in case of propargite, the per cent mortality was 0.10 percent at 1 hour interval and it gradually increased with increase in exposure time, which was only 20 percent at 48 hours of exposure.

Table 1. Influence of acaricides on second instar nymphs of *Blaptostethus pallescens* at different time intervals by Leaf disc method

Mortality recorded after hour	Percentage mortality of second instar nymph of *B. pallescens* (Mean ± SE)			
	Propargite (300 ml/acre)	Ethion (450 ml/acre)	Control (Distilled water)	CD (p = 0.05)
1	00.00 ± 0.00 (00.57)	000.1 ± 0.00 (0.57)	0.00 ± 0.00 (0.57)	NS
3	04.01 ± 2.45 (07.71)	050.0 ± 05.47 (44.98)	0.00 ± 0.00 (0.57)	(9.60)
6	06.00 ± 2.91 (11.05)	086.0 ± 17.36 (68.70)	0.00 ± 0.00 (0.57)	(9.52)
12	09.00 ± 2.91 (15.49)	100.0 ± 0.00 (89.39)	0.00 ± 0.00 (0.57)	(8.10)
24	09.00 ± 2.93 (15.49)	100.0 ± 0.00 (89.39)	0.00 ± 0.00 (0.57)	(7.38)
48	20.00 ± 6.12 (25.42)	100.0 ± 0.00 (89.39)	0.00 ± 0.00 (0.57)	(8.13)

Values in parenthesis are arc sine transformed values

When second instar nymphs were released on potted plants (Table 2) they showed higher rate of mortality after the foliar spray of acaricides as compared to those in leaf disc method (Table 1). However, among the two acaricides i.e. propargite and ethion, the impact of foliar spray

of ethion on second instar nymphs was more as compared to that of propargite just as in leaf disc method. The corrected mortality of ethion treated nymphs was 10.96 per cent at one hour of exposure and it became almost 100 per cent at six hours of exposure or above. On the other hand in case of propargite, the corrected mortality of second instar nymph was from 6.97 to 75.5 per cent, when exposure time increased from one hour to 12 hours and further extension of exposure time to 24 hours caused 100 per cent mortality of second instar nymphs of *B. pallescens.*

It was concluded from the present findings that both the acaricides i.e. propargite and ethion had an adverse effect on the survival of second instar nymphs of *B. pallescens*. However, the impact of propargite was lesser as compared to ethion. Both are non-systemic acaricides belonging to sulphite ester (propargite) and organophosphate (ethion) groups and they have distinct mode of actions on mitochondrial ATPase inhibitor and acetyl cholinesterase inhibitor, respectively. These modes of actions might produce certain effects such as suppression of feeding capacity of predator to utilize prey, inhibit ability to recognize prey, reduced mobility etc which further might cause death of *B. pallescens*. The present findings were in agreement with the findings of Hamstead (1970) who reported limited survival of predacious mite *Typhlodromus fallacis* (Garman) when propargite was sprayed on foliage of lima beans. Singh and Singh (2005) observed the efficacy of ethion against mite and its predators under field conditions and found it to be highly toxic to predators. On the other hand, Mizell and Schiffauer (1991) and Sanguanpong and Schmutterer (1992) found predatory mite *Neosieulus college* (De Leon) and *Phytoseiulus persimilis* (Athias-Henriot) respectively, to be tolerant to propargite.

Table 2. Influence of acaricides on second instar nymphs of *Blaptostethus pallescens* at different time intervals (Foliar Spray Method)

Mortality recorded after hour (s)	Corrected per cent mortality of second instar nymphs of *B. pallescens* (Mean ± SE)		
	Propargite (300 ml/acre)	Ethion (450 ml/acre)	CD ($P = 0.05$)
1	06.97 ± 0.00 (00.57)	010.96 ± 0.00 (00.57)	(11.82)
3	020.97 ± 0.00 (00.57)	034.97 ± 0.00 (00.57)	(09.63)
6	029.97 ± 0.00 (00.57)	100.00 ± 0.00 (00.57)	(06.28)
12	075.50 ± 4.84 (08.92)	100.00 ± 4.84 (08.92)	(16.91)
24	100.00 ± 5.33 (28.72)	100.00 ± 5.33 (28.72)	(06.57)

Values in parenthesis are arc sine transformed values $(\sqrt{n+1})$

Hence it can be concluded that both acaricides should not be used in bio-intensive pest management programme which include this predator, or the predator could be released after the waiting period is over for propargite and the initial control to mite population could be provided by acaricides and further rise in population of mites on Brinjal could be kept in check by releasing predator.

ACKNOWLEDGEMENT

The authors are grateful to Head, Department of Entomology, Punjab Agricultural University, Ludhiana, Punjab for providing infrastructure and necessary facilities during the course of study. Authors are also thankful to Dr. Manmeet Brar Bhullar, Senior Acarologist, Department of Entomology, Punjab Agricultural University, Ludhiana for her valuable comments and suggestions to conduct the present study.

REFERENCES

Ballal CR, Gupta T, Joshi S. 2012. Predatory potential of two indigenous anthocorid predators on *Phenacoccus solenopsis* Tinsley and *Paracoccus marginatus* Williams and Granara de Willink. *J Biol Control* **26**: 18–22.

Ballal CR, Gupta T, Joshi S, Chandrashekhar K. 2009. Evaluation of an anthocorid predator *Blaptostethus pallescens* against two-spotted spider mite *Tetranychus urticae*. In: Castane C, Perdikis D. (Eds.). *Integrated control in protected crops. IOBC/WPRS Bull.* **49**: 127–132.

Dickinson BC. 1958. Ethion a promising acaricide and insecticide. *J Econ Ent.* **51**: 354–357.

Gough N. 1990. Evaluation of miticides for the control of two spotted spider mite *Tetranychus urticae* on field roses in Southern Queensland. *Crop Prot.* **9**: 119–127.

Goyal NP, Bath SS. 1967. Laboratory trials on effectiveness of some acaricides against spider mite *Tetranychus telarius* Linn. *J Res Punjab Agric Univ.* **4**: 83–87.

Gupta SK. 1985. *Handbook of plant mites of India*. Zoological Survey of India, Calcutta, India. 520 pp.

Hamstead EO. 1970. Greenhouse integrated control studies of the two spotted spider mite on lima beans with predacious mite *Typhlodromus fallacis* and insecticides. *J Econ Ent.* **63**: 1027–1028.

Hernandez LM, Stonedhal GM. 1999. A review of economically important species of genus *Orius* and *Orius*

sauteri (Hemiptera: Antocoridae) when reared on *Ephestia kuehinella* eggs. *Appl Ent Zoo.* **33**: 449–453.

Jeppson LR, McMurthy JA, Mead DW, Jesser MJ, Johnson HG. 1975. Toxicity of citrus pesticides to some predacious phytoseiid mites. *J Econ Ent.* **68**: 707–710.

Kaur P, Bhullar MB, Kaur R. 2012. Predatory potential of an anthocorid predator *Blaptostethus pallescens* (Poppius) against two spotted spider mite *Tetranychus urticae* Koch on brinjal. *Proc Agrochem Prot crops, Health Natural Envir 2nd Int Conf.* New Delhi, India.

Mizell RF, Schiffhauer DE. 1991. Kairomone response, pesticide tolerance and field efficacy of the predatory mite, *Neoseiulus College* (Deleon). *J Env Hort*. **9**: 155–159.

Sanguanpong V, Schmutterer H. 1992. Laboratory studies on the effect of neem oil and neem seed kernel extracts on the spider mite *Tetranychus urticae* Koch (Acari: Tetranychidae). Z *Pflanzen.* **99**: 637–646.

Singh J, Mukherjee IN. 1991. Pest status of phytophagous mites in some northern states of India. *Proc First Asia Pacific Conf Entmol*. Chiangmai, Thailand. 192–203.

Singh RN, Singh SP. 2005. Efficacy of some pesticides against *Tetranychus urticae* Koch and its predatory mite *Amblyseius longispinosus* (Evans). *Rest Pest Mgmt Newsl.* **14**: 7–9.

Swart M, Pazini MR, Ciniglio NF, Rangel RC, Mariconi FAM. 1990. Chemical control of two spotted spider mite tetranychus urticae Koch on cotton. *Anais da Escola superior de Agricultura' Luiz-de-Queiroz'*. **47**: 273–282.

Tawfik MFS, El-Husseini MM. 1971. The life history of the anthocorid predator, *Blaptostethus piceus* Fieber var. *Pallescens* Poppius (Hemiptera: Anthocoridae). *Bull Soc Entomol Egypte.* **55**: 239–252.

Tewari RK. 1983. Problems of sugarcane web mite (*Schizotetranychus andropogoni*) and its control. *Second All India Symp Acarol* Acarolgical Society of India, Bangalore. 65 pp.

Wilson LJ, Herron GA, Leigh TF, Rophail J. 1995. Laboratory and field evaluation of selective acaricides and propargite for the control of *Tetranychus urticae* Koch in Australian cotton. *J Aust Ent Soc.* **34:** 247–252.