



Research Article

Evaluation of anthocorid predator, *Blaptostethus pallescens* Poppius against spider mite, *Tetranychus urticae* Koch on Okra under insect net cage condition

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ABSTRACT: The present study deals with the evaluation of anthocorid bug, *Blaptostethus pallescens* Poppius against *Tetranychus urticae* Koch on okra (*Abelmoschus esculentus* L.), conducted in *Karif* season (June-August) during 2013-2015 in the net cage condition at Entomological Research Farm, Punjab Agricultural University, Ludhiana. The 6-7 days old nymphs of *B. pallescens* @ 10, 20 and 30 nymphs/m² were released at weekly interval on the mite infested plants and these were compared with chemical control (Omite @ 300ml/acre at 10 days interval) and untreated control. The releases of predators and acaricidal spray on okra were found better than control in suppressing the population of *T. urticae*. The release of *B. pallescens* @ 30 nymphs/m² was found most effective with a 75.86 to 81.20 per cent reduction of mite population over control. It was statistically at par with chemical control, where 84.04 to 91.66 per cent reduction of mite population over control was recorded. There was no significant difference observed in the reduction of mite population of the plots released with 20 and 10 nymphs/m² of *B. pallescens*. The yield of okra from the plots of chemical control was recorded highest (52.70 q/acre), followed by 45.05 q/acre from the plots released with a *B. pallescens* @ 30 nymphs/m² at seven days interval. The study concluded that, integrating predator, *B. pallescens* @ 30 nymphs/plant along with acaricide (Omite 300 ml/acre) as a component of IPM for the management of two-spotted spider mite, *T. urticae* on okra under net house conditions.

KEY WORDS: Anthocorid bug, *Blaptostethus pallescens*, okra, *Tetranychus urticae*, two-spotted red spider mite

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INTRODUCTION

Tetranychus urticae Koch, two spotted red spider mite is a polyphagous pest in India, feeds on number of host plant species mainly on cotton, brinjal, okra, cucurbits and cowpea and causes significant yield loss (Srinivasa and Sugeetha, 1999). Among the vegetables, okra (*Abelmoschus esculentus* L.) is severely infested by red spider mite causing heavy loss in its yield. In India, okra is one of the most important vegetable crop grown in the tropical and sub-tropical region on an area of 3.58 lakh and 35.24 lakh tonnes production with a productivity of 9.8 t/ha (Anonymous, 2005). In Punjab, Punjab-8, Punjab-13, Punjab Padmini and Pusa Sawani are the major varieties of okra grown under 2.66 thousand ha area with an average yield of 10.39 t/ha and a production of 27.66 thousand tonnes (Anonymous, 2013). The infestation of red spider mite causes aesthetic injuries to the okra plants by webbing which results in reduction of quality and yield of the crop. A number of conventional acaricides belonging to several groups such as organotin compounds, mitochondrial electron transport inhibitor-acaricides belonging to group

pyrazolium, pyridazinone, quinazoline etc have been reported effective against spider mites (Hayes and Laws, 1991). The frequent and indiscriminate use of synthetic chemicals has resulted in the development of resistance, consequently, hindering the cost effective management for mites (Cho *et al.*, 1995; Devine *et al.*, 2001; Dobson *et al.*, 2002). Moreover, prevailing warm and dry weather is favourable for the multiplication and spread of this pest (Jeppson *et al.*, 1975).

The importance of biological control in pest management is well known all over the world. Biological control is environmentally safe, cost-effective and energy efficient pest control method, either on its own or as a component of integrated pest management. Several predators such as predatory mites, predatory thrips, gall midge, coccinellid beetles, mirid bugs, green lace wings and anthocorid bugs have been reported to prey on spider mites under greenhouses and open field conditions. The coccinellid of the genus *Stethorus*, staphylinid, *Oligota* sp. and phytoseiid mite, *Amblyseius longispinosus* (Evans) contribute the chief predatory fauna on spider mites (Jeyarani *et al.*, 2012). Besides these predators,

anthocorids, are the potential predators of sucking pests like thrips, aphids and mealy bugs in various cropping systems in the Mediterranean Basin and sub-Saharan Africa (Hernandez and Stonedahl, 1999; Sengonca *et al.*, 2008; Zhang *et al.*, 2012; Efe and Cakmak, 2013; Wang *et al.*, 2014). In India, *B. kumbi* Rajasekhara, *B. pallescens* and *Blaptostethus pluto* (Distant) have been reported (Rajasekhara 1973; Muraleedharan, 1977; Jalali and Singh, 2002). Among, the predatory potential of *B. pallescens* has been reported against mealy bug *Phenacoccus solenopsis* Tinsley and papaya mealy bug *Paracoccus marginatus* Williams and Gronara de Wilink on cotton (Ballal *et al.*, 2009, 2012) and spider mite *Tetranychus urticae* on okra and brinjal (Kaur *et al.*, 2012). Keeping in the view the importance of two spotted spider mite as serious pest of okra and the commercial value of the crop, *B. pallescens* a potential biocontrol agent along with acaricide was, evaluate against two-spotted spider mite, *T. urticae* on okra during rainy season under insect net cage condition.

MATERIAL AND METHODS

The experiment on the evaluation of anthocorid predator, *Blaptostethus pallescens* against two-spotted spider mite, *Tetranychus urticae* on okra was conducted under net house condition at Entomological Research Farm, PAU, Ludhiana during 2013-2015. In year 2013, the experiment was conducted on potted okra plants and during 2014-2015, the experiment was conducted on the field under net house conditions.

Rearing of two-spotted spider mite and anthocorid bug *Blaptostethus pallescens*

The pure culture of two-spotted spider mite, *T. urticae* used for experiments was reared on potted plants of french bean (*Phaseolus vulgaris* Linnaeus) which were maintained in screen house at Entomological Research Farm, Punjab Agricultural University, Ludhiana. The nucleus culture of *B. pallescens* (Institute Accession No. IAN- MP- ANT- 04 and National Accession No. NAN- NBAIR- MP- ANT- 04) was procured from National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru India. It was reared according to the standardized method of NBAIR in Biological Control Laboratory, Department of Entomology, Punjab Agricultural University, Ludhiana at $27 \pm 1^\circ\text{C}$, $70 \pm 10\%$ relative humidity and L14: D10 photoperiod.

On potted okra plants

The seeds of okra (var Pusa Sawani) were sown in the earthen pots during August, 2013 and these pots were placed in the nylon net cages. After a month, the *T. urticae* mites

were released on these potted plants for their establishment. When the mites were fully established on the okra plants, the pre-treatment data was recorded and the predator was released. The experiment was carried out with five treatments, 1) *B. pallescens* @ 10 nymphs per plant, 2) *B. pallescens* @ 20 nymphs per plant, 3) *B. pallescens* @ 30 nymphs per plant, 4) Chemical control: Omite @ 300ml/acre and 5) Untreated control. The treatments were replicated five times by maintaining five plants in the each replication. Three releases of 6-7 days old nymphs of *B. pallescens* were carried out at weekly interval along with three sprays of acaricide at 10 days interval on the mite infested potted plants. The data of surviving mite population was recorded from the three leaves of each plant under the experiment. The recorded data was subjected to one way analysis of variance using Completely Randomized Design (CRD) and the treatment means were compared.

On field crop

The okra (var Pusa Sawani) was sown in the month of July in the field during 2014 and 2015. After a month, small insect net cages (4×4×4 feet) were installed in the field and the *T. urticae* mite was released for its establishment on the plants in the net cages. After the establishment of mite on the plants, pre-count of mite population was recorded. Thereafter, 6-7 days old nymphs of *B. pallescens* @ 10, 20 and 30 per one square meter were released and Omite @ 300ml/acre was sprayed on the mite infested plants. There were three replications per treatment and five plants per replication. In the year 2015, yield of okra was recorded in each treatment. The recorded data was subjected to two way analysis of variance using Randomized Block Design (RBD) and the treatment means were compared by Least Significant Difference test (LSD) at 5% level of significance (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

On the potted plants, it was observed that, the population of mites was significantly reduced after the release of *Blaptostethus pallescens* nymphs (Table 1). The *B. pallescens* @ 30 and 20 nymphs/ plant and chemical control (Omite @ 300ml/acre) were found better than the release of *B. pallescens* @ 10 nymphs/plant and untreated control. The per cent reduction of mite population over control was 84.0, 80.9, and 70.2 per cent with acaricide, *B. pallescens* @ 30 nymphs and 20 nymphs/plant, respectively. Among the *B. pallescens* release rate, 30 nymphs/plant efficiently reduced the mite population (11.4 mites/plant) and it was at par with *B. pallescens* @ 20 nymphs/plant (17.8 mites/ plant). Moreover, both these release dosages of *B. pallescens* were at par with chemical control (9.5 mites/plant). However, the release of *B.*

pallescens at lower dosages @ 10 nymphs/plant (32.6 mites/plant) was less effective and it was at par with the untreated control (59.7 mites/plant).

In the field evaluation, *B. pallescens* nymphs (6-7 days old) nymphs of *B. pallescens* were released at weekly interval on the plants infested with mites under insect net condition. It was observed that, the release of *B. pallescens* @ 30 nymphs/m² was found most effective with a 9.7 and 7.7 mites/plant during 2014 and 2015, respectively in suppressing the population of mites. There was no significant difference was observed in the reduction of mite population under the *B. pallescens* released plot and acaricide sprayed plots, in the both years (4.3 and 4.2 mites/plant) (Table 2). The release of *B. pallescens* @ 20 nymphs/m² significantly reduced the mite population 13.4 and 11.0 mites/plant, respectively in both years, was at par with *B. pallescens* @ 10 nymphs/m² (16.1 and 12.7 mites/plant, respectively). All the releases of predators and spray of acaricide on the okra were significantly superior over untreated control. In untreated control, a population of mite was comparatively higher in both the years (51.6 and 31.9 mites/plant, respectively). Further, it was observed that after the releases of *B. pallescens* @ 30 nymphs/m² and the spray of Omite @ 300 ml/acre, the percent reduction of mite population over control was 81.2 and 91.7, respectively during 2014 and 75.9 and 86.8, respectively in 2015 (Table 2). The yield of okra recorded from the acaricide sprayed plots was highest (52.70 q/acre), followed by *B. pallescens* @ 30 nymphs/m² with a 45.05q/acre at seven days interval released plots. The yield obtained in acaricide sprayed field

and *B. pallescens* @ 30 nymphs/m² was at par with each other and better than yields of other treatments.

The present study indicated that the release of *B. pallescens* @ 30 nymphs/m² at seven days interval was effective in suppressing the population of *Tetranychus urticae* on okra under net cage condition. These results are in corroboration with findings of Ballal *et al.* (2009) who observed 78 per cent reduction of two-spotted red spider mite on okra under net house condition. Kauret *et al.* (2012) revealed good predacious potential of seven day old nymphs of *B. pallescens* on (85.3% consumption) the two spotted spider mite, *T. urticae* on brinjal under the laboratory conditions. *B. pallescens* significantly suppress the population of *Corcyra cephalonica* (Stainton) by consuming its eggs and nymphs (Ballal *et al.*, 2003; Kaur *et al.*, 2011). Gupta *et al.* (2011) also indicated in their laboratory studies that *B. pallescens* could feed on the cotton mealybug, *Phenacoccus solenopsis* Tinsley which emerged as a serious pest on cotton in India. *B. pallescens* could predate on *P. solenopsis* as well as papaya mealy bug, *Paracoccus marginatus* Williams and Gronara de Willink (Ballal *et al.*, 2012). Besides releases of *B. pallescens*, the spray of Omite @ 300 ml/acre was found equally effective against *T. urticae* on okra. Omite 57 EW provided excellent control on the different strains of two-spotted spider mite infesting apple, grape, tomato and aubergine and appeared to be rapid in suppressing the mite (Angeli *et al.*, 2008). Rahman *et al.* (2007) found 1:400 dilution of propargite most promising and showing a significant reduction in red spider mite population in tea varying from 69.62 to 100%. Further,

Table 1. Evaluation of anthocorid predator, *Blaptostethus pallescens* against spider mite *Tetranychus urticae* on potted okra plants during year 2013

Treatments	Number of mite population/plant					Per cent reduction over control
	Before release	After release*				
		1 st	2 nd	3 rd	Mean	
<i>Blaptostethus pallescens</i> @ 10 nymphs/plant*	30.5	27.8 ^b (5.3) [#]	26.8 ^b (5.7)	43.4 ^b (8.5)	32.6 ^b (6.8)	45.4
<i>B. pallescens</i> @ 20 nymphs/plant*	31.6	10.8 ^a (3.3)	18.4 ^a (3.5)	24.2 ^a (4.8)	17.8 ^a (4.3)	70.2
<i>B. pallescens</i> @ 30 nymphs/plant*	30.4	7.2 ^a (2.6)	12.8 ^a (3.2)	14.20 ^a (3.9)	11.4 ^a (3.5)	80.9
Chemical control (Omite @ 300ml/acre) **	37.2	6.0 ^a (2.4)	10.4 ^a (3.1)	12.20 ^a (3.4)	9.5 ^a (3.2)	84.0
Untreated Control	38.8	29.0 ^b (5.3)	47.6 ^b (6.7)	102.6 ^b (9.4)	59.7 ^b (7.5)	-
CD (5%)	-	(1.7)	(1.9)	(3.1)	1.6	-

*Two releases at seven days interval.

**Two sprays at ten days interval

Figures in parentheses are square root transformed values

Table 2. Evaluation of anthocorid predator, *Blaptostethu spallescens* against spider mite *Tetranychus urticae* on okra in insect net house condition

Treatments	Number of mite population/plant											Yield (q/acre) (2015)	
	2014				Per cent reduction over control	2015					Per cent reduction over control		
	Before release	After release*				Before release	After release*						
		1 st	2 nd	Mean		1 st	2 nd	3 rd	4 th	Mean			
<i>B. pallescens</i> @ 10 nymphs/m ² *	36.6 (6.1) [#]	24.8 ^c (5.0)	7.3 ^b (2.8)	16.1 ^b (3.9)	68.8	24.3 (5.01)	12.5 ^c (3.7)	23.1 ^b (4.9)	8.1 ^a (3.0)	6.9 ^b (2.8)	12.7 ^{ba} (3.6)	60.2	32.40 ^b
<i>B. pallescens</i> @ 20 nymphs/m ² *	33.0 (5.8)	18.8 ^{bc} (4.4)	8.0 ^b (3.0)	13.4 ^b (3.7)	74.0	20.6 (4.6)	12.3 ^c (3.6)	17.2 ^b (4.2)	7.6 ^a (2.9)	7.0 ^b (2.8)	11.0 ^{ba} (3.4)	65.5	32.35 ^b
<i>B. pallescens</i> @ 30 nymphs/m ² *	38.3 (6.2)	13.7 ^b (3.8)	5.7 ^{ab} (2.5)	9.7 ^{ab} (3.2)	81.2	23.8 (4.9)	8.6 ^b (3.1)	13.2 ^b (3.8)	5.5 ^a (2.5)	7.8 ^b (2.9)	7.7 ^a (2.9)	75.9	45.05 ^a
Chemical control (Omite @ 300ml/acre) **	33.3 (5.8)	6.0 ^a (2.6)	2.7 ^a (1.9)	4.3 ^a (2.3)	91.7	25.7 (5.2)	0.6 ^a (1.2)	2.8 ^a (1.9)	5.1 ^a (2.5)	3.6 ^a (2.1)	4.2 ^a (2.1)	86.8	52.70 ^a
Control (untreated)	33.6 (5.8)	57.8 ^d (7.6)	45.5 ^c (6.8)	51.6 ^c (7.2)	-	27.3 (5.3)	31.9 ^d (5.7)	38.1 ^c (6.2)	33.0 ^b (5.8)	24.8 ^c (5.1)	31.9 ^c (5.7)	-	20.90 ^c
CD(5%)	(0.2)	(0.9)	(0.9)	(1.1)	-	(NS)	(0.4)	(1.1)	(0.6)	(0.7)	(0.9)	-	11.42

*The releases of *Blaptostethus pallescens* nymphs at seven days interval.

** Spray of Omite @ 300 ml/acre at ten days interval

Figures in parentheses are square root transformed value

Kumar *et al.* (2013) also revealed 81.78 per cent reduction in *T. urticae* population on different vegetables *viz.*, brinjal (*Solanum melongina* L), bitter gourd (*Momordica charantia* L.), okra (*A. esculentus*), cucurbits and cowpea (*Vigna chinensis* L.) with Omite 57 EC over the control. According to Ghosh (2013), propargite resulted in the best treatment in the suppression of mite population (88.55% suppression) on brinjal, over the mixed formulation of botanical pesticide and azadirachtin.

From the present studies, it is concluded that after the releases of *B. pallescens*, the population of two-spotted spider mite was significantly reduced as compared to untreated plants and the releases were as effective as acaricide spray. Hence, the anthocorid predator *B. pallescens* as bio-agent @ 30 nymphs/m² being safer can be used for the management of two-spotted spider mite, *T. urticae* on okra in net house condition. The use of this predator during low/initial population phase of red spider mite is likely to provide good control. Further the integration of this predator in existing IPM program (including acaricide-Omite) would provide a holistic management of the red spider mite. However, a systematic research is, needed to analyze the compatibility of *B. pallescens* with the commonly used acaricides.

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