Release of *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) and the Predacious Mite, *Phytoseiulus macropilis* (Banks) (Acari:Phytosiidae) to Control, *Tetranychus urticae* Koch (Acari: Tetranychidae) in greenhouse in Egypt

Wafaa, O. Gomaa and F. M. H. Eid
Plant Protection Research Institute, Agriculture Research Center, Dokki, Giza, Egypt
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ABSTRACT

Biological control of *Tetranychus urticae* Koch moving stages on cucumber plants by releasing the predaceous mite, *Phytoseiulus macropilis*(Banks) and second instar larvae of *Chrysoperla carnea* (Stephens) at three levels of predator : prey ratios (2:15,2:25and 2:30) in a greenhouse at Giza Governorate during 2007 season was studied. By increasing the time after releasing of *P. macropilis*,the reduction of *T. urticae* increased gradually to reach (82.36%) and (84.83%) in the 6th week and (100%) in the 10th week of treatments at2:15 and 2:25, respectively .While in case of the treatment 2:30 ,tne percent reduction fluctuated during the season .The whole mean reduction after 12 weeks of applications for the three treatments reached 68.85 , 64.9 and 35.48% ,respectively.The activity of *C.carnea* aginst *T. urticae* recorded lowest percent reduction (32.83%) .In case of the combined release of 2nd instar larvae of *C.carnea* and *P. macropilis* at the level (1+2 :30) gave the best results of controlling *T. urticae* (81.16%) reduction followed by (1+1 :30) as its reduction was (60.1%) . Releasing the predatory mite, *P. macropilis* and 2nd larvae of *C.carnea* on cucumber indicated the possibility of controlling *T. urticae* in the greenhouses.

Key Words: *Chrysoperla carnea, Phytoseiulus macropilis, Tetranychus urticae,* Release, cucumber, greenhouse.

INTRODUCTION

Cucumber, *Cucumis sativus* L. is one of the most important cucuritaceous vegetable crops in Egypt, as it is cultivated under different environmental conditions, open field and greenhouses for local consumption and exportation.

The two spotted spider mite, *Tetranychus urticae* Koch is a world wide pest attacking greenhouse crops such as; ornamentals (Vrie, 1985), vegetables (Hussey and Scopes, 1985), Charles, 1988 and El-laithy 1992. Heikal *et al.*, 2000, concluded the possibility of controlling *T. urticae* population on strawberry in Egypt by using the predatory mite, *Phytoseiulus macropilis* (Banks). Mowafi (2005) released the predatory mite *P. macropilis* early and late in the cucumber season to control the two - spotted spider mite *T. urticae*. The efficacy of the lacewing, *Chrysoperla carnea* Steph for controlling different pests on various crops has been studied by several authors (Tulisalo, 1984 and Canard *et al.*, 1984).

The present study was carried out as an attempt of using some predaceous mites and insects for controlling *T. urticae* on cucumber in greenhouse.

MATERIALS AND METHODES

Rearing of predacious mite:

The phytoseiid predator, *P. macropilis* was mass reared on *T. urticae* on bean plants in a small greenhouse (4.5m wide x 6.0 m long) at Giza Governorate. Second instar larvae of *C. carnea*, were obtained from Laboratory of Biological Control, Faculty of Agriculture, Cairo University.

Releasing of the predators:

Releasing of the predatory mite, *P. macropilis* and the predatory insect (2nd larvae of *C. carnea*) were carried out in a greenhouse (105 m^2, 7 m wide x 15 m long) cultivated with cucumber, variety (Dallah 362) at Giza Governorate . The greenhouse was divided into 7 plots (each about 15 m^2) .All plots were arranged in a randomized complete block design. Each cultivated line was considered as a replicate (5 replicates for each treatment). The predatory mite, *P. macropilis* was released at the ratios (2:15), (2: 25) and (2:30) predator: prey, respectively in the first three plots and (1 larva (L_2) of *C.carnea*: 15), (1 larva of + 1 predatory mite: 25) and (1 larva + 2 predatory mite: 30 preys) in the other three plots; while the rest cucumber plot was left without predator releasing as control. The released cucumber plots were separated from each other by a plastic sheet to avoid the predator escaping to other plots. Required population of the predatory mite individuals were calculated according to the following formula:

$$\text{Release No} = \frac{\text{Total no. of } T.\ urticae \text{ in treatment x predator ratio}}{\text{prey ratio}}$$

Infested bean leaves with the predatory mite were transferred in an ice- box to the greenhouse and then released on infested cucumber plants. After one

week of releasing, 30 leaves were taken biweekly, placed in paper bags and transferred to the laboratory. Moving stages of both predator and prey were counted on three randomized chosen inches ^{2} for 12 subsequent weeks.

The statistical equation of Henderson and Tilton 1955 was used to calculate the reduction in the mite populations. Data were analyzed using SAS program and means separated by the L.S.D test (SAS Institute, 1988).

RESULTS AND DISCUSSION

The mean number of moving stages of the two spotted spider mite, *T. urticae* was generally higher in the pre- count (just before the predators release). It was 23.5± 4.3, 19.5±2.9, 22.6±4.6, 20.7±3.9, 21.1±3.3, 24.7±5.9 and 23.4±3.3 individuals / inch ^{2} of cucumber leaf, for the six treatment and control, respectively (Table 1&2).

Release of *P. macropilis* only:

One week after releasing the predator, the population of *T. urticae* decreased slightly and averaged 19.1±5.2, 17.2±3.2, 18.2± 4.7, and 17.8±3.2 individuals/inch^2 for the different treatment, (2: 15, 2: 25 and 2: 30 predator: prey) and control, respectively . Concerning the weekly mean numbers of all stages of the predatory mite 3.2, 2.3 and 1.0 individuals/inch^2 for the three treatments, respectively were recorded.

By increasing the time, the percent reduction of *T. urticae* increased gradually to reach 82.36% in the 6th week after release and then decreased in the 7th week (78.73%) and reincreased from 8th week to reach its maximum (100%) in the 10th week. Thereafter, the percent reduction decreased for the treatment 2 predators: 15 preys, while for the second treatment, the percent reduction increased gradually to reach (100%) in the weeks 9th and 10th and then that decreased. While in case of the 3rd treatment, the percent reduction fluctuated from the 2nd week after release till the 6th week, and then decreased up to the end .The mean number of the predatory mite fluctuated during all the season and ranged between 0.2–5.6 and 1.3–7 individuals/inch^2 for the two treatments 2: 15 and 2: 25, respectively and between 0.5–6.3 individuals/inch^2 in the 3rd treatment (Table 1).

These data proved that releasing of *P. macropilis* at the level (2:15) gave the best results of controlling *T. urticae*. This treatment occupied 68.85% followed significantly by the 64.9% in the (2: 25) treatment.

The 3rd treatment was highly significant lower than the other two treatments as it recorded 35.48%. Obtained data agree with those of Heikal and Ibrahim (2001) on strawberry. However, Mowafi (2005) reported that, releasing the predatory mite, *P. macropilis* on cucumber indicated the possibility of controlling *T. urticae* in the greenhouses by applying only one release of the predator early when the pest population is low.

Relase of 2nd instar larvae(L_2) of *C.carnea* only:

Data in Table (2), indicated that predator release affected pest population by increase of reduction gradually till the 5th week and in 6th week (34.21%) till 8th week and reincreasing from 9th week till the end of the investigation. The mean percent of reduction was low (32.83%), because *C.carnea* attacks *T. urticae* and other pests such as aphids and nymphs of whitefly which infesting cucumber plants (Butler and Hungerford, 1971).

Combined release:

Combined release of 2nd instar larvae of *C. carnea* and *P. macropilis* for controlling the movable stages of *T. urticae* on cucumber leaves under greenhouse when released at the two levels (1+1: 25 and 1+2: 30 predator:prey) were tabulated in Table (2). Results revealed that after one week of release, the two predators reduced the population density of *T. urticae* from 21.1 and 24.7 individuals/ inch^2 (pre-count) to 8.2 and 6.3 individuals/inch^2 for the two levels of release, respectively. Corresponding reductions percentages were 53.39 and 64.6%, respectively.

By increasing the time after releasing, it was observed that the percent reduction of the *T. urticae* increased gradually after 4th week to reach its maximum (100%) during the two weeks post treatment of (1 ^{2nd} larvae of *C.carnea* + 1 predator mite: 25 preys). For the other treatment (1+2: 30 predator: preys), it increased gradually after releasing (64.6%) to reach its maximum percent reduction (100%) recorded by the end of evaluation.

Meanwhile, the mean number of the predatory mite stages on the two previously mentioned levels increased gradually till the 4th week only and than it decreased. During the 6th week and the two last weeks, no predatory mite was found due to the preying chrysopid larvae. *C. carnea* sometimes does not discriminate between the mites and other pests (Canard and Duelli 1984), As shown in Table (2), the general mean of reduction percentages in *T. urticae* movable stages due to releasing the larvae

Table (1): Effect of the release of *Phytoseiulus macropilis* (Banks) for reducing the population of *Tetranychus urticae* Koch infesting cucumber plants under greenhouse at Giza Governorate 2007 season.

Releasing level		2 predator / 15 prey			2 predator / 25 preys			2 predator / 30 preys			Control
Sampling		Mean No. of /inch^2		%	Mean No. of / inch^2		%	Mean No. of /inch^2		%	
		T.urticae	*P.macropilis*	Reduction	*T.urticae*	*P.macropilis*	Reduction	*T.urticae*	*P.macropilis*	Reduction	
Pre–count		23.5±4.6			19.5±4.1			22.6±4.4			23.4±3.8
After releasing (week)	1	19.1±5.3	3.2±0.4	73.03	17.2±3.2	2.3±0.8	3.37	18.2±4.7	1.0±0.1	2.24	17.8±3.2
	2	15.2±2.8	4.4±1.7	22.44	16.4±4.2	4.2±1.5	16.32	18.0±2.9	3.0±0.8	8.16	19.6±4.4
	3	14.5±4.1	4.3±2.1	34.68	15.3±2.2	5.3±2.2	31.08	17.2±3.3	3.5±1.2	22.52	22.2±3.6
	4	11.9±4.6	5.6±1.9	40.79	12.0±1.2	7.0±3.3	40.29	16.6±2.9	4.2±1.0	17.41	20.1±2.9
	5	12.3±2.7	2.1±0.2	64.03	9.0±1.0	4.1±1.9	73.68	15.1±3.1	6.3±2.1	5.84	34.2±2.2
	6	10.0±2.1	1.2±0.4	82.36	8.6±1.9	3.2±1.4	84.83	16.1±2.6	5.2±2.1	71.60	56.7±3.6
	7	9.1±1.8	2.1±1.1	78.73	6.9 ±2.4	5.1±0.5	83.87	16.7±3.9	1.3±0.3	60.98	42.8±6.1
	8	3.6±1.6	0.6±0.2	89.18	4.5±1.2	3.61.2	86.48	15.1±2.2	1.5±0.5	54.65	33.3±2.7
	9	1.0±0.3	0.5±0.1	95.63	0.0±0.0	2.4±0.9	100	13.0±2.3	1.5±0.2	43.23	22.9±3.3
	10	0.0±0.0	0.5±0.1	100	0.0±0.0	2.2±1.0	100	8.2±1.8	2.0±1.1	37.40	13.1±3.3
	11	3.0±1.1	0.3±0.1	71.69	2.1±0.6	1.8±0.4	80.18	7.1±2.4	3.1±0.1	33.01	10.6±2.1
	12	2.1±0.9	0.2±0.1	73.75	1.7±0.6	1.3±0.3	78.75	6.5±2.5	0.5±0.01	18.75	8.0±1.9
Mean reduction				68.85*			64.90			35.48	
				F value = 5.40				L.S.D = 9.18			

Table (2): Effect of releaasing *Chrysoperla carnea* (Stephens) larvae (L_2) and *Phytoseiulus macropilis* (Banks) for reducing the population of *Tetranychus urticae* Koch infesting cucumber plants under greenhouse at ±Giza Governorate 2007 season.

Releasing level		1 larvae of *C.carnea* /15 preys			1 larvae of *C.carnea* + 1 predator mite / 25 preys			1 larvae of *C.carnea* + 2 predatories mite / 30 preys			
Sampling		Mean No. of /inch^2		%	Mean No. of / inch^2		%	Mean No. of / inch^2		%	
		T.urticae	*P.macropilis*	Reduction	*T.urticae*	*P.macropilis*	Reduction	*T.urticae*	*P.macropilis*	Reduction	Control
Pre–count		20.7±3.2			19.5±2.9			22.6±4.6			23.4±3.3
After releasing (week)	1	15.0±1.9	0.0±0.0	15.73	8.2±2.1	1.0±0.01	53.39	6.3±1.1	1.5±0.4	64.60	17.8±2.6
	2	14.8±2.7	0.0±0.0	24.48	11.2±1.9	1.0±0.01	42.85	6.8±1.2	2.2±0.5	65.30	19.6±2.8
	3	16.2±1.9	0.0±0.0	27.02	13.2±2.6	2.5±0.3	40.54	7.3±0.3	3.8±0.3	67.11	22.2±5.4
	4	14.4±2.4	0.0±0.0	28.35	13.4±3.4	2.2±0.2	33.33	6.4±1.7	3.2±0.5	68.15	20.1±2.4
	5	21.2±4.3	0.0±0.0	38.01	22.0±4.3	1.3±0.5	35.67	6.3±1.9	2.5±1.5	81.57	43.2±3.3
	6	37.3±5.5	0.0±0.0	34.21	32.5±4.6	0.0±0.0	42.68	9.2±2.1	0.0±0.0	83.77	56.7±4.4
	7	31.0±2.1	0.0±0.0	27.57	22.1±3.6	0.5±0.01	48.36	7.3±1.3	0.5±0.01	82.94	42.8±6.7
	8	27.5±2.2	0.0±0.0	17.41	12.0±4.1	0.3±0.01	63.96	4.4±1.1	0.7±0.1	86.78	33.3±4.9
	9	13.9±2.1	0.0±0.0	39.30	4.6±2.0	0.0±0.0	79.90	3.1±0.3	0.3±0.01	86.46	22.9±3.4
	10	7.2±1.3	0.0±0.0	45.03	2.5±1.1	0.0±0.0	80.91	1.6±0.2	0.0±0.0	87.78	13.1±3.1
	11	5.5±0.9	0.0±0.0	48.11	0.0±0.0	1.5±0.4	100	0.0±0.0	0.2±0.01	100	10.6±2.6
	12	4.1±1.20.0	0.0±0.0	48.75	0.0±0.0	1.0±0.01	100	0.0±0.0	0.0±0.0	100	8.0±2.1
Mean reduction				32.83			60.1			81.16*	
				F value = 24.21				L.S.D = 12.6			

of *C. carnea* and *P. macropilis* at different levels of release were significantly different ,where the highest mean percent of reduction (81.16%) was recorded in case of (1+2 predator: 30 preys) treatment, followed significantly by (1+1predator: 25preys) as their reduction was (60.1%).

It can be concluded that the possibility of controlling the two–spotted mite, *T. urticae* infesting cucumber plants in greenhouse by releasing of 2nd instar larvae of *C.carnea* with *P. macropilis* at the leavel (1+2 predator: 30 preys) gave the best results of controlling *T. urticae* .

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