EFFECT OF RELEASING DIFFERENT LEVELS OF *PHYTOSEIULUS MACROPILIS* (BANKS) PREDATOR ON *TETRANYCHUS URTICAE* KOCH

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Abstract

Under a screen greenhouse conditions the predatory mite, *Phytoseiulus macropilis* (Banks) (Acari: Phytoseiidae) was released at 4 and 7 predators/pot on bean plants inculcated 7 days prior with different densities of *Tetranychus urticae* Koch (i. e. 6, 12, 24 and 48 individuals/pot). When the predatory mite, *P. macropilis* was released at low level (4 predators/pot) on bean plants, the populations of *T. urticae* increased in the pots with the increase of the initial inoculated mites. Also, populations of *T. urticae* were comparatively high after 7 and 14 days from the predator release when the predatory mite, *P. macropilis* was released at the low level than those obtained with the high level. On the other hand, higher reductions of target mite pest were obtained after 7 and 14 days when the predator was released at high rate (7 predators/pot). The same was obtained by decreasing of the initial densities of *T. urticae*. The prey: predator ratios generally should be increased, in general, with the increase of the initial inoculated *T. urticae*. It was clearly high after 7 days from the predator release, while obviously decreased after 14 days. According to the previous results is be advisable to release the predatory mite, *P. macropilis* when the *T. urticae* population is at low number to achieve suitable situation for the predator to play their role successfully.

INTRODUCTION

The two-spotted spider mite, *Tetranychus urticae* Koch is known to be the main pest of many plants which may cause moderate to several damage, resulting in low yield production together with fruits of low quality. The phytoseiid mites have received considerable attention in the last decades as effective biocontrol agents controlling populations of different species of mite pest (Helle & Sabelis, 1985 and McMurtry & Croft, 1997). The effect of releasing the predatory mite *Phytoseiulus macropilis* (Banks) on certain economic plants to control the two-spotted spider mites and other tetranychid pests were investigated by several authors: McMurtry *et al.* (1984),

Ramos & Rodriguez (1995), Heikal *et al.* (2000) and Heikal & Ibrahim (2001). Those encourged the authors to continue study to find out the suitable time and rate of release of the phytoseiid predator against the most common tetranychid in Egypt *T. urticae*.

MATERIALS AND METHODS

Kidney bean (*Phaseolus vulgaris* L.cv. Giza 3) was planted in 1:1 peat moss-vermiculate mix at a rate of three bean seeds per a 12 cm diameter plastic pot. Seedlings of about 10 days old were infested with different levels of spider mite females: males 5:1, 10:2. 20:4 and 40:8 and each treatment was replicated ten times. The inoculated mites were left for seven days under the greenhouse condition to allow reproduction. Three groups of the previous treatments were established. Plants of the first group were released with adults of the predatory mite, *P. macropilis* at the rate of three females and one male/pot. Plants of the second group were released with six females and one male of the predator individuals/pot, while those of the third group were left without predator as control. Bean pots were kept on racks at greenhouse under temperature averaged 29.3°C, with a range from 21.8°C at night to 36.8°C at day and relative humidity ranged from 18 to 74%. Holders of the stands were put in plastic jars filled with water and sides of the stands were covered with muslin to protect against other predators and insect pests. Five replicates from each treatment were inspected with the aid of a stereomicroscope after 7 days. The other five replicates were examined after 14 days from the predator release.

RESULTS AND DISCUSSION

When the predatory mite, *Phytoseiulus macropilis* (Banks) was released at low level (4 predators/pot) the populations of *Tetranychus urticae* Koch increased in the release pots with the increase of inoculated mites Table 1. They were 285, 572, 1178 and 1850 mites/pot when the initial inoculated *T. urticae* were 6, 12, 24 and 48 mites/pot, respectively. On the other hand, high increase of mites numbers was recorded in the untreated pots reaching 418, 833, 1607 and 2610 in the previous inoculations, respectively. Morever *T. urticae* mite numbers were obviously decreased after 14 days (from the predator release) to reach 124, 207, 413 and 836 mites/pot in the previous release pots, respectively. On the other hand, a very high increase in mites numbers was observed in the non-release pots, where the counts of *T. urticae* were 3024, 4477, 6373 and 6383 mites/pot in the previous inoculation, respectively.

Accordingly, reduction of *T. urticae* pest was comparatively low after 7 days from the release of its predator, reaching 31.8, 31.4, 26.7 and 29.1 % when the release pots inoculated by this mite pest at 6, 12, 24 and 48 individuals/pot, respectively. The reduction of mites was highly increased after 14 days. They were 95.9, 95.4, 93.5 and 86.9% in the previous inoculation of *T. urticae*, respectively.

The total increase of the predator after 7 days reached 131, 138, 112 and 102 predators/pot when the predator was released on bean pots inoculated with the *T. urticae* at a rate of 6, 12, 24 and 48 individuals/pot, respectively. A very high numbers of the predator were recorded after 14 days from its release, reaching 559, 757, 500 and 572 predators/pot.

The prey: predator ratio generally increased with the increase of infestation by mite pest/pot. It was clearly high after 7 days from the predator release, reaching 2.2, 4.1, 10.5 and 19.1 mite/one predator in when *T. urticae* was released at the rate of 6, 12, 24 and 48 individuals/pot, respectively. These values were obviously decreased after 14 days to 0.2, 0.3, 0.8 and 1.5, respectively.

When the predatory mite, *P. macropilis* was released at a high level (7 individuals/pot) a very low population of *T. urticae* pest was recorded after 7 and 14 days from the predator release. It was 10, 17, 33 and 177 mite/pot after 7 days and 3, 11, 20 and 45 mite/pot after 14 days when bean pots received mite pest at the rate of 6, 12, 24 and 48 individuals/pot, respectively. Therefore, very high reductions of mites were found, i.e. were 99.8, 99.8, 99.8 and 93.2 % after 7 days from the predator release and 100, 100, 100 and 99.9% after 14 days, when *T. urticae* inoculation with the previous rates, respectively Table 2. It is interesting to notice that low numbers of the predator were recorded with the high release rate of mite, reaching 15, 22, 43 and 111 predators/pot were recorded after 7 days and 5, 10, 15 and 18 predators/pot were recorded after 14 days when bean pots inoculated with *T. urticae* at the rate of 6, 12, 24 and 48 individuals/pot, respectively Table 2.

Also, the prey predator ratios were found very low as a result of reducing the *T. urticae* population. They were 0.7, 0.8, 0.8 and 1.3 *T. urticae*/one predator after 7 days and 0.6, 1.1, 1.3 and 2.5 *T. urticae*/one predator when the *T. urticae* inoculated at the rate of 6, 12, 24 and 48 individuals/pot, respectively Table 2.

Several authors who reported the initial ratio between the numbers of prey and predator is important for the regulation of prey density by phytoseiid mites. Collver (1958) reported that when the initial number of 5, 25, or 50 *Panonychus ulmi* Koch

were placed on a plant with five *Typhlodromus pyri* Scheuten, the prey population remained at a low density for the next three months. The same author (1964) also showed in insectary experiments using potted *Prunus* seedlings that starting at the beginning of the season with up to ten times as many *P. ulmi* as *T. pyri*, the latter obtained control of *P. ulmi*, and maintained it at a level of about one mite per leaf for the rest of summer. Bravenboer and Dosse (1962) reported that the best control with *P. persimilis* preying on *T. cinnabarinus* was obtained when the predators were liberated at rather low populations of the prey. Chant (1961) also compared the development of prey cultures initiates with 10 *T. urticae* and one *T. occidentalis,* with that of cultures where one *P. persimilis* was substituted for *T. occidentalis.* Both predator restricted prey increases but *P. persimilis* was the more effective predator. This may demonstrate that the significance of initial prey: predator ratio may vary, depending on the species of predators. These findings agreed with those obtained by Strong and Croft (1995) also indicated that the higher the predator-prey ratio, the better the spider mite control achieved when of *T. urticae* was controled on hops, *Humulus lupulus* L. by releasing the predatory mite *M. occidentalis* (Nesbitt). The reductions of the pest were also lower with increasing the *T. urticae* densities. Heikal and Mowafi (1998) who stated that it could be advisable to release the predatory mites, *P. macropilis* and *A. fallacies* (Garman) when the *T. urticae* population is at low level to give a suitable chance for these predators to play their role successfully.

Table 1. Effect of a low release rate of *P. macropilis* at different population densities of *T. urticae* infesting Kidney bean plants in plastic pots.

Treatments	No. of release P. macropilis/ pot			No. of inoculated T. urticae/pot			No. of T. urticae/pot after:						% reduction of T.urticae after:		% infested leaves with T. urticae after:		No. of P. macropilis after:						Ratios prey: predator after:	
							7 days			14 days							7 days			14 days				
	F.	M.	T.	F.	M.	T.	M.S.	E.	T.	M.S.	E.	T.	7 days	14 days	7 days	14 days	M.S.	E.	T.	M.S.	E.	T.	7 days	14 days
A	3	1	4	5	1	6	135	150	285	36	88	124	31.8	95.9	58.7	28.9	88	43	131	196	363	559	2.2	0.2
Control A	-	-	-	5	1	6	186	232	418	683	2341	3024	-	-	87	91.4	-	-	-	-	-	-		
B	3	1	4	10	2	12	272	300	572	72	135	207	31.4	95.4	68.8	63.3	70	68	138	269	488	757	4.1	0.3
Control B	-	-	-	10	2	12	371	462	833	1484	2993	4477	-	-	87	98.2	-	-	-	-	-	-		
C	3	1	4	20	4	24	578	600	1178	143	270	413	26.7	93.5	76.2	60	67	45	112	233	267	500	10.5	0.8
Control C	-	-	-	20	4	24	878	729	1607	2297	4076	6373	-	-	73.3	100	-	-	-	-	-	-		
D	3	1	4	40	8	48	1043	807	1850	392	444	836	29.1	86.9	65.1	69.2	57	45	102	236	336	572	19.1	1.5
Control D	-	-	-	40	8	48	1487	1123	2610	2086	4297	6383	-	-	72.5	100	-	-	-	-	-	-		

F = Female M. = Male M.S. = Moving Stage E. = Eggs T. = Total

Table 2. Effect of a high release rate of *P. macropilis* at different population densities of *T. urticae* infesting Kidney bean plants in plastic pots.

Treatments	No. of release P. macropilis/pot			No. Of inoculated T. urticae/pot			No. Of T. urticae/pot after:						% Reduction of T.urticae after:		% Infested leaves with T. urticae after:		No. Of P. macropilis after:						Ratios prey:predator after:	
							7 days			14 days							7 days			14 days				
	F.	M.	T.	F.	M.	T.	M.S.	E.	T.	M.S.	E.	T.	7 days	14 days	7 days	14 days	M.S.	E.	T.	M.S.	E.	T.	7 days	14 days
A	6	1	7	5	1	6	1	9	10	0	3	3	99.8	100	2.77	1.77	13	2	15	1	4	5	0.7	0.6
Control A	-	-	-	5	1	6	186	232	418	683	2341	3024	-	-	87	91.4	-	-	-	-	-	-		
B	6	1	7	10	2	12	2	15	17	0	11	11	99.8	100	4.55	2.55	14	8	22	2	8	10	0.8	1.1
Control B	-	-	-	10	2	12	371	462	833	1484	2993	4477	-	-	87	98.2	-	-	-	-	-	-		
C	6	1	7	20	4	24	3	30	33	0	20	20	99.8	100	7.14	3.14	32	11	43	4	11	15	0.8	1.3
Control C	-	-	-	20	4	24	878	729	1607	2297	4076	6373	-	-	73.3	100	-	-	-	-	-	-		
D	6	1	7	40	8	48	33	141	177	2	43	45	93.2	99.9	12.82	5.37	43	68	111	9	9	18	1.3	2.5
Control D	-	-	-	40	8	48	1487	1123	2610	2086	4297	6383	-	-	72.5	100	-	-	-	-	-	-		

F = Female M. = Male M.S. = Moving Stage E. = Eggs T. = Total

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تأثير إطلاق مستويات مختلفة من المفترس الأكاروسي فيتوسيولاس ماكروبيليس *Phytoseiulus macropilis* (Banks) على كثافات مختلفة من العنكبوت الأحمر *Tetranychus urticae* Koch

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تحت ظروف صوبة مغطاة بالبلاستيك الشبكي تم إطلاق المفترس الأكاروسي *Phytoseiulus macropilis (Banks)* بمعدلات ٤ ، ٧ أفراد مفترس/ أصيص على نباتات الفاصوليا تم عدوتها قبل أسبوع بكثافات مختلفة من العنكبوت الأحمر (٦ ، ١٢ ، ٢٤ ، ٤٨ فرد/ أصيص. ازدادت أعداد *Tetranychus urticae Koch* فى أصص الإطلاق بزيادة عدوى العنكبوت الأحمر فى البداية. وكان أيضا تعداد *T. urticae* أعلى نسبيا بعد ٧ و ١٤ يوم (من إطلاق المفترس) عند إطلاق المفترس الأكاروسى، *P. macropilis* بمستوى منخفض من تلك المتحصل عليها من المستويات الأعلى للإطلاق. ومن ناحية أخرى، فقد تم الحصول على خفض أعلى فى تعداد العنكبوت الأحمر بعد ٧ و ١٤ يوم عندما تم إطلاق المفترس بمعدل عالى (٧مفترسات لكل أصيص). وكان الخفض أيضا عالى مع زيادة الكثافة الابتدائية للـ *T. urticae* . وقد ازدادت نسبة زيادة الفريسة للمفترس بصفة عامة مع زيادة العدوى الأولى للـ *T. urticae*. وكانت أعلى بشكل واضح بعد ٧ أيام (من إطلاق المفترس) وقد انخفضت بوضوح بعد ١٤ يوم. وفقا للنتائج السابقة يمكن أن ننصح بإطلاق المفترس الأكاروسى، *P. macropilis* عندما يكون أعداد *T. urticae* عند مستوى منخفض لكى تعطى الفرصة المناسبة لأفراد المفترس كى تلعب دورها بنجاح.