BIOLOGICAL CONTROL OF *TETRANYCHUS URTICAE* Koch ON SWEET PEPPER PLANTATIONS IN A COMMERCIAL FARM BY THE PREDATORY MITE, *PHYTOSEIULUS MACROPILIS* (BANKS)

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Abstract

A commercial farm at Abo-Sower district (Ismailia governorate, Egypt) was chosen for large scale producing and releasing the predatory mites *Phytoseiulus macropilis* (Banks) for controlling the two-spotted spider mite, *Tetranychus urticae* Koch on sweet pepper plants under three screen-houses in the same farm. Four screen-houses (6.5m width x 40m length x 2m height) were established for producing both of the prey and predator individuals. Augmentative releases of the predator were applied on commercial sweet pepper plantats cultivated under three screen-houses (each of about 10 feddans) in the same farm to control the two-spotted spider mites *T. urticae*. The first greenhouse considered as a summer and autumn season, while the second and third screen-houses as winter and spring season. The predator was released with a rate of about 3-5 predators' individuals / pepper plant (about 60000-100000 predators/feddan). Weekly counts of moving stages of the predatory mites, *P. macropilis* and the two-spotted spider mite, *T. urticae* and also the native predatory mite, *Amblyseius swirskii* (Athias-Henriot) were estimated in the field. In the summer and autumn season the *T. urticae* densities remained more less the economic threshold levels, while in the winter and spring season the spider mite infestations were near or relatively higher on many hot spots. The foregoing results indicated the possibility of large scale producing and releasing the predatory mite, *P. macropilis* to control spider mites on sweet pepper plants under screen houses in commercial plantations. Additional predator releases were usually required to reduce the pest population, especially in the hot spot areas.

INTRODUCTION

Sweet pepper (*Capsicum annuum* L.) is one of the most important and favorite vegetable crops cultivated in Egypt for local consumption and exportation. It covered a production area of about 2625753 m^2 in green houses in year 2009 that yielded 9993 tons according to Ministry of Agriculture Statistics. Its yield depends on many factors, one of which is infestation with the two-spotted spider mite, *Tetranychus urticae* Koch which considered a major pest of many greenhouse crops, both

vegetables and ornamentals (Singh *et. al.,* 2004 and Sarwari *et. al.,* 2011). Many spider mites have become resistant to most of the commonly used pesticides. Fortunately, the natural enemies of spider mites are equally common and can be utilized for biological control either through enemy conservation or through releases of mass-reared natural enemies (Van Lenteren and Woets, 1988). Biological control has great potential for use against *T. urticae* as based on successes of biological control and due to the abundance of potential biological control agents. *Phytoseiulus macropilis* (Banks) and *P. persimilis* Athias-Henriot similarly suppressed *T. urticae* populations in greenhouse ornamental plants in Florida and Ohio experiments (Hamlen and Lindquist, 1981). Their observations indicated the importance of introducing predators into low-density spider mite populations, since 1 to 3 weeks were required to effect control. Two phytoseiidae genera, *Neoseiulus* and *Euseius* were found as predators associated with *T. urticae* on sweet pepper (Gallardo *et. al.,* 2005). Results obtained by Heikal *et. al.,* 2007 emphasized the possibility of large scale producing and releasing of the predatory mite, *P. macropilis* to control spider mites on commercial strawberry plantations. Therefore, this study dealt with releasing the predatory mite, *P. macropilis* to control the two-spotted spider mite on sweet pepper plants under three screenhouses in a commercial farm at Ismailia governorate, Egypt. There has been little research conducted on the effects of native or established mite predators on population suppression of *T. urticae* in Egypt. Thus, the populations of the native predatory mite, *Amblyseius swirskii* (Athias-Henriot) were also estimated on the released pepper plants.

MATERIALS AND METHODS

Large scale production of the predatory mite, *P. macropilis*

Four special net greenhouses were established at a chosen commercial farm at Abo-Sower district (Ismailia governorate, Egypt). Each was 6.5m (width) by 40m (length) and 3.5m (height), with a trapped - door in one side. Roof and all sides of the greenhouse were covered with dark net plastic (500 mesh). The soil of each greenhouse was well- ploughed, fertilized and treated with the recommended fungicides according to the standard commercial practices. The first and second greenhouses were used for rearing the two-spotted spider mite *T. urticae* as the preferable prey of the predator, the third and forth greenhouses for rearing the predatory mite, *Phytoseiulus macropilis* (Banks). Methods of planting, rearing and producing the predatory mite, *P. macropilis* were followed as described by Heikal *et. al.,* 2007.

Collecting the predator individuals

To reduce spider mites on the collected leaflets, bean plants in the desired bed were usually left without adding additional *T. urticae* several days before the collecting date to reduce its density. Bean leaflets harboring the predator individuals were collected early on the date of release in papper bags, tied with rubber bands and transferred to the field using ice boxes.

Released plants

The same commercial farm at Abow-Sower district (Ismailia Governorate) was chosen for release the predatory mite, *P. macropilis*. Three special net greenhouses each with about 42000 m^2 (= about ten feddans) were established. Each of the greenhouse dimensions was about 200 m (width) by 210 m (length) and 3.5m (height), with a trapped - door in the north and another in south side. Roof and all sides of the greenhouse were covered with dark net plastic (500 mesh). The soil of each greenhouse was well-ploughed, fertilized and treated with the recommended fungicides according to the standard commercial practices. Sweet pepper seedlings varieties: Lambergini, Pangi, Markia, Amberi and Atlanta were cultivated on longitudinal beds at about 1.5 m distance. Seedlings of the first screen house were transplanted in early April (as summer and autumn season), while the other two screen houses were transplanted in late July (as winter and spring season). Amount and rates of compost and bio-fertilizers were applied before and after planting pepper plants to coincide Global Gap Regulations. Weekly applications of micronized sulfur (with the rate of 250g/100 Liter water) were used as a protective procedure against infection with sucking insects and fungal disease. Several releases of the predatory insect *Chrysoperla carnea* (Stephens) were applied for controlling aphid's infestation. Infested spots of *Spodoptera littoralis* (Boisduval) were treated with the recommended dose of the bio –insecticide Dible 2x.

Release of the predatory mite individuals

Three releases of the predatory mite, *P macropilis* were applied at the beginning of pepper season (one release every other week). The predator's individuals were released with the rate of about 3-5 predator individuals / pepper plant. Randomized samples of one hundred leaflets from each greenhouse were taken at weekly intervals. Biweekly counts of moving stages of the two predatory mites, *P. macropilis* and the native predatory mite, *Amblyseius swirskii* as well as the two-spotted spider mite, *T. urticae* were estimated in the field by a special magnified hand lens (x 20). Additional inspections of pepper leaves were done, (at different parts of the greenhouses) once or twice weekly for detecting hot spots of the two-spotted

mites. Also, additional releases of the predatory mite, *P macropilis* were applied on the hot spot areas to reduce mite infestation.

RESULTS AND DISCUSSION

Data of releasing the predatory mite, *P.macropilis* on pepper plants in the first greenhouse as a summer and autumn season are presented in Table 1. The predatory mite, *P.macropilis* was released few days after transplanting pepper seedlings before detection of any mite infestation. The predator individuals began to appear in pepper plants after two weeks from the predator release (0.4/leaf). Then disappeared after reduction of mite infestation. The predator and the two-spotted mite individuals disappeared from late June to late August, 2012.Small peaks and scatter spots of mite infestation were recorded from late August to late October, 2012 where two additional releases of *P.macropilis* were applied. Individuals of the native predatory mite, *A. swirskii* began to appear in late August as a result of increasing mite pest with a population of (0.8 individuals / leaf and a peak of *P.macropilis* (1.2 individuals/leaf on mid October). The predator prey ratios were positively affected with both prey and predator densities. The highest ratio was 3.3:1 in mid September 2012. The final means of data in the first greenhouse as summer and autumn season were 0.5 , 0.2 and 0.2 individuals / leaf for *T. urticae* , *P. macropilis* and *A. swirskii*, respectively. While the final mean of data of prey: predator ratio was 1.3:1.

Numbers of the two-spotted spider mite and the two predatory mites per leaf and prey predator ratios on hot spots of mite infestation in the first greenhouse are presented in Table 4. Very few mite spots were observed in this greenhouse. The recorded T*. urticae* infestation were 9.0,9.2,6.8 and 0.5 individuals/leaf, while being 1.2,1.4,1.4 and 0.9 individuals/leaf for both predators during 12/9, 26/9, 10/10 and 24/10/2012, respectively. The final mean of prey: predator ratio was 5.3:1. The two additional releases on the hot spot areas effectively reduced the two-spotted spider mite and resulted of good prey predator ratios**.**

Data of releasing the predatory mite, *P. macropilis* on pepper plants in the second greenhouse (as a winter and spring season) are presented in Table 2. The predatory mite**,** *P. macropilis* was released about three weeks after transplanting pepper seedlings before detection of any mite infestation. The two-spotted spider mite, *T. urticae* individuals began to appear after about 6 weeks from transplanting pepper seedlings (early September, 2012) with an average of 0.3 individuals/ leaf and gradually increased till mid November 2012 to reach the first high peak (13.1 individuals/leaf) in mid November, 2012 followed with several high peaks till late

January, 2013.Then the two-spotted spider mite, *T. urticae* population rapidly declined till the end of pepper season in mid May 2013. The predatory mite, *P. macropilis* was detected with the appearance of the two-spotted spider mite, *T. urticae* in early September, 2012 .Then increased gradually with the increase of mites infestation to reach several peaks during December, 2012 ,January and February 2013 with a final peak (13.0/leaf) in mid February, 2013. Individuals of the native predatory mite, *A.swirskii* were also observed with the appearance of the two-spotted spider mite infestation with a high peak of 1.2 individuals/leaf in mid November 2012. The final means of data in the second greenhouse as a winter and spring season were 3.7, 4.5 and 0.2 individuals/leaf for *T. urticae* , *P.macropilis* and *A. swirskii* , respectively. While the final mean of prey: predator ratio was 1.5:1. This agreed with that obtained by Strong & Croft, 1995 whoreleased the predatory mite *Metaseiulus occidentalis* (Nesbitt) to control *T. urticae* on hops, *Humulus lupulus* L., and found that the higher the predator- prey ratio, the better the spider mite control achieved.

Numbers of the two-spotted spider mite and the two predatory mites per leaf and prey predator ratios on hot spots of mite infestation in the second greenhouse are presented in table 5. Several mite spots were detected in this greenhouse. The maximum recorded mites was 75.1 individuals/leaf. This level of mite infestation is known to be relatively higher than the economic threshold level. The economic threshold level for *T. urticae* on strawberry plants was 50 active mites per leaflet (Wyman *et. al.,* 1979). The maximum observed predators was 60.2 individuals/leaf while the maximum prey predator ratio was 46.5:1. The final mean of data were 30.9 individuals/leaf and 21.6 individuals/leaf for the two-spotted spider mite and the two predatory mites, respectively. Where it was 1.4:1 for the prey: predator ratio. However, reduction of mite populations could be achieved by applying several additional predator releases to correct prey predator ratios and to increase the predator efficiency. Then, the prey: predator ratios decreased in the next inspections to become within the suitable ratios. This agreed with that obtained by Heikal *et. al.,* 2007.

Data of releasing the predatory mite, *P. macropilis* in the third greenhouse (as a winter and spring season) are presented in Table 3. The two-spotted spider mite, *T. urticae* individuals began to appear after about 6 weeks from transplanting pepper seedlings (in mid September,2012) with an average of 0.4 individuals/leaf and gradually increased till mid November, 2012 to reach its peak (12.8 individuals/leaf) in mid November, 2012, followed with another several peaks at late November, December, 2012 and January, 2013. The last major peak occurred in late January, 2013 (24.6 individuals/leaf). Then the two-spotted spider mite, *T. urticae* population

rapidly declined till the end of pepper season in mid May, 2013. The predatory mite, *P. macropilis* also began to be observed with the appearance of the two-spotted spider mite, *T. urticae* in mid September, 2012. Then it increased gradually with the increase of mite infestation with several peaks during December 2012, January and February,2013 with a final peak(15.8/leaf) in late January,2013.Individuals of the native predatory mite, *A.swirskii* were recorded from mid October, 2012 until early January, 2013 with a peak of 1.2 individuals / leaf in mid November, 2012. The final mean of data in the third greenhouse as a winter and spring season were 5.4, 2.8 and 0.2 individuals / leaf for *T. urticae* , *P.macropilis* and *A.swirskii* , respectively, while the final mean of prey: predator ratios was 1.8:1.

Numbers of the two-spotted spider mite and the two predatory mites per leaf and prey predator ratios on hot spots of mite infestation in the third greenhouse are presented in Table 6. Several mite spots were also observed in this greenhouse. The maximum recorded mites were 96.2 individuals/leaf. This level of mite infestation is known to be a relatively higher than the economic threshold level. Yet, low symptoms of damages appeared on pepper plants especially in several hot spots. However, four additional predator releases were applied to suppress mite infestations. The mite population then declined to attain very low levels until the end of strawberry season at mid May. The maximum observed predators was 88.3/leaf while the maximum prey predator ratio was 16.9:1. The final means of data were 40.1/leaf and 26.6/leaf for the two-spotted spider mite and the two predatory mites, respectively, while it was 1.5:1 for the prey: predator ratios.

The native predatory mite, *A. swirskii* is considered as a generalist predatory mite. McMurtry & Rodriguez, 1987, Qingcai & Walde, 1997 and Bermúdez *et. al.*, 2010 stated that generalists feed on mites, insects, pollen and even plant juice. Its appearance in the three greenhouses might be due to the non application of the harmful pesticides on pepper plants. This agreed with that obtained by van Lenteren and Woets, 1988 who reported that the spider mite, *Tetranychus urticae*, is ubiquitous agricultural pest capable of causing significant yield loss and death of plants. Fortunately, the natural enemies of spider mites are equally common and can be utilized for biological control either through enemy conservation or through releases of mass-reared natural enemies.

Several authors emphasized the importance of releasing the predatory mites early in the season. Heikal *et. al.* 2004 advised to release the predatory mite, *P. macropilis* to control *T. urticae* on rose bushes early in the season. Hamlen and Lindquist, 1981 found that *P. macropilis* and *P. persimilis* Athias-Henriot similarly suppressed *T. urticae* populations on greenhouse ornamental plants in Florida and

Ohio experiments. Their observations indicated the importance of introducing predators into low-density spider mite populations, since 1 to 3 weeks was required to affect control.

The foregoing results revealed the possibility of large scale producing and releasing of the predatory mite, *P. macropilis* to control spider mites on sweet pepper plants under screen houses in commercial plantations. Additional predator releases were usually required to reduce the pest population, especially in the hot spot areas. The native predatory mite, *A. swirskii* could appear in the absence of harmful pesticides and could play a good role as a biological control agent.

Table 1. Release the predatory mite, *P. macropilis* on a commercial pepper field to control the two-spotted spider mite, *T. urticae* during summer and autumn season , 2012 (The first greenhouse).

Date of sampling	No. *T.urticae* /		No. Predators:				Prey:Predator Ratios
			P.macropilis		*A. swirskii*		
	100 leaves	leaf	per100 leaves	per leaf	per100 leaves	leaf	
16/5/2012	0.0	0.0	–	–	0.0	0.0	0:0
30/5/2012*	0.0	0.0	–	–	0.0	0.0	0:0
13/6/2012*	59	0.6	44	0.4	0.0	0.0	1.3:1
27/6/2012*	0.0	0.0	10	0.1	0.0	0.0	0.0:1
11/7/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
1/8/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
15/8/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
29/8/2012	12	0.1	0.0	0.0	44	0.4	0.3:1
12/9/2012**	291	2.9	10	0.1	77	0.8	3.3:1
26/9/2012**	315	3.2	111	1.1	0.0	0.0	2.8:1
10/10/2012	8	0.1	116	1.2	80	0.8	0.04:1
24/10/2012	54	0.5	15	0.2	23	0.2	1.4:1
7/11/2012	10	01	0.0	0.0	35	0.4	0.3:1
14/11/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
28/11/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
12/12/2012	0.0	0.0	0.0	0.0	0.0	0.0	0:0
Mean	46.8	0.5	19.1	0.2	16.2	0.2	1.3:1

*= Release *P. macropilis.*

**= Additional release of *P. macropilis* on *T. urticae* hot spots.

Table 2. Release the predatory mite, P. macropilis on a commercial pepper field to control T. urticae during winter and spring season, 2012-2013 (The second greenhouse).

Date of sampling	No. *T.urticae* /		No. Predators:				Prey:Predator Ratios
			No *P.macropilis*		*A. swirskii*		
	100 leaves	leaf	per100 leaves	per leaf	per100 leaves	per leaf	
25/7/2012	0.0	0.0	–	–	0.0	0.0	–
8/8/2012*	0.0	0.0	–	–	0.0	0.0	0:0
22/8/2012*	0.0	0.0	0.0	0.0	0.0	0.0	0:0
5/9/2012*	25	0.3	5.0	0.1	30	0.3	5:1
19/9/2012	201	2.0	8.0	0.1	9.0	0.1	11.8:1
3/10/2012	336	3.4	40	0.4	6.0	0.1	7.3:1
17/10/2012**	440	4.4	8	0.1	0.0	0.0	55.0:1
31/10/2012	342	3.4	48	0.5	22	0.2	4.9:1
14/11/2012**	1308	13.1	100	1.0	120	1.2	5.9:1
28/11/2012	1062	10.6	213	2.1	90	0.9	3.5:1
12/12/2012	776	7.8	880	8.8	52	0.5	0.8:1
26/12/2012**	1580	15.8	1015	10.2	36	0.4	1.5:1
9/1/2013	205	2.1	575	5.8	16	0.2	0.3:1
23/1/2013**	1580	15.8	1030	10.3	0.0	0.0	1.5:1
6/2/2013	100	1.0	255	2.6	0.0	0.0	0.4:1
20/2/2013	203	2.0	1300	13.0	0.0	0.0	0.2:1
6/3/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20/3/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3/4/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17/4/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1/5/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15/5/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean	372.0	3.7	249.0-	4.5	17.3	0.2	1.5:1

* = Release *P. macropilis.*

** = Additional release *P. macropilis* on *T. urticae* hot spots.

Table 3. Release the predatory mite, *P. macropilis* on a commercial pepper field to control *T. urticae* during winter and spring season (The third greenhouse).

Date of sampling	No. *T.urticae* /		No. Predator:				Predator: Prey Ratios
			P.macropilis		*A. swirskii*		
	100 leaves	leaf	per100 leaves	per leaf	per100 leaves	leaf	
8/8/2012	0.0	0.0	-	-	0.0	0.0	-
22/8/2012*	0.0	0.0	–	–	0.0	0.0	0.0
5/9/2012*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19/9/2012*	35	0.4	27	0.3	0.0	0.0	1:1.2
3/10/2012	10	0.1	0.0	0.0	0.0	0.0	–
17/10/2012	204	2.1	57	0.6	75	0.8	1.5:1
31/10/2012	308	3.1	90	0.9	45	0.5	2.3:1
14/11/2012**	1280	12.8	228	2.3	120	1.2	3.7:1
28/11/2012**	1386	13.9	345	3.5	90	0.9	3.2:1
12/12/2012**	1785	17.9	124	1.2	8	0.1	13.5:1
26/12/2012	2440	24.4	1580	15.8	40	0.4	1.5:1
9/1/2013	1050	10.5	1150	11.5	23	0.2	0.9:1
23/1/2013	2460	24.6	1580	15.8	0.0	0.0	1.6:1
6/2/2013	450	4.5	585	5.9	0.0	0.0	0.8:1
20/2/2013	13	0.1	125	1,3	0.0	0.0	0.1,1
6/3/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20/3/2013	0.0	0.0	0.0	0.0	20	0.2	0.0:1
3/4/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17/4/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1/5/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15/5/2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean	543.8	5.4	280.5	2.8	20.0	0.2	1.8:1

* = Release *P. macropilis.*

** = Additional release *P. macropilis* on *T. urticae* hot spots

Table 4. Numbers of the two-spotted spider mite and the two predatory mites (*P. macropilis* and *A. swirskii*) and prey predator ratios on hot spots of mite infestation in the first greenhouse.

Date of sampling	No.of mites/leaf:		Prey:Predator Ratios
	Two-spotted spider mite	Two predatory mites	
12/9/2012**	9.0	1.2	7.5:1
26/9/2012**	9.2	1.4	6.6:1
10/10/2012	6.8	1.4	4.9:1
24/10/2012	0.5	0.9	0.6:1
Mean	6.4	1.2	5.3:1

** = Additional release *P. macropilis* on *T. urticae* hot spots.

Table 5. Numbers of the two-spotted spider mite and the two predatory mites (*P. macropilis* and *A. swirskii*) and prey predator ratios on hot spots of mite infestation in the second greenhouse.

Date of sampling	No.of mites/leaf:		Prey:Predator Ratios
	Two-spotted spider mite	Two predatory mites	
17/10/2012**	13.2	0.8	16.5:1
31/10/2012	27.0	0.8	33.8:1
14/11/2012**	18.6	0.4	46.5:1
28/11/2012	25.2	1.8	13.9:1
12/12/2012	25.0	29.0	0.9:1
26/12/2012**	75.1	42.0	1.8:1
9/1/2013	33.0	31.0	1.1:1
23/1/2013**	58.2	60.2	1:1
6/2/2013	3.2	28.5	0.1:1
Mean	30.9	21.6	1.4:1

** = Additional release *P. macropilis* on *T. urticae* hot spots.

Table 6. Numbers of the two-spotted spider mite and the two predatory mites (*P.macropilis* and *A. swirskii*) and prey predator ratios on hot spots of mite infestation in the third greenhouse.

Date of sampling	No.of mites/leaf:		Prey:Predator Ratios
	Two-spotted spider mite	Two predatory mites	
17/10/2011	12.1	2.0	6.1:1
31/10/2012	22.5	3.6	6.3:1
14/11/2012**	25.3	1.5	16.9:1
28/11/2012**	37.8	6.0	6.3:1
12/12/2012**	50.1	11.0	4.6:1
26/12/2012**	52.1	38.0	1.4:1
9/1/2013	62.4	67.2	0.9:1
6/2/2013	96.2	88.3	1.1:1
20/2/2013	1.9	22.1	0.1:1
Mean	40.1	26.6	1.5:1

** = Additional release *P. macropilis* on *T. urticae* hot spots.

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المكافحة الحيوية للحلم العنكبوتى ذى البقعتين *Tetranychus urticae* Koch على نباتات الفلفل فى مزرعة تجارية بإطلاق المفترس الأكاروسى *Phytoseiulus macropilis* (Banks)

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أختيرت مزرعة بناحية أبو صوير (محافظة الإسماعيلية) لإنتاج وإطلاق المفترس الأكاروسى *Phytoseiulus macropilis* (Banks) على نطاق واسع لمكافحة العنكبوت ذو البقعتين *Tetranychus urticae* Koch على زراعات الفلفل التجارية بنفس المزرعة .تم إنتاج المفترس الأكاروسى والفريسة فى أربعة صوب مغطاة بالبلاستيك الشبكى (مساحة كل منها ٦,٥م عرض x٤٠م طولx ٢م إرتفاع). وتم الإطلاق الموسع للمفترس على نباتات الفلفل فى ثلاث صوب مغطاة بالبلاستيك الشبكى (مساحة كل منها حوالى ١٠ أفدنة) فى نفس المزرعة لمكافحة العنكبوت ذو البقعتين. حيث تم إطلاق المفترس بمعدل ٣–٥ أفراد/نبات (حوالى ٦٠٠٠٠ –١٠٠٠٠٠ مفترس/ للفدان للفدان). وقد تم فى الحقل إجراء عد أسبوعى للآفراد المتحركة لكل من المفترس والعنكبوت الأحمر وأيضا المفترس المحلى *Amblyseius swirskii* (Athias-Henriot) .فى عروة الصيف والخريف وإستمر تعداد العنكبوت ذو البقعتين أقل كثيراً من الحد الإقتصادى الحرج للإصابة بينما فى عروة الشتاء والربيع كانت الإصابة قريبة أو أعلا قليلاً من الحد الإقتصادى الحرج للإصابة .وقد دلت النتائج السابقة على إمكانية الإنتاج والإطلاق الموسع للمفترس الأكاروسى *P. macropilis* لمكافحة العنكبوت ذى البقعتين *T.urticae* على نباتات الفلفل فى الزراعات التجارية فى الصوب المغطاة بالبلاستيك الشبكى. حيث تصبح الحاجة ضرورية لعدة إطلاقات لخفض تعداد الآفة وخاصة فى البقع شديدة الإصابة.