

## BIOLOGICAL CONTROL OF *TETRANYCHUS URTICAE* KOCH USING THE PHYTOSEIID MITE, *PHYTOSEIULUS PERSIMILIS* A.-H. ON APPLE SEEDLINGS

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### Abstract

The predator mite *P. persimilis* A.- H. was released in April 5, 2003 and July 24, 2003 at levels (10, 20 and 30 adults per apple seedling). At level of infestation with two-spotted spider mite *T. urticae* with averaged 3.0, 3.5 and 3.3 per leaf, after seven months from first and second release the percent reduction of the mite pest averaged 61.95, 80.68 and 88.63%, respectively.

### INTRODUCTION

*Tetranychus urticae* Koch was the first pest mite on apple trees, which cause a lot of damage resulting reduction in Plant growth and production (Abdel-Wahed, 2003).

Due to the excessive use of acaricides, some problem were appeared especially reducing the beneficial species and polluting the ecosystem so that, it seems necessary to look forward to the natural enemies as one of the alternative methods in controlling different agricultural pests.

The predator mite, *P. persimilis* A.- H. successfully used in controlling *T. urticae*. Several authors controlled the two-spotted spider mite *T. urticae* on certain plants which released many predators mite species, Nawar (1989), Chermiti (1991), Kilincer, *et al.* (1992), El-Sayed, (1994), El-Halawany, *et al.* (2000), Heikal *et al.* (2000), Abdel-Samad *et al.* (2001), Ebrahim *et al.* (2001), Heikal *et al.* (2000), Abdel-Samad (2002), Abdel-Wahed (2003), Heikal *et al.* (2004), Fawzy *et al.* (2005), Gamal *et al.* (2005) and El-Ghobashy (2006)).

This study aim to confirm the role of the predatory mite *P. persimilis* A.- H. in controlling the mite pest *T. urticae* on apple seedlings.

### MATERIALS AND METHODS

#### Design of experiment

These experiment was carried out using eighty seedling divided into four groups each one of twenty seedling as four treatments three levels of release 10, 20 and 30 and control.

### **Mass rearing of predator**

Bean plant *Phaseolus vulgaris* L. used as host plant. Bean seeds were planted in plastic trays (40x40x12cm) with the rate of 20 seeds per trays. These trays were used in rearing the predatory mite, which used as nucleation of the predator for releasing in the green house of mass rearing. Small greenhouse divided to three isolated parts: a) rearing of clean bean plants, b) clean plants at the stage of 12 leaves were artificially infested with *T. urticae*, c) one week later, five females of predatory mite *P. persimilis* transferred to each bean plant, there were followed up the relation between the predator and the prey inside the greenhouse, when it need for prey, it was supported with more prey. About one month when the rate of predator increased to reach 15-25 individuals/ leaflet. The predatory mite was picked in small paper bags with few prey on bean leaves and transferred inside ice box. El-Sayed (1994).

### **Predators release**

When the number of predator increased for suitable number to collect and release. The leave of the beans peering the predator and small number of prey were picked in paper bag and transmitted to the seedling in ice box and the predator release on the seedling with three levels 10, 20 and 30 per seedling. Random samples 30 leaflet were collected every ten days from each treatments and inspected aid stereomicroscope. First sample was collected just before release and the next were collected every 10 days. The number of prey and predator were recorded to the end of experiment and the percent reduction was calculated according to equation of Henderson and Tilton (1955).

## **RESULTS AND DISCUSSION**

### **First level of release**

Data in table (1) cleared that, the predatory mite, *P. persimilis* was released in April 5, 2003 at levels 10, 20, 30, predators per apple seedling (with age of two years old) at level of infestation with *T. urticae* reached an average about 3 individuals per leaf of apple seedlings. The population of the two-spotted spider mite, *T. urticae* was generally moderate in the pre-count. It was 90 and 110 mite individuals/ 30 leaves in the first level of release (10 predator/ seedling) and control treatment, respectively. After releasing of the predator the percent reduction of the mite pest increased

gradually reaching its highest percent reduction 82.6% at average temperature 26.7°C and 55.8% R.H., where the number of pest in control treatment recorded 353 individual/ 30 leaves but in treated seedling reached 50 individual/ 30 leaves.

The percent reduction decreased to 38.3% at July 24<sup>th</sup> and the number of the mite pest reached to 255 individuals/ 30 leaves in treated seedling, Thus it seemed a necessary for making second release then the percent reduction fluctuated from 47.5 to 59.4% in Nov.1<sup>st</sup> recording the highest percent of reduction in Oct. 2<sup>nd</sup> reaching 70.6% at average temperature 25.5°C and 67.3% R. H. Finally at level of release 10 predators per seedling the percent reduction averaged 61.95%.

#### **Second level of release**

Also, obtained results in table (1) indicated that, when the predatory mite *P. persimilis* was released at level 20 predators/ seedling the pre-count population density of *T. urticae* were 105 and 110 individuals/ 30 leaves of seedlings for treatment and control, respectively.

The reduction percent of the mite pest increased gradually reaching its highest percentage 92.1% at average temperature 26.53°C and 68.8% in June 14<sup>th</sup>, when the number of mite pest in control 387 individuals/ 30 leaves while in treated seedling reached 53 individuals/ 30 leaves.

Table 1. Biological control of *Tetranychus urticae* Koch using the predatory mite *Phytoseiulus persimilis* A.-H. on apple seedling in spring 2003.

Sampling date	Number and reduction % of motile stages of <i>T. urticae</i> /30 leaves after release of the predatory mite.									control	Temp. °C	R.H %
	10 predators/ seedling		No. of pred.	20 predators/ seedling		No. of pred.	30 predators / seedling		No. of pred.			
	No.	R.%		No.	R.%		No.	R.%				
Pre-count before first release April 5 <sup>th</sup>	90	-	-	105	-	-	99	-	-	110	20.4	60.4
Apr.15 <sup>th</sup>	81	25	3	92	26.9	8	61	48.6	10	132	20.19	64.5
Apr.25 <sup>th</sup>	65	56.8	13	77	56.2	9	43	74	17	184	21.3	56.3
May 5 <sup>th</sup>	60	66.9	18	52	75.5	14	30	84.9	32	222	21.17	60.3
May 15 <sup>th</sup>	51	77.2	26	43	83.5	29	22	91	40	274	24.76	56.95
May 25 <sup>th</sup>	42	82.5	35	37	86.8	38	15	94.3	47	295	26.2	54.2
Jun.4 <sup>th</sup>	50	82.6	36	28	91.6	40	9	97.2	52	353	26.7	55.8
Jun.14 <sup>th</sup>	88	72	27	29	92.1	53	17	95.1	64	387	26.53	56.8
Jun.24 <sup>th</sup>	102	70.3	15	57	85.8	42	32	91.5	50	420	27.8	57.3
Jul.4 <sup>th</sup>	163	58.2	8	94	79.3	30	58	86.4	39	477	28.1	59.35
Jul.14 <sup>th</sup>	197	51	7	125	73.5	19	88	80.2	22	495	26.95	64.6
Second release July 24 <sup>th</sup>	255	38.3	2	160	66.8	9	96	78.8	18	505	27.7	68.3
Aug.3 <sup>rd</sup>	231	47.5	7	132	74.3	5	72	85.13	12	538	28.0	66.5
Aug.13 <sup>th</sup>	200	53.8	9	106	79	10	51	89.28	16	529	28.5	70.5
Aug.23 <sup>rd</sup>	172	59.8	11	88	82.4	15	36	92.4	22	523	28.9	65.6
Sep.2 <sup>nd</sup>	153	61.4	15	61	86.8	18	20	95.4	19	484	29.2	66.2
Sep.12 <sup>th</sup>	126	66.5	19	32	92.7	26	18	95.6	23	460	27.1	66.0
Sep.22 <sup>nd</sup>	110	70.12	18	30	93	28	11	97.3	27	450	27.2	64.9
Oct.2 <sup>nd</sup>	104	70.6	17	29	92.9	36	17	95.6	30	432	25.5	67.3
Oct. 12 <sup>th</sup>	100	70.5	16	25	93.7	27	8	97.8	14	414	24.87	67.1
Oct. 22 <sup>nd</sup>	126	60.6	8	33	91.1	18	18	94.9	12	391	26.3	66.1
Nov. 1 <sup>st</sup>	129	59.4	8	35	90.5	13	14	95.9	7	388	25.1	65.0
Mean	124.05	61.95	15.14	65	80.68	23.19	35.05	88.63	27.28	384.6	25.83	62.72

No.=Number      R.%=Reduction      Temp.=Temperature      R.H.= Relative humidity

No. of pred.= Number of predators

Correlation coefficient

Predatory mite at level 10 predators/ seedlings	0.20	-0.52*
Predatory mite at level 20 predators/ seedlings	0.58*	-0.01
Predatory mite at level 30 predators/ seedlings	0.58*	-0.02

When the efficiency of the predatory mite decreased to 66.8% at 24 July 24<sup>th</sup> and the number of the mite pest reached to 160 individuals/ 30 leaves in treated seedlings, there was needed to release the predatory mite again at level of 20 predators/ seedling and then the reduction percent fluctuated from 74.3 to 90.5% in Nov. 1<sup>st</sup> observed highly reduction percentges in the *T. urticae* population in Oct.12<sup>th</sup> reaching 93.7% with number of predator 27 individuals at average temperature 24.87°C and 76.1% R. H.

The average of reduction percentage of *T. urticae* population averaged 80.68% after seven months of releasing the predatory mite *P. persimilis* at level 20 predators/ seedling.

Statistic analysis of data in Table (1) indicated that there was significant positive correlated between the predatory mite population and temperature while non-significant negative correlated between predatory mite population and the relative humidity at level 20 predators/ seedling.

### **Third level of release**

When the predatory mite *P. persimilis* released against the two-spotted spider mite *T. urticae* with level 30 predators/ apple seedling. The average number of *T. urticae* per leaf was 3.3 and 3.66 individuals for the treated and control treatment, respectively (Table1).

After releasing the predatory mite, the population of *T. urticae* decreased gradually on treated apple seedlings reaching the lowest number in June 4<sup>th</sup> recording 9 individuals/ 30 leaves with percentage of reduction 97.2% at average temperature 26.7°C and 55.8% R. H.

After that population of mite pest gradually increased in number and reach 96 individual / 30 leaves with average number of 3.2 individual per leaf and the number of predatory mite were 18 individuals in July 24<sup>th</sup>. So, it needed other release for the predatory mite again in July 24.

The average of reduction percent in *T. urticae* after releasing the predatory mite *P. persimilis* at 30 predators/ seedling was 88.63% reduction after seven months of release.

Statistical analysis of data obtained in Table (1) indicated that, There was significant positive correlation between the predator mite population and temperature, while non-significant negative correlation between the predatory mite population and relative humidity at level 20 and 30 predator mites/ seedling.

These results showed that the predatory mite was still active on *T. urticae* until seven months from the second release, and giving a good results, so that it can be successfully use as bio-control agent in controlling *T. urticae* on different vegetables and orchard trees.

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*Phytoseiulus* المكافحة الحيوية للعنكبوت الأحمر العادي بالمفترس الأكاروسى  
*persimilis* على شتلات التفاح

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عند اطلاق المفترس الأكاروسى *Phytoseiulus persimilis* على شتلات التفاح المصابة بالعنكبوت الأحمر العادى بثلاثة مستويات ١٠، ٢٠، ٣٠ مفترس لكل شتلة لمكافحة العنكبوت الأحمر العادى . اثبت المفترس فاعلية كبيرة فى خفض مستوى الإصابة على شتلات التفاح بعد سبعة أشهر من الإطلاق بلغت نسبة الخفض ٦١,٩٥، ٦٨,٨٠، ٦٣,٨٨% على مستوى ١٠، ٢٠، ٣٠ مفترس لكل شتلة وأن مستوى إطلاق ٣٠ فرد لكل شتلة أعطى أعلى نسبة خفض. وتشير نتائج التحليل الإحصائى أن هناك ارتباط طردى معنوى بين تعداد المفترس ودرجة الحرارة بينما كان هناك ارتباط عكسى بين تعداد المفترس والرطوبة النسبية. من النتائج السابقة نجد أن المفترس الأكاروسى يلعب دور هام فى مكافحة العنكبوت الأحمر العادى على شتلات التفاح، لذلك يمكن استخدام هذا المفترس بنجاح فى مكافحة الحويوة للعنكبوت الأحمر العادى على الخضر والبساتين.