BIOLOGICAL CONTROL OF THE EUROPEAN RED MITE, *PANONYCHUS ULMI* (KOCH) USING THE PREDATORY MITE, *NEOSEIULUS CUCUMERIS* (OUD.) ON APPLE TREES.

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Abstract

This work was carried out under field conditions to study the biological control of European red mite, *Panonychus ulmi* (Koch) on apple trees in Dakahlia Governorate using the predacious mite *Neoseiulus cucumeris* (Oud.). The European red mite *P. ulmi* is considered one of the important mite pests attacking apple trees causing serious damage to leaves and fruits. The predatory mite was reared on the two-spotted spider mite *Tetranychus urtica* Koch and released at three levels. 50, 100 and 150 individuals per tree at average level infestation 5.65, 5.78 and 5.51 mite per leaf, respectively, while it was in control tree 8.92 individual per leaf.

The reduction percent of *P. ulmi* population on apple trees reached 90.16 after four months from release at level of release 150 individuals per tree.

The above mentioned results indicated the possibility of controlling the European red mite *P. ulmi* on apple trees using the predatory mite *N. cucumeris* as a biocontrol agent.

INTRODUCTION

The European red mite *Panonychus ulmi* (Koch) is a serious pest of apple trees causing sever damage for leaves and fruits resulting reduction of the quality and quantity of the production. This study aimed to avoid the extensive use of acaricides to gain agriculture products free from any toxic chemicals with a high marketing values production and environmental factors, depending on the predatory mite *Neoseiulus cucumeris* (Oud.) as a biocontrol agent for controlling the previous mite pest. The predatory mite *N. cucumeris* used as a biocontrol agents against different tetranychid mite pests infesting different orchard trees (Zhang *et al*., 2000 and 2001; Blaseser *et al*., 2002; Zhang *et al*., 2003 and 2003 b; Ibrahim *et al*., 2005 and 2006; Abd El-Wahed 2007 and Mohamed *et al*. 2008).

MATERIALS AND METHODS

1. Mass rearing of the predatory mite *Neoseiulus cucumeris* (Oud.) and its prey *Tetranychus urticae* Koch.

A. Mass rearing of *T. urticae* as a prey:

T. urticae is considered the most preferable prey for mass production of *N. cucumeris*, Strong culture of this mite should be available during the rearing time to maintain the predator rearing process. Thirty plastic trays (30x40x15cm) contained peutmus were used for planting bean seeds *Phaseolus vulgaris* L. The bean seeds were planted at 1-2 cm deep and followed with irrigation and fertilization as required, when the first true leaflets appeared after about one week from cultivation, bean leaves were infested with spider mite *T. urticae* and left for two weeks until the population of the spider mite increase to suitable number for rearing the predator.

B. Mass rearing the predatory mite *Neoseiulus cucumeris*:

Twenty plastic trays were prepared as above mentioned in rearing system of prey. When the population density of the prey reached to suitable density different number of arenas previously prepared for raring a stock culture of the predator were transferred to plastic trays of the predator and then left until the predator numbers increase, the plastic trays of the predator were added daily with prey as they require, after four weeks approximately the predator became suitable for collecting.

C. Release of the predatory mite, *N. cucumeris:*

Releasing was conducted on apple trees, at Aga district, Dakahlia Governorate during 2009 years. The selected trees for the present investigation were away from any pesticides.

Apple orchard trees slightly infested with European red mite *Panonychus ulmi* (Koch) were chosen and divided into four treatment including control, using for three levels of release 50, 100 and 150 individuals of predator per tree at the level of infestation 5.65, 5.8, 5.5 and 5.4 mite/leaf for the treatments and control.

Each treatment comprise of three replicates including five apple trees, all replicates were distributed in randomized complete blocks. Samples of 80 leaves were inspected for each treatment, were taken randomized from the four direction of the tree, samples was inspected leaves of each samples were inspected on the tree by 20 x lens before release as pre-count and another samples were inspected after release two weeks, intervals.

D. Statistical analysis:

The percent reduction of *P. ulmi* after *N. cucumeris* release was calculated according to Henderson and Tilton aquation (1955).

RESULTS AND DISCUSSION

1. Biological control of the European red mite *Panonychus ulmi* (Koch) using the predatory mite *Neoseiulus cucumeris* (Oud.) at level of release 50 individuals per tree.

As shown in Table (1) data demonstrated that, when the predatory mite *N. cucumeris* was released at rate of 50 individuals per tree on apple trees, the mite pest *P. ulmi* population was generally low in the pre-count. They were 452 and 436 moving stages/80 leaves in released and control trees, respectively. After releasing the predator mite, the mite pest population generally declined gradually in released trees, the pest population reached after four months 245 individuals /80 leaves, while in control trees it became 714 individuals /80 leaves. The reduction percent in the pest population gradually increased from 14.27 after two weeks of release to 66.9 after four months of start of the experiment. In the same time, the population density of the predator increased from 16 individuals after two weeks to 51 individuals after four months.

2. Biological control using the predator mite *N. cucumeris* against European red mite *P.ulmi* on apple trees with level of release 100 individuals per tree.

Results in Table (2) indicated that, the pre-count of the European red mite population was 463 and 436 moving stages/80 leaves. After two weeks from the predator release on April 27, 2009, population density of *P.ulmi* decreased to 432 individuals/80 leaves with reduction 16.2%, while population in control increased from 436 to 485 moving stages /80 leaves. After four weeks from predator release population of acarine pest decreased in treatments, while highly increased in the control (402 and 531 individuals, respectively). The reduction percent of pest then increased gradually to reach 75.07 at the end of experiment.

In the control pest population increased to 714 moving stages/80 leaves. Concerning the predatory mite population , as shown in Table (2), it was, 21 predators /80 leaves after two weeks from release then increased to 59 predators /80 leaves at the end of experiment.

3. Biological control using the predator mite *N.cucumeris* against European red mite *P.ulmi* on apple trees with level of release 150 individuals per tree.

As shown in Table (3) obtained data indicated that, the predatory mite *N. cucumeris* when released with 150 individuals per tree gave high reduction percentages of population of mite pest reached after two weeks 21.92% and increased gradually until reaching to 90.16% after four months of release. The total number of *P. ulmi* in released tree decreased from 441 to 71 individuals / 80 leaves while in control trees the total number of *P. ulmi* increased from 436 to 714 individuals/80 leaves after four months of beginning the experiment. The population density of the predator increased from 24 individuals/80 leaves after two weeks to 67 individual per 80 leaves at the end of the experiment.

Data in Table (4) demonstrated that in comparison between the three levels of release, the efficiency of the predator mite in suppressing the population density of the mite pest increased with increasing the level of release. Resulting 66.9% 75.07 and 90.16% at levels of release 50, 100 and 150 individuals per tree.

Conclusion

The predatory mite *Neoseiulus cucumeris* (Oud.) introduced good results in controlling the European red mite, *Panonychus ulmi* (Koch) on apple trees at level of release 150 individuals per tree because of reducing the average density of the mite pest population to 0.89 individuals per leaf, therefore, can be use The predatory mite *N. cucumeris* as a biocontrol agent against this mite pest. These results are in harmony with those obtained by Zhang *et al*., (2001); Tuovinen *et al*., (2002); Li *et al*., (2003); Lin and Hung (2003); Ibrahim *et al*., (2005 and 2006) and Mohamed *et al* (2008).

Table 1. Biological control of the European red mite *Panonyhus ulmi* (Koch) using the predator mite *Neoseiulus cucumeris* (Oud.) on apple trees with level release 50 individuals per tree.

Sampling date	Treatment	No. of mite / 80 leaves		Reduction % of mite pest
		P. ulmi	*N.cucumeris*	
April, 13,2009 Pre-count date of release	Release Control	452 436	-- --	-- --
April, 27,2009 1st post-count	Release Control	431 485	16 --	14.27 --
May, 11. 2009	Release Control	406 531	23 -	26.24 -
May, 25, 2009	Release Control	381 579	26 --	36.52 --
June, 8, 2009	Release Control	342 609	28 --	45.83 --
June, 22, 2009	Release Control	311 634	36 --	52.68 --
July, 6, 2009	Release Control	283 672	45 --	59.37 --
July, 20, 2009	Release Control	245 714	51 --	66.9 --

Table 2. Biological control using he predator mite, *Neoseiulus cucumeris* (Oud.) against European red mite, *Panaychus ulmi* (Koch) on apple trees with level of release 100 individuals per tree.

Sampling date	Treatment	No. of mite / 80 leaves		Reduction % of mite pest
		P. ulmi	*N. cucumeris*	
April, 13,2009 Pre-count date of release	Release Control	463 436	-- --	-- --
April, 27,2009 1st post-count	Release Control	432 485	21 --	16.12 --
May, 11. 2009	Release Control	402 531	24 -	28.71 -
May, 25, 2009	Release Control	371 579	29 --	39.66 --
June, 8, 2009	Release Control	325 609	34 --	49.74 --
June, 22, 2009	Release Control	286 634	32 --	57.52 --
July, 6, 2009	Release Control	247 672	46 --	65.38 --
July, 20, 2009	Release Control	189 714	59 --	75.07 --

Table 3. Biological control using the predator mite, *Neoseiulus cucumeris* (Oud.) against European red mite, *Panaychus ulmi* (Koch) on apple trees with level of release 150 individuals per tree.

Sampling date	Treatment	No. of mite / 80 leaves		Reduction % of mite pest
		P. ulmi	*N. cucumeris*	
April, 13,2009 Pre-count date of release	Release Control	441 436	-- --	-- --
April, 27,2009 1st post-count	Release Control	383 485	24 --	21.92 --
May, 11. 2009	Release Control	352 531	26 -	34.46 -
May, 25, 2009	Release Control	308 579	33 --	47.41 --
June, 8, 2009	Release Control	241 609	47 --	60.87 --
June, 22, 2009	Release Control	156 634	45 --	75.67 --
July, 6, 2009	Release Control	97 672	58 --	85.73 --
July, 20, 2009	Release Control	71 714	67 --	90.16 --

Table 4. Comparison effect of different levels of predator release against European red mite *Panonychus ulmi* (Koch) on apple trees.

Level of release individuals / tree	Level infestation in control		Average infestation before release	Average of infestation after four months of release	Reduction percentage after release with four months
	Before	After			
50	5.45	8.92	5.65	3.06	66.9
100	5.45	8.92	5.78	2.36	75.07
150	5.45	8.92	5.51	0.89	90.16

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المكافحة الحيوية للأكاروس الأحمر الأوروبي بإستخدام المفترس الأكاروسي *Neoseiulus cucumeris* على أشجار التفاح

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يعتبر الأكاروس الأحمر الأوروبي من أهم الآفات الاكاروسية التي تصيب أشجار التفاح في مصر ويسبب خسائر فادحة للمحصول كما ونوعاً حيث يصيب الأوراق والثمار وله القدرة على وضع بيض شتوي على الفروع ويسبب تشوهات للثمار.

لذا تم استخدام المفترس الاكاروسي *N. cucumeris* لمكافحة الأكاروس الأحمر الأوروبي على أشجار التفاح في منطقة أجا بمحافظة الدقهلية وقد تم إطلاق المفترس على أشجار التفاح بمعدل 50، 100، 150 فرد للشجرة بمتوسط مستويات إصابة 5.65 ، 5.78، 5.51 على الورقة على التوالي.

وقد دلت النتائج المتحصل عليها بأن نسبة الخفض في تعداد الأكاروس الأحمر الأوروبي بعد أربعة شهور من الإطلاق 66.9% ، 75.07%، 90.16% على التوالي.

على ضوء هذه النتائج يتضح أن أنسب مستوى إطلاق لمكافحة الاكاروس الأحمر الأوروبي على أشجار التفاح هو 150 فرد للشجرة لذا يمكن استخدام المفترس الاكاروسي *N. cucumeris* بنجاح كأحد عناصر المكافحة البيولوجية الفعالة في برامج المكافحة المتكاملة للأكاروس الأحمر الأوروبي على أشجار التفاح.