

BIOLOGICAL CONTROL OF *TETRANYCHUS URTICAE* KOCH USING THE PHYTOSEIID MITE, *EUSEIUS SCUTALIS* (A. - H.) ON APPLE SEEDLINGS

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(Manuscript received 19 August 2009)

Abstract

The predator mite species *E. scutalis* (A.-H.) was released in April 10, 2004 and July 20, 2004 at levels (10, 20 and 30 adult per apple seedlings). At level of infestation with two-spotted spider mite *T. urticae* with averaged 3.23, 3.6 and 3.66 per leaf after 190 days from first and second release the percent reduction of the mite pest averaged 62.4, 72.7 and 78.6%, respectively.

INTRODUCTION

In Egypt Apple trees are highly infested by phytophagous mites *Tetranychus urticae* Koch, *Panonychus ulmi* (Koch) and *Aculus shlechtendali* (Nalepa) 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 and the new acaricides which considered one of the new approaches for controlling these agricultural pests.

The predator mite, *Euseius scutalis* (A.-H.) successfully used in controlling some of mite pests, it feeds on *T. urticae*, *Panonychus ulmi*, *A. shlechtendali*, *E. orientalis* (Klein), *Panonychus citri* (McGregor), and *Brevipalpus californicus* (Banks). Many predator mite species were released by several authors to control the previous mite pests on certain plants. (Metwally (1976), Zohdy et al. (1981), McMurtry (1986), Hiekal & Wahba (1992), El-Halawany et al. (1993), El-Sayed (2003), Opit et al. (2004), Ali et al. (2005), Fawzy, et al. (2005), Gamal et al. (2005), Mona (2006))

This study aims to confirm the role of the predator mite *E. scutalis* 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 contain 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 predator 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 predator mite *E. scutalis* transferred to each bean plant, we follow up the relation between the predator and the prey inside the greenhouse, when it need for prey we were supported it with more prey. About one month when the rate of predator increased to reach 15-25 individuals/ leaflet. The predatory mite was packed in small paper bags with few prey on bean leaves and transferred inside ice box. El-Sayed (1994) and Abo-Donia, (1994).

Predator's 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 s collected just before release and the next collected every 10 days. The number of prey and predator were recorded to the end of experiment and the percent reduction was calculated according equation of Henderson and Tilton (1955).

RESULTS AND DISCUSSION

Data in table (1) clearly demonstrated that, the predator mite *E. scutalis* was released on April 10, 2004 at leaves (10, 20 and 30 adult female per apple trees seedlings).

The predator mite *E. scutalis* was released in April 10, 2004 at level 10 adult per apple seedlings when the infestation level of *T. urticae* 97 , 122 /leaflet in release plot and control, respectively.

The reduction percentage of *T. urticae* after one, two and three months of first release were averaged 49.4, 74.4 and 48.9% and the number of predator mite were 11, 20 and 4 individuals per 30 leaves of apple seedlings, respectively.

The reduction percentage of *T. urticae* on apple seedlings reached maximum efficiency after two months of release with average 74.4% reduction and then reduced gradually to 9 July with average number 48.9%. After the second release the percent of reduction fluctuating reached the maximum reduction 81.1% in the first week of September and then decreased gradually reaching 63.3% in the end of the experiment in the third week of October in this time the level infestation recorded 98 individuals of mite pest per 30 leaflet while it recorded 336 individuals in control treatments.

The predator mite *E. scutalis* was released in 10th April 2004 at level 20 adult per apple seedlings. The pre-count of population density of *T. urticae* was 108 moving stages/30leaves in released area.

The percentage reduction in population density of *T. urticae* was 58.6% after one month of release the predator mite *E. scutalis* while the number of the mite pest in control increased from 122 to 199 moving stages/30 leaflet. After two months from releasing of predator mite, the number of *T. urticae* decreased to 38 individuals/30 leaves and the percentage of reduction reached 85.4%

Table 1. Evaluation of the predator mite *Euseius scutalis* (A.-H.) against *Tetranychus urticae* Koch on apple seedling with different release in 2004.

| Sampling date | Number and reduction % of motile stages of <i>T. urticae</i> 30 leaves after release of the predator. | | | | | | | | | control | Temp. °C | R.H % |
|---|---|------|--------------|------------------------------|------|--------------|------------------------------|------|--------------|---------|----------|-------|
| | 10 adult predators/ seedling | | No. of pred. | 20 adult predators/ seedling | | No. of pred. | 30 adult predators/ seedling | | No. of pred. | | | |
| | No. | R.% | | No. | R.% | | No. | R.% | | | | |
| Pre-count before first release April 10 th | 97 | - | - | 108 | - | - | 110 | - | - | 122 | 20.2 | 63.2 |
| April 20 th | 90 | 22.5 | 5 | 92 | 28.8 | 9 | 98 | 25.5 | 8 | 146 | 21.51 | 59.2 |
| April 30 th | 88 | 37.8 | 7 | 85 | 46 | 13 | 87 | 45.7 | 15 | 178 | 23 | 57 |
| May 10 th | 80 | 49.4 | 11 | 73 | 58.6 | 15 | 62 | 65.4 | 22 | 199 | 30.9 | 63.2 |
| May 20 th | 68 | 61.2 | 14 | 59 | 70.1 | 16 | 50 | 75.1 | 28 | 223 | 28.75 | 3 |
| May 30 th | 62 | 71.9 | 18 | 40 | 83.7 | 22 | 36 | 85.6 | 33 | 278 | 35.2 | 58.2 |
| June 9 th | 60 | 74.4 | 20 | 38 | 85.4 | 23 | 27 | 89.8 | 36 | 295 | 29.1 | 63 |
| June 19 th | 73 | 70.7 | 18 | 48 | 82.7 | 24 | 35 | 87.6 | 40 | 314 | 29.14 | 57.1 |
| June 29 th | 122 | 57 | 15 | 79 | 75 | 21 | 52 | 83.8 | 36 | 357 | 29.1 | 56.3 |
| July 9 th | 158 | 48.9 | 4 | 106 | 69.2 | 18 | 74 | 78.9 | 31 | 389 | 28.4 | 56.9 |
| Second release July 19 th | 184 | 46.2 | 1 | 145 | 61.9 | 5 | 107 | 72.4 | 18 | 430 | 29.11 | 5 |
| July 29 th | 171 | 54.8 | 7 | 121 | 71.3 | 10 | 84 | 80.4 | 20 | 476 | 28.6 | 57.2 |
| August 8 th | 113 | 70.9 | 14 | 96 | 77.8 | 12 | 70 | 84.1 | 24 | 489 | 28.4 | 56.1 |
| August 18 th | 95 | 74.2 | 16 | 81 | 80.2 | 15 | 52 | 87.5 | 30 | 463 | 29.1 | 57.0 |
| August 28 th | 73 | 79.9 | 19 | 56 | 86.2 | 18 | 31 | 92.5 | 31 | 457 | 28.8 | 56.0 |
| Sept. 7 th | 65 | 81.1 | 20 | 43 | 88.8 | 20 | 24 | 93.8 | 32 | 433 | 28.9 | 56.5 |
| Sept. 17 th | 73 | 77.7 | 15 | 55 | 84.9 | 23 | 19 | 94.8 | 36 | 412 | 26.0 | 55.3 |
| Sept. 27 th | 80 | 74.6 | 14 | 65 | 81.4 | 11 | 37 | 84.6 | 34 | 396 | 28.3 | 52.9 |
| Oct. 7 th | 94 | 69.6 | 11 | 69 | 78.6 | 6 | 52 | 84.2 | 12 | 365 | 26.4 | 52.7 |
| Oct. 17 th | 98 | 63.3 | 3 | 87 | 70.7 | 2 | 55 | 81.8 | 5 | 336 | 24.0 | 54.9 |
| Mean | 97.21 | 62.4 | 12.21 | 75.68 | 72.7 | 14.89 | 55.36 | 78.6 | 25.84 | | | |

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

No. of pred.= Number of predators

Correlation coefficient

Predator mite at level 10 predators/ seedlings

Predator mite at level 20 predators/ seedlings

Predator mite at level 30 predators/ seedlings

Temp. R. H.

0.47* -0.30

0.59** -0.29

0.57** -0.30

After second release the pest population was rapidly reduced on released plots with 43 moving stages/30 leaves in the first week of September with reduction 88.8% and then increased gradually reaching 87 moving stages/ 30 leaves in the end of the experiment in the third week of October in this time the reduction percentage was 70.7% while it recorded 336 individuals in control treatments.

The predator mite *E. scutalis* was released in 10th April 2004 at level 30 adult per apple seedlings. The pre-count of *T. urticae* was 110-122 moving stages/ 30leaves in released and control area, respectively.

The reduction percentage of *T. urticae* after one, two and three months of first release were averaged 65.4, 89.8 and 78.9% at the number of predator mite were 22, 36 and 31 individuals / 30 leaves of apple seedlings, respectively.

The reduction percentage of *T. urticae* on apple seedlings reached maximum efficiency after two months of release with average 89.8% reduction. Then the percentage reduction of the mite decreased gradually reaching 48.9, 69.2 and 78.9% after three months release so that it seems necessary to make second release with the same release during July (Table 1)

After the second release the percent of reduction gradually increased and reached the maximum reduction 81.1 , 88.8 and 94.8% during mid September in the three levels of release 10, 20 and 30 individuals/ seedling, respectively. And then decreased gradually reaching 63.3, 70.7 and 81.8% during middle of October in the same time . The average level infestation per leaf was 3.2, 2.9 and 1.8 individuals in the tree treatments while it was 11.2 in control. Also the obtained result in the same table clearly that Statistical analysis proved that significant positive correlation between the predator mite population and the temperature, while non-significant negative correlation between the predator and relative humidity.

CONCLUSION

The aforementioned results clear that the predator mite *E. scutalis* can play a great role in controlling mite pest two-spotted spider mite *T. urticae* on apple seedling, so that it can be successfully used as bio-control agent for controlling these mite pest on different vegetable and orchard trees.

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المكافحة الحيوية للعنكبوت الأحمر العادي بالمفترس الأكاروسى *EUSEIUS SCUTALIS* على شتلات التفاح

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تم إطلاق المفترس الأكاروسى *Euseius scutalis* على شتلات التفاح المصابة بالعنكبوت الأحمر العادى على ثلاثة مستويات ١٠، ٢٠، ٣٠ مفترس لكل شتلة لمكافحة العنكبوت الأحمر العادى. وتشير النتائج المتحصل عليها أنه أثبت المفترس دور فعال فى مكافحة الآفة وأدى الى خفض مستوى الإصابة على شتلات التفاح بعد ١٩٠ يوم من الإطلاق بلغت ٦٢,٤، ٧٢,٧، ٧٨,٦% على مستوى الإطلاق ١٠، ٢٠، ٣٠ مفترس لكل شتلة على التوالي وأن مستوى الخفض فى الإصابة زادت بزيادة معدل الإطلاق حيث أن مستوى إطلاق ٣٠ مفترس لكل شتلة أعطى أعلى نسبة خفض. وتشير نتائج التحليل الإحصائي أن هناك ارتباط طردي معنوى بين تعداد المفترس ودرجة الحرارة بينما كان هناك ارتباط غير معنوى 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 الحيوية للآفات الأكاروسية على الخضر والبساتين.