# OCCURRENCE AND BEHAVIOR OF PREDACIOUS MITES AND SPIDERS ASSOCIATED WITH PESTES INFESTING TOMATO PLANTS IN FAYOUM GOVERNORATE

**ABDEL-AZEIM, NAHLA A. I., E.M.A.YASSIN AND GIHAN M.E. SALLAM**

*Plant Protection Research Institute, ARC, Dokki, Giza*

(Manuscript received 7 July 2010 )

***Abstract***

Survey of predacious mites and spider associated with pests was infesting Tomato plants (variety Beto-86) in Fayoum Governorate, Egypt during 2008 and 2009 seasons to determine the most common species, which play an important role in controlling these pests.

The collected non-predacous mites were *Tyrophagous putrescentiae* (Family Acaridae), *Polyphagotarsonemus lattus* and *Tarsonemus stifer* (Family Tarsonemidae), *Tetranychus urticae* (Family Tetranychidae), *Orthotydeus californicus* (Family Tydeidae), *Kleemenia plumosus* (Family Ameroseiidae) and *Oppia sticta* (Family Oppiidae). The study showed that the commonest predacious prostigmatid and mesostignatid mites were different species. Three of them belonging to Suborder prostigmata *Pronematus ubiquitus* (Family Tydeidae), *Agistemus exertus* (Family Stigmaeidae) and *Eupodes aegyptiaca* (Family Euopodidae) and three species, *Phytoseiulus persimilis*, *Euseius scutalis* and *Amblyseius cydnodactylon* under (Suborder Mesostigmata). In this study, the abundance of these mites and spiders was differed according to environmental conditions and the time of pesticide application. The spiders in this study were *Cheiracanthium isiacum* and *C. pelasgicum* (Family : Miturgidae), *Argiope trifasciata and Cttptophora citricola* (Family: Araneidae), *Thanatus albini* (Family : Philodromidae) and *Hogna ferox* (Family : Lycosidae).The effect of the tomato russet mite, *Aculops lycopersici* on the biological aspects of the commonest predacious mite, *Pronematus* ubiquitus (McGregor) at 25 ºC and relative humidity 75 % R.H. was investigated. The life cycle of predator durated 14.0 and 18.62 days for male and female respectively. The adult predatory mite lived about 13.35 in case of male individuals and longest to recorded 16.55 days in case of adult females under the same condition. Also, the average number of female deposited eggs was 24.25 eggs. the adult predator, male and female fed on 29.4 and 36.24 movable stages, respectively during the life cycle, as well as prey consumption significantly increased during adult stages, whereas , male and female consumed 29.4 and 36.24 movable stages of the prey, respectively.

## INTRODUCTION

The phenomenal increase in tomato cultivation during the last decade in Egypt has drawn the attention to its pests and their associated predators. Tomato (*Lycopersicon esculentum* Mill cv Castlemart) plants in the open field and greenhouses

are liable to be infested with different pests such as the whitefly, *Bemisia tabaci*, the green peach aphid, *Myzus persicae* and the two-spotted spider mite, *Tetranychus urticae*. Phytophagous mites feed on plant cells and produce characteristic small, yellowish, speckled feeding marks. Many insecticides have little or no effect in controlling them. Their small size, ability to exist close to the veins of the plants, the webs and because they are a different species of pest than other insects, make control by spraying extremely difficult. The population growth of the tomato russet mite, *Aculops lycopersici* (Massee), and its effect on tomato plants were studied in glasshouses, Haque and Akira (2002).The population increased exponentially for six weeks after infestation. The intrinsic rate of natural increase was estimated to be 0.175 per day. At seven weeks after infestation, the predator, *Homeopronematus anconai* (Baker) (Acari: Tydeidae), appeared on several plants. The population of *A. lycopersici* decreased rapidly on plants where the predator appeared, due to predation. But it decreased gradually on plants where the predator did not appear, because of the damage to the host plant caused by the mites. More than 70% of the population infested the leaves Fiaboel *et al.*, 2007. The preliminary study of tomato spider mites in Tunisia was conducted by Mediouni *et al.,* (2003) showed the presence of two phytophagus species *Tetranychus urticae* (Koch) and *Aculops lycopersici* (Massee). The predatory mite, *Phytoseiulus persimilis* was also found. Li *et al.*,. (2002) showed that the *Tetranychus urticae* induces a rapid jasmonate-regulated direct defense-response in tomato. The predatory mite *Phytoseiulus persimilis* is the natural enemy of *T. urticae* and is commonly used to control spider mites on tomato (Drukker *et al*, .1997, Garthwaite (2000). The present work was directed to survey the natural enemies (mites and spiders) associated with different tomato leaves pests in Fayoum Governorate during two seasons 2008 and 2009. This study aims to throw some light on biological aspects ofthe predacious tydeid mite, *Pronematus ubiquitus* when fed on the russet mite *A. lycopersici*. The biological aspects of the predator when fed on the mite pest were noticed twice daily under laboratory conditions of 25 $\pm$ 2 °C and 70 $\pm$5 %.R.H.

## MATERIALS AND METHODS

A field experiment was conducted at Naflika village, Sennoris district (Fayoum Governorate). Tomato plants variety Beto-86 were planted at 15$^{th}$ February 2008 and 20$^{th}$ February 2009 and left to grown till they were about one month after sowing to achieve the abundance and population of the different predacous mites and spiders during the two successive seasons 2008 and 2009. Tomato leaves samples were taken and put in polyethylene bags and transferred to the laboratory. Mites were extracted directly (by fine brushes) or by using modified Tullgren funnels for 24 hours. Collected

mites (according to Krantz 1978) were cleared in Nesbitt s solution, then the individuals mounted in a drop of Hoyer s medium on glass slides, gently heated for 24 hours on hot plate to stretched individuals and get rid of the air bubbles. The spiders in this study were collected by shaking the plants on a cloth or a shake sheet. This method is referred as the drop cloth method, Sallam, 2002. Five plants of tomato were shacked over the shaking white cloth (1 m x 1 m) twice monthly during the surveying period. The surveyed spiders were kept in glass vials containing 75 % ethyl alcohol and droplets of glycerin. Living specimens were collected by camel hair brush (000) and examined by using stereomicroscope. In this study the miticide, Vertimec 1.8 % (40 cm / 100 litter of water) was used to control the phytophagous mites in the beginning of March in both tested seasons.

**Biological studies:** Twenty predator eggs were collected from already infested tomato leaves with the russet mite *A. lycopersici* and placed singly with a camel's hair brush on washed tomato leaf discs resting on water-soaked cotton. Of twenty eggs isolated, three did not hatched, two larvae died after they became entangled in the water-soaked cotton, and fifteen adult predators were produced. The produced predator females were then mated with males from stock colony and they were allowed to oviposit eggs. Different stages of the prey were introduced daily to the predatory mite males and females. The duration of the life cycle and longevity of the predator were recorded and the number of consumed prey was recorded also during these periods. However, the number of deposited predatory eggs were counted during the longevity of the adult females. All the biological aspects of the predator were noticed in the laboratory at 25 $\pm$ 2 ºC and 70 $\pm$5 %.R.H.

## RESULTS AND DISCUSSION

Table (1) indicated that, there were 7 different non-predacious mites which associated with tomato leaves which may be used as diets for the association predacious mites and spiders. In this study, the abundance of these mites and spiders was differed according to environmental conditions and the time of pesticide application. These mites were *Tyrophagous putrescentiae* (Schrank) (Family Acaridae), *Polyphagotarsonemus lattus* (Banks) and *Tarsonemus stifer* Ewing (Family Tarsonemidae), *Tetranychus urticae* Koch (Family Tetranychidae), *Orthotydeus californicus* (Banks) (Family Tydeidae) (Suborder Prostigmata). The mesostigmatid mite *Kleemania plumosus* (Oud.) (Family Ameroseiidae) the only non- predacious mites surveyed in the current study. However, the fungivorous mite *Oppia sticta* Popp

except *Kleemania plumosus* which disappeared during the second season 2009. In the current study, Table (2) showed the abundance and distribution of the predacious mite species found associated with pestes infesting tomatoplants, whereas, six pradator mite species were record, belonging to sub- order prostigmata *Pronematus ubiquitus* (McGregor) (Family Tydeidae), *Agistemus exertus* (Family Stigmaeidae) and *Eupodes aegyptiacus* Zaher and Soliman (Family Euopodidae), Phytoseiid mites were represented by *Phytoseiulus persimilis* Athias-Henriot, *Euseius scutalis* (Athias-Henriot) and *Amblyesius cydnodactylon* Shehata and Zaher. *P. persimilis* was an abundant phytoseiid species in the first season 2008 frequently observed with more than 8 mites / leaf. In this study also, the predacious mites *Agistemus exsertus*, *Phytoseiulus persimilis* and *Amblyesius cydnodactylon* had affected by using Vertimec as acaricides on tomato leaves against the phytophagus mites where it disappeared after the application. On the other hand the mites *Pronematus ubiquitus* and *Euseius scutalis* were not affected. However, the mite *Euopodes aegyptiaca* was the only predator mite which appeared after treatment and disappeared before Vertimec application. The same result showed that the tydeid mite, *Pronematus ubiquitus* and the phytoseiid mite *Phytoseiulus persimilis* were the most dominant species during the study.

Table 1. Population of the different non-predacous mites mites on tomato leaves during early summer in Fayoum Governorate during March-May (Beto-86 varity).

| Period | Astigmata | Prostigmata | Mesostigmata | Cryptostigmata |
|---|---|---|---|---|
| 2008 | | | | |
| March | - | *Polyphagotarsonemus lattus*+ | - | - |
| April | *T.putrescentiae*+ | *T. urticae*+<br>*Orthotydeus californicus*+++ | - | *Oppia sticta* Popp.+* |
| May | *T.putrescentiae*+<br>+ | *T. urticae* +++ | *Kleemania plumosus* (Oudemans) | - |
| 2009 | | | | |
| March | *T. putrescentiae*+ | *P. lattus*+++ | - | - |
| April | - | *T. urticae* (Koch)<br>*O. californicus* +++ | - | *O. sticta* ++* |
| May | *T. putrescentiae* | *T. urticae* ++<br>*Tarsonemus stifer* Ewing++ | - | - |

+ rare (1-3 mites) ++ moderate (4-8 mites) +++ high (more than 8 mites)

*before treatment with vertimec

Table 2. List and abundance of collected predacopus mites associated with Pests infesting tomato plantes.

| Period | Prostigmata | Mesostigmata |
|---|---|---|
| 2008 | | |
| March | *Pronematus ubiquitus* (McGregor) **+++ | *Phytoseiulus persimilis* (Athias-Henriot)+++* |
| April | *Agistemus exertus* *++ | *Euseius scutalis* (Athias-Henriot) ++** |
| May | *Euopodes aegyptiaca* • + | *Amblyseius cydnodactylon* Shehata and Zaher ++* |
| 2009 | | |
| March | *P. ubiquitus* **+++ | - |
| April | *P. ubiquitus*++ | *P. persimilis** |
| May | *P. ubiquitus* and *E. aegyptiaca* ** | *P. persimilis* and *Euseius** scutalis* |

+ = rare ++ moderate +++ high * Before treatment with Vertimec only
** = After and before treatment with Vertimec •After treatment with Vertimec only

Table 3. List of collected spider species associated with tomato leaves in Fayoum Governorate

| Family | Species | Occurrence |
|---|---|---|
| Miturgidae Simon | *Cheiracanthium isiacum* Cambridge * | May 2008 and 2009 |
| | *Cheiracanthium pelasgicum* (Koch)** | May 2008 |
| Araneidae Simon | *Argiope trifasciata* Forskal* | April 2008 & May 2008 and 2009 |
| | *Cttptophora citricola* (Forskal)* | April 2008 |
| Philodromidae Thorell | *Thanatus albini* (Audouin)* | April and May 2008 and 2009 |
| Lycosidae Sunderval | *Hogna ferox* (Lucas)** | May 2008 |

*Before treatment only ** Before and after treatment

Considering the spiders in the current study, Table (3) showed that six species of spiders were identified belonging to four families as follows: *Cheiracanthium isiacum* and *C. pelasgicum* (Family : Miturgidae), *Argiope trifasciata* and *Cttptophora citricola* (Family: Araneidae), *Thanatus albini* (Family : Philodromidae) and *Hogna ferox* ( Family : Lycosidae). However, three of these spiders were active during the two tested seasons and the spiders which affected by the different factors which might be were environmental factors or due to other factors did not taken in consideration in this study and disappeared during the seconds season. However, there were two spiders appeared before and after using Vertimec against different pests which are *Cheiracanthium pelasgicum* and *Hogna ferox* and this might be reflect the ability of these spider against such this compound while the rest four spiders disappeared either due to death or migration toward another neighboring fields.

Kawai and Haque (2004) listed 7 natural enemies of the phytophagus mite, *Aculops lycopersici* on tomato leaves, *Euseius concordis*, *Amblyseius victoriensis*, *Agistemus exsertus*, *Homeopronematus anconai* and *Pronematus ubiquitus* and two insects *Leptothrips mali* (Phaleothripidae) and *Scolothrips sexmaculatus* (Thripidae). They added that adults and nymphs of *H. anconai* predated all stages of *A. lycopersici*, and when a small number of *H. anconai* were released on tomato plants in a greenhouse with a high density of *A. lycopersici*, the population of *A. lycopersici* was suppressed to a low density (Kawai *et al.*, unpublished). Also, Schwartz (1993) noticed that both Arachnida and insecta, were present on the grapevine leaves following the application of fungicides for the control of powdery mildew and *Amblyesius addoensis* was the most abundant in all treatments.

**Biological studies:** Feeding of the rust mite, *Aculops lycopersici* on the surface of the plant produces a bronzed or russetted appearance on both stems and leaves and superficial cracking of the tissue. Typically the symptoms first appear on the lower portions of the plant, and as the affected foliage dries up, the infestation moves upwards. Eventually death of the whole plant can result. Crop losses are mostly caused when older plants are attacked, in which case severe defoliation will result in the fruit becoming sun-scorched. Although the pest has not often been recorded in recent years, it remains a potentially serious pest, because of the difficulty in diagnosing it. So this part of study aims to throw some light on the controlling of the russet mite, *Aculops lycopersici* by using the tydeid mite, *Pronematus ubiquitus*.From the obtained data in Table (4), it was observed that life cycle of the mite, *P.ubiquitus* lasted 14.0 and 18.62 days when the male and female fed on *A. lycopersici*, respectively. However, the adult predatory mite lived about 13.35 for male and longest 16.55 days for females. Also, the same table denoted that the average number of female deposited eggs was 24.25 eggs . However, The adult male and female consumed about 14.11 and 16.35 movable stages of the mite, *A. lycopersici*, respectively during the life cycle period of the predator, these numbers of the prey were significantly increased during adult period. Where they fed on 29.4 and 36.24 movable stages of the prey, respectively Table (4). Similar results were obtained by Kawai and Haque (2004) where they noticed that the adults and nymphs of the predatory tydeid mite *H. anconai* predated all stages of *A. lycopersici* when it released on tomato plants in a greenhouse with a high density of *A. lycopersici*, the population of *A. lycopersici* was suppressed to a low density.

Table 4. Biological aspects of the predacious mite, *Pronematus ubiquitus* when fed on the tomato rust mite, *Aculops lycopersici* at 25 ± 2 ºC and 70 ±5 %.R.H.

| Biological aspect | Duration in days ± S.D | | Consumption rate / day | |
|---|---|---|---|---|
| | Male | Female | Predatory female | Predatory male |
| Life cycle (Average) | 14.0 ±1.1 (13-15) | 18.62 ± 1.38 (17-20) | 16.35±3.6 (13-20) | 14.11±2.1 (12-16) |
| Longevity (Average) | 13.35 ±1.25 (12-15) | 16.55±1.47 (15-18) | 36.24±7.65 (27-45) | 29.14±5.75 (23-35) |
| Fecundity (Average) | - | 24.25 ±3.71 (20-28) | - | - |

## REFERENCES


1. Drukker, B., A. Janssen, W. Ravensberg and M. W. Sabelis. 1997. Improved control capacity of the mite predator *Phytoseiulus persimilis* (Acari: Phytoseiidae) on tomato. Exp. Appl. Acarol 21: 507–518
2. Fiaboel, K. K. M, G. C. Manoel, J. Gondim G. J. Demoraes, C.K. P. Ogol and M. Knapp. 2007. Surveys for natural enemies of the tomato red spider mite *Tetranychus evansi* (Acari: Tetranychidae) in northeastern and southeastern Brazil. Zootaxa, 1395: 33–58.
3. Garthwaite, D. 2000. Changes in biological control usage in Great Britain between 1968 and 1995 with particular reference to biological control on tomato crops. Biocontrol Sci. Techn 10: 451–457
4. Haque, M. M and K. Akira. 2002. Population growth of tomato russet mite, *Aculops lycopersici* (Acari: Eriophyidae) and its injury effect on the growth of tomato plants. Journal of the Acarological Society of Japan.11(1): 1-10.
5. Kawai, A. and M. M. Haque. 2004. Population dynamics of tomato russet mite, *Aculops lycopersici* (Massee) and its natural Enemy, *Homeopronematus anconai* (Baker). Jarq, 38 (3), 161 – 166.
6. Krantz, G. W. 1978. Amanual of Acarology, O. S.M.Book Stores Inc.Convallis, Oregon Litho, USA.
7. Li C. Y., M.M. Williams, Y.T.Loh, G. I. Lee and G.A.Howe. 2002. Resistance of cultivated tomato to cell content-feeding herbivores is regulated by the octadecanoid-signaling pathway. Plant Physiology 130: 494–503
8. Mediouni, J., R. Souissi. and H. Yazid. 2003. Preliminary study of tomato spider mites in Tunisia.8th Arab Congress of Plant Protection, 12-16.
9. Sallam, G. M. 2002. Studies on true spiders in Egypt. Ph.D.Thesis, Fac. Agric., Cairo Univ., 144 pp.
10. Schwartz, A. 1993. Occurrence of natural enemies of phytophagous mites on grapevine leaves following application of fungicides for disease control. S. Afri. J. Enol. Vitic., Vol. 14, No. 1: 16- 17.

# تواجد وسلوك الاكاروسات والعناكب المفترسة على نباتات الطماطم في محافظة الفيوم

**نهلة على إبراهيم عبد العظيم ، عصام محمد عبد السلام ياسين ، جيهان محمد السيد سلام**

*معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – جيزة*

أجريت هذه الدراسة على مدار موسمين متتالين ٢٠٠٨ و ٢٠٠٩ لدراسة تواجد وتذبذب أعداد المفترسات الاكاروسية والعنكبوتية التي تتواجد على أوراق نباتات الطماطم الصنف في منطقة نقليفة بمركز سنورس بمحافظة الفيوم على الصنف بيتو-٨٦. وقد أثبتت الدراسة وجود سبعة أنواع من الاكاروسات الغير مفترسة والتي يمكن أن تستخدم كغذاء للاكاروسات والعناكب المفترسة وهذه الاكاروسات كالاتى : – *Tyrophagous putrescentie* و *Polyphagotarsonemus lattus* و *Tarsonemus stifer* و *Tetranychus urticae* و *Orthotydeus californicus* و *Kleemenia plumosus*, و *Oppia sticta*

وأثبتت الدراسة أيضا وجود ستة أنواع من الاكاروسات المفترسة والتي تنتمى إلى تحت رتبتي الثغر الامامى Prostigmata والثغر المتوسط Mesostigmata وهى الأنواع *Pronematus ubiquitus* و *Agistemus exertus* و *Eupodes aegyptiaca* و *Phytoseiulus persimilis* و *Euseius scutalis* و *Amblyseius cydnodactylon* . وفى هذه الدراسة كانت العناكب التابعين لعائلة Miturgidae و *Argiope trifasciata* و *Ctptophora citricola* المنتميان لعائلة Araneidae و *Thanatus albini* المنتمى لعائلة Philodromidae والنوع *Hogna ferox* المنتمى لعائلة Lycosidae هي الموجودة. كما أجريت الدراسة لمعرفة تأثير اكاروس صدأ الطماطم على المظاهر البيولوجية للاكاروس المفترس *Pronematus ubiquitus* وإمكانية استخدامه في مجال المكافحة البيولوجية حيث أثبتت النتائج المتحصل عليها أن فترة دورة حياة الاكاروس استغرقت ١٤,٠ و ١٨,٦٢ يوما في حالة تغذية الذكور والإناث على الترتيب واستهلكت هذه الأفراد في هذه الفترة ١٤,١١ و ١٦,٣٥ فردا من الفريسة أثناء عملية التغذية أما الأفراد البالغة من المفترس فقد استغرقت فترة مقدارها ١٣,٣٥ و ١٦,٥٥ يوما للذكور والإناث على الترتيب متغذية على عدد من الفريسة مقداره ١٤,١١ و ١٦,٣٥على الترتيب.