

INCIDENCE OF PREDACIOUS ACTINEDID MITES ASSOCIATED WITH CERTAIN SOILS OF SOME FIELD CROPS IN DIFFERENT LOCATIONS OF EGYPT

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Abstract

The present study was directed towards the habitat of various predaceous actinedid (Prostigmata) mites associated with different soil field crops. Samples collected monthly from maize, cotton and soybean as summer field crops and faba bean, wheat, clover and onion as winter field ones. Incidence study conducted during the seasons of (2012/2013 and 2013/2014) revealed the occurrence of 33 different prostigmatid mite species in 9 families under 18 genera. These are Euopodidae (2 species), Erynetidae (1 species), Tydeidae (3 species), Bdellidae (2 species), Cunaxidae (9 species), Raphignathidae (3 species), Cheyletidae (11 species and one species for each Anystidae and Trombididae). The dominant families were Cheyletidae and Cunaxidae with the dominant species *Cheletonella caucasica* (Volgin), *Cheyletus malaccensis* Oudemans, *C. eruditus* (Shrank) (Cheyletidae) and *Neocunaxoides andrei* (Baker and Hoffman) (Cunaxidae) and *Eupodes aegyptiacus* Abou Awad and El-Bagoury (Euopodidae). The winter field crops were represented by 26 mite species and faba bean harbored the highest number (10 species), while, the summer field crops recorded 31 mite species of which maize soil harbored the high number (18 species). The most abundant mites were *Cunaxa capreolus* Berlese and *C. setirostris* (Family Cunaxidae) associated with 3 and 4 soil field crops, respectively and the cheyletid mites, *C. eruditus* and *C. malaccensis* which associated with four different soil field crops, respectively.

INTRODUCTION

Members of the subclass Acari are the largest group of invertebrates, and have large economic importance. More than 60,000 species of mites have been described from various regions of the world, the number of undescribed species is estimated to exceed 600,000 (Evans, 1992), and the majority of such undescribed species are expected to live in tropical regions. Actinedida and Gamasida represent the major group of soil mites which found in many soil habitats (Wallwork, 1976, Mostafa, 1980 and Convey *et al.*, 2000). The Actinedid mites (suborder Prostigmata) represent the major group of soil mites which found in many soil habitats (Convey *et al.*, 2000). Although the Acarina communities of Egyptian soil have not been widely studied, some information is available on the prostigmatid mites' fauna. A side from their feeding injury, some mite

species have been found to transmit plant viruses. Many mites are predaceous on other pest and some species have been used in biological control programme. The majority of these species appear to be predators associated with small and immature stages of insects, mites, and nematodes in the soil surface (Wallwork, 1976). The present work aims to throw some light upon the incidence of some predaceous actinedid mites in different soils under some winter and summer field crops in five Governorates..

MATERIALS AND METHODS

1- Survey and distribution of soil mites:

For survey studies, soil samples of about 500 gm were collected all over the season throughout the two successive seasons 2012/2013 and 2013/2014 from different field crops such as broad bean, *Ficia faba* L. and onion, (*Allium cepa* L.), wheat, (*Triticum aestivum* L.) and clover, (*Trifolium alexandrinum* L.) as winter crops and cotton, (*Gossypium barbadense* L.), maize, (*Zea mays* L.) and soybean (*Glycine max* L.) Merr) as summer crops in different regions of Egypt (Qaluobia, Giza, Menoufia, Giza and Beni Suief Governorates). Samples were freshly and singly transferred to the laboratory for mite collection in cellophane page in the same collection day. Mites extraction was carried out using modified Berlese funnels according to Krantz and Walter (2009). The extracted mites were mounted in Hoyer's medium on clean glass slides, examined microscopically then identified according to Griffiths, 1960, Summers and Price, 1970, Hughes, 1976, Zaher, 1986, Volgin, 1989 and Krantz and Walter 2009.

RESULTS AND DISCUSSION

Mites' diversity and species composition of predacious actinedid soil mites:

Incidence study reveals that the occurrence of predacious prostigmatid mites inhabiting different soil under field crops (broad bean, onion, wheat, clover, cotton, maize and soybean) during 2012/2013 and 2013/2014 seasons. As shown in Table (1) data indicated that there were 33 different mite species belong to 9 families and 18 genera were recorded as follows: Both Anystidae and Trombididae families recorded one mite species. There are two species for family Euopodidae while one species was recorded for family Erynetidae. In addition, there were three, two, nine, three and eleven species for Tydeidae, Bdellidae, Cunaxidae, Raphignathidae and Cheyletidae families, respectively. Also, obtained results cleared that cheyletid and cunaxid mites were dominant, whereas the predatory mites *Cheletonella caucasica* (Volgin), *Cheyletus malaccensis* Oudemans (Cheyletidae) and *Neocunaxoides andrei* (Baker and Hoffman) (Cunaxidae) and *Eupodes aegyptiacus* Abou Awad and El-Bagoury (Euopodidae) were dominant in the numbers.

Family: Eupodidae Koch

Two eupodid mite species were recorded: *Eupodes aegyptiacus* Abou Awad and El-Bagoury and *E. niloticus* Abou Awad and El-Bagoury, Table (1). The first species was found under onion soil in Qaluobia governorate while the second species were recorded in the soil of both Maize and faba bean in Giza and Qaluobia governorates, respectively. The two collected mite species were found in high numbers.

Family: Erynetidae Oudemans

Only one species of the family Erynetidae (*Ereynetes* sp.) was recorded, from Giza and Qaluobia governorate during this study from soil of cotton and broad bean, respectively in rare number.

Family: Tydeidae Kramer

Three mite species of the family Tydeidae were collected. These species were *Orthotydeus kochi* (Oudemans) from soil of broad bean in Qaluobia in high numbers, *Tydeus aegyptiacus* (Rasmy and El-Bagoury) from Menofia, Giza and Beni Suef governorates associated with soil of cotton and maize plants in moderate numbers and *Pronematus rykei* (Baker) from soil of onion in Qaluobia governorate in rare number.

Family: Bdellidae Duges

The bdellid mites, *Spinibdella bifurcate* Atyeo was collected from Giza in soil of maize plant in Giza and *S. depressa* Atyeo from soil of cotton and maize in Qaluobia governorate.

Family: Cunaxidae Thor

The following cunaxid mites, *Cunaxa capreolus* Berlese, *C. setirostris* (Hoffman), *C. nercruzanum* Baker and Hoffmann, *Coleoscerius breslauensis* (Den Heyer), *Coleoscerius. bapto*s (Chaudhri), *Neocunaxoides Andrei* (Baker and Hoffman), *Pulaeus zaheri* EL-Bishlawy and Rakha and *P. lebulentus*, *P. niloticus* Zaher and EL-Bishlawy, *P. glebulentus* Den Heyer were collected associated with different soils planted with different filed crops, Table (1). The abundance of these individuals was also observed in Tables (1&3).

Family Raphignathidae Kramer

Raphignathus niloticus Zaher, *R. ehari* Zaher and Gomaa and *R. bakeri* Zaher and Gomaa were collected from Qaluobia governorate associated with soil of maize, onion and maize plants, respectively. These mites were collected in moderate numbers.

Family: Cheyletidae Leach

The eleven cheyletid mites obtained during this study, *Acaroppsellina docta* (Berlese), *A. notchi* Gomaa and Hassan, *Acaroppsellina* sp., *Cheletonella caucasica* Volgin, *Hemicheyletia congensis* Volgin, *Cheyletus badreyi* Zaher and Hassan, *C. eruditus* (Shrank), *C. malaccensis* Oudemans, *Ker bakeri* Zaher and Soliman,

K.summersi Gomaa and Hassan and *Eutogenes africanus* Wafaa and Soliman were 11 different cheyletid species collected in this study inhabiting the soils of different field crops in different locations.

Family Anystidae

The family Anystidae was represented in this survey by one species *Anystis* sp. which collected in moderate number in soil cultivated with faba bean in Menofia governorate.

Family Trombidiidae

The predacious mite, *Leeuwenhoekia* sp. belongs to family Trombidiidae was recorded in the current study with rare number in Giza governorate associated with maize soil.

Mites seasonal abundance in soil of tested field crops

As shown in Table (2), the winter field crops were represented by 26 different soil predacious mites, where the broad bean harbored the highest number of mites (10 species), while onion, clover and wheat harbored 9, 3 and 4 soil mite species, respectively. On the other hand, the summer field crops harbored 31 mite species. The maize soil aggregated the high numbers of actinedid predacious mites (18 species) followed by cotton which harbored 8 different mite species, while soybean crop represented by the lowest, five mite species, Table (2). The most abundant mites were *Cunaxa capreolus* and *C. setirostris* (Family Cunaxidae) which associated with 3 and 4 soils of field crops, respectively, and the cheyletid mites *Cheyletus eruditus* and *C. malaccensis* which associated with four different soils of field crops, respectively, Table (2). Obtained results are in agree with those obtained by Zaher (1986), Kaid (1998), Romeih (2002) and Ezz El- Dein (2003), where the soil of the same field crops harbored in most cases the actinedid mites as common soil mites in the Egyptian fauna. The abundance and presence of predacious mites might be related to growing plants, types of soil, organic matter, agrochemical applications and availability of prey as indicated in earlier studies (Al-Rehiyani and Fouly (2005), El-Benhawy, (2002) and El-Benhawy *et al.*, (2006).

In conclusion, predaceous mites are free living arthropods mainly inhabiting different habitats. Food preference and specialization are not clear enough so far. The large number of predacious mites species found in the soil cultivated with different field crops may have a role in regulating insects, mites and nematode pests in these habitats.

Table 1. Incidence of different soil actinedid predaceous mites inhabiting some field crops at different regions of Egypt.

| Family | Mites species | Locality | Host (s) | Abundance |
|-----------------------|--------------------------------------------------------|----------------------------------|-------------------------------------|-----------|
| Eupodidae Koch | <i>Eupodes aegyptiacus</i> Abou Awad and El-Bagoury | Qaluobia | Onion, wheat | +++ |
| | <i>Eupodes niloticus</i> Abou Awad and El-Bagoury | Giza, Qaluobia | Maize, Broad bean | +++ |
| Erynetidae Oudemans | <i>Ereynetes</i> sp. | Giza, Qaluobia | Cotton Broad bean | + + |
| | | | | |
| Tydeidae Kramer | <i>Orthotydeus kochi</i> (Oudemans) | Qaluobia | Broad bean | +++ |
| | <i>Tydeus aegyptiacus</i> (Rasmy and El-Bagoury) | Menoufia, Giza, Beni Suief | Cotton, maize | ++ |
| | <i>Pronematus rykei</i> (Baker) | Qaluobia, Menofia | Onion, clover | + |
| Bdellidae Duges | <i>Spinibdella bifurcate</i> Atyeo | Giza, Menofia | Maize | ++ |
| | <i>Spinebdella depressa</i> Atyeo | Qaluobia, Benha | Cotton , maize | ++ |
| Cunaxidae Thor | <i>Cunaxa capreolus</i> Berlese | Qaluobia | Maize, clover, wheat, onion | ++ |
| | <i>Cunaxa setirostris</i> (Hoffman) | El-Kanater, Giza | Maize, onion, soybean, cotton | + |
| | <i>Cunaxa nercruzanum</i> Baker and Hoffmann | Beni Suief, Qaluobia | Broad bean, maize | + + |
| | <i>Coleoscerius breslauensis</i> (Den Heyer) | Qaluobia | Broad bean | + |
| | <i>Coleoscerius baptois</i> (Chaudhri). | Qaluobia | Onion | + |
| | <i>Neocunaxoides andrei</i> (Baker and Hoffman) | Giza, Menofia | Cotton, maize | +++ |
| | <i>Pulaeus zaheri</i> EL-Bishlawy and Rakha | Qaluobia | Broadbean | + |
| | <i>Pulaeus niloticus</i> Zaher and EL-Bishlawy | Giza | Cotton, soybean | + |
| | <i>Pulaeus glebulentus</i> Den Heyer | Giza, Qaluobia | Cotton, maize | ++ ++ |
| Raphignathidae Kramer | <i>Raphignathus niloticus</i> Zaher | Qaluobia, Menofia | Maize, soybean | ++ |
| | <i>Raphignathus ehari</i> Zaher and Gomaa | Qaluobia | Onion | ++ |

Table 1. Cont.,

| Family | Mites species | Locality | Host (s) | Abundance |
|-------------------------------------------------|--------------------------------------------------|----------------------------------|-------------------------------------|-----------|
| Raphignathidae Kramer | <i>Raphignathus bakeri</i> Zaher and Gomaa | Qaluobia | Maize | ++ |
| Cheyletidae Leach | <i>Acaroppsellina docta</i> (Berlese) | Qaluobia | Cotton | + |
| | <i>Acaroppsellina notchi</i> Gomaa and Hassan | Qaluobia, | Cotton, Maize | ++ |
| | <i>Acaroppsellina</i> sp. | Qaluobia | Onion | + |
| | <i>Cheletonella caucasica</i> Volgin | Qaluobia | Maize, wheat | +++ |
| | <i>Henicheyletia congensis</i> Volgin | Menofia, Giza | Maize, onion | ++ |
| | <i>Cheyletus badreyi</i> Zaher and Hassan | Qaluobia | Maize, soybean | + |
| | <i>Cheyletus eruditus</i> (Shrank) | Giza | Onion, clover, Maize, soybean | +++ |
| | <i>Cheyletus malaccensis</i> Oudemans | Giza, Qaluobia, Beni Suief | Onion, Clover, cotton, Wheat | +++ |
| | <i>Ker bakeri</i> Zaher and Soliman | Qaluobia | Broad bean, soybean | + |
| | <i>Ker summersi</i> Gomaa and Hassan | Qaluobia | Broad bean, wheat | + |
| <i>Eutogenes africanus</i> Wafaa and Soliman | Menofia, Qaluobia | Maize, Broad bean | + | |
| Anystidae Oudemans | <i>Anystes</i> sp. | Menofia | Broad bean, soybean | ++ |
| Trombidiidae | <i>Leeuwenhoekia</i> sp. | Giza | Maize, wheat | + |

+ = rare number < 3 individuals.

++ = moderate number (3-9) individuals.

+++ = high number (more than 9 individuals).

Table 2. Presence of different soil actinoid predaceous mites associated with different field crops

| Family | Species | Winter field crops | | | | Summer field crops | | |
|----------------|----------------------------------|--------------------|-----------|--------|-------|--------------------|-------|---------|
| | | Onion | Faba bean | Clover | Wheat | Cotton | Maize | Soybean |
| Eupodidae | <i>Eupodes aegyptiacus</i> | + | - | - | + | - | - | - |
| | <i>Eupodes niloticus</i> | - | + | - | - | - | + | - |
| Ereynetidae | <i>Ereynetes</i> sp. | - | + | - | - | + | - | - |
| Tydeidae | <i>Orthotydeus kochi</i> | - | + | - | - | - | - | - |
| | <i>Tydeus aegyptiacus</i> | - | - | - | - | + | + | - |
| | <i>Pronematus rykei</i> | + | - | + | - | - | - | - |
| Bdellidae | <i>Spinibdella bifurcate</i> | - | - | - | - | - | + | - |
| | <i>Spinebdella depressa</i> | - | - | - | - | + | + | - |
| Cunaxidae | <i>Cunaxa capreolus</i> | + | - | - | + | - | + | - |
| | <i>Cunaxa setirostris</i> | + | - | - | - | + | + | + |
| | <i>Cunaxa nercruzanum</i> | - | + | - | - | - | + | - |
| | <i>Coleoscerius breslauensis</i> | - | + | - | - | - | - | - |
| | <i>Coleoscerius baptois</i> | + | - | - | - | - | - | - |
| | <i>Neocunaxoides andrei</i> | - | - | - | - | + | + | - |
| | <i>Pulaeus zaheri</i> | - | + | - | - | - | - | - |
| | <i>Pulaeus niloticus</i> | - | - | - | - | - | + | + |
| | <i>Pulaeus glebulentus</i> | - | - | - | - | + | + | - |
| Raphignathidae | <i>Raphignathus niloticus</i> | | | | | | + | + |
| | <i>Raphignathus ehari</i> | + | - | - | - | - | - | - |
| | <i>Raphignathus bakeri</i> | - | - | - | - | - | + | - |

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Table 2. Cont.

| Family | Species | Winter field crops | | | | Summer field crops | | |
|-------------|--------------------------------|--------------------|------------|--------|-------|--------------------|-------|---------|
| | | Onion | Broad bean | Clover | Wheat | Cotton | Maize | Soybean |
| Cheyletidae | <i>Acaroppsellina docta</i> | - | - | - | - | + | - | - |
| | <i>Acaroppsellina notchi</i> | - | - | - | - | + | + | - |
| | <i>Acaroppsellina</i> sp. | + | - | - | + | - | + | - |
| | <i>Cheletonella caucasica</i> | - | - | - | - | - | - | - |
| | <i>Henicheyletia congensis</i> | + | - | - | - | - | + | - |
| | <i>Cheyletus badreyi</i> | - | - | - | - | - | + | + |
| | <i>Cheyletus eruditus</i> | + | - | + | - | - | + | + |
| | <i>Cheyletus malaccensis</i> | + | - | + | + | + | - | - |
| | <i>Ker bakeri</i> | - | + | - | - | - | - | + |
| | <i>Ker summersi</i> | - | + | - | + | - | - | - |
| | <i>Eutogenes africanus</i> | - | + | - | - | - | + | - |
| Anystidae | <i>Anystes</i> sp. | - | + | - | - | - | - | + |
| Trombididae | <i>Leeuwenhoekia</i> sp. | - | - | - | + | - | + | - |

+ = presence
- = absent

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تواجد الاكاروسات المفترسة ذات الثغر الامامى المرتبطة بتربة بعض المحاصيل الحقلية فى مناطق مختلفة من مصر

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اجريت هذه الدراسة لحصر الاكاروسات المفترسة المنتمية الى تحت رتبة ذات الثغر الامامى
والمرتبطة بتربة بعض المحاصيل الحقلية (الفول البلدى - البصل - القمح - البرسيم) كمحاصيل
حقلية شتوية و (القطن والذرة وفول الصويا) كمحاصيل حقلية صيفية فى مناطق مختلفة من
مصر (القليوبية - الجيزة - المنوفية - بنى سويف) فى موسمين متتاليين 2013/2012 و
2014/2013 وقد اسفرت الدراسة على وجود 33 نوع من المفترسات الاكاروسية تابعة ل 9
فصائل تحت 18 جنس كالاتى: عائلة Euopodidae والتي شملت على نوعين اثنين و عائلة
Erynetidae وقد احتوت على نوع واحد فقط وعائلة Tydeidae وقد شملت على ثلاث انواع من
الاکاروسات وعائلة Bdellidae والتي شملت نوعين اثنين اما عائلة Cunaxidae فقد تم حصر 9
انواع وهى تعتبر ثانى اكبرعائلة من حيث عدد الانواع وعائلة Raphignathidae وقد اشتملت فى
هذه الدراسة على ثلاث انواع اما عائلة Cheyletidae والتي جاءت فى المرتبة الاولى من حيث عدد
الانواع التى تم حصرها فقد اشتملت على 11 نوع اما كلا من عائلتي Anystidae و Trombididae
فقد احتوت كلا منهما على نوع واحد فقط فى هذه الدراسة. ولقد وجد ان المحاصيل الشتوية فى هذه
الدراسة قد احتوت على 26 نوع بينما سجل تحت المحاصيل الصيفية 31 نوع أى معظم الانواع
محل الدراسة.