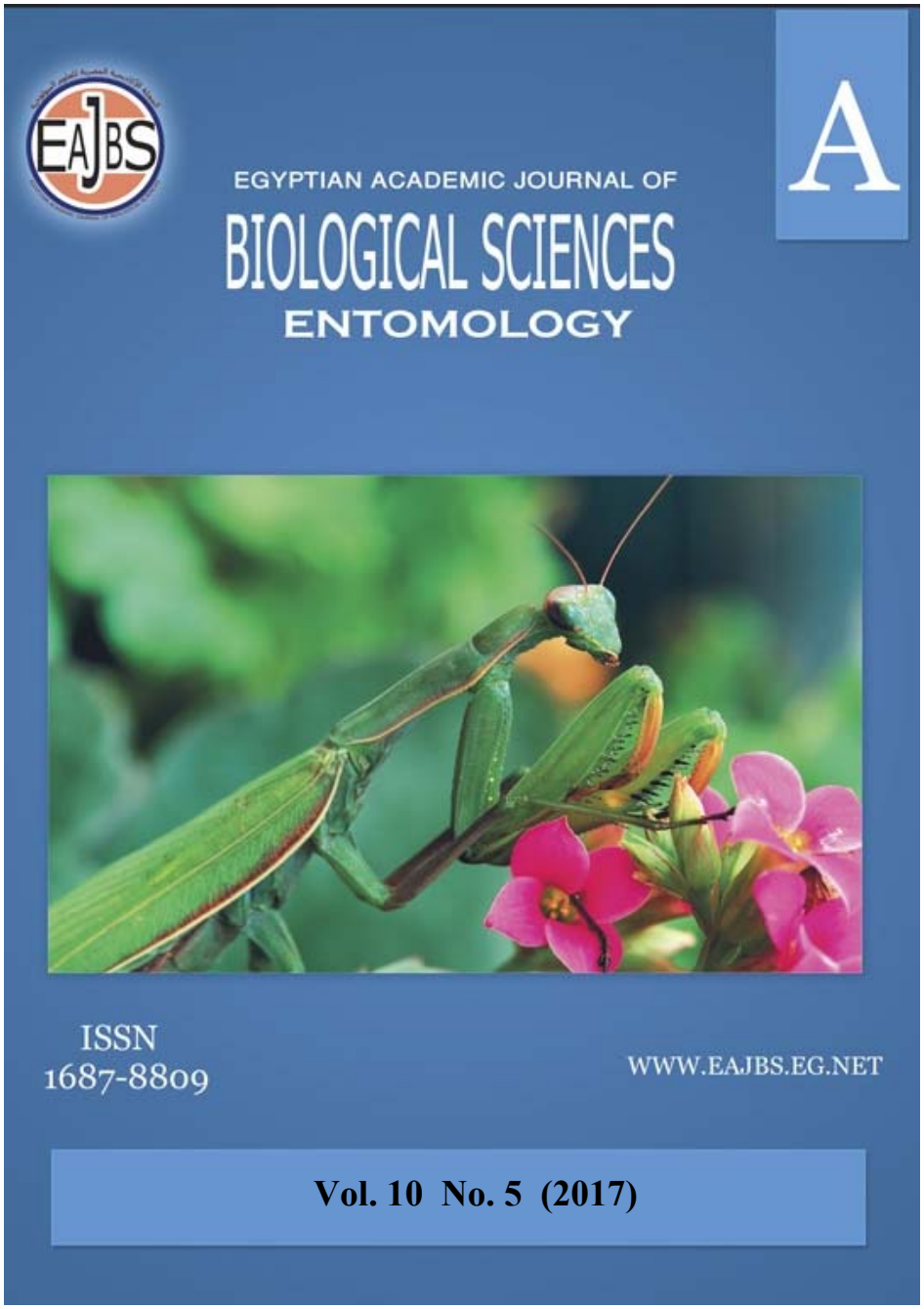

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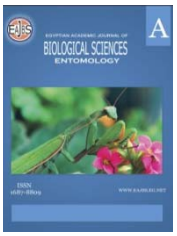

Occurrence of Fungivorous Mites in Different Habitats at Dakahlia Governorate

Adel M. Mostafa[1], Wafaa L.F. Ibrahim[2], Basma M. Abou El-Nour[2], E. M.A. Yassin[1] and Noura F. E. Abou El-Einien[1]

1- Plant Protection Research Institute, A.R.C., Dokki, Giza, Egypt.
2- Zoology Dept, Fac. Sci., (Girls), Al-Azhar Univ., Cairo, Egypt.

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ABSTRACT

The present study was conducted during four years (2013-2016) to throw some light on the acarofauna of the different fauna in different regions covered El-Dakahlia Governorate. This study revealed the occurrence of 36 different mite species belonging to 23 genera and 14 families under four suborders as follows: Suborder Astigmata (Acaridida) which represented by 16 different species belong to 11 genera and 5 families. Also, Suborder Prostigmata (Actinedida) represented in this study by 7 mite species belonging to 4 genera in 4 families. On the other hand, the Suborder Mesostigmata (Gamasida) was represented by 10 mite species belonging to 5 genera in 3 families. The suborder Cryptostigmata (Oribatida) in this study included three mite species belong to two families. The stored product materials were the most source of mite abundance (33 different species) and the commonest mites were *T. putrescentiae*, *Tarsonemus granaries* and *P. pygmaeus*. On the other hand, the plant leaves were infested with 3 mites species and the most abundant mites were *Orthotydeus californicus* and *T. putrescentiae*, but the different tested soil harbored 4 mites, and *O. sticta* was the only dominant collected mite. The regions can be descending arranged as follows: Belkas (14 species), Meit Ghamr (11 species), Talkha (10 species), Aga and Sherbein (9 species), El-Mansoura (8 species), Meneit El-Nasr and Dekirnes (7 species), El-Sinbilawein (6 species) and El-Manzala (5 species). The dominant species of different tested regions in this study was the acarid mite, *T. putrescentiae*.

INTRODUCTION

Up-to-date dramatically increase in the population in the world requires an efficient modern human food and animal production industry and the manufacture of good quality feeds and food. A ‘pest of stored products’ can refer to any organism that infests and damages stored food, books and documents, fabrics, leather, carpets, and any other dried or preserved item that is not used shortly after it is delivered to a location, or moved regularly. Technically, these pests can include microorganisms such as fungi and arthropods such as insects and mites. Damage by insects, mites, fungi, and sprouting causes hundreds of millions of dollars of economic losses to grain producers, merchandisers, and processors each year (Harein and Meronuck 1995). Stored product mites are important pests of stored food commodities and animal feed in areas with humid climates (Sanchez-Ramos and Castanera, 2003). These pests negatively influence the quality of stored commodities, cause allergic reaction and disseminate toxic moulds (Hubert *et al.*, 2004).

The pest importance of stored product mites has been reviewed and three pest risks are suggested; (i) direct consumption on human food, animal feed or other products changing the quality of infested products, they can penetrate grains and feed directly on the grain kernels, therefore they destroy their germination power, change the moisture contents of medius, initiating growth and spread mould **(**Sinha and Wallace, 1977; Taha, 1985); Gulati and Mathur, 1995); (ii) interaction to microorganisms leading to the transfer of mycotoxins production fungi (Sinha, 1964) or pathogenic bacteria; (iii) production of hazardous compounds among them the allergens are of the highest importance**.** Mites associated with different materials (plants, stored products, soil) have different relationships, ranging from fungivorous, parasitic and predators associated with other microorganisms. According to the available literature numerous surveys of the plant leaves, stored products and soil fungivorous mites associated with different materials have been undertaken in various parts of the world, but only limited studies were carried out in Egypt. Therefore, the present study was conducted to detect the fungivorous mites of some stored materials, plant leaves and soil of some field crops in different regions of El-Dakahlia Governorate, Egypt during the period 2013-2016.

MATERIALS AND METHODS

A. Study regions: In this study, different districts of Dakahlia Governorate were chosen i.e., Meit Ghamr, Aga, El-Mansoura, Belkas, Talkha, Meneit El-Nasr, El-Sinbilawein, Sherbein, El-Manzala and Dekirnes to achieve this study.

B. Collection of different fungivorous mites

Collection of fungivorous mites on different plant leaves: The examined plants to study the occurrence of different fungivorous mites were soybean, maize**,** cotton, clover, wheat, and sugar beat. The samples (20 leaves) were randomly picked up twice monthly and transferred to identify mites.

Collection of fungivorous mites from stored products: Samples were collected from different localities from the tested materials of about 500 gm as placed in plastic bags marked by labels denoting date of collection, place, and habitat. The examined stored materials were seeds (cotton, wheat, maize, lentil, barley, cow pea, rice) grains, animal feed (wheat bran, wheat and clover straw), dry fruits (fig, date palm) and others (cheese, biscuit, maize flour, milk powder, karkadia, macaroni, boksomate, chocolate, bread, and sugar). The samples were brought to Acarology Research Laboratory in Cotton and Field Crops Acarology Department, Plant Prot. Res. Inst., Agricultural Research Center, for examination in the same collection day.

Collection of fungivorous mites from field crops soils:Samples of 500 g soil under some field cops (wheat, cotton, soybean, maize, sugar beet and clover) were randomly taken from a layer of 5 cm of upper soils, placed in paper bags and transferred in same collection day to be identified and recorded.

C. Isolation of mites: Mites extraction was carried out using modified Tullgren funnels. Each funnel has 60-Watt electric lamb. Samples of tested stored products and soil exposed to light for 24 hours, and the extracted mites were received in Petri-dishes (diameter 9 cm, high 1.5 cm) filled with water. The plant leaves mites were examined and isolated by aiding of a Stereomicroscope.

D. Mounting of mites: Collected mites were kept in Nesbitt's solution for about 24 hours for clearing them. Nesbitt's solution is prepared as (chloral hydrate (40 gm) distilled water (25 ml), and hydrochloric acid (2, 5). For mounting the collected mites, Hoyer's medium was used, which was prepared as follow: Distilled water (50 ml),

chloral hydrate (50 gm), glycerin (20 ml) and Arabic gum (30 gm) due to Hughes (1976), and Krantz and Walter (2009), drop of Hoyer's medium was put on the widely slide glass, after that the individual of mite (adult stage or immature) mounted in the medium and covered with glass cover, the slide was gently heated to stretch mite individual and rendering it clear and transparent, and to remove any air bubbles under the cover. After a few days the mounted specimens become clear and ready for further studies.

E. Identification of the collected mites: The identification of different species was conducted according to Hughes (1961 & 1976); Lindquist and Evans (1965); Shereef *et al*. (1980); Zaher (1986); Fan and Zhang (2003); Krantz and Walter (2009).

RESULTS AND DISCUSSION

The present study was conducted during four years (2013, 2014, 2015 and 2016) to throw some light on the acarofauna of the different stored products, plant leaves and some field crops soils in different regions covered El-Dakahlia Governorate. This study revealed the occurrence of 36 different mite species belonging to 23 genera and 14 families under four suborders, (Table 1) as follows: Suborder Astigmata which was represented by 16 different species belong to 11 genera and 5 families. The recorded families as represented in Table (1) were Acaridae 9 species (*Tyrophagus putrescentiae*, *T. longior*, *Rhizoglyphus robini*, *R. echinopus*, *Caloglyphus beta*, *C. berlesei*, *Suidasia nesbitti*, *Acarus siro* and *A. farris*); family Lardoglyphidae (one species, *Lardoglyphus zacheri*); family Glycyphagidae as 4 species (*Glycyphagus domesticus*, *G. ornatus, Lepidoglyphus destructor* and *Blomia freemani*); Pyroglyphidae (one species, *Dermatophagoides farinae*) and family Chortoglyphidae (one species, *Chortoglyphus arcuatus*).

Table 1: Incidence of different mites associated with different habitats at different regions of El-Dakahlia Governorate during 2013-2016.

Family	Species	Habitat	Location (s)	Abund.
Suborder Astigmata (Acaridida) Canestrini				
Acaridae Leach	*Tyrophagus putrescentiae* (Schrank)	Wheat straw, date palm fruits, beat leaves, wheat bran, milk powder, chocolate, bread, leaves of cotton, soybean and maize	All regions	+++
	T. longior (Gervais)	wheat bran, milk powder	Meit Ghamr, Belkas	+++
	Rhizoglyphus robini (F. & R.)	Date fruits, dried fig fruits	El-Mansoura, Aga, El-Manzala	+++
	R. echinopus (Fumouze & Robin)	Stored date fruits	Talkha, Belkas, El-Manzala	+++
	Caloglyphus beta Attia	Cheese, barley grains	Belkas, Meit Ghamr	+
	C. berlesei (Michael)	Rice, clover straw	Dekirnes, Meit Ghamr	+++
	Suidasia nesbitti Hughes	Cheese, biscuit,	Aga, El-Sinbilawein, Sherbein	++
	Acarus siro L.	wheat bran and flour, macaroni, milk powder, chocolate, wheat and clover straw	Meit Ghamr, Sherbein, El-Sinbilawein	+++
	A. farris (Oudemans)	Macaroni, rice	Belkas, Meit Ghamr, El-Manzala	+
Lardoglyphidae Oudemans	*Lardoglyphus zacheri* (Oudemans)	wheat straw, boksomate	Belkas, El-Mansoura, Sherbeen	+
Glycyphagidae Berlese	*Glycyphagus domesticus* (De-Geer)	wheat and clover straw	Meniet El-Nasr, El-Manzala	+++
	G. ornatus Kramer	wheat straw, milk powder	El-Sinbilawein, El-Mansoura	++
	Lepidoglyphus destructor (Schrank)	wheat straw ,cheese	Meit Ghamr, Talkha, El-Mansoura	++
	Blomia freemani Hughes	Macaroni, biscuit	Belkas, Aga, El-Manzala	+
Pyroglyphidae Cunliffe	Dermatophagoides farinae Hughes	*Wheat bran, sugar*	Talkha, El-Mansoura	+
Chortoglyphidae Berlese	Chortoglyphus arcuatus (Troupeau)	*Clover seeds, karkadia*	Dekirnes, Belkas, Talkha	+
Suborder Prostigmata				
Tydeidae Kramer	*Orthotydeus kochi* (Oudemans)	Date fruits, barley grains, wheat flour	Aga, Dekirnes, Belkas	+++
	O. californicus (Banks)	wheat grains ,milk powder, (sugar beet, soybean, maize and cotton leaves)	Meneit El-Nasr, El-Sinbilawein	+++
Tarsonmeidae Kramer	*Tarsonemus gladifer* (Mahunka)	Biscuit, wheat grains, dried fig fruits	Meit Ghamr, Talkha	+++
	Tarsonmeus granaries Lindquist	Date fruits, wheat bran, barley grains, wheat straw, maize grains, wheat flour, cotton leav	Talkha, Belkas, El-Manzala, El-Mansoura	+
Eupodidae Koch	*Eupodes aegyptiacus* Abou-Awad and El-Bagoury	Rice, wheat seeds	Aga, Meit Ghamr	+++
	Eupodes momeni Abou-Awad	maize flour, dried fig fruits	Belkas, Talkha, Sherbein	+
Scutacaridae Oudemans	*Scutacarus evansi* Soliman and Kandeel	wheat bran, macaroni	Meneit El-Nasr, Sherbein	+

Cont. 1:

Family	Species	Habitat	Location (s)	Abund.
Suborder Gamasida (Mesostigmata)				
Ascidae Voigts & Oudemans	*Proctolaelaps pygmaeus* (Muller)	Stored date fruits, wheat and clover starw, bread, maize and wheat flour, cheese, milk powder, onion bulbs	Belkas, Dekirnes, Meit Ghamr	+++
	Proctolaelaps striatus Afifi, Hssan and El-Bishlawy	Stored date fruits, maize flour, biscuit	Aga, Belkas, El-Mansoura	+++
Ascidae Voigts & Oudemans	*Proctolaelaps aegyptiaca* Nasr	Date fruits and maize flour	Meneit El-Nasr, Aga, Sherbein	++
	Lasioseius aegypticus Afifi	Soybean soil, wheat and clover straw	Talkha, El-Mansoura	++
	Lasioseius bispinosus Evans	wheat bran, soybean straw	Aga, Belkas, Meit Ghamr	+
Ameroseiidae Evans	*Kleemenia plumosus* Manson	maize flour, clover straw	Talkha, El-Mansoura	+++
	K. plumigera Oudemans	Clover straw	Belkas, Meneit El-Nasr	+
	K. kosi El Badry, Nasr and Hafez	Rice, sugar beet soil	Dekirnes, Meneit El-Nasr	+
Uropodidae Berlese	*Urobovella krantzi* (Zaher & Afifi)	Maize and wheat flour	Meit Ghamr, Sherbein	+++
	Fuscuropoda marginata (Koch)	Cotton soil, sugar beet soil	Belkas, El-Sinbilawein	+
Suborder Oribatida (Cryptostigmata)				
Oribatulidae Thor	*Schleoribatus zaheri* (Youssif and Nasr)	Maize soil, maize flour	Dekirnes, Meit Ghamr	++
	Zygoribatula tritici El-Badry and Nasr	Soybean and wheat soil	Belkas, El-Sinbilawein, Sherbein	+
Oppiidae Grandjean	*Oppia sticta* (Popp)	Wheat, cotton, maize and soil	Belkas, Meneit El-Nasr	+++

+ = rare (1-3 mite individuals) ++ = moderate (4-8 mite individuals)
+++ = high (more than 8 mite individuals)

The most abundant family was Acaridae. Also, Suborder Prostigmata was represented in this study by 7 mite species belong to 4 genera in 4 families. The families were Tydeidae (2 species), Tarsonemidae (2 species), Eupodidae (2 species) and Scutacaridae (one species). On the other hand, the mesostigmatid mites were represented by 10 mite species and 5 genera in 3 families and the most abundant family was Ascidae (5 species), while Ameroseiidae included (3 species) and Uropodidae with (2 species); the dominant mesostigmatid species were *Proctolaelaps pygmaeus*, *P. striatus, Kleemenia plumosus* and *Urobovella krantzi.*

The cryptostigmatids in this study included three mite species belong to two families, i.e. Oribatulidae and Oppiidae and the dominant species was *Oppia sticta*. As shown in Table (2), the stored product materials were the most sources of mite abundance in the current study (33 different species and the commonest mites were *T. putrescentiae*, *Tarsonemus graneries*, *Proctolaelaps pygmaeus* and *Acarus siro)*. On the other hand, these plant leaves were infested with 3 mites species and associated mites were *Orthotydeus californicus* and *T. putrescentiae*, but the different tested field cops soil contained 4 soil fungivorous mites and *Oppiia sticta* was the only dominant collected mite.

Table 2: List of dominant mites associated with different habitats of El-Dakahlia Governorate during 2013-2016 seasons.

Mites	Habitat		
	Stored products	Plant leaves	Plan soil
Number of collected mite species	33	3	4
The dominant mite (s)	*T. putrescentiae, Tarsonmeus granaries, P. pygmaeus, Acarus siro*	*O. californicus , T. putrescentiae*	*Oppia sticta*

The data represented in Table (3) showed the number of collected mites associated with different stored habitats in different regions of El-Dakahlia Governorate and also the dominant mite species in different regions. The regions can be descending arranged as follows: Belkas (14 species), Meit Ghamr (11 species), Talkha (10 species), Aga and Sherbein (9 species), El-Mansoura (8 species), Meneit El-Nasr and Dekirnes (7 species), El-Sinbilawein (6 species) and El-Manzala (5 species). The dominant species of different tested regions in this study was the acarid mite, *T. putrescentiae*.

Similar results were obtained by Mostafa *et al*. (2006) where they recorded 93 species of mites belonging to 53 genera, 26 families and 4 suborders association with

stored products at 16 Egyptian governorates. The suborder Acaridida (Astigmata) (fungivorous mites) was represented by families Acaridae, Chortoglyphidae, Glycyphagidae, Pyroglyphidae and Suidasidae.

Table 3: Mite numbers in different regions of El-Dakahlia Governorate during 2013-2016 seasons.

Mites	Regions									
	Aga	Talkha	Belkas	Meit Ghamr	Meneit El-Nasr	El-Sinbilawein	Dekimes	El-Mansoura	El-Manzala	Sherbein
Number of collected mite species	9	10	14	11	7	6	7	8	5	9
The most abundant mite (s)	*T. putrescentiae* *R. robini* *O. kochi* *E. aegyptiacus* *P. striatus* *P. aegyptiaca*	*T. putrescentiae* *R. echinopus* *T. gladifer* *L. aegypticus* *O. kochi* *P. pygmaeus*	*T. putrescentiae* *T. longior* *P. pygmaeus,* *P. striatus* *O. sticta*	*T. putrescentiae* *T. longior* *C. berlesei* *A. siro, T. gladifer,* *E. aegyptiacus,* *U. krantzi*	*T. putrescentiae* *G. domesticus* *O. californicus* *P. aegyptiaca* *O. sticta*	*T. putrescentiae* *A. siro* *O. californicus*	*T. putrescentiae* *C. berlesei* *O. kochi* *P. pygmaeus*	*T. putrescentiae* *R. robini* *P. striatus* *L. aegypticus* *K. plumosus*	*T. putrescentiae* *R. robini* *R. echinopus*	*T. putrescentiae* *P. aegyptiaca* *U. krantzi*

The data obtained by Habashy (2010) proved the occurrence of 27 different fungivorous mite species inhabiting some stored products where the mesostigmatids were Ameroseiidae, Ascidae and Uropodidae. An intensive survey carried out by Abdel Khalik (2013) to the mites associated with different stored products at different areas in El-Menofia Governorate proved the occurrence of 82 mite species belonging to 54 genera under 30 families belonging to 4 suborders Astigmata, Prostigmata, Mesostigmata and Cryptostigmata. Data revealed the occurrence of 28 different acaridid fungivorous mite species in 17 genera and 7 families. The families were Acaridae, Suidasidae, Glycyphagidae**,** Histiomidae, Pyroglyphidae, Carpoglyphidae and Chortoglyphidae.

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ARABIC SUMMARY

تواجد الأكاروسات فطرية التغذية المصاحبة للبيئات المختلفة فى محافظة الدقهلية

عادل محمود مصطفى[1] – وفاء لبيب فكرى ابراهيم[2]- بسمة محمد ابو النور[2] – عصام محمد عبدالسلام ياسين[1] – نورا فرح السيد ابو العينين[1]

1- معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – الجيزة – مصر
2- قسم علم الحيوان – كلية العلوم (بنات) – جامعة الازهر- القاهرة – مصر

أجريت هذه الدراسة فى مناطق مختلفة من محافظة الدقهلية لالقاء بعض الضوء على تواجد الأكاروسات الفطرية التغذية المصاحبة للمواد المخزونة وأوراق وتربة بعض النباتات وذلك فى الفترة 2013 /2014 و 2014/2015 حيث اشارت النتائج المحتصل عليها على وجود 36 نوع أكاروسى و 23 جنسا داخل 14 عائلة أكاروسية ينتموا إلى أربع تحت رتب أكاروسية مختلفة. ولقد شملت تحت رتبة الأكاروسات عديمة الثغر Astigmata 16 نوع أكاروسى و 11 جنسا داخل 5 عائلات مختلفة وقد شملت الأكاروسات أمامية الثغر Prostigmata 7 أنواع و 4 أجناس داخل 4 عائلات ومن ناحية أخرى دلت الدراسة على أن مجموعة الأكاروسات ذات الثغر المتوسط Mesostigmata قد شملت 10 أنواع أكاروسية و5 أجناس فى 3 عائلات Cryptostigmata فكانت ثلاثة أنواع أكاروسية وثلاثة أجناس فى عائلتين اثنتين. ولقد أشارت النتائج المتحصل عليها أيضا إلى أن منطقة بلقاس كانت أكثر المناطق احتواءا للأكاروسات (14 نوع) يليها منطقة ميت غمر (11 نوع) و طلخا (10 أنواع) ومناطق أجا وشربين لكل منهما (9 أنواع) و منطقة المنصورة (8 أنواع) ومنطقتى منية النصر ودكرنس (7 أنواع) والسنبلاوين (6 أنواع) و المنزلة (5 أنواع). من ناحية أخرى دلت النتائج على أن الأكاروسات الفطرية التغذية والتى تواجدت مصاحبة للمواد المخزونة كان عددها 33 نوع أما الأكاروسات التى تواجدت على أوراق النباتات كان عددها 3 أنواع واحتوت تربة المحاصيل الحقلية المختبرة على 4 أنواع من الأكاروسات الفطرية التغذية.