SINAI Journal of Applied Sciences 12 (3) 2023 601-614

Available online at www.sinjas.journals.ekb.eg

SCREENED BY SINAI Journal of Applied Sciences

iThenticate Professional Plagiarism Prevention

Print ISSN 2314-6079
Online ISSN 2682-3527

ARU-EGYPT SJAS Trust Science | It Creates

INCIDENCE OF MITES ASSOCIATED WITH INSECTS IN NORTH SINAI GOVERNORATE, EGYPT

Maison M.M. Hamdy[1*]; M.M.H. Kandeel[2]; H.M.G. El-Kawas[3]; S.M. Abd El-Karim[1] and M.N. El-Basiony

1. Dept. Plant Prot. (Agricultural Zoology) Fac. Environ. Agric. Sci., El-Arish Univ., Egypt.
2. Dept. Plant Prot. (Agricultural Zoology) Fac. Technol. and Dev., Zagazig Univ., Egypt.
3. Dept. Plant Prot. Res. Inst., Agric. Res. Cent., Dokki, Giza, Egypt.

ARTICLE INFO

Article history:
Received: 01/05/2023
Revised: 19/07/2023
Accepted: 31/07/2023

Keywords:
Acari,
Insects,
incidence,
occurrence,
North Sinai, Egypt.

ABSTRACT

A study was undertaken during a period extended from January 2020 – December 2021 at two distraicts, El-Arish and Beer El-Abd in North Sinai Governorate, Egypt to record the mites associated with ten insects under 10 genera, 7 families, and three orders, *e.g.* Coleoptera, Lepidoptera and Hemiptera were sampled for the identification of the associated mite species. The results revealed 36 species of mites under 26 genera, 15 families and 2 orders, collected from 10 species of insects under 10 genera, 7 families and 3 orders. Mite family Acaridae was represented by maximum number of species/genera (6/5) followed by 7 families, *Ascidae, Macrochelidae, Rhodacaridae, Varroidae, Siteroptidae, Pyemotidae*, and *Lardoglyphidae* were represented by single species each. Of the 36 species of the collected mites 9 species under 6 genera, the weevil *Sitophilus oryzae* (L.) from which the mites collected, belonged to order *Coleoptera harboured* the maximum number of mite species, while single mite species *Glycyphagous domesticus* (De Geer) was collected from the weevil *Bruchusru fimanus Boheman* belonged to order Coleoptera.

INTRODUCTION

Mites are worldwide in distribution and inhabite the most knowing habitats. Mites develop diverse symbiotic relationships with other arthropods, mainly insects **(Lindquist, 1975).** They are commonly found to be parasitic or phoretic on insects, mostly of the orders Coleoptera, Diptera and Hymenoptera. In relation to mites parasitic on insects, honey bee mites are the best examples causing significant damage to apiculture **(El-Kawas and Negm, 2018).**

Mites are parasites of humans, cattle, poultry, honey bee, and pets, as well as pests of stored grains and processed foods **(Hughes, 1976).**

El-Kawas (2011) stated that varying degrees of bio-relationships are reported between mites and some economic insects in Egypt. These relations were classified to five categories *e.g.* parasitism, predatism, phoresy, saprophagous and fungivorous mite species. Some of these relationships play an important role in the biological control of some economic insect pests by suppressing their population under the economic threshold level.

Predacious mites constitute a group of considerably high predatory actives towards both embryonic and postembryonic stages of their hosts. They are beneficial mites, which have high potentiality to keep a check on the population level of pest species. Their target hosts mainly comprise of phytophagous mites and small insect pests.

*** Corresponding author: E-mail address:** maison.medhat@agri.aru.edu.eg
https://doi.org/ 10.21608/sinjas.2023.208243.1201

The parasitic mites were almost representing the orders Mesostigmata and Trombidiroms which may be either internal or external parasites. Some of them may parasitize the hosts during a part of their life span, while the other spent their life associated with the hosts.

Certain predatory and parasitic mites are known to be capable of regulating their prey population and save the environment from pollution in addition to save costs for controlling insect pests.

So, it was necessary to improve systematic description and revision of Acari taxa which are associated with economic insects to evaluate their potentiality as biocontrol agents.

The objective of the present work is to record mite assiocted with some economic insects in North Sinia Governorate to throw some light on the relationships between mites and the collect insects. In addition to explicate the occurrence of mites associated with insects in the present study.

MATERIALS AND METHODS

Incidence of Mites Associated With the Collected Insects

Adults and immature stages of ten insect species in addition to their nests were collected from two districts, El-Arish and Beer El-Abd, North Sinai Governorate, Egypt during two successive years 2020-21.

Insect samples blonged to eight species: Red palm weevil, *Rhynchophorus ferrugineus* (Olivier) (Curculionidae), Rice weevil, *Sitophilus oryzae* (L.) (Curculionidae), Grain weevil, *Sitophilus granaries* L. (Curculionidae), the lesser grain borer, *Rhyzopertha dominica* (Fabricius) (Bostrichidae), Flour beetle, *Tribolium castaneum* (Herbst) (Tenebrionidae), Cowpea Weevil, *Callosobruchus chinensis* L. (Chrysomelidae), Bean weevil *Bruchusru fimanus* Boheman (Chrysomelidae) and Hairy rose beetle, *Tropinota squalida* (Scopoli) (Scarabaeidae), order Coleoptera. Hymenoptera represented by honey bee, *Apis mellifera* L. (Apidae) and order Hemiptera represented by the cottony cushion scale, *Icerya purchase* Maskell (Monophlebidae).

The insects were collected from field crops, orchards, stored products, and ornamental plants. The flying insects were collected by the sweeping net or light traps. The nests of those insects were gathered by the aid of hands, while those infesting plants and terrestrial insects were collected with the help of a forceps.

Insect samples were put in test tubes containing small piece of cotton wool soaked in chloroform, while the insect nests, plant vegetations, debris, and the stored products were kept in paper bags and transferred to the laboratory to extract mites.

The occurrence of the collected mite species associated with the collected insects in the present study was calculated using the occurrence quation.

Occurrence (%) =No. of each mite individual / Total No. of the collected mite species × 100

Mite Extraction

Insect specimens were put in Petri-dishes after being killed or anesthetized by chloroform. These samples were carefully inspected under a stereoscopic microscope by help of a forceps and needle. Also, vegetative samples were inspected by the same method.

Insect nests, stored products, and debris were placed in Tullgren's funnels with a 60 watt bulb for 24 hours to extract mites.

Mounting and Identification of the Collected Mites

Mites were kept in lactic acid for clearing before mounting in Hoyer's medium containing few drops of iodine, gently heated to have stretched individuals and hasten the clearing process.

The mounted slides were put for three days on an electrical hot plate at 45°C. Labels recording all the necessary informations were stuck on one side of the slides. After that, slides were examined under a phase-contrast microscope where mites were identified to their taxonomic taxa.

Identification and taxonomy

The identification and taxonomy of the collected mite species to the family level were done according to the keys given by **Baker and Wharton (1952) and Krantz and Walter (2009).**

Then were further segregated to the genera and species level using different specific keys as follows: **Lindquist and Evans (1965)** for Gamasida, **Chant (1965)**, **Elbadry (1967)** and **Abo-Shnaf and Moraes (2014)** for Phytoseiidae, **Lindquist (1975)** for Ascidae, **Summers (1966)** for raphignathoids; **Summers and Price (1970)** for Cheyletidae; **Attiah (1969)** and **Hughes (1976)** for Astigmatina and **Zaher (1986)** for the recorded Egyptian species.

RESULTS AND DISCUSSION

Incidence of Mites Associated with Certain Economic Insects at El-Arish and Beer El-Abd

Thirty-sex species of mites were reported in association with some insect species which collected from El-Arish and Beer El-Abd districts, North Sinai, Egypt during two successive seasons 2020-21. The collected mites belong to 26 genera, 15 families and two superorders as follows: Parasitiformes and Acariformes.

The Superorder Parasitiformes was represented by suborder Monogynaspida, order Mesostigmata.

The superorder Acariformes was represented by both suborders Sarcopteformes and Oribatida, where the Oribatida was recorded by Cohort Astigmatina.

Superorder parasitiformes

The Parasitiformes was recorded by order Mesostigmata by the suborder Monogynaspida.

Suborder monogynaspida

The Monogynaspida mites were represented by 19 species belonging to 9 families: Laelapidae (2 species), Uropodidae (5 species), Digamasellidae (3 species), Melicharidae (2 species), Ascidae (1 species), Macrochelidae (1 species), Phytoseiidae (2 species), Rhodacaridae (2 species) and Varroidae (1 species) (Table 1).

Family Laelapidae Berlese, 1892

Two species were recorded, *Laelaspis stronemicus* (Koch), attached to the dorsum and abdomen of *Tropinota squalida* (Scopoli) at El-Arish and *Androlaelaps egyptiacus* Hafez, El-Badry and Nasr was found in granaries accompany with *Sitophilus granaries* L. at El-Arish.

Family Uropodidae Kramer, 1881

Five species were recorded, *Uroobovella flagelliger* (Berlese), *U. fimicola* (Berlese), *U. marginata* (Koch) and *U. ovatis*, under the elytra and inside the cocoon of the red palm weevil *Rhynchophorus ferrugineus* (Olivier) in El-Arish and Beer El-Abd, and *Rhynchopolipus rhnychophori* (Ewing), attached the dorsum and abdomen of *T. squalida* at El-Arish.

In Egypt, **El-Bishlawy and Allam (2003), Gomaa (2006), Al-Deeb *et al.* (2011)** and **Hassan *et al.* (2011)** surveyed the uropodid mites and studied the relations between them and different stages of red palm weevils. **El-Kawas (2011)** recorded *Uroobovella* (*Fuscuropoda*) *marginata (*Koch) and *Uropoda minima* Kramer in association with *R. ferrugineus* in high numbers at Sharkia and North Sinai Governorates. The mite, *U. marginata* was firstly recorded inhabiting the cocoon of red palm weevil, while *U. minima* was recorded beneath the elytra of that insect.

Table 1. Incidence of mites associated with the collected insects during two successive years from 2020-2021 at El-Arish and Beer El-Abd in North Sinai Governorate, Egypt

Mite Taxon	Insect host	Habitat /(Site of occurrence)	Locality
I-Order Mesostigmata			
1-Laelapidae Berlese ,1892			
Laelaspis stronemicus (Koch)	*Tropinota squalida* (Scopoli)	Attached to the dorsal and abdomen of the host.	El-Arish
Androlaelaps egyptiacus Hafez, El-Badry and Naser	*Sitophilus granaries* L.	Granaries	
2-Family Uropodidae Karmer, 1881			
Uroobovella fimicola (Berlese)	*Rhynchophorus ferrugineus* (Oliv.)	Under the elytra and inside the cocoon of the host.	El-Arish and Beer El-Abd
U. flagelliger (Berlese)	*R. ferrugineus*		
U. ovalis Hirs. & Zim.-Nic.			
U. marginata (Koch)	*R. ferrugineus* and *T. squalida*	Under the elytra and inside the cocoon of the first host and attached to the dorsal and abdomen of the second host.	
Rhynchopolipus rhnychophori (Ewing)	*T. squalida*	Attached to the dorsal and abdomen of the host.	El-Arish
3-Family Digamasellidae Evaans, 1957			
Dendrolaelaps rasmii Nasr & Mersal	*S. granaries*	Accompanying with host insects in *Hordeum vulgare* L	El-Arish and Beer El-Abd
D. aegypticus Metwally & Mersal			
D. zaheri Metwally & Mersal	*Callosobruchus chinensis* L.	Accompanying with cowpea.	

Table 1. Cont.

Mite Taxon	Insect host	Habitat / (Site of occurrence)	Locality
4-Family Melicharidae Hirschmann , 1962			
Proctolaelaps pygmaeus (Müller)	*Rhyzopertha dominica* (Fab.), *Sitophilus oryzae* (L.) and *R. ferrugineus*	Accompanying with the hosts in rice grains.	El-Arish and Beer El-Abd
P. aegyptiacus Nasr	*Rh. dominica* and *S. oryzae*		
5-Family Ascidae Voigtsand oudemans ,1905			
Blattisocius tarsalis (Berlese)	*S. oryzae*	Accompanying with the hosts in rice grains.	El-Arish and Beer El-Abd
6-Family Macrochelidae Vitzthum ,1930			
Macrocheles sembelawanii Hafez, El-Badry & Nassar	*T. squalida*	On the upper surface of the host insect.	El-Arish
7-Family Phytoseiidae Berlese , 1916			
Neoseiulus cucumeris (Oud.)	*Icerya purchase* Maskell	Attached to the dorsal of the host on mango trees	El-Arish and Beer El-Abd
N. zaheri (El-Borolossy)	*I. purchase*		
Rhodacarellus tabeenue H.& N.	*Callosobruchus chinensis* L.	On cowpea grains.	
8-Family Rhodacaridae Evans , 1957			
Dendrolobatus longisetosus (Shcherbak)	*Callosobruchus chinensis*	On cowpea grains.	El-Arish and Beer El-Abd.
9-Family Varroidae Delfinado& Baker ,1974			
Varroa destructor Anderson & Trueman	*Apis mellifera* L.	Attached to the body of the bee	El-Arish and Beer El-Abd
II-Order Trompidiforms			
1-Family Cheyletidae Leach , 1815			
Acaropsellina docta (Berlese)	*Tribolium castaneum* (Herbst)	Flour	El-Arish

Table 1. Cont.

Mite Taxon	Insect host	Habitat/ (site of occurrence)	Locality
Cheyletus eruditus (Schrank)	*S. oryzae*	Accompanying with the host in rice grains.	El-Arish and Beer El-Abd
Cheyletus malaccensis Oudemans	*S. oryzae* and *S.granaries*	Accompanying with the hosts in rice grains.	El-Arish
Ker bakeri Zaher & Soliman	*Rhyzopertha dominica* (Fab.)	Corn seeds	
2-Family Siteroptidae Mahunka , 1970			
Siteroptes serratesetae Soliman & Kandeel	*R. ferrugines*	Attached to the dorsal of the host and on the wings	El-Arish
3-Family Pyemotidae Oudemans ,1937			
Pyemotes herfsi Oudemans	*Callosobruchus chinensis*	Cowpea seeds	El-Arish
Order Sarcoptiformes			
1-Family Acaridae Ewing and Nesbitt, 1802			
Acarus siro L.	*Apis mellifera* L.	In debris of bee hives	El-Arish
Caloglyphus sp.	*S. oryzae*	Accompanying with the host rice grains.	El-Arish
Mycetoglyphus sp.			
M. fungivorus Oud.			
Aleuroglyphus ovatus (Troupeau)	*S.granaries*	Accompanying with host in *Hordeum vulgare* L.	El-Arish and Beer El-Abd
Suidasia nesbitt (Hughes)	*T. castaneum*	Flour	El-Arish
2-Family Lardoglyphidae Oudemans , 1927			
Lardoglyphus konoi (Sasa & Asanuma)	*S. oryzae*	Accompanying with the host in rice grains.	El-Arish
3-Family Glycyphagidae Berlese			
Glycyphagous domesticus (De Geer)	*Bruchusru fimanus* Boheman	Attached to the dorsal and abdomen of the host.	El-Arish

Table 1. Cont.

Mite Taxon	Insect host	Habitat/ (site of occurrence)	Locality
Gohiera sp.	*C. chinensis*	Cowpea grains	El-Arish and Beer El-Abd
G. fusca (Oudemans)			
Lepidoglyphus distructor Oudemans			

Family Digamasellidae Evans, 1957

Three species were recorded, *Dendrolaelaps rasmii* Nasr and Mersal, *D. aegypticus* Metwally and Mersal, associated with the weevil, *Sitophilus granaries* L. on *Hordeum vulgare* L. in El-Arish and Beer El-Abd, and *Dendrolaelaps zaheri* Metwally and Mersal found accompanying with *Callosobruchus chinensis* L. on cowpea beans in El-Arish and Beer El-Abd. **Fain *et al.* (1995)** and **Hurst *et al.* (1997)**, recorded some acarofouna species associated with carbid beetles were belonging to 21 species and 8 genera, of them two species of Digamasellidae.

Family Melicharidae Hirschman, 1962

Two species were recorded, *Proctolaelaps pygmaeus* (Müller) accompanying with *Rhyzopertha dominica* (Fa.), *Sitophilus oryzae* (L.) and attaching to the body of red palm weevil at El-Arish and Beer El-Abd, while *P. aegyptiacus* Nasr was recorded in association with *Rh. dominica* and *S. oryzae* in rice grains in El-Arish and Beer El-Abd. **El-Kawas (2011)** recorded *P. pygmaeus* beneath wings of *Gryllus domesticus* (L.) with moderate numbers at Ismalia and North Sinai Governorates, while **Abo-Shnaf and Moraes (2016)** recorded *P. pygmaeus* from litter underneath mango, apricot, fig, cucumber, at Fayoum Governorate, while *P. aegyptiacus* was noticed on the upper body of the ornamental palm mealybug, *Icerya seychellarum* (Westwood) with rare numbers at Skarkia, Ismalia and Giza Governorates.

Family Ascidae Oudemans, 1905

Blattosocius tarsalia (Berlese) was recorded accompanying with *S. oryzae* in El-Arish and Beer El-Abd. **Maareg and Saleh (1989)**, **Kumar (1997), Fain (1998), Moser *et al.* (2010) and Hassan *et al.* (2011),** collected some ascids from several species of carbid beetles and other coleopterous.

Macrochelidae Vitzthum, 1930

Macrocheles sembelawanii Hafez, El-Badry and Nasr was recorded on the upper surface of the host *Tropinota squalida* (Scopoli) at El-Arish. **Hafez *et al.* (1985)** recorded *M. sembelawanii* on coxal region of *Pentodon deserti* Heyden at Sharkia Governorate, Egypt.

Phytoseiidae Berlese, 1916

Two species were recorded, *Neoseiulus cucumeris* (Oudemans) and *N. zaheri* (El-Borolossy) in association with *Icerya purchase* Maskell on leaves of mango trees in El-Arish and Beer El-Abd. **El-Kawas (2011)** collected *N. cucumeris* in moderate numbers around the body of *I. seychellarum* at Sharkia Governorate.

Family Rhodacaridae Evans, 1957

Two species were recorded, *Rhodacarellus tabeenue* Hafez and Nasr and *Dendrolaelaspis longisetosus* (Shcherbak), in association with the weevil, *Callosobruchus chinensis* L. on cowpea grains at El-Arish and Beer El-Abd. **Lindquist *et al.* (2009)** stated that Rhodacaridae is a widespread of free living mites found in the soil and in accumulations of decaying organic material such as compost, manure and tidal debris.

Family Varroidae Delfinado and Baker, 1974

A single species, *Varroa destructor* Anderson and Trueman represented the family, attached with the body of the honey bee, *A. mellifera* in El-Arish and Beer El-Abd. **Locke (2016)** declared that *V. destructor* was the most serious danger to apiculture globally, and it has been responsible for severe losses of wild honeybee populations in Europe and North America.

Anderson and Trueman (2000) mentioned that *Varroa jacobsoni* Oudemans is an ectoparasitic mite of the Eastern honeybee (*Apis cerana)* in Asia. It eventually shifted hosts to the Western honeybee (*A. mellifera)* and has since become a major pest of that species globally. **El-Kawas (2011)** collected the mite *V. destructor* in rare numbers attached the intersegmental membrane of the workers and broods of the honeybee *A. mellifera* at Sharkia Governorate.

Superorder acariformes

The Acariformes was represented through the two orders, Trombidiformes and Sarcoptiformes.

Order trombidiformes

The Trombidiformes was represented by 17 species belonging to the suborder Prostigmata through three families, Cheyletidae, Siteroptidae and Pyemotidae.

Family Cheyletidae Leach, 1815

Four species were recorded, *Acaropsellina docta* Berlese, accompaning with the weevil *Tribolium castaneum* (Herbst) in flour, at El Arish, *Cheyletus eruditus* (Schrank) and *Cheyletus malaccensis* Oudemans, recorded in associating with the weevil, *S. oryzae* in rice grains at El-Arish and Beer El Abd, and *Ker bakeri* Zaher and Soliman, associating *R. dominica* in corn seeds in El Arish. **El-Kawas (2011)** recorded *C. malaccensis* in moderate numbers from granaries associated with the coleopterous species, *T. castaneum*, *Tenebrio molitor* L. and *S. oryzae* at Sharkia Governorate.

Family Siteroptidae Mahunka, 1970:

Only one species, *Siteroptes serratesetae* Soliman and Kandeel, attached with the dorsum and wings of red palm weevil at El-Arish. **Kandeel (1981)** collected this mite from organic manure at Sharkia Governorate.

Family Pyemotidae Oudemans, 1937

Only one species, *Pyemotes herfsi* (Oudemans), associated with cowepea weevil, *Callosobruchus chinensis* L. on cowpeas seeds in El Arish. **Kandeel (1977)** recorded *P. herfsi* in association with larvae of *Pectinophora gossypiella* (Saunders). **Bruce and Le Cato (1979)** reported *Pyemotes tritici* (La Greze-Fossat and Montane) as a biological control agent for a number of different insects. **El-Kawas (2011)** recorded *P. herfsi* attaching the larvae and adults of *Sitotroga cerealella* (Olivier) in a laboratory culture with rare numbers.

Order sarcoptiformes

The Sarcoptiformes was represented by the suborder Oribatida through the Astigmatina families, Acaridae, Lardoglyphidae and Glycyphagidae.

Family Acaridae Ewing and Nesbitt, 1802

Six species were recorded: *Acarus siro* L., in debris of bee hives (*A. mellifera*) in El-Arish, the species *Caloglyphus* sp., *Mycetoglyphus* sp., *M. fungivorus* Oudemans, accompanying *S. oryzae* in rice grains; *Aleuroglyphus ovatus* (Troupeau) accompanying *S. granaries* in *Hordeum vulgare* L. in El-Arish and Beer El-Abd; *Aleuroglyphus ovatus* (Troupeau) accompanying *Sitophilus granaries* L. on *Hordeum vulgare* L. in El-Arish and Beer El-Abd, and *Suidasia nesbitt* (Hughes) accompanying *T. castaneum* in flour in El Arish. **El-Kawas (2011)** recorded *Caloglyphus krameri* (Berlese) in rare numbers inside the dry pods of okra infested with *Oxycarenus hyalinipennis* at Sharkia Governorate, while *Sudasia nesbitt* (Hughes) was collected in rare numbers inside the granaries associated with *S. oryzae* at the same locality.

Family Lardoglyphidae Oudemans, 1927

Only one species, *Lardoglyphus konoi* (Sasa and Asanuma), recorded accompanying *S. oryzae* infesting rice grains in El-Arish.

Family glycyphagidae berlese

Four species were recorded, the three species of them: *Gohiera* sp., *G. fusca* (Oudemans), and *Lepidoglyphus distructor* Oudemans accompanying *Callosobruchus chinensis* in cowpea grains in El-Arish and Beer El-Abd, and *Glycyphagous domesticus* (De Geer), attached with the dorsum and abdomen of *Bruchusru fimanus* Boheman in El-Arish. **Baker (1939)** recorded several mite species belong to acarids beneath the elytrae and the body of coleopterous insects.

Occurrence of Mites Associated with Certain Insects at El-Arish in North Sinai Governorate

Thirty-five mite species were recorded in association with the collected insects at El-Arish, North Sinai Governorate, during the period extended from January 2020 to December 2021. According to the Relative Frequency % (RF) for the collected mites, revealed that *Uroobovella flagelliger* (Berlese) was the most occurrence mite species associated with the collected insects at El-Arish (RF= 14.80%) at El-Arish while the

mite species *Dendrolaelaps rasmii* Nasr and Mersal, *Dendrolaelaps zaheri* Metwally and Mersal and *Aleuroglyphus ovatus* (Troupeau) were the lowest occurrence species (RF= 0.23% for both species) at El-Arish district (Table 2).

Occurrence of Mites Associated with Certain Insects at Beer El-Abd in North Sinai Governorate

Twenty one mite species recorded in association with the collected insects at Beer El-Abd district in North Sinai Governorate, during the period extended from January 2020 to December 2021.

Both mite species *Varroa destructor* Anderson and Trueman and *Uroobovella flagelliger* (Berlese) were the most occurrence of mite species associated with the collected insects at El-Arish, where the Relative Frequency (RF) reorded 14.80% for each species. While the mite *Dendrolaelaps rasmii* Nasr and Mersal was the lowest occurrence species (RF= 0.22%) (Table 3).

Table 2. Occurrence of mites associated with collected insects at El-Arish district in North Sinai, Governorate, Egypt during two successive years from 2020-2021

Mite species	No. of the collected mites individuals	Occurrence (%)
Laelaspis stronemicus	250	5.96
Androlaelaps egyptiacus	180	4.29
Uroobovella fimicola	430	10.26
U. flagelliger	620	14.80
U. ovalis	250	5.96
U. marginata	550	13.12
Dendrolaelaps rasmii	10	0.23
D. aegypticus	20	0.47
D. zaheri	10	0.23
Proctolaelaps pygmaeus	70	1.67
P. aegyptiacus	50	1.19
Blattisocius tarsalis	40	0.95
Macrocheles sembelawanii	88	2.10
Neoseiulus cucumeris	50	1.19
N. zaheri	70	1.67
Rhodacarellus tabeenue	120	2.86
Dendrolobatus longisetosus	12	0.28
Varroa destructor	480	11.45
Acaropsellina docta	89	2.12
Cheyletus eruditus	60	1.43
Cheyletus malaccensis	80	1.90
Ker bakeri	102	2.43
Siteroptes serratesetae	99	2.36
Pyemotes herfsi	66	1.57
Acarus siro	108	2.57
Caloglyphus sp.	45	1.07
Mycetoglyphus sp.	50	1.19
M. fungivorus	80	1.90
Aleuroglyphus ovatus	10	0.23
Suidasia nesbitt	90	2.14
Lardoglyphus konoi	30	0.71
Glycyphagous domesticus	99	2.36
Gohiera sp.	40	0.95
Lepidoglyphus distructor	48	0.14
G. fusca	43	1.02
Total number of the collected individuals	4189	-

Table 3. Occurrence of mites associated with collected insects at Beer El-Abd district in North Sinai, Governorate, Egypt during two successive years from 2020-2021

Mite species	No. of the collected mites individuals	Occurrence (%)
Uroobovella fimicola	300	16.75
U. flagelliger	180	10.05
U. ovalis	100	5.58
U. marginata	200	11.16
Rhynchopolipus rhnychophori	420	23.45
Dendrolaelaps rasmii	4	0.22
D. aegypticus	17	0.94
D. zaheri	13	0.72
Proctolaelaps pygmaeus	8	0.44
P. aegyptiacus	10	0.55
Blattisocius tarsalis	20	1.11
Neoseiulus cucumeris	28	1.56
N. zaheri	7	0.39
Rhodacarellus tabeenue	70	3.90
Dendrolobatus longisetosus	11	0.61
Varroa destructor	300	16.75
Cheyletus eruditus	7	0.39
Aleuroglyphus ovatus	12	0.67
Gohiera sp.	30	1.67
G. fusca	20	1.11
Lepidoglyphus distructor	34	1.89
Total number of the collected samples	1791	0

REFERENCES

Abo-Shnaf, R.I.A. and Moraes, G.J.D. (2016). Phytoseiid mites (Acari: Phytoseiidae) from Egypt, with new records, descriptions of new species and a key to species. Zootaxa, 3865 (1):1-71.

Abo-Shnaf, R.I.A. and Moraes, G.J.de (2014). *Proctolaelaps* species (Acari: Mesostigmata: Melicharidae) from Egypt, with description of a new species and complementary descriptions of other five species. Zootaxa, 4162(3): 479-503.

Al-Deeb, M.A.; Muzaffar, S.; Abuagla, A.M. and Sharif, E.M. (2011). Distribution and abundance of phoretic mites (Astigmata, Mesostigmata) on *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae). Florida Entomol., 94 (4): 748-755.

Anderson, D.L. and Trueman, J.W.H. (2000). *Varroa jacobsoni* (Acari: Varroidae) is more than one species. Exp. Appl. Acarol., 24(3): 165-189.

Attiah, H. H. (1969). Tyroglyphoid mites associated with stored food in U. A. R. Ministry of Agriculture, Plant Protection Department, Tech., Bull., 10: 51pp.

Baker, E.W. (1939). The fig mite, *Eriophyes ficus* Cotte, and other mites of the fig tree, *Ficus carica* L. Calif. Dept. Agric. Bull., 28: 266-275.

Baker, E.W. and Wharton, G.W. (1952). An Introduction to Acarology. The Macmillan Co. of New York and Toronto, 465 + xiii pages.

Bruce, W.A. and LeCato, J.L. (1979). *Pyemotes tritici*: Potential biological control agent of stored product insects. In: J.G. Rodriguez (Editor), Recent Advances in Acarology, 1. Academic, New York: 213-220.

Chant, D.A. (1965). Generic concepts in the family Phytoseiidae (Acarina: Mesostigmata). Can. Ent., 97: 351-374.

Elbadry, E.A. (1967). Five new phytoseiid mites from U.A.R. with collection notes on three other species (Acarina: Phytoseiidae). Indian J. Ent., 29 (2): 177 - 189.

El-Bishlawy, S.M.O. and Allam, S.F.M. (2003). A new canestriniid mite (Acari, Astigmata, Canestriniidae) associated with *Blaps polychresta* Forsk. (Insecta, Coleoptera, Tenebrionidae). Bulletin OILB/SROP, 26(1): 267-271.

El-Kawas, H.M.G. (2011). Acarines as Biological Control Agents: An Overview of Bio-Relationships Between Mites and Insects in Egypt. Published by Lap Lambert Academic Publishing, 128 pp.

El-Kawas, H.M.G. and Negm, M.W. (2018). Parasitic and phoretic mites (Arachnida, Acari) reported from insects (Arthropoda: Insecta) in Egypt. J. Insect Biodivers. Syst., 4(1): 57–71.

Fain, A. (1998). Description of mites (Acari) phoretic on Phoridae (Insecta: Diptera) with description of four new species of the genus *Uroseius* Berlese (Parasitiformes, Uropodina, Polyaspididae). Int. J. Acarol., 24(3): 213-220.

Fain, A.; Noti, M.I. and Dufrêne, M. (1995). Observation on the mites (Acari) associated with Carabidae (Coleoptera) in Belgium. I. Annotated list of the species. Int. J. Acarol., 21(2): 107-122.

Gomaa, W.O. (2006). Three mites species associated with the red palm weevil, *Rhynchophorus ferrugineus* (Olivier), in Egypt. Bull. Fac. of Agri., Cairo Univ., 57(3): 543-548.

Hafez, S.M.; El-Badry, E.A. and Nasr, A.K. (1985). Four new macrochelid mites from Egypt. Bull. Fac. Agric., Ain Shams Univ.

Hassan, M.F.; Nasr, A.K.; Allam, S.F.; Taha, H.A. and Mahmoud, R.A. (2011). Biodiversity and seasonal fluctuation of mite families associated with the red palm weevil, *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae) in Egypt. Egypt. J. Biol. Pest Control, 21(2): 317-323.

Hughes, A. M. (1976). The Mites of Stored Food and Houses, 2nd Ed, Her Majesty's stationery office, 400.

Hurst, G.D.D.; Majerus, M.E.N. and Fain, A. (1997). Coccinellidae (Coleoptera) as vectors of mites. Eur. J. Entomol., 94: 317-319.

Kandeel, M.M.H. (1977). Ecological and Biological Studies on Pyemotid Mites. M. Sc. Thesis, Fac. Agric., Cairo Univ., 234 pp.

Kandeel, M.M.H. (1981). Ecological and Biological Studies on Some Tarsonemid Mites. Ph.D. Thesis, Fac. Agric., Cairo Univ., 306.

Krantz, G.W. and Walter, D.E. (2009). A Manual of Acarology. Third Edition. Texas Tech University Press; Lubbock, Texas, 807.

Kumar, D. (1997) Mite infestation in stored grain pest culture. Insect Environ., 3 (2): 42.

Lindquist, E.E. (1975). Associations between mites and other arthropods in forest floor habitats. The Canadian Entomol., 107: 425-437.

Lindquist, E.E. and Evans, G. (1965). Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina:

Mesostigmata). The Memoirs of the Entomol. Soc. Canada, 97(S47): 5-66.

Lindquist, E. E. and Evans, G. O. (1965). Taxonomic consepts in Ascidae

Lindquist, E.E.; Krantz, G.W. and Walter, D.E. (2009). Order Mesostigmata In: Krantz, G.W.; Walter, D.E. editors. A Manual of Acarology. 3rd Ed. Lubbock, TX, USA: Texas Tech Univ. Press, 124-232.

Locke, B. (2016). Natural *Varroa* mite-surviving *Apis mellifera* honeybee populations. Apidologie, 47(3): 467-482.

Maareg, M.F. and Saleh, R.S. (1989). Seasonal occurrence of mites and other invertebrate fauna of chicken manure in Egypt. Progress-in-Acarology, 2: 301-303.

Moser, J.C.; Konrad, H.; Blomquist, S.R. and Kirisits, T. (2010). Do mites phoretic on elm bark beetles contribute to the transmission of Dutch elm disease? Naturwissenschaften, 97(2): 219-227.

Summers, F.M. (1966). Key to families of the Raphignathoidea (Acarina). Acarologia, 8 (2): 226-229.

Summers, F.M. and Price, D.W. (1970). Review of the Mite Family Cheyletidae. Publisher Univ. Cal. Press, Berkeley, Publications in Entomol., 61: 153.

Zaher, M.A. (1986). Survey and ecological studies on phytophagous and predaceous and soil mites in Egypt: II – (A and B) Predaceous and Nonphytophagous mites (Nile Valley and Delta): Report of PL. 480 Program, U.S.A. Project No. E.G.-ARS-30, Grant No. FG-EG. 139 (A: 567 pp. and + B: 259 figs.)

الملخص العربي

حصـــر للأكـــاروســـات المصاحبة للحشـــرات بمحـافظـــة شـــمال ســـيناء، مصـــر

ميسون مدحت محمود حمدي[1]، محمد محمد حسن قنديل[2]، هاني محمد جلال القواص[3]، صلاح محمد عبد الكريم[1]، محمد نجيب البسيوني[1]

1- قسم الإنتاج النباتي (حيوان زراعي)، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.
2- قسم الإنتاج النباتي (حيوان زراعي)، كلية التكنولوجيا والتنمية، جامعة الزقازيق، مصر.
3- قسم بحوث أكاروس القطن والمحاصيل، معهد بحوث وقاية النباتات، مركز البحوث الزراعية، مصر.

أجريت هذه الدراسة في منطقتي العريش وبئر العبد التابعتين لمحافظة شمال سيناء بمصر خلال الفترة من يناير 2020 الي ديسمبر2021. في هذه الدراسة تم تسجيل 36 نوعاً من الأكاروسات تتبع 26 جنساً و15 فصيلة ورتبتين مصاحبة لـعشرة أنواع من الحشرات وعشرة أجناس وفصيلتين وثلاث رتب هي غمدية الأجنحة وحرشفية الأجنحة ونصفية الأجنحة. سجل 35 و21 نوع من الأكاروسات المصاحبة للحشرات في منطقتي العريش وبئر العبد، على الترتيب. وفي هذا الدراسة تم إستعراض لبعض المعلومات عن العوائل الحشرية وأماكن تعلق الأكاروسات به وكذلك أماكن توزيع الأكاروسات جغرافيا.

الكلمات الإسترشادية: الأكاروسات، الحشرات، حصر، التواجد، شمال سيناء، مصر.

REVIEWERS:
Dr. Murad Fahmy Hassan | mfhassan51@yahoo.com
Agric. Animal Sci. (Acarus), Fac. Agric., Cairo Univ., Egypt.
Dr. Gad Rady | gad.hamada@fagr.bu.edu.eg
Dept. Plant Protection, Fac. Agric., Benha Univ., Egypt.