

# Journal of Plant Protection and Pathology

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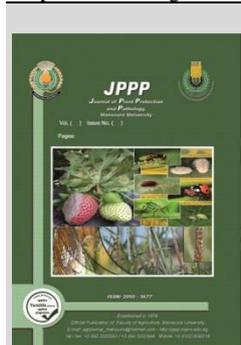
## Some Astigmated, Prostigmated and Cryptostigmated Mites Inhabiting some Stored Products at El-Sharqia Governorate, Egypt

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### ABSTRACT

This work was conducted to survey the mite species associated with stored food stuff during the two successive years (2018 and 2019), in El-Sharqia Governorate. The obtained results indicated that thirty eight mite species were found in twenty four different stored products, as follows: wheat grain, wheat flour, wheat bran, rice grain, maize grain, garlic, hay, onion, pea, cumin, corn, pea, bread bean, animal feed, poultry feed, carrot, Egyptian clover, straw, okra seeds, grass, watercress, potato, house dust and barley were collected from El-Sharqia governorate, Egypt. The collected mites were found belonging to three suborders and 15 families in order Acariformes. Suborder Acaridida (Astigmata) included 21 species belong to 6 families; suborder Actinedida (Prostigmata) included 12 species of 7 families, while suborder Oribatida (Cryptostigmata) included only five species of two families.

**Keywords:** Survey, Astigmata, Prostigmata, Cryptostigmata, Mites and Stored products.

### INTRODUCTION

Stored products inhabiting mites living originally in small numbers on seeds, plants, decaying vegetation and in nests of mammals are gradually introduced to all types of stored products due to human activities (food storage). Mites normally attack either stored un processed products (such as grains, vegetables, fruits, meat, bulbs, hay) or prepared products (flour or flour products, cheese, dried fruits cured-fish etc., (Zdarkkova, 1967).

Mites are a major factor of qualitative and quantitative losses to several stored products. Also, mites are the pest importance of stored product mites has been reviewed where they cause direct consumption on human food, animal feed or other products changing the quality of infested products. Also, they can penetrate the hard grains and feed directly on the grain kernels, therefore they destroy their germination, change the moisture contents of mediums, initiating growth and spread mould (Taha, 1985).

Conclusion: The search interested with the following points: Incidence and collection of mites inhabiting different sources of stored products at EL-Sharqia governorate. Also, different food stuff will be investigated using modified Tullgren funnel to detect their mite fauna. In addition to, mites will be assorted according to the type of food stuff and the site of collection.

### MATERIALS AND METHODS

#### A-Sampling procedure

The present investigation tended to record the different mite species associated with different stored products which brought from different districts at El-Sharqia Governorate. The samples of stored food products were picked and singly kept in tightly closed polyethylene bags. A label including all necessary information

concerning habitat, locality and date of collection were attached to each bag and then, transferred to the laboratory.

A sample of 250 gm from each material was isolated by modified Tullgren funnels, in 3cm deep layers and kept for 24 hours below 40 watt electric lamps. The mites were collected into Petri-dishes with airing of Vaseline mixed with citronella oil to prevent mite escape (Metwally, 1976). Active mite individuals were transferred by 0.3 mm camel hair brush and examined using stereomicroscope. Isolated specimens were placed in Nesbitt as a clearing solution (Krantz and Walter, 2009) (40 gm chloral hydrate, 25 ml distilled water and 2.5 ml concentrated hydrochloric acid) for 24 hours. After that, mites were mounted singly by placing in a drop of Hoyer's medium (Hughes, 1976; Krantz and Walter, 2009).

#### B- Mite Identification

Identification was carried out according, Griffiths (1960), Lindquist and Evans (1965), Hughes (1961-1976), Summer and Price, (1970), Zaher *et al.* (1984), Krantz and Walter (2009). Mite specimens were kept on the mite collection of Agric., Zoology and Nematology Department Faculty of Agric., AL-Azhar University.

### RESULTS AND DISCUSSION

#### Incidence mites inhabiting associated with stored products

Mites of stored products were recorded during the two successive years (2018 and 2019). The collected mites belonging to order: Acariformes.

**Order:** Acariformes Obtained results are presented in Tables 1, 2 and 3. This order was represented by three suborders: Acaridida, Actinidida and Oribatida.

**A-Suborder:** Acaridida (Astigmata) Canestrini which included 21 species, 11 genera in six families Acaridae, Rhizoglyphidae Suidasidae, Glycyphagidae, Carpoglyphidae,

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DOI: 10.21608/jppp.2020.96007

Pyroglyphidae as show in Table (1). These results agree with those obtained by Attiah (1969) who recorded 10 mite species belonging to Astigmata. Similarly, Zaher *et al.*, (1984) studied the incidence of mites associated with seeds and food products in upper Egypt, and they found that members of acarid mites were the most common species found infesting seeds, flour and food-stuff.

**Family: Acaridae**

This family was represented by 13 species and 4 genera and it was the most frequent family of mites collected from different materials. These observations agree with Zaher *et al.*, (1984) who studied the incidence of mites associated with seeds and food products in Upper Egypt. Moreover, Taha (1985) showed that the family Acaridae was the most common family collected from different stored products. Also, Ghazy (2016) indicated that this family was represented by eight species collected from ten different food products.

*Tyrophagus putrescentiae*, it is noticeable that this mite species was the most common species of storage acari belonging to the genus *Tyrophagus*, found in only 4 different sources, Egyptian clover collected from Zagazig and Deyarb Negm by in moderate numbers during the period of study. Similar results with regard to *T. putrescentiae*, which was found in different areas outside Egypt Hughes (1976) and Maurya and Jamil (1982).

*Tyrophagus longior* (Gervais) was extracted by few numbers from animal feed and pea collected from Zagazig and AboHammad in few numbers during 2019. However, *Tyrophagus palmarum* Oudemans, was found in moderate numbers from wheat bran and onion, in AboHammad and Kafr Saqr districts.

*Tyrophagus neiswanderi* Jonston isolated from Egyptian clover, wheat grain, wheat flour and wheat bran, collected from Zagazig by in large numbers during period of survey (2018, 2019).

Also, *Tyrophagus similis* Volgin was collected in few numbers from maize grain, from Zagazig and Kafr Saqr.

*Tyrophagus tropicus* Roberston was extracted in few numbers from wheat bran, collected from Zagazig and AboHammad in large numbers during the whole period of study.

*Acarus siro* Linnaeus which is belonging to the genus *Acarus*, was rarely found in animal feed, at Zagazig and Deyarb Negm, during the two years.

Also, *Acarus farris* Oudemans isolated from animal feed and poultry feed, collected from at Zagazig and AboHammad districts in few numbers.

*Acarus gracilis* Hughs was found in moderate numbers in maize grain, at Zagazig and Deyarb Negm.

*Caloglyphus rhizoglyphoides* (Zachvatkin) belonging to the genus *Caloglyphus*, was rarely found in Straw, okra seeds and grass, at Zagazig and AboHammad during the whole period of study.

*Caloglyphus mycophagus* (Megnin) was extracted from animal feed, seeds and grass collected from at Zagazig, Deyarb Negm and Kafr Saqr districts in large numbers by during 2018 and 2019.

*Caloglyphus berlessei* (Michael) was collected in few numbers in grass and watercress, at Zagazig and AboHammad

Finally, *Tyrolichus casi* Oudemans, belonging to the genus *Tyrolichus*, was found in maize grain, potato and maize grain, at Zagazig and Deyarb Negm.

Incidence of the acarid mites has been previously reported by many authors in Canada Hughes (1976); Sinha *et al.* (1979); Thind and Clarke (2001); Mohamed (2003); Nasr (2010); Abdel-Khalik (2013); Taha (2014) and El-Bltagy (2017). Also, Nagah (2018) isolated 24 species belonging to the family Acaridae.

**Family: Rhizoglyphidae Claparede**

This family was represented by two genera, the first genus was *Rhizoglyphus*, which represented by one species, *Rhizoglyphus robini* Claparede, which was isolated in moderate numbers from straw and animal feed, at Zagazig and Deyarb Negm. The second genus was *Thyreophagus entomophagus* (Labaulbene), was represented by also one species, *Thyreophagus entomophagus* (Labaulbene), collected from potato and maize grain, by dominant numbers during the whole period of study.

**Family: Glycyphagidae Berlese**

This family was represented by two genera, the first one is *Glycyphagus* which represented by two species, *Glycyphagus domesticus* (De-Geer) found in straw, okra seeds and grass and collected from Zagazig and AboHammad in moderate numbers during in 2019 year. Additionally, *Glycyphagus ornatus* Kramer was rarely found in wheat bran and onion, at Zagazig and Deyarb Negm in 2018.

The second genus was *Lapidoglyphus*, which was represented by a single species, *Lapidoglyphus destruactor* (Schrank), which rarely collected from wheat bran, onion and potato, from Zagazig and AboHammad during the summer season of 2018. These findings agree with Ghazy (2016) who indicated that this family was represented by three species, collected from seven sources, bran, wheat, cheese, maize, chicken debris, corn and bean from Damietta governorate. Glycyphagid mites have been also studied by Criffiths (1960); Hughes (1976); Sinha *et al.* (1979); Thind and Clarke (2001); Mohamed (2003); Nasr (2010); Abdel-Khalik (2013); Taha (2014); El-Bltagy (2017) and Nagah (2018).

**Family: Suidasidae Hughes**

This family represented by one species, *Suidasia nesbitti* Hughes belonging to genus *Suidasia*, isolated from Potato and maize grain, collected from Zagazig, Deyarb Negm and Kafr Saqr by dominant numbers during the period of study. Also, fawzy (1996) studied this species. Taha (2014); El-Bltagy (2017) and Nagah (2018), all studied this family.

**Family: Carpoglyphidae Robin**

This family represented by one species *Carpoglyphus lactis* (Linnaeus) belonging to genus *Carpoglyphus*, extracted from wheat bran and onion, from Zagazig and AboHammad by intermediate numbers during the whole two years.

**Family: Pyroglyphidae Fain**

This family represented by one species, *Pyroglyphus africanus* (Hughes) belonging to genus *Pyroglyphus* isolated from house dust, collected from Zagazig and Deyarb Negm by intermediate numbers during the period of study. Incidence of acarid mites had been examined by many authors Hughes (1976); Thind and Clark (2001); Mohamed- (2003) and Abdel-Khalik (2013).

**Table 1. Incidence of order Acariformes, suborder Acaridida (Astigmata) mite species in El-sharqia Governorate for two years (2018 and 2019). (Order Acariformes, Suborder Acaridida (Astigmata))**

Family	Species	Habitat	Abundance	Locality
Acaridae Ewing and Nesbitt	<i>Tyrophagus putrescentiae</i> (Schrank)	onion - garlic- hay-egyptian clover	+++++	Zagazig - Deyarb Negm
	<i>Tyrophagus longior</i> (Gervais)	animal feed- pea	++	Zagazig - AboHammad
	<i>Tyrophagus palmarum</i> Oudemans	wheat bran-onion	+++	AboHammad - Kafr Saqr
	<i>Tyrophagus neiswanderi</i> Jonston	egyptian clover- wheat grain-wheat flour- wheat bran	+++++	Zagazig
	<i>Tyrophagus similis</i> Volgin	maize grain	++	Zagazig -Kafr Saqr
	<i>Tyrophagus tropicus</i> Roberston	wheat bran	+++++	Zagazig - AboHammad
	<i>Acarus siro</i> Linnaeus	animal feed	+	Zagazig - Deyarb Negm
	<i>Acarus farris</i> Oudemans	animal feed- poultry feed	++	Zagazig - AboHammad
	<i>Acarus gracilis</i> Hughes	maize grain	+++	Zagazig - Deyarb Negm
	<i>Caloglyphus rhizoglyphoides</i> (Zachvatkin)	straw- okra seeds- grass	+	Zagazig - AboHammad
	<i>Caloglyphus mycophagus</i> (Megnin)	animal feed- seeds- grass	+++++	Zagazig - Deyarb Negm - Kafr Saqr
	<i>Caloglyphus berlessei</i> (Michael)	grass- watercress	++	Zagazig - AboHammad
<i>Tyrolichus casi</i> Oudemans	maize grain potato- maize grain	++	Zagazig- Deyarb Negm	
Rhizoglyphidae Claparede	<i>Rhizoglyphus robini</i> Claparede	straw- animal feed	+++	Zagazig - Deyarb Negm
	<i>Thyreophagus entomophagus</i> (Labaulbene)	potato- maize grain	+++++	Zagazig - Deyarb Negm - Kafr Saqr
Glycyphagidae Berlese	<i>Glycyphagus domesticus</i> (De-Geer)	straw- okra seeds- grass	+++	Zagazig - AboHammad
	<i>Glycyphagus ornatus</i> Kramer	wheat bran-onion	+	Zagazig - Deyarb Negm
	<i>Lapidoglyphus destructor</i> (Schrank)	wheat bran-onion -potato	+	Zagazig - AboHammad
Suidasidae Hughes	<i>Suidasia nesbitti</i> Hughes	potato- maize grain	+++++	Zagazig - Deyarb Negm - Kafr Saqr
Carpoglyphidae Robin	<i>Carpoglyphus lactis</i> (Linnaeus)	wheat bran-onion	+++	Zagazig - AboHammad
Pyroglyphidae Fain	<i>Pyroglyphus africanus</i> (Hughes)	house dust	+++	Zagazig - Deyarb Negm

**B- Suborder: Actinedida (Prostigmata):**

which included 12 species belonging to 9 genera of seven families, Bdellidae Duges, Cunaxidae Thor, Cheyletidae Leach, Tydidae Kramer, Raphgnathidae Kramer, Eupodidae Koch, Eupodidae Koch and Stigmaeidae Oudemans as show in Table (2).

**Family: Bdellidae Duges**

This family represented by two genera during the whole year of 2018. The first genus was *Neomologus*, represented by tone species, *Neomologus aegypticus* Soliman which extracted from onion and garlic, by rare numbers collected from Zagazig and AboHammad.

The second genus was *Spinibdella*, represented by tone species, *Spinibdella bifurcate* Atyea, isolated from animal feed and grass by intermediate numbers connected from Zagazig, Deyarb Negm and Kafr Saqr during the summer season.

**Family: Cunaxidae Thor**

This family represented by two genera during the whole years of 2018 and 2019.

The first genus was *Areocumaxides*, represented by one species, *Areocumaxides anderi* (Baker & Hoffann), isolated from Straw, hay and carrot from Zagazig and Deyarb Negm by intermediate numbers.

The second genus was *Cunaxa*, represented by one species, *Cunaxa africanus* Den Heyer, extracted from Potato, maize grain, animal feed and hay by intermediate numbers collected from Deyarb Negm and Kafr Saqr.

**Family: Cheyletidae Leach**

This family considered the second common family of storage acari as predator mites, cheyletid mites were found associated with other mites.

El-Badry *et al.* (1980) reported that the extensive distribution of the cheyletid mites has been seen not only in Egypt but also abroad. Hughes (1976) mentioned that the cheyletid mites are generally found associated with acarid mites in granaries, warehouses, beans and also in the leaf-litter, and top soil inhabited by different kinds of micro arthropods. Putatundia (2002) showed that, the cheyletid mite species were beneficial predators, available in very high numbers, which might have been keeping the population of destructive mites under control.

This family represented by one genus *Cheyletus*, which represented by four species during the whole years of 2018 and 2019 as follows:

The first species was *Cheyletus malaccensis* Oudemans, isolated from straw, okra seeds and grass, by intermediate numbers, collected from Zagazig and AboHammad.

The second species was *Cheyletus fortis* Oudemans, isolated from wheat bran and onion, by rare numbers collected from Zagazig and Deyarb Negm.

The third species was *Cheyletus eruditus* (Schrank), extracted from wheat bran, onion and Potato by rare numbers collected from Deyarb Negm and AboHammad.

The fourth species was *Cheyletus troussarti* Oudemans, extracted from animal feed by rare numbers collected from Deyarb Negm and AboHammad.

**Family: Tydidae Kramer**

This family represented by one species *Tydeus* sp. belonging to *Tydeus* genus, isolated from potato by dominant numbers collected from Zagazig, Deyarb Negm and Kafr Saqr through the two years. This result agrees with the results of Nagah (2018).

**Family: Raphgnathidae Kramer**

This family represented by one species *Raphgnathus niloticus* Rakha & Mohamed, belonging to *Raphgnathus* genus, extracted from wheat bran and onion by intermediate numbers from AboHammad during the whole years of 2018 and 2019. This result agrees with the results of Nagah (2018) which isolated *Raphgnathus* sp., by rare numbers from wheat and flour from Shubra (Qalubia Governorate).

**Family: Eupodidae Koch**

This family represented by one species *Cocceupodes communis* Shiba, belonging to *Cocceupode* genus, collected from Zagazig, isolated from barley grain, rice grain and cummin by few numbers during the study period. These

results agree with the results of Nagah (2018) which isolated *Eupodes* genus from onion, from Toukh (Qalubia Governorate) during the 2017 year.

**Family: Stigmaeidae Odemans**

This family represented by one species *Stigmaeus africanus* Soliman and Gomaa belonging to *Stigmaeus* genus, extracted from bean, pea and bread, collected from Deyarb Negm by rare numbers during the summer season. These results agree with the results of El-Bltagy (2017) which extracted the same species, *Stigmaeus africanus* Soliman and Gomaa from rice and wheat, collected from Nasr City (Cairo) and Sammanoud (Gharbia), during the whole year of 2014.

**Table 2. Incidence of order Acariformes, Suborder Actinedida (Prostigmata) mite species in El-sharqia Governorate for two years (2018 and 2019). (Order Acariformes, Suborder Actinedida (Prostigmata))**

Family	Species	Habitat	Abundance	Locality
Bdellidae Duges	<i>Neomologus aegypticus</i> Soliman	onion -garlic	+	Zagazig - AboHammad
	<i>Spinibdella bifurcate</i> Atyea	animal feed- grass	+++	Zagazig - Deyarb Negm - Kafr Saqr
Cunaxidae Thor	<i>Areocumaxides anderi</i> (Baker & Hoffann)	straw – hay- carrot	+++	Zagazig - Deyarb Negm
	<i>Cunaxa africanus</i> Den Heyer	potato animal feed - maize grain- hay	+++	Deyarb Negm - Kafr Saqr
Cheyletidae Leach	<i>Cheyletus malaccensis</i> Oudemans	straw - okra seeds - grass	+++	Zagazig - AboHammad
	<i>Cheyletus fortis</i> Oudemans	wheat bran- onion	+	Zagazig - Deyarb Negm
	<i>Cheyletus eruditus</i> (Schrank)	wheat bran - onion - potato	+	Deyarb Negm- AboHammad
	<i>Cheyletus troussarti</i> Oudemans	animal feed	+	Deyarb Negm- AboHammad
Tydidae Kramer	<i>Tydeus</i> sp.	potato	++++	Zagazig - Deyarb Negm - Kafr Saqr
Raphgnathidae Kramer	<i>Raphgnathus niloticus</i> Rakha & Mohamed	wheat bran-onion	+++	AboHammad
Eupodidae Koch	<i>Cocceupodes communis</i> Shiba	barley grain - rice grain- cummin	++	Zagazig
Stigmaeidae Odemans	<i>Stigmaeus africanus</i>	bean- pea- bread	+	Deyarb Negm

**C– Suborder: Oribatida (Cryptostigmata)** which included five species belonging to four genera of two families as show in Table (3).

**Family: Oppiidae Grandjean**

This family was included one species *Oppia* sp., which was isolated from animal feed and okra seeds collected from Zagazig by dominant numbers during the summer seasons of 2018 and 2019 years. This result agrees with the results of Nagah (2018) and El-Bltagy–Hala (2017).

**Family: Oribatulidae Thor**

This family represented by three genera as follows:

The first genus was *Zygoribatula*, represented by *Zygoribatula tritici* El-Badry & Nasr isolated from potato and okra seeds, collected from Deyarb Negm, by intermediate numbers.

The second genus was *Rostrozetes*, represented by two species, *Rostrozetes africanus* (Youesf & Nasr)

extracted from carrot and okra seeds, collected from Zagazig and Deyarb Negm by rare numbers. Also, *Rostrozetes aegypticus* (Youesf & Nasr) isolated from animal feed and poultry feed, collected from Kafr Saqr by rare numbers during the summer season of 2019 year.

The third genus was *Scheloribates*, represented by two species, *Scheloribates* sp., extracted from okra seeds, collected by few numbers from Zagazig during the whole years of 2018 and 2019.

The studies on the incidence of storage mites have been reported by El-Sanady (1990) and (2005) who recorded twenty four mite species extracted from different stored products belonging to 53 genera, 30 families and four suborders and Abou- El Enien (2011) in Egypt who recorded different mite species in different kinds of stored products.

**Table 3. Incidence of order Acariformes, suborder Oribatida (Cryptostigmata) mite species in El-sharqia Governorate for two years (2018 and 2019). (Order Acariformes, suborder Oribatida (Cryptostigmata))**

Family	Species	Habitat	Abundance	Locality
Oppiidae Grandjean	<i>Oppia</i> sp.	animal feed- okra seeds	++++	Zagazig
Oribatulidae Thor	<i>Zygoribatula tritici</i> El-Badry & Nasr	potato- okra seeds	+++	Deyarb Negm
	<i>Rostrozetes africanus</i> (Youesf & Nasr)	carrot- okra seeds	+	Zagazig -Deyarb Negm
	<i>Rostrozetes aegypticus</i> ( Youesf & Nasr)	animal feed- poultry feed	+	Kafr Saqr
	<i>Scheloribates</i> sp.	okra seeds	++	Zagazig

Large numbers ++++: The mite species number more than 10% of total population.

Moderate numbers +++: The mite species number between 5-10 % of total population.

Few ++: The mite species number between 2- 5 % of total population.

Rare +: The mite species number less than 2% of total population.

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## دراسات حصر لبعض الأكاروسات أمامية الثغور ، عديمة الثغور ومختلفية الثغور المتواجدة في المخزونة في محافظة الشرقية ، مصر

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تم إجراء هذه الدراسة لتجميع وتسجيل بعض الأكاروسات المرتبطة ببعض المواد الغذائية المخزونة في محافظة الشرقية خلال عام ٢٠١٨ و ٢٠١٩م. وقد أظهرت النتائج عن وجود ثمانية وثلاثون نوعاً من الأكاروسات في أربعة وعشرين مادة من المواد الغذائية المخزونة وهي كالأتي: حبوب القمح ونخالة القمح (ردة) ونخالة الدقيق وحبوب الذرة وحبوب الشعير وحبوب الأرز والبازلاء والخبز والبقول والفاصوليا والكمون والبصل والثوم والبرسيم والقش والبامية والبطاطا والجزر وأكل الحيوانات والدجاج وغبار المنازل والجرير والعشب والشعير. أظهرت النتائج التصنيفية لأنواع الأكاروسية المجمعة أنها تنتمي إلى رتبة Acariformes والتي تحتوي على ثلاثة تحت رتب وهم كالأتي:- تحت رتبة عديمة الثغور (Acaridida (Astigmata) تحتوي على ٦ فصائل ممثلة في ٢١ نوع منتميين إلى عشرة أجناس. تحت رتبة أمامية الثغور (Prostigmata) Actinmedida تحتوي على ٧ فصائل ممثلة في ٢٧ نوع منتميين إلى ١٢ جنس. تحت رتبة مختفية الثغور (Cryptostigmata) Oribatida تحتوي على فصيلتين ممثلة في ٥ أنواع منتميين إلى ٤ أجناس. تحتوي تحت رتبة عديمة الثغور على ٦ فصائل وهم: Glycyphagidae Berlese, Rhizoglyphidae Claparede, Acaridae Ewing and Nesbitt, Suidasidae Hughes, Carpoglyphidae Robin and Pyroglyphidae Fain). تحت رتبة أمامية الثغور على ٧ فصائل وهم: Bdellidae Duges, Cunaxidae Thor, Cheyletidae Leach, Tydidae Kramer, Rhabdophoridae Vitzthum, Euopodidae Koch and Stigmaeidae Odemans). أيضا تحتوي تحت رتبة مختفية الثغور على فصيلتين وهم (Oppiidae Grandean and Oribatulidae) Thor). ولذلك في هذه الدراسة تم مابلي: حصر وتجميع عينات الأكاروسات المتواجدة في الحبوب المخزونة في مناطق مختلفة في محافظة الشرقية خلال عامي ٢٠١٨ و ٢٠١٩م ، أيضا تم تجميع عينات الأكاروسات باستخدام قمع تيلجرن المعدل من بيئات مختلفة حيث تم حصر عينات الحلم وكتابة البيانات لكل نوع طبقا لنوع الغذاء ومكان التجميع.