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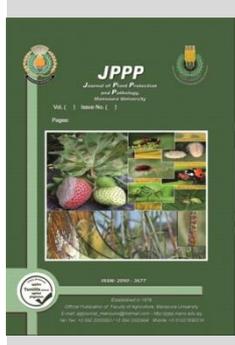
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Survey of some Mites Associated with Stored Grains and their Products from Different Governorates

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ABSTRACT

In this study 53 mite species were collected from 18 different stored products sources: wheat-straw, wheat-grains, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-palm, dried-molokhia, cucumber-seeds, squash-seeds, watermelon-seeds, flour, animal-feed and skins were collected from six governorates: Fayoum, Giza, Bein-Seuf, Cairo, Qalyobia and Dakuahlia during two years from January 2018 to December 2019. Mite incidence proved the occurrence of 23 Astigmatic mite species belonging to 11 genera and 5 families, while Prostigmatid mites were represented by 17 mites species belonging to nine genera in five families, in addition to 13 mite species of Mesostigmatid belonging to eight genera and five families. The present study reveals the similarity which exists between the stored product mites of Egypt and that of other comparable parts of the world. Whereas *Tyrophagus putrescentiae* (Shrank, 1781) is considered a major pest of stored grain and dominant than other Astigmatid mites.

Keywords: Survey; associated mites; stored grains; Sub-order Astigmate; Prostigmata; Mesostigmata.

INTRODUCTION

Mites associated with stored products are of great economic importance, which causes a serious variable degree of damage; not only they can consume large amounts of stored food products, but also contaminate food with their bodies and extractions. During favorable conditions, the mite-population in stored food products may markedly increase, making it unsuitable for human and domestic animals consumption. Moreover, mites of stored food products are known to cause various diseases to people, handling these products if infested with mites. Some of the species associated with stored products are known to be Acarina pests, parasitic and predatory mites that can play an important role in the population structure of stored product pests (Gerson and Vandevrie, 1974). In addition to the survey, the Acarina associated with various foodstuffs in Qalyobia governorate with emphasis on the role of different existence (El-Lakwah *et al.*, 1993) Halawa (2003) investigated that survey the mites associated of Alexandria governorate sites.

The present investigation aims to survey the mites associated with various commodities of stored products in different governorates.

MATERIALS AND METHODS

1- Mites collection:

For knowing the mite species-wise quantitatively and qualitatively distribution pattern of storage Acarina, 18 source materials were investigated for their mite content, and 2160 samples were taken from six governorates; Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia. The tested source materials were; wheat grains, wheat-straw, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-plam, dried-molokhia, cucumber-seeds, squash-seeds, watermelon-seeds, flour, animal-feed and skins. Samples were collected from each source monthly for a period of two successive years from January 2018 to December 2019.

2- Mites isolation:

For isolating mites, samples of about 250 gm were taken from each material of stored products and spread (over muslin) in modified burses funnel in 3 cm deep layer, which kept for about 24 hours below 60 watts electric lamp. Then mites are received in Petri-dishes (10cm diameter *1.5 cm high) and smeared its side by a ring of Vaseline mixed with citronella oil to prevent mite escaping. A species of moistened cotton was placed in each petri-dish to provide the mites with sufficient moisture. Active brush and examined using stereo-microscope.

3- Mounting, preservation and identifications:

Isolated specimens were placed in nesbittes solution (40 gm chloral-hydrate, 25 ml distilled water and 2.5 ml concentrated hydrochloric acid), for 24 h then mounted by placing a drop of Hoyer's medium (50ml distilled water, 30 grams arabic gum crystals, 200 gm chloral-hydrate and 20 gm glycerine), Hughes (1976), in the center of clean 1x3 microscope glass slide mite individual was pressed carefully to the bottom of the droplet and arranged using a clean pair of forceps, a cover-slide was picked up to the edge, applied the opposite edge to the edge of the Hyers droplet to allow the cover-slide to fall into place. Mounted slide was placed on hot-plate at 45°C for 2-4 days (Krantz, 1978), Sub-order, host for habitat date and locality of the collection were included on the identified slide label.

The specimens were identified and validated according to general morphology and terminology followed by Griffiths (1960), Hughes (1976) and Attiah (1969).

RESULTS AND DISCUSSION

The collected data show that mite incidence proved the occurrence of 23 Astigmatid mites species belonging to 11 genera and 5 families, while Prostigmatid mites represented by 17 mite species belonging to 9 genera in 5

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families, in addition to 13 mite species of Mesostigmatid mites belonging to 8 genera and 5 families (Table 1):

1- Sub-order: Astigmatid (Canestrini, 1891):

- Family: Acaridae (Ewing and Nesbitt, 1924):

It has been recorded that the family Acaridae happens to be the most common family of stored product mites which represented by 14 mite species collected from 15 materials were investigated. Certain predacious mites were frequently found associated with acarida mites, in the cadence of this family has been examined by some other authors in Canada (Sinha and Wallace, 1966) in Egypt (Attiah, 1969) in England (Hughes, 1976), the species-wise text is given below, (Table 1): *Tyrophagus putrescentiae* (Shrank, 1781), *Tyrophagus palmarum* (Oudemans, 1974), *Caloglyphus hughuasi* (Samsinak, 1966), *Caloglyphus rhizoglyphoides* (Zachvatkin, 1937), *Caloglyphus betae* (Attiah, 1969), *Caloglyphus berlesii* (Michael), *Caloglyphus oudemans* (Zachvatkin), *Rhizoglyphus robini* (Claparede, 1869), *Rhizoglyphus ismaili* (El-Naggar, Taha and Hoda), *Rhizoglyphus echinopus* (Fumouze and Robin), *Mycetoglyphus fungivorus* (Oudemans, 1932), *Acarus farriers* (Oudemans), *Suidasia nesbitti* (Hughes) and *Aleureglyphus ovatus* (Troupeau).

- Family: Glycophagidae (Berlese, 1887):

Glycophagid mites have been also studied by Griffiths (1960), Sinha and Wallace (1966) and Hughes (1976). This family had represented by four mite species: *Glycophagus domesticus* (De-Geor), *Glycophagus aegyptiacus* (Attiah, 1969), *Glycophagus oryzae* Attiah, 1969 and *Labidoglyphus destructor* (Shrank), where collected from 9 stored materials in six governorates: Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.

- Family: Labidophoridae (Zachvatkin, 1941):

Only two mite species *Goheria fusca* (Oud), and *Goheria wahabi* (El-Naggar, Taha and Hoda) were recorded from Wheat-hay, rice, wheat-bran collected from flour mills, granaries, farm stores in Qalyobia governorate.

- Family: Ctenoglyphidae (Zachvatkin, 1941):

All this family has been represented by two mite species: *Damesoglyphus intermedius* (Canestrini), *Stenoglyphus hughesi* (Attiah) where they were extracted from barley, wheat-grains, rice and skins in moderate numbers collected from granaries stores, rice mills and flour mills in Giza and Daquahlia governorates.

- Family: Pyroglyphidae (Cunliffe, 1958):

Pyroglyphid mites were represented by *Dermatophagoides fariuae* (Hughes) it was found associated with flour, wheat-grains, rice and corn in moderate numbers collected flour mills, farm stores and silk in Giza and Qalyobia governorates.

2- Sub-order: Prostigmata (Kramer, 1877):

Prostigmatid mites represented by 17 mite species belonging to 9 genera, five families collected from 15 stores material in six governorates (Table 1).

- Family: Gheyletidae (Leach, 1815):

This family contains the species-wise text is given below: *Chegletus malaccensis* (Oudemans, 1950), *Chegletus malayensis* (Cunliffe), *Chegletus fortis* (Oud.) *Acaropsellina sollers* (Rhdendorf) and *Cheletomorpha lepidopterorum* (Shaw).

- Family: Tydeidae (Kramer, 1877):

Tydeius interruptus, *Tydeius californicus* and *Prononatus subiquitus*

- Family: Cunaxidae (Thor, 1902):

Only one species *pulaeus pectinatus* belonging to this family.

- Family: Tarsonomidae (Kramer, 1877):

Tarsonemus granarius Lindquist, *Tarsonemus floricolus* Can and Fans, *Tarsonemus gladiflor* Mahunka, *Tarsonemus ipis* Lindquist and *Steonotarsonemus spirifix* March.

- Family: Pyemotidae (Oudemans.):

Pyemotes herfsi (Oud.), *P. dimorphus* (Gross and Moser) and *P. scolyti* (Oud.)

3- Sub-order: Mesostigmata (Gamasida): Families and the species-wise test is given below:

- Family: Ascidae (Voigts and Oud., 1905):

Proctolaelaps pygmaeus (Muller), *Proctolaelaps histrix* (Vitzthum), *Proctolaelaps stratus* (Afifi, Hassan and El-Bishlawy), *Blattisocus tarsalis* (Berlese) and *Blattisocus keegani* (Fax).

- Family: Laelapidae (Berlese):

Hypoaspis sardo (Berlese), *Hypoaspis miles* (Berlese), *Olealelaps olivi* (Hafez & Nasr) and *Androlaelaps zaheri* (Hafez and Nasr).

- Family: Ameroseiidae (Evans, 1963):

Kleemania plumegra (Oud.) and *Kleemania plumosus* (Oud.)

- Family: Phytoseiidae (Berlese):

Only one mite species *Amblyseius cydnodactylon* (Shehata and Zaher) belonging to this family.

- Family: Packylaelapidae (Berlese):

Zygozeius badryii (Al-Badry and Nasr) was recorded to this family, (Table 1).

In this study of the survey of mites associated with stored products, 23 mite species belonging to Astigmatid mites were collected from 15 sources. Obtained data in Table (2) revealed that 14 mite species were belonging to family Acaridae, one of them *Tyrophagus putrescentiae* was dominant and constant species while four species were found in moderate numbers, whereby they formed between 11-15 % of the total population and occurred in 20- 40 % of sources. Also, five mite species of Acarid mites were found in few numbers and accidental where they occurred in less than 20% of sources, in addition, *Tyrophagus palmarum*, *Caloglyphus berlese*, *Rhizoglyphus ismaili* and *Mycetoglyphus fungivorus* were found in rarely number whereby they formed less than 5% of the total population.

On the other hand, Glycophagid mites were represented by four mite species two of them *Glycophagus domesticus* and *Glycophagus oryzae* were found in moderate numbers and accidental in source materials but *Labidoglyphus destructor* was found in few numbers and was isolated from less than 20 % of sources, while the least one found in rarely numbers was the species *Glycophagus aegyptiacus*.

The Labidophorid mites were represented by *Goheria fusca* in few numbers and were accidental, while *Goheria wahabi* was found in rare numbers where it isolated from two sources. The Ctenoglyphid mites were found in moderate numbers and occurred in five sources. *Dermatophagoides farinae* one of Pyroglyphid mites was found in a few numbers and isolated from four materials, (Table 2).

In addition, obtained data in (Table 2) cleared that rice-grain and wheat-grain were the most attractive materials for Astigmatid mites in different localities while leather and watermelon-seeds were the lowest sources in aggregation mites. As a whole, the present survey reveals the similarity which exists between the stored product mites of Egypt and that of other comparable parts of the world. Whereas *Tyrophagus*

putrescentiae is considered a major pest of stored grain and dominant than other Astigmatid mites, Emmanouel, *et al.* (1994). Mites of stored products are widely distributed over

Egypt and the world. Samples were taken from six governorates; Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.

Table 1. Mites genera collect from different sources of six governorates during two years.

Mite species	Sources	Governorates
I-Sub-order:Astigmatida (Canestrini, 189): 1-Family:Acaridae (Ewing and Nesbitt,1924): <i>Tyrophagus putrescentiae</i> (Shrank,1781). <i>Tyrophagus palmarum</i> (Oudemans, 1974). <i>Caloglyphus hughuasi</i> (Samsinok, 1966). <i>Caloglyphus rhizoglyphoides</i> (Zachvattain,1937). <i>Caloglyphus betae</i> (Attiah,1969). <i>Caloglyphus berlesei</i> (Michael). <i>Caloglyphus oudemans</i> (Zachvatkin). <i>Rhizoglyphus robini</i> (Claparede,1869). <i>Rhizoglyphus ismaili</i> (El-Naggar, Taha and Hoda). <i>Rhizoglyphus echinopus</i> (Fumouze and Robin). <i>Mycetoglyphus fungivorus</i> (Oud,1932). <i>Acarus farries</i> (Oudemans). <i>Suidasia nesbitti</i> (Hughes). <i>Aleuregluphus ovatus</i> (Troupeau). 2-Family:Glycophagidae (Berlese,1887): <i>Glycophagus domesticus</i> (DenGear). <i>Glycophagus aegyptiacus</i> (Attiah, 1969). <i>Glycophagus oryzae</i> (Attiah, 1969). <i>Labidoglyphus destructor</i> (Shrank). 3-Family:Labidophoridae (Zachvatkin, 1941): <i>Goheria fusca</i> (Oudmans). <i>Gohrria wahabi</i> (El-Naggar, Taha and Hoda). 4-Family: Ctenoglyphidae (Zachvatkin, 1941): <i>Damesoglyphus intermedius</i> (Canestrini). <i>Stenoglyphus hughesi</i> (Attiah). 5-Family: Phytoglyphidae Cunliffe, 1958: <i>Dermatophagoides fariuae</i> (Hughes).	wheat-straw, wheat-grains, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-palm, dried-molokhia, cucumber-seeds, squash-seeds, watermelon-seeds, flour, animal-feed and skins	Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.
II-Sub-order:Prostigmata (Kramer, 1877): 1-Family:Gheyletidae (Leach,1815): <i>Cheyletus malaccensis</i> (Oudemans,1950). <i>Cheyletus Malayensis</i> (Cunliffe). <i>Cheyletus Fortis</i> (Oud.). <i>Acaropsellina sollers</i> (Rhdendorf). <i>Cheletomorpha lepidopterorum</i> (Shaw). 2-Family:Tydeidae (Kramer, 1877): <i>Tydeus interruptus</i> <i>Tydeus californicus</i> <i>Prononatus subquitosus</i> 3-Family:Cunaxidae (Thor,1902): <i>Pulaeus pectinatus</i> 4 Family:Tarsonomidae (Kramer,1877): <i>Tarsonemus granarius</i> (Lindquist). <i>Tarsonemus floricolus</i> (Can and Fanz). <i>Tarsonemus gladifor</i> (Mahunka). <i>Tarsonemus ipis</i> (Lindquist). <i>Stesnotarsonemus spirifx</i> (March). 5-Family: Pyemotidae (Oud.): <i>Pyemotes herfsi</i> (Oud.). <i>Pyemotes dimorphus</i> (Gross and Moser). <i>Pyemotes scolyti</i> (Oud.).	wheat-straw, wheat-grains, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-palm, dried-molokhia, cucumber-seeds, squash-seeds, watermelon-seeds, flour, animal-feed and skins	Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.
III-Sub-order :Mesostigmata (Gamasida): 1-Family:Ascidae (Voigts and Oud. 1905): <i>Proctolaelaps pygmaeus</i> (Muller). <i>Proctolaelaps hystrix</i> (Vitzthum). <i>Proctolaelaps stratus</i> (Afifi, Hassan and El-Bishlawy). <i>Blattisocus tarsalis</i> (Berlese). <i>Blattisocus keegani</i> (Fax). 2-Family:Laelapidae (Berlese): <i>Hypoaspis sardo</i> (Berlese). <i>Hypoaspis miles</i> (Berlese). <i>Olealelaps olive</i> (Hafez and Nasr). <i>Androlaelaps zaheri</i> (Hafez and Nasr). 3-Family : Ameroseiidae(Evans,1963): <i>Klemania plumegra</i> (Oud.). <i>Keemania plumosus</i> (Oud.). 4-Family:Phytoseiidae (Berlese): <i>Amblyseius cydnodactylon</i> (Shehata and Zaher) 5-Family:Packylaelapidae (Berlese): <i>Zygozeius badryii</i> (Al-Badry and Nasr).	wheat-straw, wheat-grains, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-palm, dried-molokhia, cucumber-seeds, squash-seeds, watermelon-seeds, flour, animal-feed and skins	Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.

Data in (Table 3) clearly show that the Giza governorate was the highest in the number of Astigmatid mite species where (15) out of 23 mite species were isolated from samples collected from Giza while Beni-Suef was the lowest one where (8) mite species belonging to Sub-order Astigmata. On the other hand, in Fayoum, Giza and Qalyobia, mites of Prostigmatid were found for each, While in Cairo, mites were represented by (7)

Prostigmatid mites as the lowest one. Mesostigmatid mites which are represented by 13 species in this study, (9) mite species were found in Giza while (7) species out of 13 species were extracted from samples collected from Fayoum, but for mite species for each Beni-Suef, Cairo and Daquahlia for mesostigmata were not founded (Table3).

Table 2. Abundance and occurrences of Astigmatid mites in stored products collect from six governorates during two years.

Mites species	Abundance	Stored product	Governorate	Occurrence%
1-Family:Acaridae (Ewing and Nesbitt,1924): <i>Tyrophagus putrescentiae</i> <i>Caloglyphus hughuasi</i> (Samsinok,1966). <i>Caloglyphus rhizoglyphoides</i> (Zachvattain,1937). <i>Caloglyphus betae</i> (Attiah,1969). <i>Caloglyphus</i> (Oudemans). <i>Acarus farries</i> (Oudemans). <i>Suidasia nesbitti</i> (Aughes). <i>Aleuregluphus ovatus</i> (Troupeau). <i>Oudem</i> (Zachvatkin). <i>Rhizoglyphus robini</i> (Claparede,1869). <i>Rhizoglyphus echinopus</i> (Fumouze and Robin), <i>Tyrophagus palmarum</i> (Oudemans,1974). <i>Caloglyphus berlesei</i> (Michael), <i>Rhizoglyphus ismaili</i> (El-Naggar, Taha and Hoda). <i>Mycetoglyphus fungivorous</i> (Oud,1932).	++++			More than 40%
2-Family:Glyophagidae (Berlese, 1887): <i>Glycyphagus domesticus</i> (DenGear), <i>Glycyphagus oryzae</i> (Attiah,1969). <i>Labidoglyphus destructor</i> (Shrank). <i>Glycyphagus aegyptiacus</i> (Attiah,1969).	+++ ++ +	15 sources: Wheat-straw, wheat-grains, wheat-bran, rice, rice-hay, barley, garlic, onion, faba-bean, corn, date-palm, dried-molokhia, cucumber-seeds, squash-seeds and flour.	Cairo, Giza, Fayoum, Beni-Suef, Qalyobia and Daquahlia.	20-40% Less than 20% Less than 5%
3-Family:Labidophoridae (Zachvatkin 1941): <i>Goheria fusca</i> (Oud). <i>Goheria wahabi</i> (El-Naggar, Taha and Hoda).	++ +	2 sources: Wheat-hay and wheat bran	Qalyobia	Less than 20% Less than 5%
4-Family:Ctenoglyphidae (Zachvatkin 1941): <i>Damesoglyphus intermedius</i> (Canestrini). <i>Stenoglyphus hughesi</i> (Attiah).	+++ +++	5 sources: Barley, wheat-grains, rice and skin & food animal	Beni-Suef, Giza and Daquahlia.	20-40% 20-40%
5-Family:Phyroglyphidae (Cunliffe, 1958): <i>Dermatophagoides farinae</i> (Hughes).	++	4 sources: Flour, wheat-grains, rice and corn	Giza and Qalyobia	Less than 20%

++++ high number, +++moderate number, ++ few number +rare number.

Table 3. Three mite sub-orders according to locality for six governorates during two years.

Governorate	Astigmata	Prostigmata	Mesostigmata
Cairo	++	+ (7)	-
Giza	+++ (15)	++	+++ (9)
Fayoum	++	++	+(7)
Qalyobia	++	++	++
Daquahlia	-	-	-
Beni-Suef	+(8)	-	-
no. of mite species	23	17	13

+++high locality, ++moderate locality, +low locality and - not found

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حصري بعض الأكاروسات المرتبطة بالحبوب ومنتجاتها المخزونة في مختلف محافظات مصر

زغلول عبد الفتاح حلوة ، نيللى أحمد حسن عبد الفتاح و رشأ أحمد زينهم

قسم بحوث آفات الحبوب والمواد المخزونة - معهد بحوث وقاية النباتات - مركز البحوث الزراعية

تهدف الدراسة الى التعرف على بعض الأكاروسات المرتبطة بالحبوب ومنتجاتها والمواد المخزونة. تم فحص ودراسة 53 نوع من الأكاروسات المختلفة السلوك والمجموعة من 18 مادة من الحبوب والمواد الغذائية الأخرى تم اخذ عيناتها من مناطق مختلفة من المحافظات المنكورة وهي دقيق القمح - الرتبة-حبوب القمح- نين القمح- الشعير-الارز- قطن الارز- البليح-الذرة الشامية- الفول- الكسب- لب الخبز- لب الكوسة-لب البطيخ- البصل- الثوم- الملوخية الجافة-الجلود جمعت من 6 محافظات هي القويوم- الجيزة- بني سويف - القاهرة- القليوبية والدقهلية والدراسة اجريت في عامين متتاليين من يناير 2018 إلى ديسمبر 2019. وأوضحت النتائج التالية: تم تسجيل ثلاثة وعشرين نوعا تبعاً ل 11 جنسا تحت خمس عائلات اللحم عديم الشعر Astigmat. أهمها اللحم الأكاريدى Acarid حيث تعتبر أكثر العائلات شيوعا وضمت 14 نوع تم عزلها من 15 منتج غذائي جمعت من المحافظات المنكورة. وبالنسبة اللحم الأملمي الثغر Prostigmat تم تسجيل عدد 17 نوعا تبعاً ل 9 أجناس تحت خمس عائلات جمعت من 15 مادة غذائية من تلك المحافظات، وقد تناولت الدراسة أيضا اللحم المتوسط الثغر Mesotigmat والذي اشتهرت على 13 نوعا تبعاً ل 8 أجناس تحت خمس عائلات. ومن هذه الدراسة امكن تحديد مستوى الاصابة النسبية لتعداد افراد النوع وبالنسبة لتواجد النوع من المواد الغذائية في مصر، وبناءا عليه امكن تصنيف الأنواع تبعاً لمستوى الأفراد وتصنيف المنتجات الغذائية المخزونة تبعاً لعدد الأنواع المهاجمة لها او التي أصابتها. لذا عليه القول ان اللحم *T. putrescentiae* تسالغ او سائد بالنسبة لكثافة أو تعداد الافراد في مجموعة عديمة الثغر .