J. Plant Prot. and Path., Mansoura Univ., Vol.10 (5): 257 - 260, 2019

Survey of Main Mites and Insect Species Associated with Stored Maize in Giza Governorate

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ABSTRACT

Various mite species such as predators, fungivores and parasites associated with insect species inhabiting stored maize grains were surveyed from 14 untreated stores maize located from different sites at Giza governorate during the two successive years 2016 and 2017. These mites feed on stored materials, fungus or being predators or parasites of store maize insects, so that they considered to be one of the most biological control agent for their associated insect and mite pests. Twenty one mite species belong to ten families and 14 genera in four suborders were collected. Suborder Astigmata contains eight different species belonging to four genera in two families, suborder Prostigmata represented by six different species belonging to four genera in four families**.** In addition, six different species belonging to five genera in three different families in suborder Mesostigmata. Finally, suborder Cryptostigmata had one family Orbatulidae included one species. While the insects were recorded five families with six species in order Coleoptera.

Keywords: Mites**,** insects, survey, maize, stored product mites, fungivores.

INTRODUCTION

Maize (*Zea mays* L.) is the most widely produced grain worldwide, and it is an essential element in many tropical, subtropical and warm countries, including most of Africa (Onwueme and Sinha, 1991; FAOSTAT, 2014). Moreover, developed countries uses maize for animal feed and as a raw material for other industrial processes, because of being cheap to produce.

A stored grain including maize provides all the essential nutritive requirements for insects and mites that capable of chewing the hard kernels. Due to the enormous biotic potential of these pests, heating of grain-mass and moisture translocation occurs, which permit the development of molds and also prevent the grain germination, [Zdarkova, (1996); Stejskal *et al*., (2003); El-Sayed and Ghallab, (2007) and Tefera *et al*., (2010)].

Many species of mites feed on fungi and other micro-organisms. Contamination by alive and dead mite in different stages such as exuviae and feaces results in being harmful for human consumption. In addition, it causes various diseases to fodder workers and also leads to gastric disorders in animals that eats infested fodder, Hughes, (1976); Sinha and Wallace, (1977); Taha, (1985); Nangia *et al*., (1989) and El-Sayed and Ghallab, (2007).

On the other hand, Barker, (1967) and Nangia *et al*., (1989) observed another group of mites that acts as a biological control agent, such as predatory mite which feed on eggs of stored grains pest (mites and insects).

The objective of the present investigation aimed to generate inventory of the inhabit mites and insects that cause great damage to stored maize and their associated predaceous and parasitic mites in Giza governorate.

MATERIALS AND METHODS

Intensive survey was carried out during the two successive years 2016 and 2017, samples of maize were collected from 14 untreated stores of maize from different sites at Giza governorate.

Samples of almost 300 gm. of maize collected in cloth bags, labeled with the date and origin of its collection, transported to the laboratory and examined as soon as possible.

For extracting mites and insects, samples were placed in modified Tullgren funnels and left for a period of 24 hours below 60-watt electric lamp. Extracted pests were received in Petri-dishes filled with water and its edges smeared with a layer of Vaseline to prevent mites escaping. Extracted mites were cleared in Nesbitt's solution, then mounted in Hoyer's medium on glass slides for identification.

Collected mites and insects were identified and classified into their taxonomical rank by using different specific keys (Lindquist & Evans, 1965; Summers & Price, 1970; Hughes, 1976; Krantz, 1978; Zaher, 1984 and Zaher, 1986).

RESULTS AND DISCUSSION

This study revealed the occurrence of mites and insect species inhabiting maize, which feed on stored materials, fungus or being predators or parasites that may be of great benefit in the biological control of associated insect and mite pests. Twenty one mite species belong to four suborders representing ten families and 14 genera were collected. While the insects were recorded five families with six species in order Coleoptera.

A) Collected mites:

The mite species were classified according to suborders to four groups as follows.

1) Suborder Astigmata

Astigmatid mites observed in eight different species belonging to four genera in two families, (Table 1). Members of these families may cause direct injury by feeding and losing weight of stored grains and by contamination with old skins, excrement and dead bodies, also feed on fungi. Infested materials became unsuitable for human consumption and may cause digestive troubles when eaten and dermatitis when handled, Sinha, (1964).

Family Acaridae (Ewing & Nesbitt)

Five acarid species were recorded, *Caloglyphus sp*.; *Acarus siro* (Linnaeus); *Tyrophagus longior* (Gervais); *T. putrescentiae* (Schrank) and *Tyrophagus* sp.. *A. siro* and *T. putrescentiae* were found in stored maize with great numbers.

These results similar to those obtained by Sinha and Mills (1968) who was described that *A. siro* fed on *Penicillium* sp. and distributed the spores throughout the substrate. Moreover, Fan and Zhang, (2007) reported that genus *Tyrophagus* comprises a group of primarily fungivores mites, including the mould mites, commonly found in stored food products and decaying organic matter. El-Sanady, (1999) collected 24 species of astigmatid mites from different localities of Egypt associated with 15

materials of stored products. The same author mentioned that, the family Acaridae happens to be the most common family of the storage acari, which represented by 13 species.

Family Glycyphagidae (Berlese)

Three glycyphagid species were recorded in moderately abundance: *Glycyphagus domesticus*; *G. ornatus* and *Glycyphagus* sp.

These results agree with Cui *et al.*, (2003) who collected 44 mite species belonging to 22 genera and seven families Acaridae; Lardoglyphidae; Glycyphagidae; Chortoglyphidae; Carpoglyphidae; Histiostomatidae and Pyroglyphidae).

Moreover, Taha (1985) recorded 65 species belonging to 34 genera under 20 families and four suborders included Suborder Astigmata, which represented by 13 species belonging to seven genera under four families collected from different stored products in different localities in Egypt.

Table 1. Incidence of mites collected from stored maize in Giza governorates, Egypt, during 2016 & 2017.

suborder	Family	Scientific name	Density
Astigmata	Acaridae	*Caloglyphus sp.*	+
		Acarus siro (Linnaeus)	+++
		Tyrophagus longior (Gervais)	++
		Tyrophagus putrescentiae (Schrank)	+++
		Tyrophagus sp.	++
	Glycyphagidae	*Glycyphagous domesticus* (Degeer)	+
		Glycyphagous ornatus (Kramer)	++
		Glycyphagus sp.	++
Prostigmata	Tydeidae	*Orthotydeus sp.*	+
	Tarsonemidae	*Tarsonmeus granaries* (Lindquist)	+
Mesostigmata	Chyletidae	*Cheyletus malaccensis* (Oudemans)	+++
		Cheyletus eruditus (Schrank)	++
		Cheyletus sp.	+
	Pyemotidae	*Pyemotes herfsi* (Oudemans)	+
	Ascidae	*Proctolaelaps peygmaeus* (Muller)	+
		Proctolaelaps Sp.	++
		Blattisocius tarsalis (Berlese)	+++
		Lasioseius aegypticus (Afifi)	+
	Lealapidae	*Androlaelaps casalis* (Berlese)	+++
	Ameroseiidae	*Kleemenia plumosus* (Manson)	++
Cryptostigmata	Oribatuloidae	*Scheloribates* sp.	+

+ = Rare (1 - 3 individuals) ++ = Moderate (3 - 9 individuals)
+++ = High (more than 9 individuals)

2) Suborder Prostigmata

This study indicated that there were six different species belonging to four genera in four families, Table (1).

Family Tydeidae

Tydeid mites regarded as miscellaneous in feeding habits and it is represented by one species *Orthotydeus sp.*with rare numbers.

Families Tarsonomidae and Pymotidae

Families Tarsonomidae and Pymotidae are fungivorous mites, each represented in few numbers by a single species *Tarsonmeus granaries* (Lindquist) and *Pyemotes herfsi* (Oudemans) respectively.

Longshu and Qinghai (1997) surveyed 79 mite species infesting food stuffs belonging to 25 families in the Acaridida, Actinedida, Gamasida and Oribatida. *T. granarius* sometimes occurred in few numbers.

Families Cheyletidae

Predacious Cheyletid mites represented by three species. *Cheyletus malaccensis* (Oudemans) was the most widely distributed predator in this family.

The obtained result agrees with that of Taha (1985); Hoda *et al*., (1990) and El-Sayed and Ghallab (2007) whose cited that *C. malaccensis* was the most common species of prostigmatid mites associated with different types of stored products.

3) Suborder Mesostigmata

As shown in table (1), the collected mesostigmatid mites were six different species belonging to five genera in three different families. Most individuals of this suborder feed as predaceous on different harmful microarthropods associated with them such as Ascidae, Laelapidae, but there are some mites feed as Fungivorous such as *Kleemania plumosus* (Family: Ameroseiidae).

Family Ascidae (Voigts & Oudemans)

Four Ascid species were recorded, *Proctolaelaps peygmaeus*; *Proctolaelaps Sp.; Blattisocius tarsalis* (Berlese) and *Lasioseius aegypticus* Afifi. The most widely distributed predator in this family was *B. tarsalis* (Berlese).

These findings similar to that obtained by El-Sayed and Ghallab (2007) who stated that, the highest occurrence of this family was noticed in maize. Moreover, Athanassiou *et al.,* (2001) noticed that the highest population densities for mites were recorded during September and October the predators, *B. tarsalis* and *B. keegani*. In addition, *B. tarsalis* exserted effective natural control against stored product pyralid moth, especially *Anagasta cautella* (Walker), Lindquist (1983). In contrary, *P. Pygmaeus* and *L. aegypticus* Afifi were recorded with few numbers of individuals in stored maize.

Family Lealapidae

Single Lealapid species was recorded in highly abundance, *Androlaelaps casalis*. This result similar to that obtained by Emmanouel *et al.*, (1994), who surveyed mites associated with stored products involved the examination of wheat, maize, barley, wheat flour, bran. They found 17 species belonging to 11 families and four orders in Greece.

Family Ameroseiidae

Ameroseiid mite, *Kleemenia plumosus* was recorded in moderate numbers. This result confirmed by the data obtained by Mabrouk (1988), who surveyed three Ameroseiid species; *K. kosi* (El-Badry, Nasr & Hafez), *K. plumosus* (Oudemans) and *K. zaheri* (El-Badry, Nasr & Hafez) from wheat and flour at Giza, Menia and Fayoum.

4) Suborder Cryptostigmata

Orbatulidae was represented in a single species, *Scheloribates* sp. Table (1). This data agree with that obtained by Zaher *et al*., (1986); Parkinson (1990); Mahmoud (1992); El- Naggar *et al*., (1992); Mostafa and Shokeir (1993) and Mostafa *et al*., (2006), who surveyed mites associated with stored products.

B) Collected insects:

This study revealed that there were five families with six species in order Coleoptera infested stored maize in Giza as showen in Table (2).

Sitophilus oyrzae (Linnaeus) and *Tribolium castaneum* (Herbst) observed in highly abundance. In contrary *Sitophilus granaries* (Linnaeus) and *Rhyzopertha* dominica (Fabricius) were rarely observed, while *Oryzaephilus surinamensis* (Linnaeus) and *Lasioderma serricorne* (Fabricius) were moderately observed.

Generally, many species of mites destroying germination of maize seeds, they also feed on fungi and other micro-organisms results in Contamination that can be harmful for human consumption.

Table 2. Incidence of insects collected from stored maize in Giza governorates, Egypt, during 2016 & 2017.

Order	Family	Scientific name	Common name	Density
Coleoptera	Curculionidae	*Sitophilus oyrzae* (Linnaeus)	Rice weevil	+++
		Sitophilus granaries (Linnaeus)	Granary weevil	+
	Tenebrionidae	*Tribolium castaneum* (Herbst)	Rust Red flour beetle	+++
	Bostrichidae	Rhyzopertha dominica (Fabricius)	Lesser grain borer	+
	Silvanidae	*Oryzaephilus surinamensis* (Linnaeus)	Saw-grain beetle	++
	Anobiidae	*Lasioderma serricorne* (Fabricius)	Cigarette beetle	++

+ = Rare (1 - 3 individuals) **++ = Moderate (3 - 9 individuals)** **+++ = High (more than 9 individuals)**

Otherwise, there is another group of mites acts as beneficial forms, such as predatory mite which feed on mite pests and insect pests or mites parasitic. the ascidic mite *Blattisocius tarsalis* is a good potential agent that use as a predator to control stored grain pests that showed by Barker (1967) who cited that immature stages and adults of this predator fed on eggs of numbers of different grain beetles: *Tribolium confusum* (Jacqueline du Val); *T. castaneum* Herbst; *Trygoderma* sp. and *Oryzaephilus surinamensis* Linnaeus.

REFERENCES

Athanassiou, C. G.; N. E. Palyvos; P. A. Eliopoulos and G. T. Papadoulis (2001). Distribution and migration of insects and mites in flat storage containing wheat. Phytoparasitica, 29 (5): 379-392.

Barker, P. S. (1967). Bionomic of *Blattisocius keegani* Fox (Acarina: Ascidae), a predator on eggs of pests of stored grain. Can. J. Zool. 45 (1): 093-9.

Cui, Y. B.; C. P. LI; J. Wang; Q. G. Yang and Y. Jian (2003). Acaroid mites (Acari: Astigmata) in Chinese traditional medicines. Annals of Tropical Medicine and Parasitology. 97 (8): 865- 873.

El-Naggar, M. E.; M. A. Rakha and H. A. Taha (1992). Mites of stored grain in Egypt. Egypt. J. Biol. Pest. Cout., 2 (2): 109- 122.

El-Sanady, M. A. (1999).: Biological studies on mites associated with stored products. M. Sc. Thesis, Fac. Sci. Cairo Univ., Egypt, 108 pp.

El-Sayed, F. M. A. and M. M. A. Ghallab (2007). Survey on Mites Associated with Major Insect Pests Infesting Stored Grains in Middle Delta. ACARINES: Journal of the Egyptian Society of Acarology 1: 29-38.

Emmanouel N. G., C.T. Buchelos, C. T. E. Dukidis (1994). A survey on the mites of stored grain in Greece. J Stored Prod Res 30 (2):175–178.

Fan, Q. H and Z. Q. Zhang (2007). Fauna of New Zealand Number (56) *Tyrophagus* (Acari: Astigmata: Acaridae). Manaaki Whenua Press, NZ.

FAOSTAT, 2014. (verified on June 15, 2017). http:// faostat. fao.org.

Hoda, F. M.; M. E. El-Naggar; H. A. Taha; and M. M. EL-Beheiry (1990). Prostigmati mites associated with stored products. Agric. Res. Rev. 68: 77-85.

Hughes, A. M. (1976). The mites of stored food and houses Tech. Bull. Minist. Agric. Fish. Food, Bull. 9, 400 pp.

Krantz, G.W. 1978. A Manual of Acarology. Second edition, Oregon State Univ. Book Stores, Inc., Corvallis, 509 pp.

Lindquist, E. E. (1983). Some thoughts on the potential for use of mites in biological control including a modified concept of "parasitoids", pp.12-20.

Lindquist, E.E. and Evans, G.O. 1965. Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). Mem. Ent. Soc. Can., 47: 1-64.

Longshu, L. and F. Qinghai (1997). A survey of food mites from four provinces of China. Systematic and Applied Acarol., 2 : 247- 250.

Mabrouk, A. M. H. (1988). Studies on Egyptian gamasida. Ph.D. Thesis, Fac. of Agric., Cairo Univ., 170 pp.

Mahmoud, S. H. (1992). Mite fauna of stored grain seeds in Central Iraq. J. Stored Product Res., 28, (3): 179-181.

Mostafa, A. M. and N. I. Shokeir (1993). Stored product mites in Egypt. J. Appl. Sci., 9 (8): 730- 739.

Mostafa, A. M.; E. M. Fatma; E. M. A. Yassin and A.A. Mohammed (2006). Occurrence of mite species associated with stored products in Egypt. Egypt. J. of Appl. Sci., 21 (12A): 227- 236.

Nangia, N.; G. P. ChannaBasavanna and C. A. Viraktamath (1989). Acarines associated with stored products in Karnataka, India. Progress in Acarology, 2: 241-248.

Onwueme, I. C. and T. D. Sinha (1991). Field Crop Production in Tropical Africa. CTA, Wageningen, The Netherlands, p. 159.

Parkinson, C.L. (1990). Population increase and damage by three species of mites on wheat at 20°C and two humidities. Exp. & Appl. Acarol., 2 (3): 179-193.

Sinha, R. N. and H. A. Wallace (1977). Storage stability of farm stored rapeseed and barley. Can .J .Plant. Sci., 5: 351-365.

Sinha, R. N. and J. T. Mills (1968). Feeding and reproduction of the grain mite and the mushroom mite on some species of *Penicilium.* J. econ. Ent.61 (6): 1548-1552.

Sinha, R. N., (1964). Ecological relationships of stored product mites and seed borne fungi, Proc. 1st Int. Congr. Acarology, 1963. Acarologia, 6: 372- 389.

Stejskal V, J. Hubert, Z. Kucerova; Z. Munzbergova; J. Lukas and E. Zdarkova (2003). The influence of the type of storage on pest infestation of stored grain in the Czech Republic. Plant Soil Environ 49(2):55–62.

Summers, F.M. and D.W. Price, 1970. Review of the mite family Cheyletidae. Univ. Calif. Publ. Entomol., 61: 153 pp.

Taha, H. A., (1985). Morphological and biological studies on some mites associated with stored products. Ph. D. Thesis, 159 pp., Fac. Agric. Al- Azhar Univ. Egypt.

Tefera, T., Kanampiu, F., Groote, H.D., Hellin, J., Mugo, S., Kimenju, S., Beyene, Y., Boddupalli, P., Shiferaw, B., Banziger, M., (2010). The metal silo: an effective grain storage technology for reducing post-harvest insect and pathogen losses in maize while improving smallholder farmers' food security in developing countries. Crop Prot. 30, 240-245.

Zaher, M. A.; M. I. Mohamed and S. M. Abd El-Halim (1986). Incidence of mites associated with stored seeds and food products in Upper Egypt. Exp. & App. Acarology, 2: 19-24.

Zaher, M.A. 1984. Survey and ecological studies on phytophagous, predaceous and soil mites in Egypt. I- Phytophagous mites in Egypt (Nile valley and Delta). PL-480 Programme, USA, Project No. EGARS 30, Grant no. FG-EG-139, 228 pp.

Zdarkova E. (1996). The effect of mites on germination of seed. Ochr Rostl 32(3):175–179.

حصر لأهم الأكاروسات والحشرات المرتبطه بالذره المخزونه في محافظه الجيزه

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تم حصر الاكاروسات والحشرات المرتبطه بالذره المخزنه خلال العامين ٢٠١٦ و٢٠١٧ في مناطق مختلفه من محافظه الجيزه .الاكاروسات التي تم تواجدها كانت تتبع ١٤ جنس تحت عشره عائلات تحت اربعه فصائل حيث كانت طبيعه تغذيتها اما فطريه او مفترسه او متطفله علي الحشرات المتواجده . وكانت الحشرات المتواجده تتبع سته اجناس تحت خمسه عائلات تحت فصيله واحده .وكانت اهم الاكاروسات *Blattisocius tarsalis* حيث وجد انه الاطوار البالغه والغير بالغه منه تتغذي علي بيض الخنافس *Tribolium castaneum, Trygoderma* sp. and *Oryzaephilus surinamensis*