

SURVEY OF MITES ASSOCIATED WITH STORED ONION BULBS AT EL-MENOFIA GOVERNORATE

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Abstract

A survey on mites associated with stored onion bulbs at El-Menofia governorate during 2014 and 2015 years, proved the occurrence of 21 different species. Of these, eight species from two families Acaridae and Glycyphagidae belong to Astigmata, six species belong to five families (Bdellidae, Rhagididae, Cheyletidae, Tydeidae and Neophyllobidae) under Prostigmata, 6 species in 3 families (Ascidae, Laelapidae and Ameroseiidae) belong to Mesostigmata and one mite species in one family (Oppiidae) under Suborder Cryptostigmata. Members of the families Acaridae, Glycyphagidae and Cheyletidae were the most common mites, found in many samples with high abundance. The storage conditions affected on the abundance of different collected mites, as *Rhizoglyphus echinopus*, *Tyrophagus putrescentiae*, *Caloglyphus berlesei* (Family Acaridae), *Glycyphagus ornatus* (Family Glycyphagidae); and *Cheyletus eruditus*, Family (Cheyletidae); were recorded from the different three storage conditions. On the other hand, *Lardoglyphus konoj*, *Lardoglyphus zacheri*, *Tyrophagus tropicus*, *Spinibdella bifurcata*, *Coccorhagidia clavifron*, *Lasioseius egypticus*, *Lasiosius lindquisti*, *Androlaelaps wahabi*, *Kleemenia plumosus* and *K. zacheri* were collected from the bulbs which exposed to straw covered bulbs condition. On the other hand, *Pronematus rykei* (Tydeidae) and *Neophyllobius aegyptium* (Neophyllobidae) were identified species when onion bulbs stored with opened and shady room condition; while *Cheyletus badryi* (Cheyletidae) was isolated from onion bulbs stored at straw covered bulbs and Indoor storage conditions.

INTRODUCTION

The loss of foods in the post-harvest system is not new; it has always been a problem for mankind. In these days of rapidly enlarging population in the poorest countries of the world where food is already short, there is an increasing urgency to do a better job of conserving mankind food supply in order to alleviate hunger and malnutrition. Onion, *Allium cepa* L., is one of the most important vegetable crops in Egypt in terms of crop value, Mostafa (2011). The fresh onions are spring and summer crops, high in water and sugar content and noted for their sweet, mild flavor, Chomchalow (2003). Storage mites are important pests of all types of stored commodities. They are not only responsible for direct damage in form of weight reduction but also imply the indirect damage in form of germination loss of the grains,

deterioration of the nutrients and quality of the stored grains and other stored products. Some granary mites transmit disease agents to agricultural crops, e.g. *Botrytis allii* Munn to onion (E1-Atrozy, 1974). Diaz *et al.*, (1999) mentioned that bulb mites of the genus *Rhizoglyphus* (Claparede) (Acari: Acaridae) have been identified as pests of many crops and ornamentals in storage, in the greenhouse, and in the field and the most important hosts are species in the family Liliaceae (e.g. *Allium* spp.). The authors added that also, mite populations grew faster on *Fusarium*-infested bulbs, suggesting that infestation by this pathogen creates conditions favorable to mite development. Survey conducted by Mostafa (2011) in Egypt indicated the presence of 12 mite species associated with stored onion bulbs, *Allium cepa* L. Rangarajan *et al.*, (1971) in India found unidentified species of *Rhizoglyphus* infesting stored onion bulbs. Group of 5-10 mites were found under the outer sheath, while severe infestation was found inside the bulbs. So, the current study is conducted to study the effect of different storage conditions on the abundance of stored mites on onion bulbs at El-Menofia governorate.

MATERIALS AND METHODS

Samples of about 10 onion bulbs (randomized collected) were taken from four different locations (Ashmoun, El-Sadat and Quesna regions), Menofia governorate at all storage conditions (straw covered bulbs, opened and shady room and indoor) for each mentioned districts). The study conducted in two seasons 2014 and 2015. Samples were collected in polyethylene bags, then transferred to laboratory for inspection in the same collection day. Isolated mites were identified and recorded. Mites are isolated by using modified Tullgern's funnel kept for about 24 hours below 60-watt electric lamp. Collected mites were put in Nesbitt's clearing agent, then mounted on glass slide using Hoyer's medium for examination. Labels with necessary data were stuck on the slides. Identification of species followed on review given by Hughes (1961), Attiah (1969), Zaher (1986) and Krantz and Walter (2009).

RESULTS AND DISCUSSION

A general survey at three different regions of El-Menofia governorate mentioned before was undertaken for two years 2014 and 2015. The study revealed the occurrence of 21 different mite species belonging to 14 genera and 10 families under four suborders as follows, Table (1).

Table 1. Occurrence of mite species associated with stored onion under different storage methods.

Mite families	Mite species	Storage condition	Feeding nature	Locality	Abund.
Suborder Acaridida					
Acaridae Leach	<i>Rhizoglyphus echinopus</i> (F. & R.)	A, B and C	Fungivorous	All regions	+++
	<i>Lardoglyphus konoii</i> (Sasa and Asanuma)	A	Fungivorous	Ashmoun	+
	<i>Lardoglyphus zacheri</i> Oudemans	A	Fungivorous	Ashmoun	+
	<i>Tyrophagus tropicus</i> Robertson	A	Fungivorous	Ashmoun	+
	<i>Tyrophagus putrescentiae</i> (Schrak)	A, B and C	Fungivorous	All regions	+++
	<i>Caloglyphus berlesei</i> (Michael)	A, B and C	Fungivorous	All regions	+++
	<i>Caloglyphus beta</i> Atiah	A and B	Fungivorous	Ashmoun	++
Glycyphagidae Berlese	<i>Glycyphagus ornatus</i> (Kramer)	A, B and C	Fungivorous	Ashmoun	+++
Suborder Actinedida					
Bdellidae Duges	<i>Spinibdella bifurcata</i> Atyeo	A	Predator	Ashmoun	+
Rhagidiidae Oudemans	<i>Coccorhagidia clavifron</i> Canestrini	A	Predator	Ashmoun	+

Table (1): Cont

Mite families	Mite species	Storage condition	Feeding nature	Locality	Abund.
Suborder Actinedida					
Cheyletidae Leach	<i>Cheyletus eruditus</i> (Shrank)	A, B and C	Predator	All regions	+++
	<i>Cheyletus badryi</i> Zaher and Hassan	A and C.	Predator	Quiesna	+++
Tydeidae Kramer	<i>Pronematus rykei</i> (Baker)	B	Predator	Quiesna	+++
Neophyllobidae	<i>Neophyllobius aegyptium</i> Soliman and Zaher	B	Predator	Quiesna	+
Suborder Gamasida					
Ascidae Voigts and Oudemans	<i>Lasioseius egypticus</i> Afifi	A	Predator	Ashmoun	+
	<i>Lasiosius lindiquisti</i> Nasr and Abou –Awad	A	Predator	Ashmoun	+
Laelapidae Berlese	<i>Androlaelaps wahabi</i> Metwaly and Ibraheem	A	Predator	Ashmoun	+
	<i>Androlaelaps casalies</i> (Berlese)	A and B	Predator	Ashmoun and Quiesna	+++
Ameroseiidae Evans	<i>Kleemenia plumosus</i> Oud.	A	Predator	Ashmoun	+++
	<i>Kleemenia zaheri</i> El-Badry, Nasr and Hafez	A	Fungivorous	Ashmoun	++
Suborder Oribatida					
Oppiidae Grandjean	<i>Oppia sticta</i> Popp	B	Fungivorous	Quiesna	+++

A = straw covered bulbs
+ = rare (1- 3 individuals)

B- opened shady room
++ = moderate (4-8 individuals)

C= Indoor
+++ high (more than 8 individuals)

1- Sub-order: Acaridida

This sub-order was represented by eight mite species belonging to five genera under two families Acaridae and Glycyphagidae. The species were *Rhizoglyphus echinopus*, *Lardoglyphus konoji*, *L. zacheri*, *Tyrophagus tropicus*, *T. putrescentiae*, *Caloglyphus berlesei* and *C. beta* (Acaridae) and *Glycyphagus ornatus* (Glycyphagidae).

The feeding habit of these mite species in this suborder is regarded as fungivorous according to Zaher (1986) and Mostafa *et al.*, (2006).

2- Suborder: Actinedida

Six species belonging to five genera belong to five families represented suborder Actinedida were collected. All of the collected actinedid mites are predators on other associated stored onion pests. These species and families were *Spinibdella bifurcata* Atyeo (Bdellidae); *Coccorhagidia clavifron* Canestrini (Rhagididae); *Cheyletus eruditus* (Shrank) and *Cheyletus badryi* Zaher and Hassan (Cheyletidae); *Pronematus rykei* (Baker) (Tydeidae); *Neophyllobius aegyptium* Soliman and Zaher (Neophyllobidae).

All collected actinedid mites were fed as predaceous mites, Table (1), Zaher (1986).

3- Suborder: Gamasida

The current study indicated that the onion bulbs in Menofia Governorate infested with six different mesostigmatid mites belonging to three different families, two species for each family. The mites were *Lasioseius egypticus* and *L. lindquisti* (family: Ascidae); *Androlaelaps wahabi* and *A. casalies* (family: Laelapidae) and *Kleemenia plumosus* and *K. zacheri* (family: Ameroseiidae). The first four mites are regarded as predaceous mites, but the last two (Ameroseiid mites) were observed fed as fungivorous mites, Zaher (1986).

4- Suborder: Oribatida:

The only collected oribatid mite in this study was *Oppiia sticta* with high abundance which feeds as fungivorous mite, Zaher (1986).

As shown in Table (1), the storage conditions affected on the abundance of different collected mites, as *R. echinopus*, *Tyrophagus putrescentiae*, *C. berlesei* (Family Acaridae), *G. ornatus* (Family Glycyphagidae); and *C. eruditus*, Family (Cheyletidae); where surveyed from the different three storage conditions, straw covered bulbs, opened and shady room and Indoor conditions. On the other hand, *Lardoglyphus konoji*, *Lardoglyphus zacheri*, *Tyrophagus tropicus*, *Spinibdella bifurcata*, *Coccorhagidia clavifron*, *Lasioseius egypticus*, *L. lindquisti*, *Androlaelaps wahabi*, *Kleemenia plumosus* and *K. zacheri* were collected from the bulbs which exposed to straw covered bulbs condition. On the other hand, *Pronematus rykei* (Tydeidae) and *N. aegyptium* (Neophyllobidae) were the identified species when onion bulbs stored

with opened and shady room condition; while *C. badryi* (Cheyletidae) was extracted from onion bulbs stored at straw covered bulbs and Indoor storage conditions, Table (1).

The identified species varied in their abundance from one district to another (Table 1). These findings are in accordance with the fact that the bulb mite, *R. echinopus* is generally the most important and most frequent stored product mite on stored onion bulbs (Sandhu 1976; Smirnov and Smirnova 1978; Lee and Wen 1980; Gerson *et al.*, 1985 and Gerson *et al.*, 1991). Mostafa (2011) noticed that the predatory mite *Macrocheles africanus* was dominant and accessory, it was found in decaying onion bulbs that heavy infested with onion bulb fly larvae *Eumerus amoenus* Loew and acarid mites Baker and Wharton (1952) observed that in the field, the mite *R. echinopus* apparently di little damage to healthy onion plants affected only rotted bulbs, but if the mites became established in stored bulbs they appeared to hasten decay. Although it usually fed on rotted or decayed tissues, the mite could infest healthy tissues if in contact with it. Mostafa *et al.*, (2006) collected ninety-three species of mites belonging to 53 genera and 26 families and four suborders in association with stored products at 16 governorates in Egypt. Only two species *Pyemotes herfesi* (Oudemans) (Pyemotidae) *Lasioseius bispinosus* Evans (Ascidae) were collected associated with onion bulbs at Sohag and El-Menofia Governorates, respectively. *Rhizoglyphus echinopus* (F.& R.) as cosmopolitan species, occurring on bulbs of bulbous plants, in soil, compost and retting plants was found on potato, tulip, hyacinth, lily and onion bulbs. Sollerz *et al.*, (2004). The current survey emphasizes the important of mites on stored onion bulbs, information that may aid in understanding and preventing losses caused by mite contamination of these stored agricultural products

REFERENCES

1. Attiah, H. H. 1969. Tyroglyphid mites associated with stored food in U.A.R. Egypt. Min. Agric., Plant Prortect. Dep. Tech. Bull., 10:1-51.
2. Baker, E.W. and G.W. Wharton 1952. An introduction to Acarology. Macmillan Co. New York City, 1- 465.
3. Chomchalow, N. 2003. Protection of stored products with special reference to Thailand. AU J.T. 7 (1): 31-47.
4. Diaz, A.; K. Okabe; C.J. Eckenrode; M. G. Villania and B.M. O'Connor. 1999. Biology, ecology, and management of the bulb mites of the genus *Rhizoglyphus* (Acari: Acaridae). Exp. & App. Acarol. 24: 85–113.

5. E1-Atrozy, N. A. 1974. Studies on acarids associated with onion bulbs and ornamental corms. Ph.D. Thesis, Fac0 of Agric., Cairo Univ.,134 pp.
6. Gerson, U; E. Cohen and S. Capua 1991. Bulb mite, *Rhizoglyphus robini* (Astigmata : Acaridae) as an experimental animal. Exp. Appl. Acarol.,12: 1-2 : 103-110.
7. Gerson, U.; S. Yathom; S. Capua and D. Thorens 1985. *Rhizoglyphus robini* Claparède (Acari: Astigmata: Acaridae) as a soil mite Acarologia, 26 (4): 371-380.
8. Hughes, A. M. 1961. The mites of stored food. Min. Agric. Fishers and Food Tech Bull. 9: London: 287 pp.
9. Krantz, G.W. and D.E. Walter 2009. A manual of Acarology, 3rd ed. , Texas Tech Univ., Press.
10. Lee, H. S. and H.C. Wen 1980. Field investigation of the acarid bulb mites on onion and their control. J. Agric.Res. China, 29-3: 211-218.
11. Mostafa, E. M. 2011. Incidence of mites inhabiting stored onion bulbs in Egypt, with description of a new species of the genus *Lasioseius* Berlese (Acari : Gamasida). Plant Prot. and Path., Mansoura Univ., Vol. 2 (10): 855 -863, 2011
12. Mostafa, A.M.; Fatma, E. Mohamed, E.M.A. Yassin, and Azza, A. Mohamed 2006. Occurrence of mite species associated with stored products in Egypt. Egypt. J.Appl. Sci., 21 (12 A): 227-
13. Rangarajan, A.V.; N. R. Mahadevan and C. Amalraj 1971. Occurrence of the bulb mite, *Rhyzoglyphus*. on onion in storage. Indian J. Entomol., 33; 355-356.
14. Sandhu, G. S. 1976. New record of bulb mite *Rhizoglyphus echinopus* (Fumouze and Robin) from stored onions in India. Sci. Culture, 42(4):221-222.
15. Smirnov, K. S. and G. M. Smirnova 1978. Pests and diseases of onion. Zashchita Rastenii, pp.53
16. Solarz, K., P. Szilman; E. Solarz, M. Krazak and A. Jagla 2004. Some allergenic species of astigmatid mites (Acari, Acaridida) from different synanthropic environments in Southern Poland. Acta Zoologica Cracoviensia, 47(3-4): 125-145.
17. Zaher, M. A. 1986. Incidence of mites associated with stored seeds and food products in Upper Egypt. Exp. & App. Acarol, 2: 19-24.

حصار الاكاروسات المرتبطة بكورمات البصل المخزنة فى محافظة المنوفية

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تصاب كورمات البصل المخزنة بالعديد من اكاروسات المواد المخزونة اثناء فترة التخزين حيث منها ما يسبب ضررا مباشرا لهذه الكورمات او ضررا غير مباشر بافرازاتها ومخلفاتها المختلفة كما توجد بعض الاكاروسات التى تمارس تغذيتها بالافتراس على هذه الاكاروسات وغيرها من الاكاروسات الغير كاملة من الحشرات الضارة حيث تعتبر هذه الانواع احد وسائل المكافحة الحيوية وقد تم فصل ٢١ نوع اكاروسى من هذه الكورمات فى محافظة المنوفية (السادات قويسنا - اشمون). حيث تم جمع ٨ انواع فى عائلتين هما Acaridae و Glycyphagidae والتى تنتمى الى تحت رتبة الاكاروسات عديمة الثغر Acaridida و ٦ انواع فى ٥ عائلات (Bdellidae و Rhagididae و Cheyletidae و Tydeidae و Neophyllobidae فى تحت رتبة Actinedida و ٦ انواع فى ٣ عائلات (Amerosiidae و Laelapidae و Ascidae) تنتمى الى تحت رتبة الاكاروسات ذات الثغر المتوسط Gamasida ونوع واحد فقط يتبع عائلة Oppiidae والذى ينتمى الى اكاروسات اللحم الخنفسى Oribatida. ولقد أثرت ظروف تخزين كورمات البصل على نوع الاكاروسات المتواجدة حيث تم جمع الانواع *Rhizoglyphus echinopus* و *Tyrophagus putrescentiae* و *Caloglyphus berlesii* و *Glycyphagus ornatus* و *Cheyletus eruditus* تحت جميع الظروف التى تعرضت لها الابصال وهى (المغطاه بالقش والموجودة فى الحجرات المظلمة المفتوحة والمخزنة داخل المنازل). من ناحية اخرى وجدت الانواع *Caloglyphus beta* و *Androlaelaps casalis* فى كلا من الابصال التى خزنت تحت القش وداخل الحجرات المظلمة المفتوحة والنوع *Cheyletus badryi* وجد على الابصال المغطاه بالقش والتى خزنت داخل المنازل.