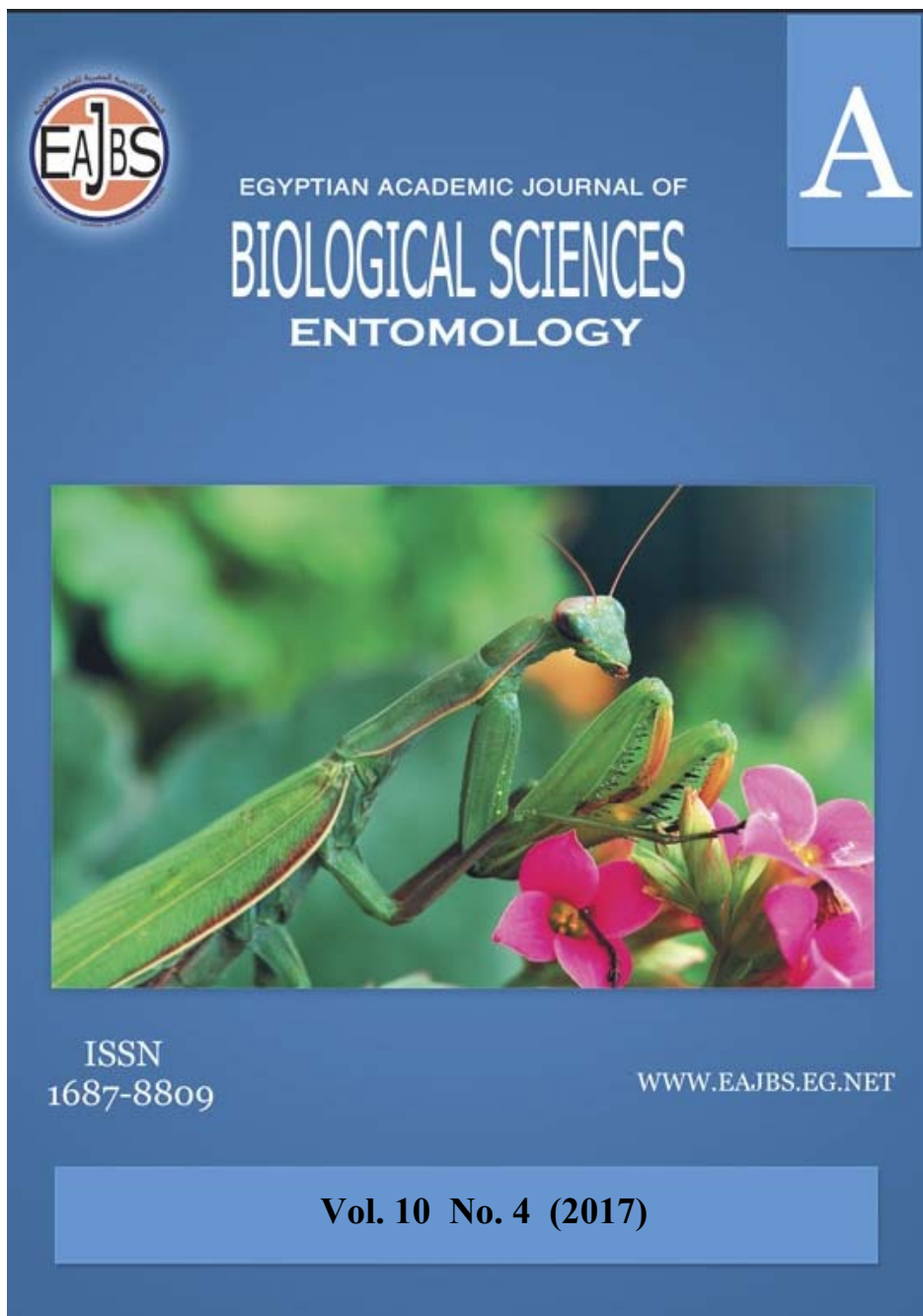
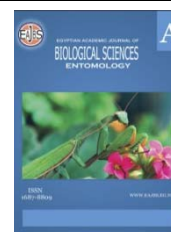


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Occurrence of Mites and Insects Associated with Date Palm Fruits in Different Governorates of Egypt

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ABSTRACT

The present study was conducted during four years (2013, 2014, 2015 and 2016) to throw some light on the acarofauna and insects of the date palm fruits in different regions covered 9 Egyptian governorates differed in their ecological conditions. This study revealed the occurrence of 84 mite species differed in their feeding behavior infested different fruits, belonging to 51 genera and 25 families under four suborders. Suborder Astigmata which was represented by 21 different species belong to 11 genera and 4 families. The recorded families were Acaridae (13 species), Lardoglyphidae (one species), Glycyphagidae (6 species) and Pyroglyphidae (one species). Suborder Prostigmata was represented in this study by 38 mite species belonging to 26 genera in 11 families: Tydeidae (12 species), Cheyletidae (12 species), Cunaxidae (3 species), Stigmaeidae, Camerobiidae and Rhagididae (2 species for each), Pyemotidae, Caligonellidae, Bdellidae, Eupodidae, and Tarsonemidae (one species for each). On the other hand, the mesostigmatid mites were represented by 22 mite species belonging to 12 genera in 9 families and the most common family was Ascidae represented by 12 mite species. The cryptostigmatids in this study included three mite species belong to Family Oribatidae. The obtained results indicated that the fallen fruits harbored the most abundant mites (53), followed by stored fruits with 34 mites and fresh fruits infested by 18 species. The study showed that there were two mite species associated with residue fruits on the tree, while the Agwa product included one mite only. Regarding the different study regions, it was found that El-Menofia governorate included 47 different mites, followed by El-Behira governorate which harbored 38 mites, Giza governorate with 17 mites, El-Dakahlia (14 species), El-Sharkia (7 species) and Damietta (6 species), Beni Suief (3 species), Sohag (5 species) and Cairo (3 species). In this study, 12 insect species in 3 orders and 8 families are listed as important pests of date palm fruits during different times. The most abundant family was Nitidulidae (5 species), as the rest collected families were represented by one species for each. The stored date fruits were attacked by *Carpophilus hemipterus*, *Carpophilus mutilatus*, *Coccotrypes dactyliperda*, *Oryzaephilus surinamensis*, *Lasioderma serricorn*, and *Tribolium confusum*. While, the fallen fruits were infested by *C. hemipterus*, *C. immaculatus*, *C. mutilatus*, *C. dimidiatus*, *Carpophilus* sp., *Coccotrypes dactyliperda*, and *Lasioderma serricorn*. On the other hand, *L. serricorn*, *Fannia incisurata*, *Tetrastichus* sp. and *Pteromalus* sp. were observed associated with the fresh date fruits. The most common insects in this study were *C. hemipterus*, *C. mutilatus* and *T. confusum*, as they appeared on infested fruits during all study periods with very high abundance, while *C. dactyliperda* was least abundant insect.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is one of the oldest known fruit crops and has been cultivated in the Middle East and North Africa for at least 5000 years, Zohary and Hopf (2000). *P. dactylifera* is among the most important species in the

Palm family (Arecaceae), which encompasses about 200 genera and more than 2,500 species, (El Hadrami and El Hadrami, 2009; Jain *et al.*, 2011). In the Nile delta, there is one third of the productive date palm in Egypt (2,000,000 trees). The date fruit is a good source of food providing fibre, carbohydrates, minerals and vitamins besides having anti-mutagenic and anti-carcinogenic properties (Baloch *et al.*, 2006; Mohamed, 2000). Date palms are attacked by many pests and diseases and their nature and severity vary with cultivar, location, weather and cultural practices (Carpenter and Elmer, 1978 and Zaid *et al.*, 2002). The most comprehensive publication available on pests and diseases of date palm was given by Carpenter and Elmer (1978) who reported 54 species of mite and insect pests of date palm worldwide. A more recent review on arthropod pests of date palm and their management was given by Blumberg (2008) who reported 16 major and 15 minor species. The distribution pattern of mites is not constant everywhere, but differs according to the environment factors, where it either free living (phytophagous, graminivorous, fungivorous and sarcophagus), parasitic and predacious mites on other injuries insects and mites, Putatunda (2005), Taha *et al.* (2016). Severe infestation with mite resulting in economic reduction in the quality and quantity of crop production. The aim of this study is focused on survey of different mites and insects associated with date palm fruits in the field and in store in different Egyptian localities during the study periods (2013-2016).

MATERIALS AND METHODS

Mites collection. Date palm fruits samples were collected from different date fruits (freshly on tree, stored, residue on the tree, fallen fruits under trees and from Agwa product) The collected samples were transferred to the Cotton and Field Crops Acarology Department of Plant Protection Research Institute, Agricultural Research Center. Mites were extracted using a Berlese funnel. Specimens were removed using a stereomicroscope, cleared in Nesbitt's solution, and mounted in Hoyer's medium on glass microscopic slides for identification. The slides were placed on an oven at 45°C for three days and then the specimens were examined using a light microscope. Specimens are deposited in the Acarological Collection of Plant Protection Research Institute, Agricultural Research Center. Date Variety Agwa, was obtained from market.

Mites identification. The identification of different collected mites were identified according to Hughes 1961, 1976; Summers and Price (1970); Zaher (1986); Fain and Zhang, 2003, 2007; Krantz and Walter, 2009.

Insects identification. The different collected insects were identified in Insect Classification and Survey Dept., Plant Protection Res. Inst., Dokki, Giza.

RESULTS AND DISCUSSION

Survey of mite species associated with different date fruits in different regions of Egypt. General survey on 9 Egyptian governorates was undertaken for four years 2013, 2014, 2015 and 2016. This study revealed the occurrence of 87 mite species infested different fruit materials, belonging to 53 genera and 26 families under four suborders as in Table (1).

Suborder: Acaridida (Astigmata): As shown in Table (1), this suborder was represented by 21 different species belong to 11 genera and 4 families. The feeding habit of the collected mite species of this suborder is recorded, Table (1).

The recorded families were Acaridae (13 species), Lardoglyphidae (1 species), Glycyphagidae (6 species) and Pyroglyphidae (1 species). The most abundant mites in this subfamily were *Tyrophagus putrescentiae*, *Rhizoglyphus robini*, *R. echinopus* (Acaridae) and *Lepidoglyphus destructor* (Glycyphagidae).

Table 1: Incidence of different mites associated with date palm fruits at different regions of Egypt

Family	Species	Habitat	Location (s)	Abund.	Feeding behavior and reference (s)	
					Behavior	Reference (s)
Suborder Astigmata (Acaridida) Canestrini						
Acaridae	<i>Tyrophagus putrescentiae</i> (Schränk)	Fresh fruits	El-Sadat , Rashid	++++	Fungivorous Miscellaneous Nematophagous	Zaher, 1986 Fan and Zhang 2007 Belgrami and Tahseen 1991
		Fallen fruits	El-Sadat	++++		
		Fallen fruits	Wadi El-Natroun	++++		
		Residual on tree	El-Sadat	+++++		
		Stored fruits	Aga, Ashmoun, Rashid, Giza Rashid	++++		
	<i>T. longior</i> (Gervais)	Stored fruits	El-Wahat El-Baharia	+++	Miscellaneous	Fan and Zhang 2007
	<i>T. neiswanderi</i> Johnstone & Bruce	Stored fruits Fallen fruits	El-Wahat El-Baharia Wadi El-Natroun	+++ +	Phytophagous	Fan and Zhang 2007
	<i>T. javensis</i> (Oudemans)	Stored fruits	El-Wahat El-Baharia	+++	??	??
	<i>T. perniciosus</i> Zakhvatkin	Fallen fruits	El-Sadat Wadi El-Natroun	+++ ++	Fungivorous	Zhang 2003
	<i>Rhizoglyphus robini</i> (Fumouze & Robin)	Stored fruits	Ashmoun, Aga	++++	Bulb and corn feeder	Fan and Zhang, 2003
<i>R. echinopus</i> (Fumouze & Robin)	Stored fruits	Ashmoun, Rashid	++++	Fungivorous Bulb and corn feed	Zedan, 1988 Fain and Zhang, 2003	
	Stored fruits	Ashmoun	++			
	Fallen fruits	Rashid	+++			
	Fallen fruits	Rashid	+++			
<i>R. howensis</i> Manson	Fresh red fruits	New Damietta	++++	??	??	
<i>Caloglyphus berlesei</i> (Michael)	Stored fruits	Ashmoun, Sohag	+++	Fungivorous	Pimentel <i>et al.</i> , 1960	
	Fresh fruits	Belbees	+			
<i>C. mycophagous</i> (Megnin)	Stored fruits	El-Sinbalween	++	??	??	
Acaridae	<i>Suidasia nesbitti</i> Hughes	Stored fruits	Aga, Beni Suef	+++	Fungivorous	Chmielewski, 1991.
		Fallen fruits	Wadi El-Natroun	+	Granivorous	Hughes, 1976
		Stored fruits	Aga	+		
<i>Acarus farris</i> (Oudemans)	Fallen fruits	Wadi El-Natroun	+	Scavenger	Liu , 2013	
Lardoglyphidae	<i>Lardoglyphus zacheri</i> (Oudemans)	Stored fruits	Ashmoun	+	Scavenger	Iverson <i>et al.</i> , 1996
Glycyphagidae	<i>Glycyphagus ornatus</i> (Kramer)	Stored fruits	Ashmoun	+	Predator	??
	<i>Glycyphagus domesticus</i> (De-Geer)	Stored fruits	Meniet El-Nasr	+++	Granivorous	Chmielewski, 2002
	<i>Blomia tropicalus</i> (Blot)	Fallen fruits	El-Wahat El-Baharia	+++	??	??
	<i>B. freemani</i> Hughes	Stored fruits	Aga	+	??	??
	<i>Grammolichus aegyptiacus</i> Shereef and Fawzy	Fallen fruits	Ashmoun	+	Scavenger	Shereef and Fawzy, 2001
	<i>Lepidoglyphus destructor</i> (Schränk)	Fallen fruits	Giza, Rashid, El-Sadat	++++	Granivorous Fungivorous	Chmielewski (2001) Stratil <i>et al.</i> , 1980
Stored fruits		Ashmoun, Rashid, Aga	++++			
Pyroglyphidae	<i>Dermatophagoides farinae</i> Hughes	Stored fruits	Aga, Sohag, Ashmoun	+	Granivorous & fungivorous	Taha <i>et al.</i> , 2004

Table (1): Cont.

Family	Species	Habitat	Location (s)	Abund.	Feeding behavior and reference	
					Behavior	Reference (s)
Suborder Prostigmata						
Tydeidae	<i>Orthotydeus longisetosus</i> El-Bagoury and Momen	Fallen fruits Fallen fruits Fresh fruits	El-Sadat, Beni Suief Wadi El-Natroun Damietta	++++ ++++ ++++	??	??
	<i>O. caudatus</i> (Duges)	Fresh fruits	Beni Suief	??	Predator	Duso <i>et al.</i> , 2005
	<i>O. kochi</i> (Oudemans)	Fallen fruits Fresh fruits	Giza, Belbees Housh Eisa	+++ +++	fungivorous	El-Bagoury 1978
	<i>O. californicus</i> (Banks)	Fresh fruits Fallen fruits Fresh fruits Fallen fruits	Giza, Rashid El-Sadat Rashid Rashid, El-Sadat	++++ ++++ ++ ++++	Phytophagous Predator Miscellinious	Zaher, 1986 Wahba, 1976 Yassin, 2004
	<i>O. palmatus</i> Yassin	Fallen fruits	Wadi El-Natroun	+++	??	??
	<i>Tydeus ferulus</i> (Baker)	Fallen fruits	Rashid	+++	Predator	Brickhill, 1958
	<i>T. bakeri</i> Brickhill	Fallen fruits	Wadi El-Natroun	+++	??	??
	<i>Metapronematus zaheri</i> Yassin	Fallen fruits	Ashmoun	+++	???	???
	<i>M. ashmouni</i> Yassin	Fallen fruits	Wadi El-Natroun	+++	??	??
	<i>M. aegyptiaca</i> Yassin	Fresh fruits	Rashid	+++	??	??
Tydeidae	<i>Homeopronematus ashmounii</i> Yassin	Fallen fruits	Wadi El-Natroun	+++	??	??
	<i>Prtonematulus vandus</i> Baker	Fallen fruits Fallen fruits Fallen fruits	El-Wahat El-Baharia Ashmoun El-Sadat	+++ +++ ++	??	??
Stigmaeidae	<i>Mediolota brevistis</i> Wood	Fresh fruits	Rashid	+	??	??
	<i>Ledermulleriopsis insica</i> Wood	Fresh fruits Fallen fruits Stored fruits	Ashmoun El-Sadat Ashmoun	+++ + +	??	??
Pyemotidae	<i>Pymotes herfesi</i> Oudemans	Stored fruits	El-Wahat El-Baharia	++	Parasites on <i>Pectinophora</i> <i>gossypiella</i> (Saund.) larvae	Tawfik and Awadallah, 1970
Caligonellidae	<i>Neognathus oblongus</i> (Soliman)	Stored fruits	Ashmoun	+	Predator	Zaher (1986)
Bdellidae	<i>Spinibdella bifurcata</i> Atyeo	Fallen fruits Fallen fruits	Ashmoun El-Sadat, Belbees	+ +	Predator	Zaher (1986)
	<i>Neophyllobius mangiferus</i> Zaher and Gomaa	Fallen fruits	Giza	+	Predator	Zaher (1986)
	<i>N. aegyptium</i> Soliman and Zaher	Stored fruits	Ashmoun	+	Predator	Zaher (1986)
Cheyletidae	<i>Hemicheyletia congensis</i> (Cunliffe)	Fallen fruits Fallen fruits Fallen fruits	Wadi El-Natroun Rashid El-Sadat	+ + +	Predator	Zaher (1986)

Table (1): Cont.

Family	Species	Habitat	Location (s)	Abund.	Feeding behavior and reference	
					Behavior	Reference (s)
Cheyletidae	<i>Acaropsellina docta</i> (Berlese)	Stored fruits	Cairo, Aga, Sohag	++++	Predator	Zaher (1986)
	<i>Acaropsis sollers</i> Kuzin	Fallen fruits	Wadi El-Natroun	+++	Predator	Zaher (1986)
	<i>Lepidocheylea solimani</i> Zaher and Hassan	Fallen fruits	El-Sadat	+	Predator	Zaher (1986)
	<i>Acarosella notchi</i> Gomaa & Hassan	Fallen fruits	El-Sadat El-Sadat	+++ +++	Predator	Zaher (1986)
	<i>Cheletonella caucasia</i> Volgin	Fallen fruits	Wadi El-Natroun	+	??	??
	<i>Cheyletus malaccensis</i> (Oudemans)	Stored fruits	Giza, Rashid, Sohag Ashmoun, Aga	++++ ++++	Predator	Zaher, 1986
	<i>Cheyletus badryi</i> (Zaher & Hassan)	Stored fruits Agwa fruits	Cairo Giza, Rashid	+++ +++	Predator	Zaher, 1986
	<i>Cheyletus cacahuamilpensis</i> Baker	Fallen fruits	Sohag	+	Predator	Zaher, 1986
	<i>Cheyletus eruditus</i> (Schrank)	Stored fruits Stored fruits	Cairo, Belbees Ashmoun, Aga, Rash	++++ ++++	Predator	Zaher (1986)
	<i>Dendrocheylea wellsi</i> (Baker)	Fallen fruits	Rashid	+	?	?
	<i>Dendrocheylea bregetova</i> Volgin	Fallen fruits	Rashid	+	?	?
Cunaxidae	<i>Pulaeus niloticus</i> Zaher & El Bishlawy	Fallen fruits	El-Sadat	+	Predator	Zaher (1986)
	<i>Cunaxa capreolus</i> (Berlese)	Fallen fruits	Wadi El-Natroun	+++	Predator	Zaher (1986)
	<i>Coleoscirus simplex</i> (Ewing)	Fallen fruits	El-Wahat El-Baharia	++++	Nematophagous	Walter and Kaplan, 1991
Eupodidae	<i>Eupodes niloticus</i> Abou-Awad & El-Bagoury	Residue fruits Fallen fruits Fallen fruits	El-Sadat El-Sadat Wadi El-Natroun	+ +++ +++	??	??
Tarsonmeidae	<i>Tarsonmeus granaries</i> Lindquist	Fresh fruits	Damietta	+++	??	??
		Fallen fruits	El-Sadat	++++		
		Fresh fruits	Rashid	+++		
Rhagididae	<i>Robustacheles (R) mucronata</i>	Stored fruits	Ashmoun	+++	??	??
	<i>Cocorhagidia clarifrons</i> (Canestrini)	Stored fruits	Ashmoun	??		
Suborder Mesostigmata						
Ascidae	<i>Proctolaelaps aegyptiaca</i> Nasr	Fallen fruits	Rashid	++	??	??
		Fallen fruits	El-Sadat	+++		
		Fallen fruits	El-Sadat	++++		
		Stored fruits	El-Wahat El-Baharia	++		
		Stored fruits	Ashmoun	+++		
		Fresh fruits	El-Wahat El-Baharia	+++		
		Fallen fruits	Belbees	++		
Fallen fruits	Ashmoun	+++				

Table (1) Cont.

Family	Species	Habitat	Location (s)	Abund.	Feeding behavior and reference	
					Behavior	Reference (s)
Suborder Gamasida (Mesostigmata)						
Ascidae	<i>Proctolaelaps pygmaeus</i> (Muller)	Fallen fruits Residue fruits Fresh fruits	El-Wahat El-Baharia El-Sadat El-Sadat, Rashid	+++ +++ +++	Fungivorous	Shereef <i>et al.</i> , 1980
	<i>Proctolaelaps striatus</i> Afifi, Hssan and El-Bishlawy	Fallen fruits Residue fruits	Rashid, El-Sadat, Damietta, El-Wahat El-Baharia El-Sadat	+++ +++ +++	Fungivorous	Afifi <i>et al.</i> , 1984
	<i>Proctolaelaps orientalis</i> Bhattacharyya	Fallen fruits	El-Sadat	++++	??	??
	<i>P. gizanensis</i> Abou Shnaf and Moraes	Fallen fruits	Rashid, Giza, El-Sadat	++++	??	??
	<i>Blattisocius dentriticus</i> (Berlese)	Stored fruits	Ashmoun	+++	Predator	Zaher, 1986
	<i>Blattisocius keegani</i> Fox	Fallen fruits Stored fruits Residue fruits	El-Sadat Ashmoun, Aga, Sohag, Rashid El-Sadat	+++ ++++ ++++	Predator	Zaher (1986)
	<i>Blattisocius tarsalis</i> (Berlese)	Stored fruits Residue fruits	Ashmoun, Aga Ashmoun	+++ +++	Predator	Cobanoglu, 1996
	<i>Lasioseius bispinosus</i> Evans	Fallen fruits Stored fruits	Rashid Ashmoun	+++ +++	??	??
<i>Lasioseius lindquisti</i> Nasr and Abou Awad	Fallen fruits Fresh fruits	Belbees Damietta	++++ +++	??	??	
Ascidae	<i>Lasioseius aegypticus</i> Afifi	Stored fruits Stored fruits	Ashmoun Ashmoun	+++ +++	Fungivorous	Zaher (1986)
	<i>L. africanus</i> Nasr	Stored fruits	Ashmoun	++++	Predator	Zaher, 1986
Macrochelidae	<i>Macrocheles meridorius</i> (Berlese)	Fallen fruits	Wadi El-Natroun	+++	Predator	Zaher, 1986
Pachylaelapidae	<i>Pachylaelaps reticulatus</i> (Berlese)	Fallen fruits	Wadi El-Natroun	+++	Predator	Zaher, 1986
Ameroseiidae	<i>Kleemenia plumosus</i> Manson	Fallen fruits	Ashmoun, Beni Suief	+++	Fungivorous	Zaher (1986)
	<i>K. plumigera</i> Oudemans	Fallen fruits	El-Sadat	+	Fungivorous	Zaher (1986)
Anystidae	<i>Erthracarus</i> sp.	Fresh fruits	Rashid	+	?	?
		Fallen fruits	El-Sadat	+		
Uropodidae	<i>Urobovella krantzi</i> (Zaher & Afifi)	Fallen fruits	New Damietta	++++	Fungivorous	Zaher (1986)
		Fallen fruits	El-Sadat	+	???	???
Trachyuropodidae	<i>Oplitis pecinui</i> Hirschmann	Fallen fruits	El-Sadat	+	?	?
Laelapidae	<i>Laelaspis astronomicus</i> (Koch)	Fallen fruits	Wadi El-Natroun	+++		
	<i>Androlaelaps aegypticus</i> Hafez, Elbadry & Naser	Stored fruits Fallen fruits	El-Wahat El-Baharia El-Sadat, Belbees	++++ ++++	Predator	Zaher, 1986
Parasitidae	<i>Vulgarogamasus burchanensis</i> (Oudemans)	Fresh fruits	El-Sadat	+	Predator	Zaher, 1986
		Stored fruits	Ashmoun	+++		
Suborder Oribatida (Cryptostigmata)						
Oribatulidae	<i>Schleoribatus zaheri</i> (Youssif and Nasr, 1978)	Fallen fruits	New Damietta	++	fungivorous	Zaher, 1986
	<i>Schleoribatus laevigatus</i> (Koch)	Fallen fruits	Wadi El-Natroun	++	?	?
	<i>Zygoribitula sayedi</i> El-Badry and Nasr	Fresh fruits	El-Sadat El-Sadat	++ ++	?	?

Suborder Actinedida (Prostigmata): The tabulated data in Table (1) showed that the prostigmatid mites inhabiting different habitats of date fruits were represented by 38 mite species belonging to 26 genera in 11 families. The recorded families were Tydeidae (12 species), Stigmaeidae (2 species), Pyemotidae, Caligonellidae, Bdellidae, Eupodidae, and Tarsonmeidae (one species for each family), Camerobiidae (2 species), Cheyletidae (12 species), Cunaxidae (3 species), and Rhagididae (2 species). The most abundant prostigmatid mites in this study were *Orthotydeus longisetosus*, *O. californicus* (Tydeidae), *Cheyletus malaccensis* and *C. eruditus* (Cheyletidae).

Suborder Gamasida (Mesostigmata): Twenty-three mite species belonging to 12 genera in 9 families of gamasid mites were recorded. The recorded families were Ascidae (12 species), Ameroseiidae, Uropodidae, and Laelapidae (2 species for each), Macrochelidae, Pachylaelapidae, Anystidae, Trachyuropodidae and Parasitidae (one species for each family). The dominant species was the mite, *Proctolaelaps gizanensis* (Ascidae) and the mite *Androlaelaps aegyptiaca* (Laelapidae).

Suborder Oribatida (Cryptostigmata). As shown in Table (1), the cryptostigmatids mites were represented by three different species belong to family Oribatulidae namely *Schleoribatus zaheri*, *Schleoribatus laevigatus* and *Zygoribitula sayedi*.

The tabulated data in Table (2) indicate that the fallen date fruits and stored

date fruits were the most stored date fruits containing the different mite species (the dominant species), 53 and 34 mites, respectively, but the fresh date fruits were infested with 18 mite species. On the other hand, the residue fruits on trees included two mites, and the date Agwa had one mite species only in this study.

Table 2: List of dominant mites associated with different date fruits

Mites	Date fruit kinds				
	Fresh fruits	Stored fruits	Fallen fruits	Residue fruits on tree	Agwa
Number of collected mite species	18	34	53	2	1
The dominant mite (s)	<i>T. putrescentiae</i> <i>O. californicus</i> <i>P. pygmaeus</i>	<i>T. putrescentiae</i> <i>R. robini</i> , <i>R. echinopus</i> <i>L. destructor</i> <i>C. malaccensis</i> <i>A. docat</i> , <i>B. keegani</i>	<i>T. putrescentiae</i> <i>P. gizanensis</i> <i>L. destructor</i> <i>O. californicus</i>	<i>Proctolaelaps pygmaeus</i>	<i>Cheyletus badreya</i>

Table (3) shows the mite species numbers and abundance ratios in different study regions, where, El-Menofia Governorate represented the highest harbored number (45) mite species and the most abundant species were, *T. putrescentiae*, *R. robini*, *L. destructor*, *O. californicus*, *T. graneries*, *P. pygmaeus*, *P. gizanensis*, *P. orientalis*, *B. keegani*, *A. aegyptiacus*, *C. eruditus*, and *C. malaccensis*. On the other hand, the study regions Beni Suief, Sohag, and Cairo governorates were the lowest regions and included 3 different mite species for each region. This survey study emphasizes the importance of mites associated with different date palm fruits in understanding and preventing economic losses caused by mite contamination of these agricultural products. A study was conducted on mite populations associated with stored dried dates on the Gazally date variety in Alexandria, Egypt was conducted by Rezk (2016). Ten mite species belonging to seven families were collected and recorded. The most common mites belong to family Acaridae (27.69%) followed by the families Ascidae (19.7%), Glycyphagidae (15.49%), Carpoglyphidae (13.1%) and Cheyletidae (11.21%). The most dominant species were *Tyrophagus putrescentiae*, *Blomia freemani*, *Blattisocius keegani*, *Carpoglyphus lactis*, and *Cheyletus malaccensis*.

Table 3: Mite numbers associated with different stored hay in different regions during 2015 and 2016 seasons.

Mites	Regions								
	El-Behira	El-Dakahlia	El-Menofia	Giza	El- Sharkia	Darnietta	Beni Suief	Sohag	Cairo
Number of collected mite species	38	14	47	17	7	6	3	5	2
The most abundant mite (s)	<i>T. putrescentiae</i>	<i>R. echinopus</i> <i>L. destructor</i> <i>O. longisetosus</i> <i>O. californicus</i>	<i>T. putrescentiae</i> , <i>R. robini</i> <i>L. destructor</i> , <i>O. californicus</i> , <i>T. graneries</i> , <i>P. pygmaeus</i> , <i>P. gizanensis</i> , <i>P. orientalis</i> ,	<i>T. putrescentiae</i> <i>L. destructor</i> <i>O. californicus</i> <i>C. malaccensis</i>	<i>C. eruditus</i> <i>L. lindiquiesti</i> <i>A. aegyptiacus</i>	<i>R. howensis</i> <i>U. kranzi</i>	<i>O. longisetosus</i>	<i>A. docta</i>	<i>A. docta</i> <i>C. eruditus</i>

Insect pests attacking dates during plantation, harvesting and storage.

Twelve species in 3 orders and 8 families are listed as important pests of date palm during different times (Table 4). The most abundant family in this study was Nitidulidae (5 species), but the rest collected families were collected as one species for each. The stored fruits were attacked by *Carpophilus hemipterus*, *Carpophilus mutilatus*, *Coccotrypes dactyliperda*, *Oryzaephilus surinamensis*, *Lasioderma serricornis*, and *Tribolium confusum*. On the other hand, the fallen fruits in this study were infested by *Carpophilus hemipterus*, *C. immaculatus*, *C. mutilatus*, *C.*

dimidiatus, *Carpophilus* sp., *Coccotrypes dactyliperda* and *Lasioderma serricorn*. The fresh date palm fruits were attacked in this study by *Lasioderma serricorn*, *Fannia incisurata*, *Tetrastichus* sp., and *Pteromalus* sp. The most common date fruits insects in this study were *Carpophilus hemipterus*, *C. mutilates*, and *Tribolium confusum*, as they appeared on infested fruits during all study periods with very high abundance. On the other hand, *Coccotrypes dactyliperda* was collected with moderate numbers during 2014 and 2015 seasons. Similar results were obtained by El-Shafie (2012) who reported 22 insect species that can infest date fruit during harvesting and storage, among them the majority of the species belong to orders Coleoptera and Lepidoptera.

Table (4): Survey of the different insect species associated with different date fruits in Egypt

Order	Family	Species	Localities	Fruits state	Abun.	Remarks
Coleoptera L.	Nitidulidae Latreille	<i>Carpophilus hemipterus</i> Linnaeus	El-Sadat Ashmoun	Fallen Stored	++++ +++	2013,2014, 2015,2016 2014, 2015, 2016
		<i>C. immaculatus</i> Lucas	Rashid El-Sadat	Fallen Fallen	+++ ++++	2013 2014, 2015, 2016
		<i>C. mutilatus</i> Erichson	El-Sadat Ashmoun	Fallen Stored	++++ +++	2013, 2014,2015,2016 2013, 2014, 2015
		<i>C. dimidiatus</i> Fabricius	El-Sadat	Fallen	+++	2014,2015, 2016
		<i>Carpophilus</i> sp.	El-Sadat Rashid	Fallen Fallen	+++ +++	2015, 2016 2014,2015
	Scolytidae Latreille	<i>Coccotrypes dactyliperda</i> Fabricius	Ashmoun El-Sadat	Stored Fallen	++ +++	2014,2015 2014,2015
	Cucujidae Latreille	<i>Oryzaephilus surinamensis</i> Linnaeus	Ashmoun El-Mansoura	Stored Stored	+++ +++	2014, 2016 2014,2015
	Anobiidae Fleming	<i>Lasioderma serricorn</i> Fabricius	Tanta, Ashmoun, El-Wahat El- Baharia Damietta, El-Sadat Rashid	Stored Fresh Fallen	+++ +++ +++	2014, 2015 2014, 2016 2014, 2016
	Tenebrionidae Latreille	<i>Tribolium confusum</i> Duval	El-Mansoura	Stored	++++	2013,2014,2015,20 16
	Diptera L.	Muscidae Latreille	<i>Fannia incisurata</i> (Zetterstedt)	Damietta	Fresh fruits	+++
Hymenoptera L.	Eulophidae Westwood	<i>Tetrastichus</i> sp.	Damietta	Fresh fruits	+++	2014,2015,2016
	Pteromelidae Dalman	<i>Pteromalus</i> sp.	Damietta	Fresh fruits	+++	2015,2015, 206

+ = 1-3 individuals ++ = 4-8 individuals +++ = 9- 20 individuals ++++ = more than 20 individuals

REFERENCES

- Baloch, M.K., S.A. Saleem, K. Ahmad, A.K. Baloch, W.A. Baloch 2006. Impact of controlled atmosphere on the stability of Dhakki dates. *Swiss Soc. Food Sci. Tech.*, 39: 671-676.
- Blumberg, D. 2008. Review: Date palm arthropod pests and their management in Israel. *Phytoparasitica*, 36(5): 411-448.
- Carpenter, J.B. and H. S. Elmer 1978. Pests and diseases of the date palm. *U.S. Dep. Agric. Handbook*. 527: 1-42.
- El Hadrami, I. and A. El Hadrami 2009. Breeding date palm. pp. 191-216. *In: Jain S.M. and P.M. Priyadarshan (Eds.) Breeding Plantation Tree Crops*, Springer, New York.

- Fain, Q. and Z. Zhang 2003. Revision of *Rhizoglyphus* Claparede (Acari: Acaridae) of Australasia and Oceania. 374 pp.
- 2007. Fauna of New Zealand, *Tyrophagus* (Acari: Astigmata: Acaridae). Number, 56, pp: 1-291.
- Hughes, A.M. 1961. The mites of stored food. Min. of Agr., Fish. & Food Tech. Bull., 9: 278.
- 1976. The mites of stored food and houses. Technical Bulletin No.9, Ministry of Agriculture, Fisheries and Food, London. 399 pp.
- Jain, S.M., J.M. Al-Khayri and D.V. Johnson. (Eds.) 2011. Date Palm Biotechnology. Springer, Netherlands.
- Krantz, G.W. and D.E. Walter 2009. A Manual of Acarology. Texas Tech Univ. Press, 807 pp.
- Mohamed A.E. 2000. Trace element levels in some kinds of dates. Food Chem., 49: 107-113.
- Putatunda, B.N. 2005. Mites (Acarina) associated with stored food products in Himachol Pradesh, India, A Taxonomic study. J. Entomol., Res., 29 (1): 79-82.
- Rezk, H.A. 2016. Mites associated with stored dried-dates in Egypt and the role of *Blattisocius keegani* Fox as a biological control agent. 2nd Int. Conf. of Date Palm, Kingdom Saudi Arabia, 10-12 October, 2016. Book Abstracts. p: 17.
- Summers, F.M. and D.W. Price 1970. Review of the mite family Cheyletidae. Univ. Calif. Publ. Entomol., 61: 153 pp.
- Taha, H.A.A., M.M.H. Fawzy, A.E. El-Ghobashy and Z.E. Abdel Salam, 2016. Effect of different types of food on developmental stages, fecundity and life table parameters of the acarid mite, *Rhizoglyphus echinopus* (Fumouze and Robin, 1986). Menofia J. Plant Protection, 1: 59-65.
- Zaher, M.A. 1986. Survey and ecological studies on phytophagous, predaceous and soil mites in Egypt. II- Predaceous and non-phytophagous mites (Nile valley and Delta). PL-480 Program. USA Project No. EG- ARS-30. Grant No. FG-EG-139, 567 pp.
- Zaid, A., de Wet, P.F., M. Djerbi and A. Oihabi, A. 2002. Diseases and pests of date palm, p.227-281. In: Zaid, A. (ed.), Date palm cultivation. Food and Agriculture Organization. Plant production and protection paper no. 156. Food and Agriculture organization of the United Nations, Rome, Italy.
- Zohary, D. and Hopf, M. 2000. Domestication of palms in the old world: the origin and spread of cultivated plants in West Asia, Europe, and the Nile Valley. Oxford University Press, Oxon, UK.

ARABIC SUMMARY

تواجد الأكاروسات والحشرات المرتبطة بثمار البلح في مناطق مختلفة من مصر

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أجريت هذه الدراسة في الفترة (٢٠١٣ و ٢٠١٤ و ٢٠١٥ و ٢٠١٦) لإلقاء بعض الضوء على البيئة الأكاروسية والحشرية المصاحبة لثمار البلح في تسع محافظات مختلفة من مصر تختلف في الظروف المناخية وهي المنوفية - البحيرة - الجيزة - الدقهلية - الشرقية - دمياط - بنى سويف - سوهاج - القاهرة. ولقد أسفرت الدراسة عن تواجد ٨٤ نوع أكاروسى مختلف في طبيعته الغذائية في ٥١ جنساً و ٢٥ عائلة أكاروسية داخل ٤ تحت رتب أكاروسية مختلفة كالآتى:- حيث شملت تحت رتبة عديمة الثغر Astigmata على ٢١ نوع أكاروسى في ١١ جنساً داخل ٤ عائلات حيث شملت عائلة Acaridae على ١٣ نوعاً وعائلة Lardoglyphidae على نوع واحد فقط وعائلة Glycyphagidae على ٦ أنواع مختلفة أما عائلة Pyroglyphidae فقد شملت على نوع واحد من الأكاروسات. وقد شملت مجموعة تحت رتبة الأكاروسات الامامية الثغر Prostigmata في هذه الدراسة على ٣٨ نوع أكاروسى ينتمون الى ٢٦ جنساً داخل ١١ عائلة أكاروسية مختلفة حيث شملت عائلة Tydeidae على ١٢ نوعاً وعائلة Cunaxidae على ٣ أنواع وعائلات Stigmaeidae و Camerobiidae و Rhagididae على نوعين اثنين لكل عائلة. أما عائلات Pyemotidae و Caligonellidae و Bdellidae و Eupodidae و Tarsonemidae فعلى نوع واحد داخل كل عائلة. ومن ناحية اخرى فقد وجد أن الأكاروسات المتوسطة الثغر Mesostigmata قد شملت على ٢٢ نوع أكاروسى داخل ١٢ جنساً فى ٩ عائلات بينما شملت الأكاروسات ذات الحلم الخفسي Cryptostigmata على ٣ أنواع داخل عائلة واحدة وهي عائلة Oribatidae. كما أشارت الدراسة أيضاً إلى أن ثمار البلح المتساقط شملت على أكثر الأنواع (53 نوعاً) يليها ثمار البلح في المخازن وشملت على 34 نوعاً أكاروسياً وشملت ثمار البلح الطازجة على الأشجار على 18 نوع أكاروسى مختلف أما ثمار البلح المتبقية على الأشجار بعد موسم الحصاد فقد شملت على نوعين اثنين من الأكاروسات ووجد نوع أكاروسى واحد فقط فى بلح العجوة. و أشارت الدراسة إلى أن محافظة المنوفية كانت أكثر المحافظات احتواءً على الأكاروسات وشملت على ٤٥ نوعاً من الأكاروسات يليها محافظة البحيرة فى المرتبة الثانية (٣٤ نوعاً) ثم الجيزة (١٥ نوعاً) ثم جاءت الدقهلية و الشرقية و دمياط بعدد ٧ أكاروسات لكل منها ثم بنى سويف و سوهاج والقاهرة ولكل منها ٣ أكاروسات فقط. وفى هذه الدراسة تم جمع ١٢ نوعاً حشرياً داخل ٣ رتب فى ٨ عائلات مختلفة حيث كانت عائلة Nitidulidae اكثر العائلات انتشاراً وشملت على ٥ أنواع ومثلت باقى العائلات بنوع واحد فقط داخل كل عائلة وهي Scolytidae و Cucujidae و Anobiidae و Tenebrionidae و Muscidae و Eulophidae و Pteromelidae.