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Orijinal araştırma (Original article)

Mites (Acari) associated with stored apricots in Malatya, Elazığ and İzmir provinces of Turkey[1]

Sultan ÇOBANOĞLU[2*]

Summary

In this study, the mite fauna of stored apricots in Malatya, Elazığ and Izmir provinces of Turkey was determined. The samples were collected mainly from most important cultivated areas and exporting center during 2000-2002. Sixteen mite species belonging to 11 family and 13 genera were identified. All the obtained mite samples were evaluated in this paper. Frequency and occurrence rates and intensity of infestation are included.

Pachylaelaps sp. (Mesostigmata: Pachylaelapidae), *Oribatula tibialis* (Nicolet, 1855) (Cryptostigmata: Oribatulidae), *Tectocepheus velatus* (Michael, 1880) (Cryptostigmata: Tectocepheidae), *Cymbaeremaeus cymba* (Nicolet, 1855) (Cryptostigmata: Cymbaeremaeidae) and *Scheloribates* sp. (Cryptostigmata: Scheloribatidae) are new records for stored apricots in Turkey. Out of 601 samples, 133 were infested with mites and the infestion ratio is 22.19 %. *Carpoglyphus lactis* (L.) (Astigmata: Carpoglyphidae) was the most abundant species on dried apricots. The infestation rate of *C. lactis* was 69.14%.

The possibility of biological control of stored product mites by two common predacious species, *Blattisocius tarsalis* (Berlese, 1918) and *Blattisocius mali* (Oudemans, 1929) (Mesostigmata: Ascidae) were examined. *B. tarsalis* was the most common and populated beneficial mites with the 62.30 % ratio among the beneficial mites.

Key words: Stored apricot, Turkey, *Carpoglyphus*, *Blattisocius*, Acari

Anahtar sözcükler: Depolanmış kayısı, Türkiye, *Carpoglyphus*, *Blattisocius*, Akar

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[2] Ankara University, Agriculture Faculty, Department of Plant Protection, 06110 Dışkapı, Ankara, Turkey

[*] Sorumlu yazar (Corresponding author) e-mail: coban@agri.ankara.edu.tr

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Introduction

The mite fauna was surveyed mainly in İzmir to determine the stored product mite species of Turkey (Özer & Toros, 1978; Özer et al., 1989) but these studies were more interested in a general survey than limited number of habitats. These surveys gave a species list of mites especially in stored grain and grain products. In the work reported here the object has been provided list of both beneficial and harmful mites and a quantitative assesment of mite numbers in stored apricots in Turkey.

Mite samples were collected from İzmir, Elazığ and Malatya provinces. Turkey has 350 thousand ton apricot production in a year which includes the 16.42 % of the world production and has a first rank of the world production capacity. Malatya and Elazığ are important as the cultivation center and Malatya has 52.90 % total apricot production in Turkey. İzmir is very important for apricot exportation and also conducting the industrial institutions and storages of apricots. However, very little was known about the mite (Acarina) fauna of stored apricots in Turkey. *Carpoglyphus lactis* (L.) (Astigmata: Carpoglyphidae) was known as the only pest species from dried apricots. Astigmatid mites, are common on stored products in various part of Turkey (Özer et al., 1989; Çobanoğlu, 1996; Kılıç & Toros, 2000; Özman & Zdarkova, 2000).

The aim of the study was to provide a list of mite species occuring on dried apricots and quantitative assessment and detect predatory mite species for use in future biological control programs.

Material and Methods

The surveys were conducted of dried apricot storages, driers, brushing and handling machines, interior fabric areas of the storage seasons during 2000-2002 years. Samples of dried apricots were taken at monthly intervals from Malatya, Elazığ which are the main growing areas and İzmir provinces as an exportation center of Turkey (Figure 1). The location of the sampling as follows:

Malatya: Akçadağ, Arapgir, Arguvan, Battalgazi, Centrum, Darende, Deregezen, Doğanşehir, Hanım farm, Hekimhan, Kale-Kurşunlu, Pötürge, Yazıhan, Yeşilyurt.

Elazığ: Baskil, Centrum, Keban, Maden.

İzmir: Agricultural Quarantine Directorate (AQD), Alsancak, Bornova, Centrum-Konak, Çamdibi, Gaziemir, Işıkkent, Kemalpaşa, Menemen, Ören, Yenişehir (Table 1).

Mites were extracted from the samples by using Berlese funnels and preserved in 70 % alcohol. For identification purpose they were clarified in lactophenol solution and mounted in Hoyer's fluid. The slides were dried (2-4 weeks) at 35 ºC. All the obtained mites were considered as to asses the relative

numbers of mites. The mite samples are deposited as part of the author's collection, at the University of Ankara, Agricultural Faculty, Plant Protection Department, Ankara-Turkey.

Figure 1. Dried apricot sampling localities (*) in Turkey.

For identification purposes original descriptions and the following keys were used: Baker (1949), Hughes (1976), Griffiths (1985) and Karg (1994). All the measurements were done in micrometers (µm) and figures taken by digital image system or drawn by using microscope directly. The identification of the Cryptostigmata was done by Dr. Lorinda GROBLER (National Museum, P.O. Box 266. Bloemfontein 9300, South Africa). The following abbreviations are used in this paper: ♀ (female), ♂ (male), N (Nymph), U.A. (University of Ankara, Plant Protection Department, Ankara Turkey), AQD (Agricultural Quarantine Directorate).

Results and Discussion

In total 601 dried apricot samples were obtained from three provinces of Turkey which are 300 samples from Malatya, 62 from Elazığ and 239 samples from İzmir. Among them, 133 samples were identified as infested with mites and infestation ratio was 22.19 % (Table 1).

Table 1. Total number of dried apricot samples obtained from Malatya, Elazığ and İzmir provinces and their infestation rates (%)

Provinces	Localities	Number of obtained samples	Number of infested by mites	Infestation Ratio (%)
Malatya	Akçadağ	7	-	0.00
	Arapgir		-	0.00
	Arguvan	2	-	0.00
	Battalgazi	11	1	9.09
	Centrum	176	28	15.90
	Darende	12	1	8.30
	Deregezen	3	1	33.30
	Doğanşehir	1	-	0.00
	Hanım farm	9	2	22.20
	Hekimhan	46	-	0.00
	Kale	22	1	4.50
	Pötürge	1	-	0.00
	Yazı Hanı	8	2	25.00
	Yeşilyurt	2	-	0.00
	Total	**300**	**36**	**12.00**
Elazığ	Baskil	23	6	26.08
	Centrum	19	-	0.00
	Keban	15	2	13.30
	Maden	5	1	20.00
	Total	**62**	**9**	**14.51**
Malatya & Elazığ	Total	362	45	12.43
İzmir	(AQD)	25	24	96.00
	Alsancak	23	1	4.34
	Bornova	19	4	21.05
	Centrum	2	-	0.00
	Çamdibi	26	7	26.92
	Gaziemir	5	2	40.00
	Işıkkent	27	9	33.30
	Kemalpaşa	59	24	40.67
	Menemen	26	6	23.07
	Ören	24	9	37.50
	Yenişehir	3	-	0.00
	Total	**239**	**88**	**36.82**
Total		**601**	**133**	**22.19**

Identification of species

Sixteen mite species belonging to 11 families and 13 genera were identified, of these, *Pachylaelaps* sp. (Mesostigmata: Pachylaelapidae) and Cryptostigmata species are newly recorded from dried apricot storages in Turkey. These are namely; *Pachylaelaps* sp., *Oribatula tibialis* (Nicolet, 1855) (Cryptostigmata: Oribatulidae), *Tectocepheus velatus* (Michael, 1880) (Cryptostigmata: Tectocepheidae), *Cymbaeremaeus cymba* (Nicolet, 1855) (Cryptostigmata: Cymbaeremaeidae), *Scheloribates* sp. (Cryptostigmata: Scheloribatidae). The presence of the mite species and their intensity from stored apricot samples are shown (Table 2). From counting of the specimen, 1251 mite specimens were obtained, 893 of them are harmfull (71.93 %), while 358 specimen considered beneficials and detrivorous (28.61 %). *C. lactis* is the most

abundant species and 865 specimen obtained (69.14 %). *Tyrophagus putrescentiae* (Schrank, 1781) (Astigmata: Acaridae) is in the second among the harmful mites (1.36 %), *Tyrophagus similis* Volgin, 1946 (Astigmata: Acaridae), *Caloglyphus mycophagus* (Megnin, 1874) (Astigmata: Acaridae) and *Cenopalpus* sp. (Prostigmata: Tenuipalpidae) are the other identified harmful mite species. *Blattisocius tarsalis* (Berlese, 1918) (Mesostigmata: Ascidae) was the most common beneficial mites and 223 specimen were obtained (17.82 %), between this group *Blattisocius mali* (Oudemans, 1929) (Mesostigmata: Ascidae) (3.03 %) was in the second row while *O. tibialis* was (2.48 %) in third (Table 2).

Table 2. Mite species which were obtained from stored apricots in Malatya, Elazığ and İzmir provinces of Turkey

Familia	Species	Number of specimen	Percentage (%)
Acaridae	*Tyrophagus similis*	9	0.72
	Tyrophagus putrescentiae	17	1.36
	Caloglyphus mycophagus	1	0.08
Carpoglyphidae	*Carpoglyphus lactis*	865	69.14
Tenuipalpidae	*Cenopalpus* sp.	1	0.36
Harmfull **Total**		**893**	**71.93**
Ascidae	*Blattisocius tarsalis*	223	17.82
	Blattisocius keegani	21	1.68
	Blattisocius mali	38	3.03
	Melichares agilis	16	1.28
Pachylaelapidae	*Pachylaelaps* sp.	19	1.51
Cheyletidae	*Cheyletogenes ornatus*	1	0.08
Oribatulidae	*Oribatula tibialis*	31	2.48
Tectocepheidae	*Tectocepheus velatus*	4	0.32
Cymbaeremaeidae	*Cymbaeremaeus cymba*	2	0.16
Scheloribatidae	*Scheloribates* sp.	2	0.16
Stigmaeidae	*Stigmaeus sp*.	1	0.08
Beneficial **Total**		**358**	**28.61**
General		**1251**	**100.00**

Pest species

Astigmata

In this study, four Astigmata species were obtained from dried apricot storages in Malatya, Elazığ and İzmir provinces of Turkey (Table 2).

Acaridae

Tyrophagus Oudemans, 1924

Tyrophagus similis Volgin, 1946

Female: Idiosomal length: 328.75±23.30 (290-390) µm; and width: 161.25±17.83 (130-210) µm (n=4). On the hysteroma the dorsal setae d1 and d2 similar in length of lateral setae (la). Dorsal hysterosomal d3 is much longer than the setae d1 and d2. Posterior lateral seta (lp) as long as the other posteriors of idiosoma. The solenidion on the tarsi I is relativeley stout, and

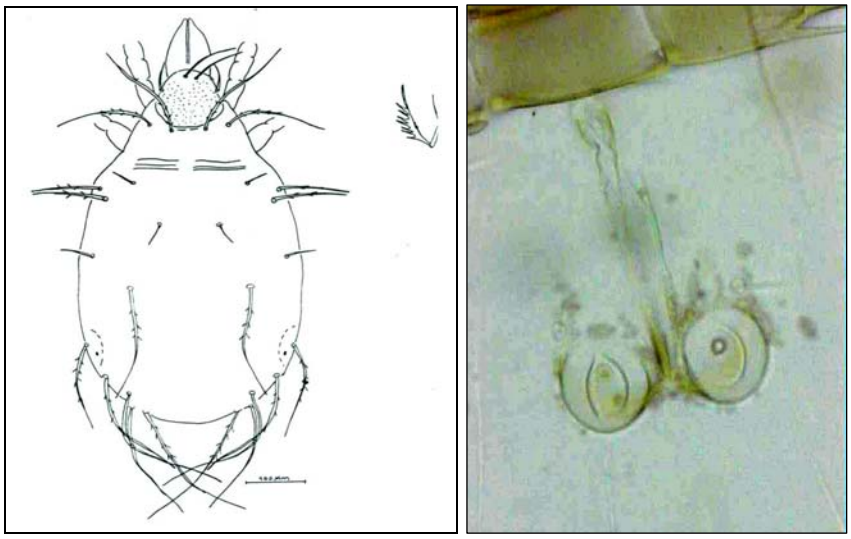
obvious head. Supra coxal setae pectinated and has relatively short extensions (Figure 2a).

Male: A pair of genital sucker are obvious and placed on the ventral side of posterior hysterosoma (Figure 2b). Tarsi IV have a pair tarsal sucker and placed on the first part of segment.

Material examined: Elazığ: Keban, 16.05.2000 (7♀♀, 1♂, 1N).

Comments: *T. similis*, has been collected from grassland and on some vegetables such as spinach. It was reported from Australia, Belgium, England, Germany, Holland, New Zeland and U.S.A. (Hughes, 1976).

It was previously reported from stored products in Ankara and Thrace provinces of Turkey (Acıcan et al., 1993; Kılıç & Toros, 2000).



a *b*

Figure 2. *Tyrophagus similis* Volgin, 1946 (Astigmata: Acaridae), (a) dorsum and supra coxal seta (female), (b) genital suckers (male).

***Tyrophagus putrescentiae* (Schrank, 1781)**

Female: Idiosoma length: 388.33±40.90 (345-470) µm and width: 205.00±15.20 (185-235) µm, (n=3). Hysteroma with the dorsal setae (d1) similar in length of lateral setae (la); d2, 2.00-3.50 times longer than the d1 or la. The solenidion on the tarsi I is longer and gradually become thicker. Supra coxal setae pectinated and has relatively long extensions (Figure 3).

Male: Idiosomal length 383.33±69.04 (260-500) µm, and width: 191.66±13.57 (165-210)µm (n=3). Male similar to females. It has a pair of obvious genital suckers on the ventral side of posterior hysterosoma.

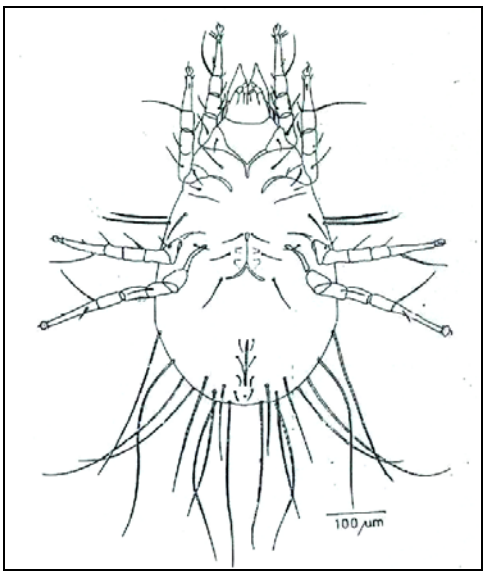


Figure 3. *Tyrophagus putrescentiae* (Schrank, 1781) (Astigmata: Acaridae), ventrum (female).

Material examined: Malatya: Centrum, 11.05.2001 (1♂); 17.02.2002 (1♀); Hanım farm, 23.03.2001 (6♀♀); 17.02.2002 (1♀). İzmir: Gaziemir, 21.06.2000 (2♂♂, 1♀, 1N); Kemalpaşa-Ören, 12.11.2000 (2♂♂, 1♀); 13.12.2000 (1♀).

Comments: *T. putrescentiae* is a cosmopolitan species. It was reported from Canada, Czech Republic, China, England, Poland and Russia from different stored products and bee hives (Sinha, 1963; Zdarkova, 1967; Hughes, 1976).

This species was reported from dried figs for the first time in Turkey (Özar et al., 1986). It was previously reported from different stored products and house dust in İzmir, Edirne and Ankara (Özer et. al., 1989; Acıcan et al., 1993; Çobanoğlu, 1996; Kılıç & Toros, 2000).

***Caloglyphus* Berlese, 1923**

***Caloglyphus mycophagus* (Megnin, 1874)**

Female: Idiosomal length: 290 µm and width: 145 µm (n=1). On the hysteroma, scapular external (Sce) four times or more longer than the scapular internal (Sci), vertical external unconspicous. Dorsal setae (d1, d2) and (la) similar in length. All the other setae at the end of the body are not too long. Tarsi I short, the solenidion on the tarsi I is larger and big head. The setae on pretarsi (ra, f) is ended leaf shaped (Figure 4).

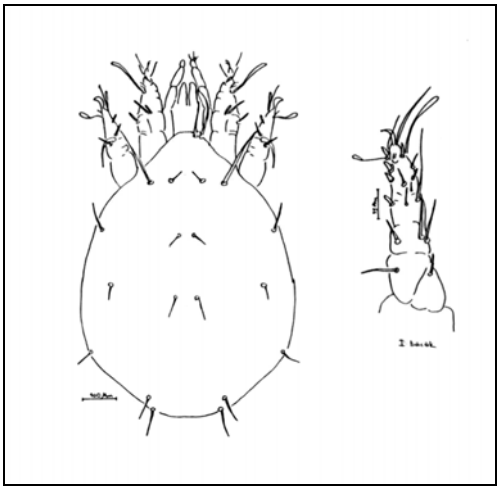


Figure 4. *Caloglyphus mycophagus* (Megnin, 1874) (Astigmata: Acaridae), dorsum (female) and leg (I).

Material examined: Elazığ: Keban, 16.05.2000 (1♀).

Comments: This species was previously reported from house dust in Turkey (Acıcan et al., 1993). *C. mycophagus*, was reported from cultivated mushrooms in England and France (Hughes, 1976).

Carpoglyphidae

***Carpoglyphus* Rubin, 1869**

***Carpoglyphus lactis* (Linnaeus, 1758)**

Female: Idiosoma length: 416.84±10.97 (335-500) µm and width: 259.47±11.78 (185-345) µm (n=19). On the hysteroma the dorsal setae (d1, d2) and (la) small and blunt shaped at tip.

Male: Idiosomal length 363.33±15.01 (290-550) µm, and width: 215.25±10.07 (155-330) µm (n=20). It has a pair of obvious genital sucker on the ventral side of posterior hysterosoma. Idiosoma colourless, oval and shiny. There is no obvious line between hysterosomal and propodosomal plates. The ventral apodeme of legs I and II developed very well and joined ventrally. The setae on hysterosoma are straight. All the claws are well developed and attach at the pair of conydylophore to the legs.

Material examined: Malatya: Battalgazi, 13.07.2000 (1♀, 1♂, 1N); Centrum, 09.06.2000 (17♀♀, 10♂♂, 3N); 15.06.2000 (1♂, 1N); 21.06.2000 (3♀♀, 1♂); 11.07.2000 (2♀♀, 1N); 12.07.2000 (8♀♀, 4♂♂, 1N); 13.07.2000 (6♀♀, 1♂); 02.08.2000 (2♀♀, 1♂); 12.12.2000 (2♀♀); 23.03.2001 (12♀♀, 6♂♂, 1N); 11.06.2001 (2♀♀); 14.08.2001 (12♀♀, 5♂♂, 5N); 17.02.2002 (4♀♀, 2♂♂); 18.02.2002 (3♀♀); Hanım farm, 17.02.2001 (2♀♀, 1♂); Kale, 11.07.2000 (2♀♀, 1N); Darende, 12.07.2000 (2♀♀, 1♂); Yazıhan, 12.12.2000 (1♀); 23.03.2001

(2♂♂). Elazığ: Baskil, 21.07.2000 (1♂, 4N); 02.08.2000 (16♀♀, 2♂♂); Keban, 13.07.2000 (1♀, 2♂♂). İzmir: AQD, 19.07 2000 (16♂♂, 2N); 16.08.2000 (68♀♀, 25♂♂, 18N); 19.09.2000 (1♀, 1♂); 17.10.2000 (1♀); 14.11.2000(1♀); 12.12.2000 (5♀♀); 20.02.2001 (4♀♀, 3♂♂) ; 17.04.2001 (13♀♀, 5♂♂, 2N); 15.05.2001 (6♀♀, 3♂♂,1N); 12.06.2001 (2♀♀); 11.09.2001 (20♀♀, 5♂♂,1N); 10.10.2001 (10♀♀, 1♂, 1N); 8.11.2001 (2♀♀); 05.12.2001 (10♀♀, 5♂♂); 23.01.2002 (3♀♀); Bornova, 15.05.2001 (5♀♀, 2♂♂, 8N); 12.06.2001 (2♀♀); Çamdibi, 18.07.2000 (21♀♀, 5♂♂); 15.08.2000 (9♀♀, 8♂♂, 1N); 19.09.2000(2♀♀); 12.06.2001 (2N); 11.09.2001 (2♀♀); 10.10.2001(1♀, 1♂); 06.11.2001 (2♀♀); 08.11.2001 (2♀♀); Gaziemir, 21.06.2000 (17♀♀, 9♂♂, 2N); Işıkkent, 15.08.2000 (16♀♀, 7♂♂, 2N); 17.10.2000 (2♀♀); 14.11.2000 (4♀♀); 12.06.2001 (2N); 07.11.2001 (5♂♂); Kemalpaşa-Ören, 25.04.2000 (9♀♀, 8♂♂, 2N); 21.06.2000 (45♀♀, 12♂♂, 3N); 19.07.2000 (4♀♀, 1♂); 16.08.2000 (29♀♀, 7♂♂, 2N); 05.09.2000 (2♀♀); 19.09.2000 (1♂); 19.10.2000 (8♀♀, 2♂♂, 1N); 14.11.2000 (12♀, 8♂♂, 1N); 13.12.2000 (8♀♀); 17.01.2001 (3♀♀, 11♂♂, 1N); 21.02.2001 (1♀); 16.04.2001 (14♀♀); 16.05.2001 (5♀♀); 13.06.2001 (7♀♀, 1♂, 2N); 15.08.2001 (2♀♀); 12.09.2001 (3♀♀, 2♂♂, 5N); 10.10.2001 (1♀); 02.11.2001 (8♀♀, 7♂♂); 30.01.2002 (5N); 21.02.2002 (1♀); 26.02.2002 (5♀♀, 2♂♂, 1N); 26.03.2002 (1♀, 5♂♂, 3N); Menemen, 26.04.2000 (2♂♂); 25.05.2000 (7♀♀, 8♂♂, 1N); 15.08.2000 (18♀♀, 10♂♂); 10.09.2001 (9♀♀, 1♂, 2N); 27.03.2002 (4♀♀).

Comments: *C. lactis*, was found in all three provinces. It was found very common and high density in some dry apricot samples (Figure 5).

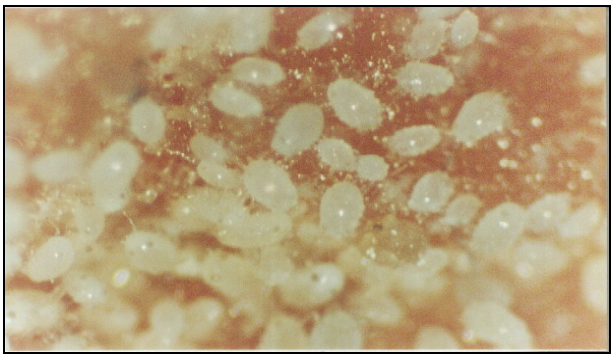


Figure 5. *Carpoglyphus lactis* (Linnaeus, 1758) (Astigmata: Carpoglyphidae), population on dried apricots (samples from İzmir).

We collected 865 specimens which 551 are females, 251 males identified. 711 specimens were obtained from İzmir, 128 were from Malatya and 26 were from Elazığ. It is considered that 69.14 % of the obtained mites belong to this species. This value is 96.86 % of the harmful mites. Some of the apricot samples were over populated with this species. *C. lactis* feed by sketching of the apricot surface and sucking the dew of the food and gradually disconcerted

the chemical structure. This is a very common species occuring in stored products and dried fruits in Turkey (Özer et al., 1989).

C. lactis, was reported from beehives and on different seeds in Poland. It is infected sun flower seeds and reported on food which have high lipid and protein content (Chmielewski, 1972; 1992). It is also reported from dried fruit, pollen, cocoa beans, groundnuts and beehives in Argentina, Europe and North America (Zdarkova, 1967; Hughes, 1976).

Tenuipalpidae

***Cenopalpus* sp.**

This group is known as false spider mites and they are very small.

Material examined: İzmir: Centrum-Konak, 03.04.2000 (1♀).

Comments: False spider mites are very common mites in orchards and ornamental trees in Turkey. Tenuipalid samples were reported on stored nuts from Black sea provinces of Turkey (Özman & Zdarkova, 2000).

Beneficial Mites

Prostigmata

Cheyletidae

The members of this family include important species prey on mites and eggs of small insects. It is important to use beneficial agents for controlling stored product pests (Bruce & Le Cato, 1979).

***Cheyletogenes* Oudemans, 1905**

***Cheyletogenes ornatus* (Canestrini & Fanzago, 1876)**

Female: Idiosoma length: 390µm and width: 240µm (n=1). Hysterosoma global shape and the dorsal setae fan shaped. The members of this species are pale yellow in colour, gnathosoma well developed and their peritreme are 'm' shaped. They don't have claw on leg I.

Material examined: Malatya: Centrum, 18.07.2000 (1♀).

Comments: *C. ornatus*, is a rear species in Turkey especially associated with bulbaceous plants and stored products. *C. ornatus* is regarded an important agent in the natural control of various scale insects and mite species in orchards (Baker, 1949; Avidov et al., 1968; Summers & Price, 1970). *C.ornatus* is reported from Europe, Israel, North and South Africa and U.S.A. (Hughes, 1976).

Stigmaeidae

***Stigmaeus* sp.**

Material examined: Malatya: Centrum, (1♀), 18.07.2000.

Comments: They are more abundant in orchards (Çobanoğlu & Özman, 2002). Stigmaeid species are predators on phytophagous mites in orchards and they are known pollenophagous.

Mesostigmata

Five mesostigmatid species are identified from dried apricot storages in Turkey (Table 2).

Ascidae

***Blattisocius* Keegan, 1944**

Fixed digit of chelicera (Df) has setiform pilus dentilis. Dorsal shield entire female with ventro-anal shield with two to six ventrianal setae.

***Blattisocius tarsalis* (Berlese, 1918)**

Female: Idiosomal length: 607.33±20.06 (510-755) µm and width: 326.66±13.40 (245-440) µm (n=15). This is a very common predatory mite species in storages. They are elongated mites, characterized by a relatively short peritreme, it is reaching about posterior margin of Coxa II. Fixed digit of the chelicera very short than the movable one and without teeth. Ventrianal plate longer than its width and bears three pairs preanal setae.

Male: Idiosomal length 536.81±24.22 (400-685) µm, and width: 275.90±15.40 (200-370) µm (n=11). Male is similar to female. Chelicera of male changed and as (r) shaped.

Material examined: Malatya: Battalgazi, 13.07.2000 (1♀, 1♂, 1N); Centrum, 01.11.2000 (8♀♀, 2♂♂, 4N); 11.05 2001(1N); 11.06. 2001 (4♀♀, 2N); 17.02. 2002 (1♀); Deregezen, 16.05.2000 (1N). İzmir: AQD, 16.08.2000 (7♀♀, 1N); 19.09.2000 (13♀♀, 3♂♂); 17.10.2000 (19♀♀); 17.04.2001 (1♀, 2♂♂, 1N); 10.10.2001 (13♀♀, 5♂♂); 03.01.2002 (7♀♀, 3♂♂); 28.02.2002 (2♂♂, 3N); 28.03.2002 (3♀♀); Çamdibi, 12.06.2001 (4♀♀, 3♂♂, 3N); Gaziemir, 21.06.2000 (1N); Kemalpaşa-Ören, 21.06.2000 (3♀♀, 6♂♂, 3N); 19.09.2000 (1♀, 1♂); 18.04.2001 (2♀♀, 2♂, 3N); 13.06.2001 (7♀♀); 15.08.2001 (4♂♂); 12.09.2001 (2♀♀); Menemen, 15.08.2000 (1♀); Işıkkent, 20.09.2000 (32♀♀, 4♂♂, 2N); 17.10.2000 (14♀♀, 7♂♂, 1N); 14.11.2000 (4♀♀); 18. 07. 2001 (4♀♀, 2♂♂).

B. tarsalis, is very common predatory mites, 223 specimens were collected from dried apricot samples, which of them 17.82 % of mite samples.

Comments: *B. tarsalis* is a very common predatory mite species on small insects and their eggs in İzmir, Black Sea and Thrace provinces of Turkey (Özer et al., 1989; Çobanoğlu, 1996, Kılıç & Toros, 2000; Özman & Zdarkova, 2000). This species was reported from Australia, England, Holland, Israel, Italy, North

Africa, Sweden and U.S.A on *Ephestia* spp., *Plodia* spp. and *Sitotraga* spp. (Lepidoptera: Pyralidae) eggs (Hughes, 1976).

***Blattisocius keegani* Fox, 1947**

Female: Idiosomal length: 563.75±19.83 (530-615) µm and width: 290.00±13.38 (250-305) µm (n=4). This is pale yellow in colour and not very common predatory species in storages. It is very close to *B. tarsalis* in general appearance and its peritreme is much shorter, Fixed digit of the chelicera 2/3 of movable one and includes small theeth.

Material examined: Malatya: Centrum, 13.07.2000 (8♀♀); Darende, 13.07.2000 (1♀); Yazıhan, 13.07.2000 (1♀). İzmir: AQD, 10.10.2001 (1♀); Işıkkent-Bornova, 12.06.2001 (2N); Kemalpaşa-Ören, 15.08. 2000 (2♀♀, 2N); Menemen, 18.07.2000 (3♀♀, 1♂).

B. keegani, mainly collected from İzmir (88.34 %), there wasn't any collection from Elazığ. This ratio shows that 1.68 % mite specimen belongs to this species (Table 2).

Comments: *B. keegani* was obtained from the nests of rats and birds and cultures of *Tribolium confusum* Jacquelin du Val, *T. castaneum* (Herbst) (Coleoptera: Tenebrionidae), *Trogoderma* spp. (Coleoptera: Dermestidae) and *Oryzaephilus surinamensis* (L.) (Coleoptera: Silvanidae) (Hughes, 1976). It was previously reported from stored products in İzmir and on nuts in Black Sea provinces of Turkey (Özer et al., 1989; Özman & Zdarkova, 2000).

***Blattisocius mali* (Oudemans, 1929)**

Female: Idiosomal length: 647.50±25.28 (535-720) µm and width: 329.00±15.52 (300-385) µm (n=6). This is a yellow, brown in colour and not very common species in Turkey. In general appearance it is very close to *B. tarsalis* but its peritreme is longer. Fixed and movable digit of the chelicera equal in length. Ventrianal shield large with four pairs of ventrianal setae (Figure 6 a).

Male: Idiosomal length: 290 µm and width: 250 µm (n=1). Similar to female. Chelicera of male changed and as in Figure (6b).

Material examined: Malatya: Centrum, 14.08.2001 (10♀♀). İzmir: Kemalpaşa-Ören, 24.05.2000 (1♀); 21.06.2000 (6♀♀); 13.06.2001 (7♀♀); 15.08.2001 (1♀); 06.11.2001 (2♀♀); 02.01.2002 (4♀♀).

B. mali, presented by 38 individuals which is 3.03 % of mites. There is not any collection from Elazığ.

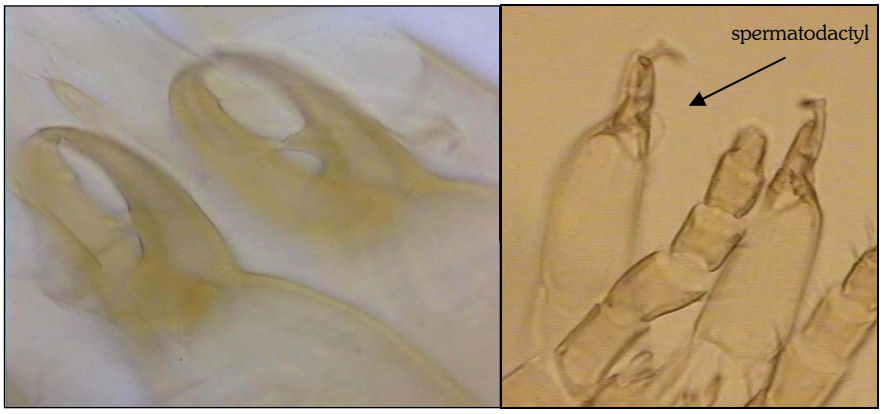


Figure 6. *Blattisocius mali* (Oudemans, 1929) (Mesostigmata: Ascidae), (a) chelicera (female); (b) spermatodactyl (male).

Comments: *B. mali* is a predator of acarid mites and was reported previously from stored products in İzmir (Özer et al., 1989). This species was distributed in England, Holland and Israel (Hughes, 1976).

***Melichares* Hering, 1838**

***Melichares agilis* Hering, 1838**

Female: Idiosomal length: 601.15±12.76 (525-690) µm and width: 256.53±13.80 (205-400) µm (n=13). This is yellow in colour and not very common predatory species in storages.

Material examined: İzmir: Işıkkent, 12.06.2001 (1♀); Kemalpaşa-Ören, 13.06.2001 (15♀♀).

M. agilis, occured 1.28 % mite specimen (Table 2).

Comments: *M. agilis* was reported on *Acarus siro* L. (Astigmata: Acaridae) eggs and young stages. This species found on the dried fruits infected with *C. lactis* and from house dusts (Hughes, 1976). *M. agilis* was previously reported on nuts from Black Sea provinces of Turkey (Özman & Zdarkova, 2000). This species was reported from England, Germany and Holland (Hughes, 1976).

Pachylaelapidae

***Pachylaelaps* Berlese, 1886**

***Pachylaelaps* sp.**

Pachylaelaps species are mostly collected on beetles. They prefer humid and organic areas and feed on fungi and dead insects (Karg, 1994).

Female: They are dark brown in colour and large mites. Idiosomal length: 576.25±34.60 (500-660) µm and width: 361.25±46.92 (240-465) µm (n=4).

Material examined: İzmir: Menemen, 26.04. 2004 (14♀♀, 5N).

Pachylaelaps sp., presented by nineteen individuals and all were from İzmir which is equal to 1.51 % of mites (Table 2).

Comments: *Pachylaelaps* sp. is reported firstly from stored products in Turkey.

Cryptostigmata

The members of this group rarely seen in stored products they mainly found in soil. They are mostly live saprofitic and on deteriorate substance. They are very common in the forest soil and organic matters. Litters and microorganisms are food source for Cryptostigmata. They are known as beetle mites (Hughes, 1976).

Oribatulidae

***Oribatula* s.str. Berlese, 1895**

***Oribatula* (s.str.) *tibialis* (Nicolet, 1855)**

Female: Idiosomal length: 401.50±53.67 (295-525) µm and width: 261.25±61.89 (215-435) µm (n=4). Females are brown in colour and heavily sclerotized. Notogaster is concave at posterior and includes 13 pairs of simple and short setae. Sensilli are elliptic and with small papillae on it (Figure 7).

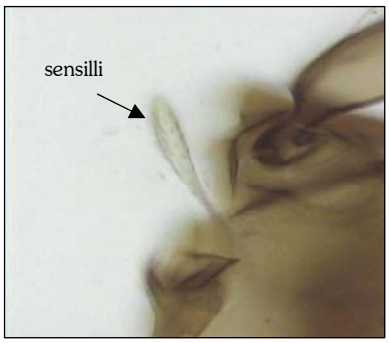


Figure 7. *Oribatula* (s.str.) *tibialis* (Nicolet,1855) (Cryptostigmata: Oribatulidae), sensilli.

Material examined: Elazığ: Maden, 17.09.2000 (2♀♀, 1N). İzmir: Menemen, 26.04.2000 (28♀♀).

O. tibialis, presented by 31 individuals which is 2.48 % mite specimen (Table 2).

Comments: *O tibialis* was previously reported from forest soil in Erzurum (Ayyıldız & Luxton, 1989). This is a cosmopolit species and reported from, Mediterranean countries, North Africa and Spain (Subias & Gil-Martin, 1997).

Tectocepheidae

***Tectocepheus* Berlese 1913**

***Tectocepheus velatus* (Michael, 1880)**

Female: Idiosomal length: 423.57±36.19 (395-510) µm and width: 254.28±33.51 (135-345) µm (n=4). Females are brown in colour and rounded shape.

Material examined: İzmir: Menemen, 26.04.2000 (4♀♀).

From the samples, 0.32 % mite specimen belongs to this species (Table 2).

Comments: *T. velatus*, was previously reported from forest soil in Erzurum (Ayyıldız, 1988). It is reported for the first time in dried apricots in Turkey. This species was reported from Europe and North America (Ayyıldız, 1988).

Cymbaeremaeidae

***Cymbaeremaeus* Berlese, 1896**

***Cymbaeremaeus cymba* (Nicolet, 1855)**

Female: Idiosomal length: 525 µm and width: 435 µm (n=1). Females are dark brown in colour and rounded shape.

Material examined: İzmir: Menemen, 18.07.2000 (2♀♀).

C. cymba, presented by only two individuals and collected from İzmir. This ratio shows that 0.16 % mite specimen belongs to this species (Table 2).

Comments: *C. cymba* was previously reported from natural mushrooms in Ankara. It is reported for the first time in stored apricots in Turkey. This species is distributing Mediterrenean countries and Palearctic provinces (Subias & Gil-Martin, 1997; Grobler et al., 2004; Per & Ayyıldız, 2005).

Scheloribatidae

***Scheloribates* Berlese, 1908**

***Scheloribates* sp.**

Material examined: İzmir: Menemen, 26.04.2000 (2♀♀). This is dark brown and globular shape.

Scheloribates sp. presented by only 2 individuals and collected from İzmir. This ratio shows that 0.16 % mite specimen belongs to this species (Table 2).

Comments: This is first report from stored products in Turkey.

A total of 601 dried apricot samples from Malatya, Elazığ and İzmir were examined. The infestation rate was 22.19 %. The samples from Malatya and Elazığ have lower densities comparing to İzmir.

As a conclusion, the most common harmful mite species is *C. lactis* 69.14 % (865 individuals) and followed by *T. putrescentiae* and *T. similis* on dried apricots. The most abundant beneficial mite species indescending order of frequency of occurrence are *B. tarsalis* (17.82 %), *B. mali* (3.03 %) and *B. keegani* (1.68 %). The most abundant detrivorus mite species indescending order of frequency of occurrence are *O. tibialis* (2.48 %), *T. velatus* (0.32 %) and *C. cymba* (0.16 %).

Özet

Malatya, Elazığ ve İzmir (Türkiye) illerinde depolanmış kuru kayısılar üzerindeki akar türleri (Acari)

Bu çalışmanın amacı, ülkemizde depolanmış kuru kayısılardaki akar türlerinin belirlenmesidir. Örnekler 2000-2002 yılları arasında kayısı yetiştiriciliğinde önemli yeri olan Malatya ve Elazığ ile ihracat merkezi olan İzmir illerinden toplanmıştır. Elde edilen akarların bulunuş sıklıkları ve oranları da değerlendirilmiştir. Çalışmada kuru kayısılardan 11 familya ve 13 cinse ait 16 akar türü saptanmıştır.

Pachylaelaps sp. (Mesostigmata: Pachylaelapidae), *Oribatula tibialis* (Nicolet, 1855) (Cryptostigmata: Oribatulidae), *Tectocepheus velatus* (Michael, 1880) (Cryptostigmata: Tectocepheidae), *Cymbaeremaeus cymba* (Nicolet, 1855) (Cryptostigmata: Cymbaeremaeidae) ve *Scheloribates* sp. (Cryptostigmata: Scheloribatidae), Türkiye'de depolanmış kuru kayısılardan ilk kez saptanmış olup, konukçu olarak ülkemizde ilk kayıt olarak değerlendirilmiştir. Çalışmada 601 kayısı örneği incelenmiş ve bunun 133'ü akarla bulaşık olarak saptanmıştır. Tüm örneklerin akarla bulaşma oranı % 22.19'dur. Depolanmış kuru kayısılarda en yaygın tür *Carpoglyphus lactis* (L.) (Astigmata: Carpoglyphidae) olup, bulaşık örneklerin % 69.14'unu oluşturmaktadır.

Depolanmış kuru kayısı örneklerinde faydalı akar türleri de belirlenmiştir. *Blattisocius tarsalis* (Berlese, 1918) ve *Blattisocius mali* (Oudemans, 1929) (Mesostigmata: Ascidae), en yaygın avcı akar türleridir. *B. tarsalis* faydalı akar türleri arasında en yoğun olarak belirlenen türdür ve faydalı akarların % 62.30'unu oluşturmaktadır.

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