

# Species Composition of Mites Associated with some Stored Leguminous Seeds in Egypt

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## ABSTRACT

Taxonomic survey and species composition of mite species associated with the stored seeds of four legumes and two leguminous bi-products viz., broad bean, kidney bean, cowpea, lentil, crushed broad bean and crushed soybean were carried out during July 2000 – June 2001.

A total of thirty-six mite species belonging to twenty-six genera pertaining to seventeen families of the three mite suborders were collected and identified. Amongst, sixteen species belonging to thirteen genera following six families represented Acaridida; twelve species belonging to eight genera following seven families represented Actinedida and eight species belonging to five genera following four families represented Gamasida.

It could be elucidated that the most common mite species infesting the tested stored legume crops as pests were *Tyrophagus putrescentiae* (Schrank), *Blomia freemani* Hughes, *Lepidoglyphus destructor* (Schrank) and *Glycyphagus domesticus* (Schrank).

Relatively the most abundant species of predacious mites were *Cheyletus malaccensis* Oud. and *Blattisocius mali* (Berlese).

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Additional key words: Acaridida, Actinedida and Gamasida.

## INTRODUCTION

In Egypt, Willcoks (1914) recorded the first information on mites, which were found with stored agricultural crops. Wafa *et al.* (1966) surveyed some mite species causing damage for stored grains and seeds. They mentioned that some mite species usually cause damage to grains. Abd El-Tawab and El-Dinissa (1972) recorded three mite species belonging to one family associated with stored grains and seeds. El-Kifi *et al.* (1974) scored a list of mite pests infested the leguminous crops. Tadros (1984) surveyed mites infesting the stored foot products in Kafr El-Sheikh region. The selected products included legume seeds, such as beans, peas and lentils. Saleh *et al.* (1985 and 1986) surveyed 33 mite species associated with stored products including 15 materials among them fenugreek, whole and broken lentils, and chickpea. Zaher *et al.* (1986) recorded 15 species in eight families belong to Prostigmata, six species in three families belonging to Astigmata and three species in two families belonging to Mesostigmata. Members of the families Cheyletidae and Acaridae were the most common mites found in many samples. Those of Caligonellidae, Ascidae and Raphignathidae were fairly common, but occurred in fewer types of samples. Sharshir and Tadros (1995) scored 15 mite species from Prostigmata, Astigmata and Mesostigmata associated with some cereals, legumes and bi-products in Kafr El-Sheikh. Broad beans hold the majority of pests (61.11%) followed by lentil (27.78%), while soybean was the least

(11.11%). Helal *et al.* (2002) found 20 mite species belonging to eight families associated with fenugreek and other stored products.

Taxonomic survey and comparison of mite species associated with the stored seeds of four legumes and two leguminous bi-products viz., broad bean, kidney bean, cowpea, lentils, crushed broad bean and crushed soybean were studied and discussed.

## MATERIALS AND METHODS

### a. Sample sites:

Amounts of approximately ten-kg form each of four tested legumes and two leguminous bi-products (Table 1) were bought from local markets and transported immediately to the laboratory. Samples of legume crops were cleaned up (sterilized) thermally in an electrical oven at 60°C for about six hours to maintain them free from any insect and/or mite individuals (Fields, 1992 and Baker, 2000). These samples were left in canvas bags for a period of six months for natural infestation under laboratory conditions.

Table 1. The six selected legume and bi-product crops.

No.	Common name	Scientific name
1	Broad bean	<i>Vicia faba</i>
2	Kidney bean	<i>Phaseolus vulgaris</i>
3	Cowpea	<i>Vigna sinensis</i>
4	Lentils	<i>Lens esculenta</i>
5	Crushed broad bean	<i>Vicia faba</i>
6	Crushed soybean	<i>Glycine max</i>

### b. Experimental design:

The work was carried out at the laboratory of Economic Entomology and Agricultural Zoology Department, Faculty of Agriculture, University of Menoufia, Shebin El-Kom from July 2000 through June 2001. A sample of each crop was gathered and placed in a plastic bag. Bags were transported immediately in the same day from the store to the laboratory. It was planned to take 250g from each crop at monthly intervals, replicated three times and transported to the laboratory for extraction.

### c. Extraction methods:

Each sample was put in a piece of cheese cloth of 25 x 25 cm closed from its upper edge by thread and transferred directly to a Battery of modified Tullgren funnel. A 60-watt bulb on top of each funnel served as the heat light source to drive the arthropods downward into a 200 ml glass jar containing 70% ethyl alcohol. It was planned to mark every Tullgren to hold the same material all over time experiment. The process of extraction took place for 48 hours (Sinha, 1964 and Tadros, 1984). After the extraction period, the contents of the

glass jar were transferred to screw-cupped jars, where predacious and scavenging arthropods were held for counting using a stereomicroscope.

#### **d. Clearing and mounting:**

From extracted mites the three mite suborders (Acaridida, Actinedida and Gamasida) were selected and counted. Then mites were transferred in another small pots, by using a very fine camel hairbrush (000) under a binocular-microscope. After the transferring of all mites, they were covered with drops of lactic acid and they left for a period of 3 – 4 weeks to be cleared up. Two types of preparation were used for mites according to Grandjean (1949) and explained by Zaki (1983), the temporary and the permanent preparations.

#### **e. Identification:**

Identification of mite specimens were carried out by using first, the temporary mounted (open preparation) which was easy to study all the specimens positions by the change and move of the individual as desired, using the research microscope under the maximum magnification force. The open mounts, with regard to especial routine identification tasks were more economical in concern to time than the preparations. On the other hand, the permanent mounts were easily handled, ready for an immediate study of different parts of mite specimens, and namely the observed important constant taxonomic characters.

More than 2000 mite specimens from different samples were identified using the keys of Hughes (1976), Krantz (1978) and Zaher (1986).

## **RESULTS AND DISCUSSION**

It is of worthwhile to mention that the monthly estimates of mite's abundance associated with four legume crops and two bi-products in store conditions were represented by the numbers of mites per 250g of each of these samples taken from the six-stored legume crops under consideration. The overall averages were considered as the average of 12 months for inspected sample of each crop.

In order to clarify the relative contribution made to the fauna by the main species of mites, the system of grouping of Davis (1962) and explained by Zaki (1983) has been adopted in which species were grouped into classes on basis of their dominance values or levels. The criteria of dominancy and frequency for mite species are as follows: occasionally under 5%, frequently from 5 to 10% and always over 10%. The obtained data represent the distribution of mite species in various stored legume crops.

In general, the exhibited data in Table 2 revealed that a total of thirty-six mite species belonging to twenty-six genera following seventeen families of the three mite suborders were collected and identified. However, sixteen spices belonging to thirteen genera following six families represented suborder Acaridida. Twelve spices belonging to eight genera following seven families represented suborder Actinedida. Eight spices belonging to five genera following four families represented suborder Gamasida.

It could be elucidated that the most common mite species infesting the stored legume crops as pests were *Tyrophagus putrescentiae* (Schrank), *Blomia freemani* Hughes (Acaridida, Acaridae), *Lepidoglyphus destructor* (Schrank) and *Glycyphagus domesticus* (Schrank) (Acaridida, Glycyphagidae). Relatively the most abundant species of predacious mites were *Cheyletus malaccensis* Oud. (Actinedida, Cheyletidae) and *Blattisocius mali* (Berlese) (Gamasida, Ascidae).

It is noteworthy to mention that, some mite species only associated with one stored legume crop and some others with two stored crops and so on. For instance, *Carpoglyphus lactis* (L.) (Acaridida, Carpo-glyphidae), *Cheyletus trux* (Rohd.) (Actinedida, Cheyletidae) and *Cheyletus* sp. associated with broad bean only. *Hypoaspis sclerotarsus* (Strand.) (Gamasida, Lealapididae), *Digamasellus* sp. associated with kidney bean only. *Amblyseies* sp. associated with cowpea only. *Tyrophagus lini* Sinha (Acaridida, Acaridae), *Dermatophagoides farinae* Hughes (Acaridida, Pyroglyphidae), *Bdella lignicola* (Baker et. Balock) (Actinedida, Bedlidae), *Acarophenax tribolii* (New. et. Duv.) (Actinedida, Acarophenocidae) and *Tydeus kohi* (Thor.) (Actinedida, Tydeidae) were found associated with lentil only. *Cheyletus eruditus* (Schrank) (Actinedida, Cheyletidae) inhabited crushed soybean only. In addition, *Rhizoglyphus robini* (Claparede) (Acaridida, Acaridae), and *Euroglyphus longior* (Trouessart) (Acaridida, Pyroglyphidae) infested stored broad bean and lentil crops, while *Cheyletus trouesarti* (Oud.) inhabited stored cowpea and crushed broad bean crops.

Herein after, the numbers of mite associated with each of the six store legume crops were recorded in Table 2 and could be explained as follow:

- a. A total of twenty-three mite species following sixteen genera belonging to eleven families associated with stored broad bean crop.
- b. A total of fifteen mite species following thirteen genera belonging to nine families associated with stored kidney bean crop.
- c. A total of eighteen mite species following fourteen genera belonging to nine families associated with stored cowpea crop.
- d. A total of twenty-six mite species following twenty genera belonging to fourteen families associated with stored lentil crop.
- f. A total of fifteen mite species following eleven genera belonging to eight families associated with stored crushed broad bean crop.
- i. A total of fifteen mite species following eleven genera belonging to eight families associated with stored crushed soybean crop.

Among the present faunistic survey for mites, fourteen mite species were recorded associated with the six-stored legume crops similar to those of Sinha (1964). Also, Chould-Hurry and Mukherjee (1972) who stated that the most common mite species as pests were *T. putrescentiae*, *Glycyphagus* sp., while *C. eruditus*, *B. keegani* were predator species.

The previous results are in line with those of Taha (1985) who recorded sixty-five species belonging to thirty-four genera under twenty families and four

suborders of mites associated with stored products. **Gabrial (1990)** recorded 28 mite species belonging to 14 families infesting stored grains and its bi-products in Kafr El-Sheikh.

**Hoda et al. (1990)** surveyed the prostigmatid mite fauna associated with stored products including 23 sources among them cowpea, broad bean and bean. Twenty-three species that belong to eleven genera and six families of Prostigmata were collected and recorded from 23 samples of different stored products. Eight species were from family Cheyletidae.

**Mostafa and Shokeir (1994)** found that 23 mite species represented eight families belonging to Actinedida, 21 species represented six families belonging to Acaridida and 12 species represented six families belonging to Gamasida associated with stored products.

**Tadros and Gabrial (1994)** investigated 24 materials including six legumes and bi-products for susceptibility to mite infestation during 38 months. The major mite species were *A. siro*, *T. putrescentiae*, and *C. malaccensis*. *Vicia faba* was the least infested crop.

The previous results are supportive of the findings of **Longshu et al. (1997)** who asserted that the acaridid mite *T. putrescentiae* was the most common species followed by *Suidasia nesbitti*, *L. destructor*, *C. plumiger* and *Carpoglyphus lactis*.

**Rezk (2000)** stated that the most common mite species associated with stored products are those of family Acaridae (27.69%) followed by the families Ascidae (19.7%) and Cheyletidae (11.2%).

**Palyvos et al. (2002)** found thirty-seven mite species belonging to twenty-three families associated with stored products. As to the criteria of dominancy and frequency, the species *L. destructor* was found to be dominant and accessory *C. arcuatus* was found dominant but accidental.

Noticeably, the above cited mite suborders, detected infesting or associating with stored legume crops are similar to those found associating with stored onion and garlic crops as mentioned by **Zaki et al. (2003)**, who showed that a total of thirteen mite species following ten genera belonging to seven families of three mite suborders were collected and recovered from straw under stored onion and garlic crops in the investigated stores at Alexandria and Quisna regions. The proportions of the three suborders Acaridida, Actinedida and Gamasida were 54.2%, 27.5% and 18.3% and represented by four, five and four species, successively.

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Table 2: A list of mite species recovered from six-stored legume crops during July 2000 – June 2001.

Suborder of Acari	Family	Mite species	Stored Legume Crops					
			BB	KB	C	L	CB	CS
<b>Acaridida</b>	Acaridae	<i>Tyrophagus putrescentiae</i> (Schrank)	***	***	***	***	***	***
		<i>Tyrophagus lini</i> Sinha	-	-	-	*	-	-
		<i>Blomia freemani</i> Hughes	*	***	**	*	**	***
		<i>Aleuroglyphus ovatus</i> (Troupean)	-	*	-	*	-	*
		<i>Rhizoglyphus robini</i> (Claparede)	*	-	-	*	-	-
	Glycyphagidae	<i>Lepidoglyphus destructor</i> (Schrank)	***	***	***	***	***	***
		<i>Glycyphagus domesticus</i> (De Geer)	***	***	***	***	***	***
		<i>Glycyphagus destructor</i> (Schrank)	*	-	*	*	-	**
		<i>Gohieria fusca</i> (Oudemans)	*	-	*	-	*	-
	Pyroglyphidae	<i>Dermatophagoides farinae</i> Hughes	-	-	-	*	-	-
		<i>Euroglyphus longior</i> (Trouessart)	*	-	-	*	-	-
		<i>Aeroglyphus robusta</i> (Coor)	-	-	*	*	-	*
	Suidasidae	<i>Suidasia medanensis</i> (Oudemans)	*	*	*	*	-	-
		<i>Suidasia nesbetti</i> Hughes	*	-	-	*	-	-
	Chortoglyphidae	<i>Chortoglyphus arcuatus</i> (Troupean)	*	-	-	*	*	-
	Carpoglyphidae	<i>Carpoglyphus lactis</i> (L.)	*	-	-	-	-	-

Where BB = Broad bean, KB = Kidney bean, C = Cowpea, L = Lentil, CB = Crushed broad bean, CS = Crushed soybean and \* = Occasionally, \*\* = Frequently and \*\*\* = Always



Table 2: (1 Continued): A list of mite species recovered from six-stored legume crops during July 2000 June 2001.

Suborder of Acari	Family	Mite species	Stored Legume Crops					
			BB	KB	C	L	CB	CS
<b>Actinedida</b>	Cheyletidae	<i>Cheyletus malaccensis</i> Oudemans	**	**	**	**	**	**
		<i>Cheyletus eruditus</i> (Schrank)	-	-	-	-	-	*
		<i>Cheyletus trouesarti</i> (Oudemans)	-	-	*	-	*	-
		<i>Cheyletus trux</i> (Rohdendorf)	*	-	-	-	-	-
		<i>Cheyletus</i> sp.	*	-	-	-	-	-
		<i>Acaropsis sollers</i> (Rohdendorf)	*	-	*	*	*	-
	Cunaxidae	<i>Cunaxa capreolus</i> (Berlese)	*	*	-	*	*	*
	Pyemotidae	<i>Pyemotes herfsi</i> (Oudemans)	*	-	*	*	*	-
	Bdellidae	<i>Bdella lignicola</i> (Baker et Balogh)	-	-	-	*	-	-
	Acarophenocidae	<i>Acarophenax tribolii</i> (New. et Duv.)	-	-	-	*	-	-
Tydeidae	<i>Tydeus kohi</i> (Thor.)	-	-	-	*	-	-	
Phytoseiidae	<i>Amblyseius</i> sp.	-	-	*	-	-	-	
<b>Gamasida</b>	Ascidae	<i>Blattisocius keegani</i> (Fox)	-	*	*	*	-	*
		<i>Blattisocius mali</i> (Berlese)	*	**	*	**	*	*
		<i>Blattisocius tarsalis</i> (Berlese)	*	-	-	*	*	-
	Amerosiidae	<i>Kleemaniania plumigera</i> (Oudemans)	*	*	*	*	*	*
		<i>Kleemaniania plumosa</i> (Oudemans)	*	*	*	*	*	*
	Lealapididae	<i>Androlealaps casalis</i> (Berlese)	*	*	*	*	-	*
		<i>Hypoaspis sclerotarsus</i> (Strand.)	-	*	-	-	-	-
Digamasellidae	<i>Digamasellus</i> sp.	-	*	-	-	-	-	

## الملخص العربي تركيب أنواع الحلم المصاحبة لبذور بعض محاصيل البقوليات المخزونة في مصر

أمينة محمد زكى ١ ، سعد السيد سالم ١ ، على أحمد عثمان ١ ، محسن عطية محمد أبو طايش ٢  
١- قسم الحشرات الاقتصادية والحيوان الزراعى ، كلية للزراعة جامعة المنوفية.  
٢- محطة البحوث الزراعية ، سخا ، كفر الشيخ .

تم إجراء حصر تسميى وتركيبى لأنواع الحلم المصاحب لأربعة من المحاصيل البقولية وهى الفول البلدى ، الفاصوليا ، اللوبيا ، العدس واثنان من الناتج الثانوى للبقول هى الفول البلدى المجروش وفول الصويا المجروش لمدة عام من يوليه ٢٠٠٠ إلى يونيو ٢٠٠١ .  
وجد أن العدد الكلى لأنواع الحلم الموجودة التى جمعت وصنفت ناهز ٣٦ نوعاً تمثل أو تندرج تحت ٢٦ جنساً تتبع ١٧ عائلة تنتمى لثلاث تحت رتب أكاروسية . حيث مثلت تحت رتبة الأكاريديدا بـ ١٦ نوع تمثل ١٣ جنس تتبع ست عائلات ؛ الأكتيبيدا مثلت بـ ١٢ نوع لثمانية أجناس تتبع سبع عائلات ؛ الجماسيدا مثلت بثمانية أنواع لخمس لجناس تتبع أربع عائلات . وقد لمكن إيضاح أن أكثر أنواع الحلم شيوعا التى تصيب محاصيل البقوليات الست المخزونة كآفات هى :

***Tyrophagus putrescentiae*, *Blomla freemani*, *Lepidoglyphus destructor*,  
*Glycyphagus domesticus* . وكانت أكثر أنواع الحلم المقترس من حيث تعدادها النسبى هى  
*Blattisocius mali* و *Cheyletus malaccensis***