

## Phytophagous and Predacious Mites of Economic Importance on Date Palms in Dakahleya and New Valley Governorates

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### ABSTRACT

Phytophagous mites and their natural enemies associated with the date palm trees, *Phoenix dactylifera* L. in two environmental localities (Gamassa village, Dakahleya Governorate and El-Kharga village, New Valley Governorate) were studied from April 2016 to March 2017. Correlation between population density of studied mites and weather factors (minimum and maximum temperature) at both Governorates over the year was reported. The survey revealed the presence of 13 species of 11 genera belonging to nine families in Gamassa village, while mites of El-Kharga village were two mite species belonging to two families and three species of predators of low populations.

**Keywords:** *Colopalpus eriophyoides*, date palm trees, phytophagous mites, *Phyllozetanymus aegypticus*, predaceous mites, Tenuipalpidae, Tetranychidae.

### INTRODUCTION

The date palm trees, *Phoenix dactylifera* L. are distributed all over Egypt, widely cultivated in arid region of the Middle East and North Africa. Arab countries however contain 78.3% of the total world date palm trees, which demonstrated 75% of the production (El-Sebay and Abbas 2008). Survey of mites associated with palm trees was studied by many authors; El-Sanady and Mohamed (2013), Radwan and Attia (2013) and Mesbah (2014).

Tetranychidae and Tenuipalpidae are families of the subclass Acari, which form an important part of the class Arachnida, which contain most of the known mite species of worldwide distribution that have an economic importance as plant pests; therefore, these mites cause serious damage to agricultural crops, and ornamental plants. (Jeppson *et al.*, 1975). Their feeding results in the removal of chlorophyll and causes a silvery appearance to the plant tissue due to total light reflection in the air penetrated epidermal cells (Kloft and Kunkel, 1969). This appearance turns later to be rusty, heavy infestations result in a blotching, stippling or bronzing of the leaves, sometimes accompanied by leaf fall and fruit may be scarred. These mites are considered to be among the most important pests of agricultural crops worldwide.

Using natural enemies as a biological control is an alternative and effective strategy to manage different pests in agricultural systems. Most of the well-known and most efficient predators against phytophagous mite pests in the field belong to family Phytoseiidae. In addition, families Stigmaeidae, Cheyletidae, Cunaxidae, Bdellidae and Eupalopsellidae contain predaceous species that can play an important role on the complex of phytophagous mites, eggs and immature stages of small insects (Zaher 1986).

This work aimed to mention the appearance of the phytophagous mites of economic importance on the date palm trees with their occurrence, and their associated predatory mites in Dakahleya and New Valley Governorates.

### MATERIALS AND METHODS

Two field experiments were conducted in two different environmental localities, "El-Kharga", new valley Governorate, Southern of Egypt and "Gamassa", Dakahleya Governorate, North of Egypt in order to survey the different phytophagous mites infesting date palms, *P.*

*dactylifera* and their associated natural enemies. Minimum and maximum temperatures were obtained from the Meteorological Station of Central Laboratory for Agricultural Climate (CLAC), Agriculture Research Center, during the period of study.

#### Counting of the phytophagous mites

An old orchard of more than 100 palm date trees, "semi dry" variety (common name: Saeidy) located in El-Kharga, and another orchard in Gamassa (50 palm date trees) were chosen to survey the phytophagous mites on palms. The two orchards received all normal agriculture practices where the date palm trees were sprayed with sulfur in June against insects and spider mite pests.

In El-Kharga village, three palms were selected representing the entire orchard; monthly samples of 30 fronds were randomly picked from three age stages of palm fronds (old, moderate and new age) and continued for a year (2016-2017). Each age stage of 10 fronds was individually placed into paper bags and transferred to the laboratory. In Gamassa village, 20 fronds from four palm trees were randomly picked up and continued for the same period. Numbers of adults, nymphs and larvae attacked the leaf surfaces and their associated natural enemies were recorded by the aid of the Stereo-binocular microscope. Mites were isolated by using a fine camel hairbrush and mounted in Hoyer's medium (Perring *et al.*, 1996) on glass microscopic slides for identification. The specimens were examined using a light microscope. Sampling continued monthly for one year. The identification of mites based on keys given by Krantz and Walter (2009), Zaher (1986) and Al-Gboory (1987).

#### Data Analysis

Analysis of variance was conducted by one-way ANOVA to determine the significance among means of the frond age stages by using the portable statistical analysis SAS 9.3.1. Whereas the means were compared through LSD tests at 0.05 level (Wilkinson and Leland, 1999).

The simple Correlation coefficient was also calculated by using Pearson Simple Correlation Coefficient Calculator (\*).

### RESULTS AND DISCUSSION

#### Population abundance of mites infesting palms in Gamassa village

Obtained results of mites collected from date palms in Gamassa indicated the occurrence of four species of

phytophagous mites, five species of predaceous mites and four saprophagous mites, which belong to three orders, nine families and eleven genera as shown in (Table 1 and Fig. 1).

**A- Phytophagous mites**

These mites represented 32.37 % of the total collected mites (504.35 individuals) in the study, comprise four genera belonging to two families as follow:

**1- Family Tetranychidae Donnadieu**

Two genera were recorded from this family on date palm trees representing together 60.4 % of the total collected phytophagous mites (163.25 individuals)

**The dust mite, *Oligonychus afrasiaticus* Mc Gregor**

This pest collected from date fruits and the upper surface of fronds, the abundance of this pest fluctuated in spring and autumn months with high population, while the highest peak was observed in June, which averaged 11.55

individuals when temperature ranged between 24 - 32°C. The total abundance of this pest throughout the study was 58.3 individuals / frond representing 35.8% of the collected phytophagous mites (Table 1). Low temperature during December to February reduced the population.

*O. afrasiaticus* was collected also from date fruits in April and May, where its abundance on dates exceeded their occurrence on fronds (12 individuals in April), producing scar tissues on date skin, causing it to harden crack and shrivel with subsequent reduction in fruit grade marketing.

This result coincides with Negm *et al.*, (2007) who reported that *O. afrasiaticus* infests leaves and feeds on date palm on both sides, mainly along the midrib and at high infestation levels.

**Table 1. Population of the different mite species associated with date palm trees in Gamassa village**

Mites	Mar-	Apr-	May	Jun-	Jul-	Aug-	Sep-	Oct-	Nov-	Dec-	Jan-	Feb-	Total	Percentage	
Phytophagous mites															
Tetranychidae															
<i>Oligonychus afrasiaticus</i>	6.9	9.85	8.1	11.55	0	0	8	11.05	2.85	0	0	0	58.3	32.37%	
<i>Eutetranychus orientalis</i>	6.25	5.1	5.3	6.45	0.9	0	6.1	9.1	1.25	0	0	0	40.45		
Tenuipalpidae															
<i>Raoiella indica</i>	2.1	3	3.65	1.8	0	0	3.2	1.55	0	0	0	0	15.3		
<i>Brevipalpus obovatus</i>	8.05	8.3	4.1	3.8	1.8	0	6.55	8.7	7.9	0	0	0	49.2		
<b>Total</b>	<b>23.3</b>	<b>26.25</b>	<b>21.15</b>	<b>23.6</b>	<b>2.7</b>	<b>0</b>	<b>23.85</b>	<b>30.4</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>163.25</b>		
Predaceous mites															
Phytoseiidae															
<i>Amblyseius hutu</i>	8.9	7.7	5.35	4.1	0	3.05	8	11.05	10.4	0	0	0	58.55	34.67%	
<i>Amblyseius swirskii</i>	4.85	6.05	2.9	0.7	0	0	9.25	9.25	7	0	0	0	40		
Stigmaeidae															
<i>Agistemus exsertus</i>	5.95	4	2.9	4.85	0	0	3.2	9.25	2.45	0	0	0	32.6		
Cheyletidae															
<i>Cheletogenes ornatus</i>	0	2.1	0	0	0	0	3.2	1.3	3.65	0	0	0	10.25		
Eupalopsellidae															
<i>Saniosulus nudus</i>	5.95	4.8	2.9	1.2	0	0	9.25	7.1	2.25	0	0	0	33.45		
<b>Total</b>	<b>25.65</b>	<b>24.65</b>	<b>14.05</b>	<b>10.85</b>	<b>0</b>	<b>3.05</b>	<b>32.9</b>	<b>37.95</b>	<b>25.75</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>174.85</b>		
Miscellaneous mites															
Tarsonemidae															
<i>Tarsonemus stiffer</i>	8.05	7.7	5.35	9.15	0	0	7.9	11.5	5.85	0	0	0	55.5	32.96%	
<i>Tarsonemus gladifer</i>	8.9	12.65	6.75	4.95	0	0	10.75	11.95	2.6	0	0	0	58.55		
Tydeidae															
<i>Tydeus californicus</i>	5.05	3.7	4.9	2.15	0	0	4.8	6.45	3.2	0	0	0	30.25		
Acaridae															
<i>Tyrophagus putrescentiae</i>	1.6	7.4	3.8	0	0	0	3.1	5.3	0.75	0	0	0	21.95		
<b>Total</b>	<b>23.6</b>	<b>31.45</b>	<b>20.8</b>	<b>16.25</b>	<b>0</b>	<b>0</b>	<b>26.55</b>	<b>35.2</b>	<b>12.4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>166.25</b>		
Mini Temp.	15	19	23	24	24	26	24	22	15	10	11	10			
Max. Temp.	26	33	37	32	33	37	38	27	25	16	15	15			

**Mean numbers of mites on date palm trees/ fonds in Gamassa village**

**The citrus brown mite, *Eutetranychus orientalis* Klein**

The total abundance of this pest throughout the study was 40.45 individuals / frond with two annual peaks, in June and October of means 6.45, 9.1 individuals, respectively, at temperature ranged between 24-32°C and 22-27°C in the two previous months, respectively (Table 1).

It was observed that *E. orientalis* was active on palm trees during moderate temperature between 22-32°C,

while low temperature during winter months reduced the populations.

These results matched with that of El-Sanady and Mohamed (2013) who recorded the two mite pests, *O. afrasiaticus* and *E. orientalis* on both Zaghloul and Sewi varieties in Giza and Suhag Governorates.

## 2- Family Tenuipalpidae Berlese

### The red palm mite, *Raoiella indica* Hirst

The population abundance of these tenuipalpid mites appeared in low numbers in spring and autumn months, the highest peak was recorded in May (3.65 individuals) when the temperature ranged between 23-37°C, but disappeared in winter months. This result corresponds to that of Mesbah (2014) who proved the abundant of this pest in spring months.

Rodrigues *et al.* (2007) recorded this mite feeding close to the leaf midrib in the two sides of the leaf caused curling and drying of the leaflet tips and the mites remaining in the protected leaf fold and leaves become pale green, then yellow, and finally a copper-brown. Moreover, Burkle (2014) mentioned the early and advanced damages and the reducing fruit yield caused by *R. indica* feeding on palm fronds.

### Privet mite, *Brevipalpus obovatus* Donnadieu

The field study revealed the presence of this pest infesting date fruits and fronds preferring the lower surface around the midrib. These mites were collected in spring and autumn as recorded in Table (1) and Fig. (1). Two peaks were recorded, the first peak was in March and April (8.05, 8.3 individuals) while the second one was in October and November (8.7, 7.9 individuals), respectively. The temperature ranged between 15-33°C and 15-25°C in spring and autumn, respectively. These mites representing 30.1 % of the total collected phytophagous mites (163.25 individuals). Moreover, these mites were collected from dates in April and May where their abundance on dates exceeded their occurrence on fronds (14 individuals in April).

Our results agree with those of Mesbah (2014) who registered *E. orientalis*, *B. obovatus* and *Raoiella indica* from date palm trees in Giza Governorate. Childers *et al.* (2003) recorded *Brevipalpus* mites on numerous plants especially on fruits, leaves, stems, twigs, and bud tissues.

## B – Predaceous mites

Five predatory mites were identified associated with different mite pests infesting date palm trees in Gamasa village, belonging to two suborders, four families, and four genera, which represented 34.67 % of the total collected mites (504.35 individuals).

### 1-Family: Phytoseiidae Berlese

These predatory mites were observed on date palm fruits and fronds preying on different mite pests mentioned before. The field study revealed the presence of two phytoseiid mites, which represented together 56.36 % of the total collected predators (174.85 individuals).

#### *Amblyseius hutu* Pritchard- Baker

#### *Amblyseius swirskii* Athias- henriot

The fluctuation in the population of these two predatory mites appeared in few numbers in summer and disappeared in winter. Two peaks were recorded in spring and autumn ranged between 8.9- 11.05 individuals and 6.05- 9.25 individuals for *Amblyseius hutu* and *A. swirskii*, when the temperature ranged between 15-33°C and 15-38°C in spring and autumn, respectively (Table, 1). In addition, these mites were found in association with the phytophagous mites on date fruits ranged between 12, 10 individuals for the two previous species, respectively.

These findings agree with those of El-Sanady and Mohamed (2013) who recorded *A. swirskii* in Giza and Suhag on date palm trees of varieties Zaghoul and Sewei. In addition, Mesbah (2014) registered these two predators on fronds and date fruits on date palms in Giza and Sharkeya.

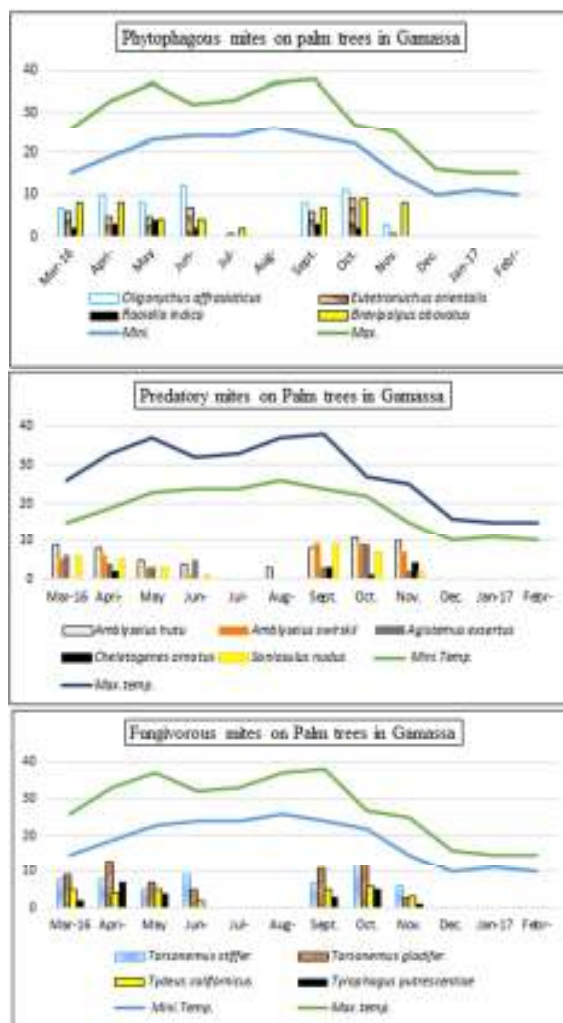


Fig.1. Phytophagous, predaceous and fungivores mites on date palm trees in Gamassa village

## 2- Family Stigmaeidae Oudemans

### *Agistemus exsertus* Gonzalez

Most abundant in October which averaged 9.25 individuals at 22 - 27°C then decreased and disappeared in winter months when temperature ranged between 10-16°C, and identified again in March at 15-26°C.

These results agree with those of El-Halawany and Abou-Setta (2013) who found this predator had one peak in spring and decreased in November then disappeared in winter months; and they reported that it was widely distributed on guava associated with tenuipalpid mites. Moreover, El-Sanady and Mohamed (2013) found this predatory mite in association with pests infesting date palm varieties in Giza and Suhag governorates of zaghoul and sewi varieties as well, it was recorded by Mesbah (2014) in Giza and Sharkeya. Also, Ghallab (2001) was recorded this

predator associated with the spider mite, *Tetranychus urticae*, *Oligonychus mangiferus*, *Scirtothrips mangifera* and different scale insects on mango trees and proved its population abundance reached the peak during September and October. On the other hand, El-Halawany *et al.*, (1990) studied the role of *A. exsertus* in suppressing the population density of *Panoychus ulmi* and *Aculus schlechtendali*. Also, Youssef (1990) and Shoeib (1996) studied its biology on several associated prey species including eggs and immatures of tetranychoid mite, whiteflies on different vegetables, crops and fruits.

Therefore, it can be concluded that *A. exsertus* may play a role in the regulation of the pest populations on date palm trees.

### 3 - Family Cheyletidae Leach

#### *Cheletogenes ornatus* Canestrini and Fanzago

Population of this family was found on date palms associated with phytophagous mites and scale insects. These mites were recorded in few numbers all over the year and its peak was observed in November which averaged 3.65 individuals when temperature ranged between 15-25°C.

Zaher (1986) reared the predator *Cheletogenes ornatus* on eggs and all stages of *T. urticae* Koch, *E. orientalis* Klein, *Cenopalpus pulcher* and both eggs and crawlers of several scale insects, *Chrysomphalus ficus* and *Parlatoria oleae* (Clovée). Moreover, the predator, *C. ornatus* was reared by Ibrahim (1988) on eggs and immature stages of its associated pests, *Brevipalpus californicus* Banks (Acari: Tenuipalpidae) and immature stages of its associated pests, *Brevipalpus californicus*.

### 4 - Family Eupalopsellidae Willmann

#### *Saniosulus nudus* Summers

A single species was recorded in this family, which found in high number of total mean of 33.45 individuals. The peaks of this mite were recorded in September and October of mean count of 9.25, 7.1 individuals, respectively, when temperature ranged between 24- 38°C.

The family Eupalopsellidae is considered as natural enemies of the associated phytophagous pests as proved by Rakha (1977) *S. nudus* was successfully reared on different associated prey of scale insect eggs or crawlers of *Lepidosaphes pallida* (Mask.), *Aonidiella auranti* (Mask.), *Chrysomphalus ficus* (Ashmead), *C. dictyospermi* (Morgan), *L. beckii* New. and *Parlatoria ziziphus* (Lucas). Gerson (1994) in his field studies recorded the predator, *Saniosulus nudus* fed on *Pseudaulacaspis* sp. on dwarf palm and immature stages of its associated pests, *B. californicus*.

### C -The miscellaneous or fungivores mites

Three families were recorded on fronds of date palms that represented in three genera and four species. These families represented 32.96 % of the total collected mites (504.35 individuals)

#### 1- Family Tarsonemidae Kramer

Two species were found on palm trees belonging to this family, which occupied 68.6 % of the total count of fungivores mites (166.25 individuals) as follow:

#### *Tarsonemus stiffer* Ewing

#### *Tarsonemus gladifer* Mahunka

During the current investigation, the population of these two tarsonomid species had high abundance as shown in Table (1) and Fig. (1). The first species, *Tarsonemus stiffer* of total population 55.5 individuals, with three peaks; the first peak was in March, the second was in June and the third peak was in October of population reached 8.05, 9.15 and 11.5 individuals, respectively, when temperature ranged between 15-16, 24-32 and 22-27°C, respectively. The lowest population occurred in May of 5.35 individuals when the temperature raised to between 23-37°C. However, in winter months, the fungivore mites were disappeared at low temperature ranged between 10-16°C, and in high temperature that ranged between 24-37°C in July and August months.

The second tarsonomid mite, *T. gladifer* followed the same trend as the previous one, in addition, it infested the date fruits in May with mean of 16 individuals. The total population was recorded 58.55 individuals, their population of high abundance of two peaks, the first peak was in April (12.65 individuals) and the second one was in September and October (10.75- 11.95 individuals) when temperature ranged between 19-33, 24-38 and 22-27°C in April, September and October, respectively.

Krantz and Walter (2009) proved that members of this family were fed on the thin walled mycelia of fungi.

#### 2- Family: Tydeidae Kramer

#### *Tydeus californicus* Banks

Survey revealed the presence of only one species in this family found in few populations on fronds in months of spring and autumn while the highest abundance was in October that averaged 6.45 individuals when temperature ranged between 22-27°C, while the lowest abundance was 2.15 individuals in June at temperature range of 24-32°C.

These results matches with the results recorded by El-Sanady and Mohamed (2013) in Giza and Suhag governorates.

#### 3- Family Acaridae Latreille

#### *Tyrophagous putrescentiae* Shrank

Only one species collected from this family, that was found with one peak in April of population of 7.4 individuals at temperature range of 19-33°C, while the lowest abundance occurred in November of average 0.75 individuals when temperature ranged between 15-25°C.

Similar results were coincided with El-Sanady and Mohamed (2013), they collected this pest attacked the two varieties Zaghoul and sewi in Giza and Suhag, as well as, Mesbah (2014) in Sharkeya Governorate. Also, Krantz and Walter (2009) cited that *T. putrescentiae* are widespread can survive on almost anything including seeds, dead plants, live plants, dead insects, other arthropods, nematodes and fungi.

#### The interaction of the predatory mites and their associated phytophagous and miscellaneous mites

The correlation between predators and their associated phytophagous and saprophagous mites collected from date palm trees (Table 2) indicates that the abundance of the predators is positively strong correlated with different pests.

**Table 2. The relation of the pest mites and their associated natural enemies and the climatic factors in Gamassa**

Taxa names	Correlation coefficient values						
	<i>Amblyseius hutu</i>	<i>Amblyseius swirskii</i>	<i>Agestimus exsertus</i>	<i>Cheletogenes ornatus</i>	<i>Saniosulus nudus</i>	Mini. Temp.	Max. Temp.
<i>Oligonychus afrasiaticus</i>	0.7	0.6	0.9	0.2	0.7	0.46	0.5
<i>Eutetranychus orientalis</i>	0.7	0.7	0.9	0.2	0.8	0.5	0.46
<i>Raoiella indica</i>	0.5	0.6	0.6	0.6	0.7	0.46	0.6
<i>Brevipalpus obovatus</i>	0.97	0.9	0.8	0.6	0.8	0.3	0.4
<i>Tarsonemus stiffer</i>	0.9	0.8	0.9	0.4	0.8	0.4	0.4
<i>Tarsonemus gladifer</i>	0.8	0.8	0.8	0.4	0.9	0.4	0.5
<i>Tydeus californicus</i>	0.9	0.9	0.8	0.4	0.9	0.3	0.4
<i>Tyrogagrus putrescentae</i>	0.7	0.7	0.6	0.4	0.7	0.3	0.4
Mini. Temp.	0.3	0.24	0.3	0.1	0.3	-----	----
Max. Temp.	0.4	0.3	0.3	0.3	0.4	-----	----

**The differentiation of the predators**

*Amblyseius hutu* and *A. swirskii* recorded the highest population of total mean count (58.55, 40 individuals), respectively, followed by *Saniosulus nudus* then *A. exsertus* that averaged (33.45, 32.6 individuals), respectively, while *Cheletogenes ornatus* recorded the lowest population of total count of 10.25 individuals.

According to the relationship between predators and their associated pests, the most of them recorded a positive strong correlation; the *Saniosulus nudus* harbored higher relationship to the pests ranged between (R= 0.7 & 0.9), followed by *A. exsertus* (R= 0.6 & 0.9), then *A. swirskii* (R= 0.6 & 0.9), then *A. hutu* (R= 0.5 & 0.97), and the last *Cheletogenes ornatus* (R= 0.2 & 0.6)

The correlation coefficient between predators and temperatures Table (2) ranged between (R= 0.3 & 0.5) and (R= 0.4 & 0.5) for minimum and maximum and eriophyids), some scale insects, whiteflies, stored product moths and pollen grains.

**Population abundance of mites infesting palm trees in El-Kharga village**

Through the field study in El-Kharga village, New Valley Governorate, the most abundant species of mite pests and their associated natural enemies on date palm trees in El-Kharga village was studied during the period between April 2016 and February 2017. Two phytophagous mites belongs to family Tenuipalpidae were detected and identified, the red palm mite, *Phylloetetranychus aegypticus* Sayed (Tetranychidae) and the orange mite *Colopalpus (Tenuipalpus) eriophyoides* Baker (Tenuipalpidae), while the predaceous mites were three genera *Neophyllobius* sp.( F: Neophyllobidae), *A. exsertus* (F: Stigamaeidae), *Cunaxa capreolus* (F: Cunaxidae) and one species of miscellaneous mite, *Tydeus californicus* (F: Tydeidae).

**1- Fluctuation the population of *Phylloetetranychus aegypticus* Sayed**

The red palm mite, *P. aegypticus* was recorded all over the year on the two surfaces of the frond but preferring the upper surface. Regarding the mean count of mite pest as shown in Table (3) and Fig. (2), the population

appeared in few numbers on fronds of date palm in June, which averaged 2.6 individuals and 4.2 eggs when the temperatures ranged between 31-47°C, then a peak with lower population density of the red palm mites appeared in September (13.6 motile stages & 15.9 eggs) at temperature range of 21-41°C. The population of the pest fluctuated then reached to sharp peak in December and January (18.7-18.3 motile stages & 19.9- 39.6 eggs) when the temperatures ranged between 8-18°C. Finally, another peak was in April of lower population (12.5 individuals & 10.5 eggs) at temperature range of 27-42°C, then the population decreased then started to increase again.

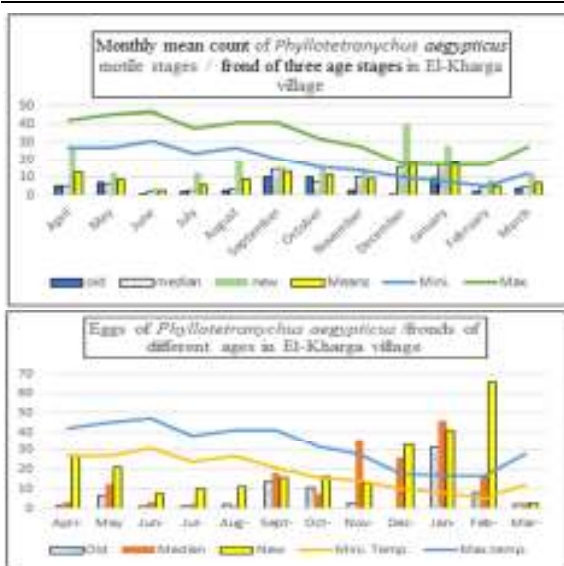
Data indicated that high temperature during June ranged between 31-47°C reduced the population of *P. aegypticus*, while low temperatures in December, January and February ranged between 5- 17°C caused significant increase in mite population.

By comparing the population of the pest on the different age stages; the population of the new age fronds suffered the highest infestation of *P. aegypticus*. Motile stages and eggs recorded a total of the mean numbers 210.6 individuals and 263.3 eggs. It could be estimated that the total numbers of the pest in the new age fronds was twice the numbers of those in the moderate age fronds (98.8 individuals) and more than triple those occupied in the old age fronds (56.7 individuals). It is obvious that there was a sharp peak in December representing the high abundance of this pest on the new age fronds (39.7 individuals), while January and February recorded the highest biomass of eggs 41-66.1 deposited by the red palm mites.

Statistical differences were observed in motile stages of the red palm mite and their eggs numbers among the three age stages of frond at P≥ 0.05. According to LSD, there was a high significant difference between individual means of the new fold and those of the two other age stages, while there were no significant differences between mean values of the two other age stages (old and median fronds). In case of egg stages, the average counts of the deposited eggs in the three age stages of frond registered no significant differences between mean of their values, but there was a high significant difference between mean of new fronds 21.9 eggs and mean of old fronds 7.13 eggs and the LSD value at 5% was 9.1.

**Table 3. The monthly mean number of the red palm mite, *Phyllotranychus aegypticus* / frond of different ages between April 2016 and March 2017**

Date	Motile stages / fronds			Means	Eggs / fronds			Means	Temperatures	
	old	median	New		old	median	new		Mini.	Max.
April	4.9	5.6	26.9	12.5	2	3.3	26.2	10.5	27	42
May	7.1	6.9	12.6	8.9	7	12.5	21.1	13.5	27	45
June	1	2.3	4.5	2.6	1.4	3.4	7.7	4.2	31	47
July	2	3	12.5	5.8	1.5	2.5	10	14	24	38
August	2.8	3.7	19.9	8.8	2.2	1.4	11	4.9	27	41
September	10.2	14.7	16	13.6	14.1	18	15.6	15.9	21	41
October	10	8.1	15.7	11.3	11.1	7.6	16.4	11.7	16	32
November	2.9	10.7	14.4	9.3	3	35.6	12.5	17	14	28
December	0.2	16.2	39.7	18.7	0.5	26.1	33.2	19.9	10	18
January	9.7	17.5	27.8	18.3	31.9	46	41	39.6	8	17
February	2.2	5.1	8.4	5.2	8.6	16.5	66.1	30.4	5	17
March	3.7	5	12.2	6.9	2.3	2.6	2.5	2.5	12	28
Total	56.7	98.8	210.6	122	85.6	175.5	263.3	10.5		
Means	4.7	8.2	17.5		7.13	14.6	21.9			
LSD at 5%		4.7				9.1				



**Fig. 2. Infestation level of *Phyllotranychus aegypticus* (motile stages & eggs) on fronds of three age stages in El-Kharga village**

**2- Fluctuation the population of *Colopalpus eriophyoides* Baker**

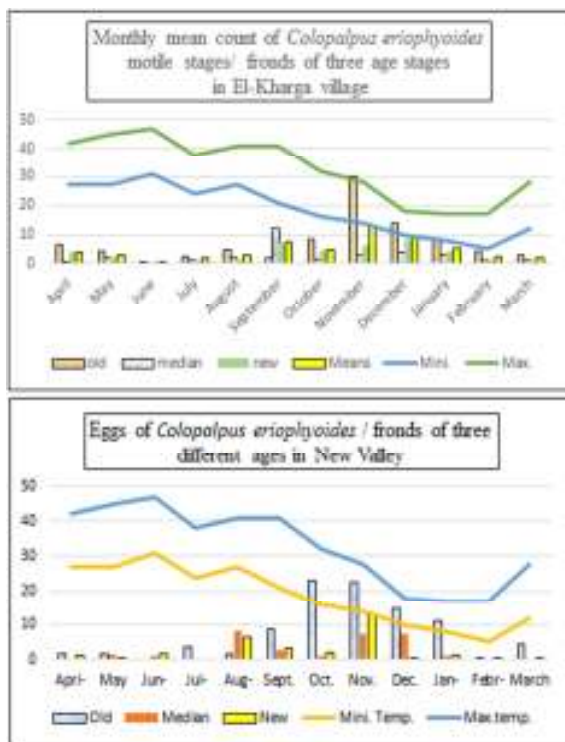
The orange palm mites, *C. eriophyoides*, were observed on the two surfaces of the fronds preferring the lower surface. Data in Table (4) and Fig. (3) showed the population of the pest which appeared in few numbers on fronds of palm in June of total average (0.7 individuals & 1.03 eggs) when the temperatures ranged between 31–47°C, then the population of the pest increased gradually reaching a peak of few individuals (7.3 individuals & 5.4 eggs) at temperature range of 21–41°C. A sharp peak occurred in November (13.2 individuals & 9.5 eggs) when the temperatures ranged between 14–28°C, then the population decreased in December to a peak of lower individuals than the previous one (8.7 individuals & 14.4 eggs) at temperature range of 10–18 °C. Data indicated that high temperature during June reduced population of *C. eriophyoides*, while moderate temperature during November caused significant increase in mite population.

**Table 4. The monthly mean number of the orange palm mite, *Colopalpus eriophyoides* / fronds of different ages between April 2016 and March 2017**

Date	Motile stages / fronds			Means	Eggs / fronds			Means	Temperatures	
	old	median	new		old	median	new		Mini	Max
April	6.7	0.8	4.1	3.9	1.7	0.3	1.4	1.13	27	42
May	4.4	2	2	2.8	1.7	1.5	0.2	1.13	27	45
June	0.7	0.4	1	0.7	0.4	1	1.7	1.03	31	47
July	2.5	1.5	1.5	1.8	2	0.7	1	1.2	24	38
August	4.8	2.1	1.5	2.8	3.6	0.4	0	1.3	27	41
September	2.3	12.2	7.4	7.3	1.9	8.1	6.2	5.4	21	41
October	8.5	1.7	4.6	4.9	9	1	2	4	16	32
November	30.2	3.2	6.3	13.2	22.7	2.7	3.2	9.5	14	28
December	14.1	4.1	8	8.7	23.2	7.2	12.9	14.4	10	18
January	8.5	3.3	4.1	5.3	14.9	7.4	0.6	7.6	8	17
February	4.5	1.2	1.4	2.4	11.2	1.2	1.3	4.6	5	17
March	3.3	1.2	1.1	1.9	0.5	0.1	0.1	0.2	12	28
Total	90.5	33.7	43	55.7	92.8	31.6	30.6	51.7		
Means	7.5	2.8	3.6		7.7	2.6	2.5			
LSD at 5%		3.9				5				

It is obvious that the old age fronds recorded the highest infestation of the orange palm mites, motile stages and eggs with average 90.5 individuals and 92.8 eggs. It could be estimated that the total numbers of the pest in the

old age fronds were twice the numbers of those of the new age fronds (43 individuals) and approached triple those which occupied in the median age fronds (33.7 individuals). Obviously, there was a sharp peak in November represented the high abundance of this pest followed by another one in December of lower population on the old age fronds (30.2, 14.1 individuals), respectively. November and December recorded the highest biomass of 22.7-23.2 eggs deposited by the orange palm mites.



**Fig. 3. Infestation level of *Colopalpus eriophyoides* (motile stages & eggs) on fronds of three age stages in El-Kharga village**

These results were in accordance with findings of Baker and Wharton (1952) who described for the first time the orange mite, *Colopalpus eriophyoides* (Baker) (= *Tenuipalpus eriophyoides*) on date palm in Basrah. Moreover, Al-Gboory (1987) recorded this mite pest in his thesis as a pest of palm trees and he studied the taxonomy of tenuipalpid mites in Central Iraq. Moreover, Mohamed *et al.*, (2014) recorded the males and females of this species for the first time in Egypt, which were collected from fronds of palm trees in Suhag governorate through the Plant survey programs.

According to LSD, there was a significant difference between the mean values of motile individuals of the old frond and the median age fronds (7.5, 3.6 individuals, respectively, and LSD = 3.9), while there were no significant differences between mean values of the two other age stages.

In case of eggs, there was no significant difference between means of eggs, which were deposited on the old fronds, and the other two age stages.

The correlation coefficient between phytophagous mites and temperatures ( $R = -0.4$ ) for minimum and maximum temperature was weak negative correlation.

Therefore, we can conclude that, as the temperature increases the phytophagous mites population decreases, and vice versa.

#### **Predaceous mites**

##### ***Neophyllobius* sp.**

A single species was recorded in this family, which was found in high number of total mean of 28 individuals in April at temperature range of 27- 42°C and 11& 8 individuals in October and November at temperature range of 14- 32°C, then did not appear again perhaps due to an error in getting samples or due to its transfer.

The predator, *Neophyllobius mangiferus* Gomma was reared by Hassan (1976), on *Chrysomphalus ficus* Ashmead, and confirmed its predatory feeding habit and its feeding effectiveness, which increased with the predator development.

##### ***Agistemus exsertus* Gonzalez**

Only one species was found of 11 individuals on new fronds in April. Fathipour and Maleknia (2016) reported that the predatory mite, *Agistemus exsertus* Gonzalez is the most common stigmatid on some fruit trees, vegetables, ornamentals, field crops, and wild plants and the mostly existed predator feeding on phytophagous mites (tetranychids, tenuipalpid, and eriophyids), some scale insects, whiteflies, stored product moths, and pollen grains.

##### ***Cunaxa capreolus* Berlese**

Only one species of five individuals were collected in February at temperature range of 5- 17°C.

Majidi and Akrami (2013) surveyed mites associated with the date palm (*Phoenix dactylifera* L.) in Larestan, Iran and listed it as an aerial predator associated with phytophagous mites.

#### **Miscellaneous mites**

##### ***Tydeus californicus* Banks**

A single species was recorded in this family, soft-bodied mite found in few numbers of total mean of 14.3 individuals. Its peak was observed in January which averaged 4.3 individuals at temperature range of 8-17°C.

Baker and Wharton (1952) described *Tydeus californicus* Banks as a predator, some are fungivorous, and some are phytophagous. Zaher (1986) collected *T. californicus* from several truck crops and fruit trees all over Egypt.

As a consequence of the highly usage of pesticides in the last years, several mite pests build-up a high population causing serious damage to their host due to harmful impact on natural enemies. The usage of acaricides in order to control pests should be done in economically and environmentally ways. The correct use of acaricides will delay the onset of resistance and give natural enemies. Right using of acaricides provides possible chance of reducing densities of actual and potential pests.

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## الأفات الأكاروسية ذات الأهمية الاقتصادية التي تهاجم نخيل البلح في محافظتي الدقهلية والوادي الجديد

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أجري هذا البحث بهدف حصر الأفات الأكاروسية بمدينة جمصة بمحافظة الدقهلية ووادي الخارجة بالوادي الجديد وكذلك أعدادها الحيوية المتواجدة معها وذلك على أشجار نخيل البلح في الفترة ما بين مارس ٢٠١٦ حتى مارس ٢٠١٧. أسفر البحث على تواجدها ١٣ نوع تنتمي إلى ١١ جنس و٩ فصائل. وقد أمكن تقسيم هذه العشرات إلى ثلاثة مجاميع تبعاً لسلوكها البيئي والغذائي وهي: الأفات الأكاروسية نباتية التغذية (٤ أنواع)، والمقترسات الأكاروسية (٥ أنواع)، وأخيراً فطرية التغذية أو متنوعة الغذاء (٤ أنواع). وقد تمثلت الأكاروسات النباتية في فصيلتين: Tetranychidae، و Tenuipalpidae كل منهما شملت نوعين من الأفات الأكاروسية الضارة، بينما تمثلت المقترسات الأكاروسية في أربعة فصائل: Phytoseiidae (شملت نوعين)؛ وفصيلة Stigmaeidae (شملت نوع واحد) واسع الانتشار بين الأفات النباتية على المحاصيل الحقلية المختلفة والخضر وأشجار الفاكهة؛ وفصيلة Cheyletidae (شملت نوع واحد) بأعداد قليلة؛ وفصيلة Eupalopsellidae (شملت نوع واحد) ولكنه وجد بأعداد كبيرة. أما المجموعة الأخيرة وهي الأكاروسات فطرية التغذية أو متنوعة الغذاء تمثلت في ثلاثة فصائل: Tarsonemidae والتي شملت على نوعين وفصيلة Tydeidae، شملت نوع واحد وفصيلة Acaridae شملت أيضاً نوع واحد. محافظة الوادي الجديد: وجدت أفراد الأكاروسات النباتية لفصيلة واحدة هي Tenuipalpidae وشملت نوعين من الأفات الهامة أما المقترسات الأكاروسية فكانت في أربعة فصائل وهي: Camerobiidae، و Stigmaeidae، و Cunaxidae، و Tydeidae وكل منهم شملت نوعاً واحداً وكان تعدادها بأعداد قليلة.