



**Ecological and Taxonomical Studies of Some Mite Species  
Infesting Pomegranate Trees and their Predators in Assiut  
Governorate**

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**LIST OF PUBLICATIONS EXTRACTED FROM OBTAINED  
RESULTS OF THE CURRENT STUDY**

Publications No.	Title
1.	<b><u>Abdelgayed, A.S.</u>; Abd El-Wahed, N.M.; Ali, A.M. and Eraky S.A. (2019a).</b> Biological aspects, thermal requirements and life table parameters of <i>Tenuipalpus punicae</i> Pritchard & Baker, 1958 (Acari: Tenuipalpidae) on pomegranate over different temperatures in Assiut, Egypt. <i>Acarines</i> , 13: 21-27.
2.	<b><u>Abdelgayed, A.S.</u>; Abd El-Wahed, N.M.; Ali, A.M. and Eraky S.A. (2019b).</b> Species composition and diversity of mites inhabiting pomegranate orchards in Assiut Governorate, Upper Egypt. <i>Acarines</i> , 13: 29-36.
3.	<b><u>Abdelgayed, A.S.</u>; Abd El-Wahed, N.M.; Ali, A.M. and Eraky S.A. (2020).</b> Food preference, predation efficiency and life table parameters of <i>Euseius scutalis</i> (Acari: Phytoseiidae) reared on <i>Tenuipalpus punicae</i> (Acari: Tenuipalpidae) and <i>Siphoninus phillyreae</i> (Hemiptera: Aleyrodidae) under constant conditions. <i>International Journal of Agricultural Science</i> , 2(2): 428-437.
4.	<b>Abo-Elmaged, T.M.; Ali, A.M.; Abd El-Wahed, N.M.; Eraky, S.A. and <u>Abdelgayed, A.S.</u> (2021).</b> Population fluctuations of mites on two pomegranate ( <i>Punica granatiuum</i> ) varieties in three suburbs of Assiut governorate, Egypt. <i>Egyptian Academic Journal of Biological Sciences, B. Zoology</i> , 13(2): 55-63.
5.	<b>Eraky, S.A.; Abd El-Wahed, N.M.; <u>Abdelgayed, A.S.</u> and Ali, A.M. (2019).</b> A new genus and new species of mites (Acari: Acaridae) extracted from soil under pomegranate trees, Assiut, Upper Egypt. <i>Acarines</i> , 13: 53-56.
6.	<b>Eraky, S.A.; <u>Abdelgayed, A.S.</u>; Abd El-Wahed, N.M. and Ali, A.M. (2020).</b> Three new species of mites (Acari: Acaridae and Histiostomatidae) extracted from the soil under pomegranate trees, Assiut, Upper Egypt. <i>Egyptian Academic Journal of Biological Sciences, A. Entomology</i> , 13(3): 147-156.



## **5- Summary and Conclusion**

Mites play an important role in the biogeochemical cycles of nature as well as in the agricultural cycles of organic matter. They are considered to be very important both in human and animal catering. According to their feeding habits, the mites occurred on pomegranate trees can be classified into three groups (phytophagous, predacious and these of unknown feeding habits). This point has gained an extended attention for the last five decades and mites have won nearly the same fame of importance as insects have.

When reviewing previous and current results focused on mite species (both phytophagous and predacious) live on pomegranate trees in both Egypt and abroad. It was cleared that, there were a lot of species pertaining to diverse groups of mites. So, the current work aimed to study the taxonomy and the ecology of some species with economic importance. In the present study, an accurate survey of mite species inhabiting citrus trees in Assiut city and its suburbs was done. The present study describes three new species, new to science, belonging to three different families of mites (Acaridae Latreille, 1802 and Histiostomatidae Berlese, 1897).

Moreover, the present study was designed to explore the ecological trends of certain phytophagous and predacious mite species inhabiting pomegranate trees under various circumstances. However, the great numbers of species and their various morphological differences acquire more intensive and comprehensive research especially for the predacious ones. Therefore, the author intended to give some morphological and taxonomical treatises.

The present work might help acarologists to classify the species of mites found on pomegranate trees, whether phytophagous or predacious ones. As for the description of the new species, the present survey helped to discover three new species that have not been described before whether in Egypt or around the world.

The present course of investigation, therefore, had to be accomplished in the following four points:

1. Survey of mites inhabiting certain pomegranate trees (pomegranate orchards) in Assiut Governorate, Upper Egypt.
2. Morphology and taxonomy of some mite species inhabiting pomegranate orchards with description of one new genus and four new species pertaining to the families: Acaridae Latreille, 1802 and Histiostomatidae Berlese, 1897.

3. Study the population fluctuation of *Tenuipalpus punicae* Pritchard & Baker, 1958 and *Oligonychus punicae* (Hirst, 1924) on pomegranate.
4. Study the biology of *Tenuipalpus punicae* Pritchard & Baker, 1958 under laboratory constant temperature.
5. Evaluation of the predatory efficiency of phytoseiid mites, *Euseius scutalis* (Athias-Henriot, 1958) that feed on *Siphoninus phillyreae* (Haliday, 1835), and *Tenuipalpus punicae* Pritchard & Baker, 1958.

The author would like to stress that the present work is principally interested to the mites taxonomy and ecology. For this purpose, the original descriptions of mites (Families: Acaridae Latreille, 1802 and Histiostomatidae Berlese, 1897), were collected and all the drawings of detailed morphological features were examined, especially for the described species of Egyptian mite fauna.

The present study included the regular samples collected from soil, leaves and debris under pomegranate fruit trees, Assiut Governorate, in order to study the mite fauna inhabiting pomegranate leaves and weeds under the pomegranate fruit trees.

Previous works were reviewed, materials and methods were explained, then results were tabulated, illustrated, discussed and summarized. The thesis was entailed with the English and Arabic summary.

**This work revealed the following results:**

**5.1. Taxonomical studies:**

Of the total number of mite fauna educed from different localities, one new genus and four new species belonging to the families: Acaridae Latreille, 1802 and Histiostomatidae Berlese, 1897 were found to be new to science.

- **These are:**
  - a. *Egyptglyphus* **Eraky et al., 2019c**
  - b. *Egyptglyphus oconnori* **Eraky et al., 2019c**
  - c. *Caloglyphus azzai* **Eraky et al., 2020a**
  - d. *Caloglyphus punicum* **Eraky et al., 2020a**
  - e. *Myianoetus granatum* **Eraky et al., 2020a**

Based on the morphological characteristics of the collected mite species, author established an identification keys for the Egyptian species of both forementioned families.



## **5.2. Ecological studies:**

### **5.2.1. Survey studies:**

Surveillance studies revealed the occurrence of 190 mite species pertaining to 50 families and 100 genera in addition to 1 unidentified genera and species. According to their feeding behavior, mites were divided into three major groups (*i.e.*, 15 species are plant feeders, 105 species are predacious mites and 70 species are of miscellaneous feeding habits).

### **5.2.2. Population fluctuation of mites:**

#### **5.2.2.1. Population fluctuation of phytophagous and predaceous mites associated with leaves of some varieties of pomegranate trees at Abou-Tig; El-Fateh and Manfalout cities in Assiut Governorate:**

The pomegranate false spider mite, *T. punicae* and the Avocado brown mite, *O. punicae* on leaves of pomegranate trees using direct count method during two successive seasons (2018-2020) in Assiut Governorate. The seasonal abundance of this mite species population expressed as monthly sum of individual numbers, average and percentages from the overall season numbers during the two inspected season (2018-2020)

#### **A.1. Population fluctuation of phytophagous mites on leaves of Baladi (Manfalouty) pomegranate variety:**

The pomegranate false spider mite, *T. punicae* on Baladi (Manfalouty) variety at Abou-Tig, El-Fateh and Manfalout cities have two annual peaks of seasonal abundance in July and August in the two years. While, the avocado brown mite, *O. punicae* had four annual peaks of seasonal abundance in June, July, August and September in the two years.

#### **B.2. Population fluctuation of phytophagous mites on leaves of Assiuty pomegranate variety:**

Clearly demonstrate that, the pomegranate false spider mite, *T. punicae* on Assiuty variety in Abou-Tig, El-Fateh and Manfalout cities has three annual peaks of seasonal abundance in July, August and September in the two years at Abou-Tig city. While, at El-Fateh city it had two annual peaks of seasonal abundance in June and July in the first year, in August and September in the second year. While, in local farm Manfalout city it had two annual peaks of seasonal abundance in July and August.

**C.3. Population fluctuation of predaceous mites on leaves of Baladi (Manfalouty) pomegranate variety:**

The phytoseiid mite, *E. scutalis* was recorded on leaves from February to November associated with different pests. On Baladi (Manfalouty) pomegranate variety the predator was found with rare numbers at first December, January, February and the population density of mite was maximum during July for the first and second years, at Abou-Tig local farm. The numbers of mite began to decrease again until the end of November, Not recorded in December and January in both years at Abou-Tig, El-Fateh and Manfalout cities. While, in Abou-Tig city the predator was found with rare numbers at first February and the population density of mite was maximum during July and August for the first and second years. While, in the local farm El-Fateh, the numbers of mite began to decrease again until the end of April not recorded in December and January in both years. While, the phytoseiid mite, *N. barkeri* was found with rare numbers at first March, at Abou-Tig city and the population density of mite was maximum during September and July for the first and second years.

**D.4. Population fluctuation of predaceous mites on leaves of Assiuty pomegranate variety:**

The phytoseiid mite, *E. scutalis* has two annual peaks of seasonal abundance in August and September in the two years at Abou-Tig for the first year and the second year. While, in El-Fateh has two annual peaks of seasonal abundance in August and September in the two years. While, in Manfalout local farm has one annual peaks of seasonal abundance in August in the first years. The low numbers of mite were recorded in December and January at Abou-Tig, El-Fateh and Manfalout local farms. While, the phytoseiid mite, *N. barkeri* found with rare numbers at first November, February and the population density of mite was maximum during July and September in the two years at Abou-Tig. While, in El-Fateh city the phytoseiid mite, *N. barkeri* found with rare numbers at first after that the number increased gradually to reached the peak of seasonal abundance in February in the two years, for the first and the second year. The numbers of mite began to decrease again gradually. In Manfalout, the phytoseiid mite, *N. barkeri* found with rare numbers at first after that the number increased gradually to reached the peak of seasonal abundance in



March in the two years, for the first and the second year. The numbers of mite began to decrease again gradually.

**E.5. The relationship between population fluctuation of the phytophagous mites, *Tenuipalpus punicae* Pritchard & Baker, 1958 and *Oligonychus punicae* (Hirst, 1924) and the predaceous mites, *Euseius scutalis* (Athias-Henriot, 1958) and *Neoseiulus barkeri* (Hughes, 1948) associated with leaves of pomegranate varieties during two years (2018/2019-2019/2020):**

**1. Leaves of Baladi (Manfalouty) pomegranate variety:**

The predaceous mites (*E. scutalis* and *N. barkeri*) have two annual peaks of seasonal abundance in September and July in Abou-Tig. While, in August and July in El-Fateh local farm and July and August in Manfalout in the first and second year. showed that a highly significant positive effect existed on population density of *T. punicae* acted by the predator mite were detected in the first and second year, in Abou-Tig, El-Fateh and Manfalout local farm in Assiut Governorate.

**2. Leaves of Assiuty pomegranate variety:**

The predaceous mites (*E. scutalis* and *N. barkeri*) have one annual peaks of seasonal abundance on leaves of Assiuty pomegranate variety was collected in July at Abou-Tig, in September and August at El-Fateh. While, in July at Manfalout during the two successive years (2018-2019 and 2019-2020).

**F.6. The effect of two weather factors in population fluctuation of mites during two successive years started from October 2018 in Abou-Tig, El-Fateh and Manfalout local farms, Assiut Governorate:**

**The results showed the following notes:**

**1. Temperature:**

The present study showed that, the density of the population of *T. punicae* and the predaceous mites on leaves of varieties pomegranate trees, exhibited significant positive correlation with temperature during the two successive years, on the other hand, the density of the population of *T. punicae* exhibited non-significant negative correlation with temperature at Abou-Tig city in Baladi and Assiuty pomegranate varieties during the two successive years. While, exhibited significant negative correlation with temperature at El-Fateh and Manfalout cities, except for Baladi pomegranate variety it exhibited non-significant negative correlation with temperature

in the First year, while exhibited significant negative correlation with temperature in the second year .

## **2. Relative humidity:**

The present study showed that, the density of the population of *T. punicae* and the predaceous mites on leaves of varieties pomegranate trees, exhibited significant negative correlation with relative humidity during the two successive years, on the other hand, the density of the population of *T. punicae* exhibited non-significant positive correlation with relative humidity at El-Fateh city, except for Assiuty variety it exhibited significant positive correlation with relative humidity during the First year, while exhibited non-significant positive correlation with relative humidity during the second year .While, exhibited significant positive correlation with relative humidity at Abou-Tig and Manfalout local farms, except for Baladi (Manfalouty) mango variety it exhibited non-significant positive correlation with relative humidity in the First year, while exhibited significant positive correlation with relative humidity in the second year.

### 5.2.3. Some biological aspects of mite species:

#### A. *Tenuipalpus punicae* Pritchard & Baker, 1958 (Tenuipalpidae Berlese, 1913):

The pomegranate red mite, *T. punicae* was raised on leaves of *Punica granatum* L. cv., Baladi "Manfalouty" at four different temperatures 20°, 25°, 30°, and 35°C, it completed the life span and its fecundity, but the mite was affected by temperature degrees.

- **This study showed the following notes:**

1. Relationships between the biotic potential of pomegranate false spider mite, *Tenuipalpus punicae* Pritchard & Baker 1958 and temperature was studied at constant temperature conditions of 20°-35°C.
2. Optimum temperatures range for *T. punicae* was 30°-35°C.
3. The shortest pre-oviposition period, the greatest egg-laying capacity and immature stages development, optimum conditions were noticed at 35°C followed by 30°C.
4. Complete age-specific fecundity schedules and life table parameters were computed from these data for each of four temperatures.
5. The shortest developmental duration was (12.56 & 9.63) days for female and male at 35°C.
6. The highest total mean fecundity rate was 13.13 eggs/female (with a daily rate of 1.59 eggs/female/day) was at 30°C.
7. The thermal constants (**K**) were (56.82, 100.80, 83.93, 122.23, 345.97, 419.22, 308.60 and 648.66) (**DDs**) for the previous stages as physiological times required for this species phenomena.
8. The maximum values of intrinsic rate of increase ( $r_m$ ) and the finite rate of increase ( $\lambda$ ) was obtained at 35°C (i.e., 0.120 and 1.12 individuals/female/day).
9. The gross reproductive rate (**GRR**) was the highest at 35°C as 16.4 eggs/female/generation.
10. The shortest time for population density doubling (**DT**) was (5.77) days at 35°C.



**B. *Euseius scutalis* (Athias-Henriot, 1958) (Phytoseiidae Berlese, 1914):**

**C. Rearing the predatory mite, *Euseius scutalis* (Athias-Henriot, 1958):**

The predatory mite, *E. scutalis* was collected from pomegranate trees (*Punica granatum* L., Lythraceae Jaume Saint-Hilaire, 1805). In the pomology farm, Faculty of Agriculture, Assiut University [27° 02' 28.20" N, 31° 00' 25.80" E]. Infested pomegranate leaves with *T. punicae* were provided daily to the stock colony of the predator as a fresh food. The stock colony was maintained under controlled conditions (30±1°C & 65±5 % R.H). Few drops of water were added when needed.

**D. Effect of temperature and effect of different kind of foods on the development *Euseius scutalis* (Athias-Henriot, 1958):**

**- Following are the most important notes:**

1. The biology, life table parameters and predation efficiency of the predatory mite, *E. scutalis* feed *T. punicae* mobile stages and *S. phillyreae* eggs were tested at constant conditions (30±1°C and 65±5% R.H.).
2. The predator completed its developmental times on both prey pests in (6.20) and (6.45) days.
3. The mite was slightly influenced by the prey type, as when fed *T. punicae* mobile stages, its developmental time was shorter than preyed on *S. phillyreae* eggs.
4. Whenever, the female predator fed the mite mobile stages, the finite rate of increase ( $\lambda$ ) was higher than that on the insect eggs.
5. The mean generation time (**T**) was also affected, whereas it was longer when the female preyed on *S. phillyreae* eggs compared with that on *T. punicae* mobile stages.
6. The *E. scutalis* female consumed high number of insect eggs during its oviposition period and the longevity was longer in comparison with feed *T. punicae* mobile stages.

**- Practical Application and Recommendations:**

1. Research on the taxonomy, morphology and ecology of the pomegranate mites is promising, especially in Egypt, as compared with other groups of fruit orchards. However, the considerable numbers of species and various morphological differences require more intensive and comprehensive research. Therefore, the present course of investigation intended to give a morphological and taxonomical treatise as apart of the ecological research, this makes the identification of the species pertaining to the mite groups easier, especially the use of the identification keys, based on the morphological characteristics of the adult and deutonymphal stages.
2. Biological control has great potential as a tactic for regulating pest populations in integrated pest management programs (**IPM**) in pomegranate orchards. Therefore, it is important to survey predacious mites associated with the both pomegranate spider mite and flat red mite in Egypt and study their role as biocontrol agents in order to minimize the use of pesticides.
3. Continuous monitoring of field crops as invasive/secondary pests may appear *e.g.*, *Oligonychus punicae* (Hirst, 1924) and *Polyphagotarsonemus latus* (Banks, 1904).
4. More surveys are needed in searching for more predatory species.
5. Testing the predation ability of the commonly reported predatory species (lab. studies and/or field releases).
6. Laboratory mass rearing of predatory mites reported.
7. *Oligonychus punicae* (Hirst, 1924) and *Tenuipalpus punicae* Pritchard & Baker, 1958 were the phytophagous mites with more abundant.
8. *Euseius scutalis* (Athias-Henriot, 1958) and *Neoseiulus barkeri* (Hughes, 1948) are the most common predator mites.
9. *Tenuipalpus punicae* Pritchard & Baker, 1958 is the most important phytophagous mites in pomegranate culture in Assiut Governorate, Upper Egypt with outbreak population in June, July and August.
10. High predator diversity was observed on associated pomegranate trees, indicating the existence of species mobility in pomegranate orchard.