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MONTHLY DYNAMICS AND POPULATION DENSITY OF PHYTOPHAGOUS AND PREDATORY MITE SPECIES ASSOCIATED WITH CITRUS ORCHARDS AT MENOUFIA GOVERNORATE

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ABSTRACT: The Population density of mite species inhabiting leaves of six citrus orchard varieties, i.e., Balady orange, Navel orange, Sweet orange, Mandarin, Lime, and Lemon, was determined for two successive years at Menoufia governorate, Egypt. *Tetranychus urticae* Koch, *Eutetranychus orientalis* (Klein), *Panonychus citri* (McGregor), *Brevipalpus pheonicis* (Geijskes), *Phyllocoptruta oleivora* (Ashmead), *Tydeus californicus* (Banks, 1904), *Amblyseius swirskii* (Athias-Henriot), and *Euseius scutalis* (Athias-Henriot) were monthly counted from the beginning of January 2022 till the end of December 2023 at Alshohadaa and Sadat City region, Menoufia governorate. Generally, the most susceptible variety to infestation with phytophagous mites at Alshohadaa was the Navel orange (13%), followed by the Balady orange (12.9%) in both 2022 and 2023. The highest infestation rate with phytophagous mites was recorded with Balady orange (13%) followed by (11.6%) recorded with Navel & Sweet orange. The most susceptible variety to the infestation with phytophagous mites in the Sadat City region was Balady orange during the two successive years.

Key words: Survey, Population density, Mites, Citrus varieties.

INTRODUCTION

Citrus fruits play a significant role in the country's agriculture and economy. Egypt is one of the world's top producers and exporters of oranges and other citrus fruits. For the 2024/2025 season (October-September), FAS/Cairo forecasts the total planted area of oranges to be 170,000 hectares (ha) (FAOSTAT, 2024; GAIN-USDA, 2024). The fertile Nile Delta provides ideal conditions for growing high-quality citrus. These fruits are not only a significant source of income but also vital for local consumption due to their health benefits. The citrus industry also supports thousands of workers across farming, packaging, and export sectors. Faunistic studies focusing on citrus mites in Egypt are still limited (Zaher *et al.*, 1970; Rasmy et al., 1972; Zaher, 1984a, b, 1986; Kandeel & Nassar, 1986; Rahil & Abd El-Halim, 2000). Few studies have been conducted on the influence of various biotic and abiotic factors on the population dynamics of phytophagous and predatory mites on citrus (Yassin, 2004; Heikal and Kassem, 2018). The most phytophagous mite families injurious to citrus include Tetranychidae, Tenuipalpidae, and Eriophyidae, which cause noteworthy damage to plants, affecting crop quantity and quality. This study aimed to assess the population density of various phytophagous and predatory mites residing in citrus orchards across two locations: Alshohadaa and Sadat City in Menoufia Governorate, and among six citrus varieties: Balady orange, Navel orange, Sweet orange, Mandarin, Lime, and Balady lemon.

MATERIALS AND METHODS

1- Survey and Sampling Design

The population dynamics of phytophagous mites, specifically *Tetranychus urticae*, *Eutetranychus orientalis*, *Panonychus citri*, *Brevipalpus pheonicis*, *Phyllocoptruta oleivora*, *and Tydeus californicus* attacking citrus varieties were studied over two successive years, from January 2022 to December 2023.

In addition to the population dynamics of the predatory mites Amblyseius swirskii and Euseius

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scutalis, which serve as a biotic factor, were also recorded during the same period. Each variety was represented by 60 trees, which were divided into three replicates (20 trees each). Monthly leaf samples were randomly taken from each variety (30 leaves). Samples were collected in polyethylene bags, tightly closed, and then transferred to the laboratory, where they were kept in the refrigerator. Samples were examined using a stereoscopic microscope, where individual mite specimens were counted and mounted singly in Hoyer's solution for the classification process. Mounted slides were kept in an electric oven at 40-50 °C for 24 hours. The labels containing all necessary information were registered on the side of each slide. Mite identification was performed according to Krantz (1970).

In the selected orchards, all agricultural practices were conducted as usual, except for pesticide applications, which were suspended throughout the survey period.

2- Statistical analysis

All obtained data were subjected to an ANOVA test using a computer program (Costat 22, 1998) to determine Duncan's multiple range test and the LSD 5% (Least significant difference).

RESULTS AND DISCUSSION

The population density of phytophagous mite species and predatory mites on six citrus varieties was studied at two locations, namely Alshohadaa and Sadat City in Menoufia Governorate, over two consecutive years from January 2022 to December 2023.

1. Population fluctuation of mite species associated with citrus varieties in 2022 and 2023 at Alshohadaa region, Menoufia governorate

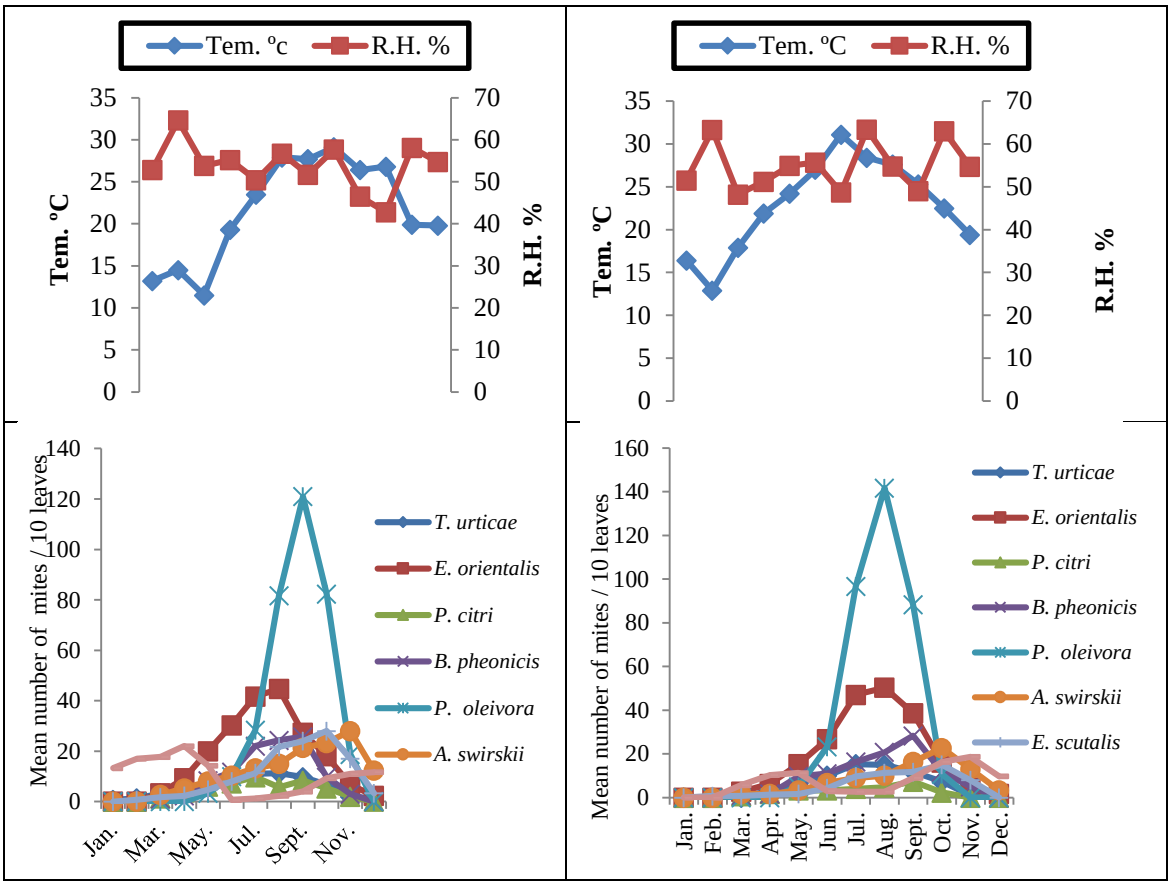
In the present study, leaf samples of orange (Balady, Navel, and Sukkari), mandarin (Balady), lime (Key lime), and lemon (Balady) were collected and analyzed for mite populations over two years.

A total of eight species of mites that belong to five families were found, where there were five phytophagous mite species, two spotted spider mites, *Tetranychus urticae*, citrus brown mite, *Eutetranychus orientalis*, European red mite, *Panonychus citri*, citrus flat mite, *Brevipalpus pheonicis*, and citrus rust mite, *Phyllocoptruta oleivora*, and two predatory mites, *Amblyseius swirskii* and *Euseius scutalis*, in addition to one miscellaneous feeding mite species, *Tydeus californicus*, in 2022 and 2023.

1.1. Balady orange, *C. sinensis* var. Balady

In the present study, samples of Balady orange leaves were collected and analyzed to determine mite populations over two years. The data illustrated in Fig. 1 show the monthly mean number of recorded mites per 10 leaves. A total of eight species of mites that belong to five families were found, where there were five phytophagous mite species, two spotted spider mites, *Tetranychus urticae*, citrus brown mite, *Eutetranychus orientalis*, European red mite, *Panonychus citri*, citrus flat mite, *Brevipalpus pheonicis*, and citrus rust mite, *Phyllocoptruta oleivora*, and two predatory mites, *Amblyseius swirskii* and *Euseius scutalis*, in addition to one miscellaneous feeding mite species, *Tydeus californicus*, in 2022 and 2023, at Alshohadaa region.

Regarding the monthly population fluctuations of Tetranychus urticae, the results in Fig. 1 indicate that the highest population density was recorded in July and August of both 2022 and 2023, with mean numbers of 11.3 and 15.3 individuals per 10 leaves, respectively. The lowest population density of Tetranychus urticae was recorded in January, February, and December of 2022 (0.7, 1.3, and 1.3 individuals/10 leaves), and in January, February, March, and December of 2023 (0.0 individuals/10 leaves) and the rest of the months of the year recorded intermediate numbers of T. urticae populations in 2022 and 2023, ranging from 3.3 to 11.0 and 1.0 to 15.0 individuals per 10 leaves, respectively.



Alshohadaa-Balady orange-2022 Alshohadaa-Balady orange-2023

Fig. (1): Population fluctuation of mite species associated with leaves of Balady orange and its predators during 2022-2023 at Alshohadaa region, Menoufia governorate.

Regarding the monthly fluctuations in the population of E. orientalis, the results in Fig. 1 indicate that the highest population density was recorded in August in both 2022 and 2023, with averages of 44.7 and 50.3 individuals, respectively. /10 leaves. The lowest population density of E. orientalis was recorded in January, February, and December 2022 (0.0, 0.0, and 2.3 individuals per 10 leaves), and in January, February, March, and December 2023 (0.0, 0.0, and 1.7 individuals per 10 leaves).

The European red mite, *P. citri*, was present in moderate numbers during all months of 2022 and 2023, with a total mean of 49.3 individuals per 10 leaves per year, and an average of 4.1 individuals /10 leaves /month during 2022, while the total mean numbers were 27.3 individuals / 10 leaves/ year, with a monthly average of 2.3 individuals /10 leaves during 2023. Regarding the citrus flat mite, B. pheonicis, the total mean number was 108.0 individuals / 10 leaves/year with a monthly average of 9.0 individuals /10 leaves during 2022, while the total mean numbers were 105.4 individuals /10 leaves/ year with an average of 8.8 individuals /10 leaves /month during 2023 Fig. (1), while the infestation with *Phyllocoptruta oleivora* reaches its maximum numbers during August, September, and October (81.7, 121.0, and 82.3 individuals /10 leaves) and July, August, and September (96.7, 141.7, and 88.3 individuals /10 leaves) during 2022 and 2023, respectively, with a monthly average of 28.8 and 30.5 individuals /10 leaves during 2022 and 2023, respectively.

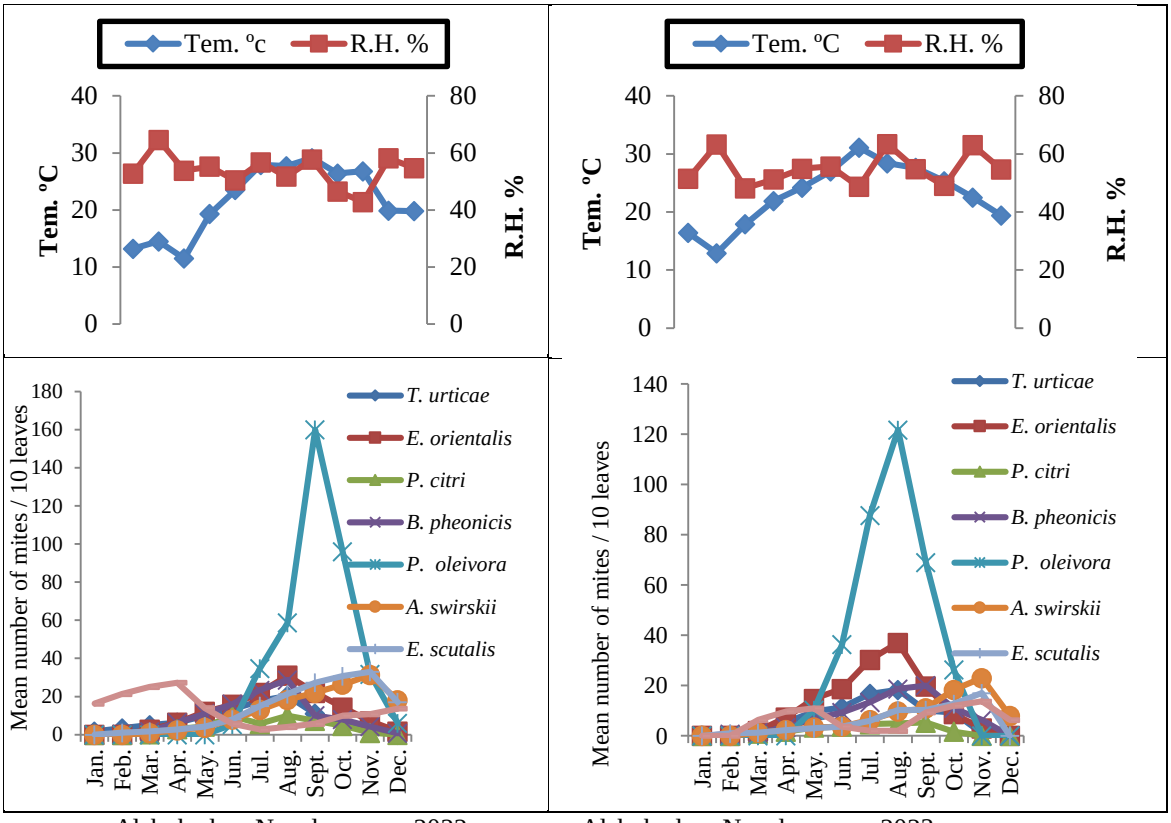
The predatory mites A. swirskii and E. scutalis were found on the leaves of Balady orange trees in most of the collected samples. Data in Fig. 1 shows that the total mean number of A. swirskii was 139.5 individuals per 10 leaves per year, with an average of 11.6

individuals /10 leaves /month during 2022, while the total mean numbers were 87.7 individuals /10 leaves/ year with a monthly average of 7.3 individuals /10 leaves during 2023. Also, the total mean number of *E. scutalis* was 122.7 individuals /10 leaves/year, with a monthly average of 10.2 individuals /10 leaves /month during 2022, while the total mean numbers were 64.4 individuals /10 leaves/year with a monthly average of 5.4 individuals /10 leaves during 2023. The other mites, *T. californicus*, have monthly average numbers of 10.4 and 7.5 individuals per 10 leaves during 2022 and 2023.

1.2. Navel orange, *C. sinensis* var. Navel (Seedless orange)

The data presented in Fig. 2 show the monthly population fluctuations of *T. urticae*. The highest population density was recorded in August during both years, 2022 and 2023, with mean numbers of 20.3 and 18.3 individuals, respectively. /10 leaves. The lowest population density of T. urticae was recorded in January, November, and December 2022 (1.7, 2.3, and 0.0 individuals/10 leaves), as well as in January, February, and December 2023 (0.0 individuals/10 leaves) and the rest of the months of the year recorded intermediate numbers of T. urticae populations in 2022 and 2023, ranging from 3.3 to 17.7 and 1.0 to 16.7 individuals per 10 leaves, respectively.

Regarding the monthly fluctuations in the population of E. orientalis, the results in Fig. 2 indicate that the highest population density was recorded in August of both 2022 and 2023, with averages of 31.0 and 37.0 individuals /10 leaves, respectively. The lowest population density of E. orientalis was recorded in January, February, and December 2022 (0.0, 0.0, and 1.7 individuals per 10 leaves) and in January, February, and December 2023 (0.0, 0.0, and 1.7 individuals per 10 leaves).



Alshohadaa- Navel orange -2022 Alshohadaa- Navel orange -2023

Fig. (2): Population fluctuation of mite species associated with leaves of Navel orange and its predators during 2022-2023 at Alshohadaa region, Menoufia governorate.

The European red mite, *P. citri*, was present in moderate numbers during all months of 2022 and 2023, with a total mean of 46.0 individuals per 10 leaves per year, and a monthly average of 3.8 individuals. /10 leaves during 2022, while the total mean numbers were 26.4 individuals. /10 leaves/ year with a monthly average of 2.2 individuals. /10 leaves during 2023. Regarding the citrus flat mite, B. pheonicis, the total mean number was 110.3 individuals /10 leaves/year with a monthly average of 9.2 individuals. 10 leaves in 2022, while the total mean number was 90.6 individuals per 10 leaves per year, with a monthly average of 7.6 individuals /10 leaves during 2023 Fig. (2), while the infestation with *Phyllocoptruta oleivora*, reaches its maximum numbers during August, September, and October (58.7, 160.0, and 96.0 individuals /10 leaves) and July, August, and September (87.7, 121.7, and 69.0 individuals /10 leaves) during 2022 and 2023, respectively, with a monthly average of 32.7 and 29.3 individuals per 10 leaves during 2022 and 2023, respectively.

Regarding the predatory mites, *A. swirskii* and *E. scutalis* were found on leaves of Navel orange trees in most of the collected samples. The data in Fig. 2 show that the total mean number of A. swirskii was 143.6 individuals. /10 leaves/year with a monthly average of 12.0 individuals /10 leaves during 2022, while the total mean numbers were 86.9 individuals / 10 leaves/year, with an average of 7.2 individuals /10 leaves /month during 2023. Additionally, the total mean number of E. scutalis was 162.0 individuals per 10 leaves per year, with a monthly average of 13.5 individuals per 10 leaves during 2022, while the total mean number was 67.6 individuals. /10 leaves/year with a monthly average of 5.6 individuals. /10 leaves during 2023. The other mites, *T. californicus*, had monthly average numbers of 13.0 and 6.3 individuals per 10 leaves in 2022 and 2023.

1.3. Sweet orange, *C. sinensis* var. sweet orange

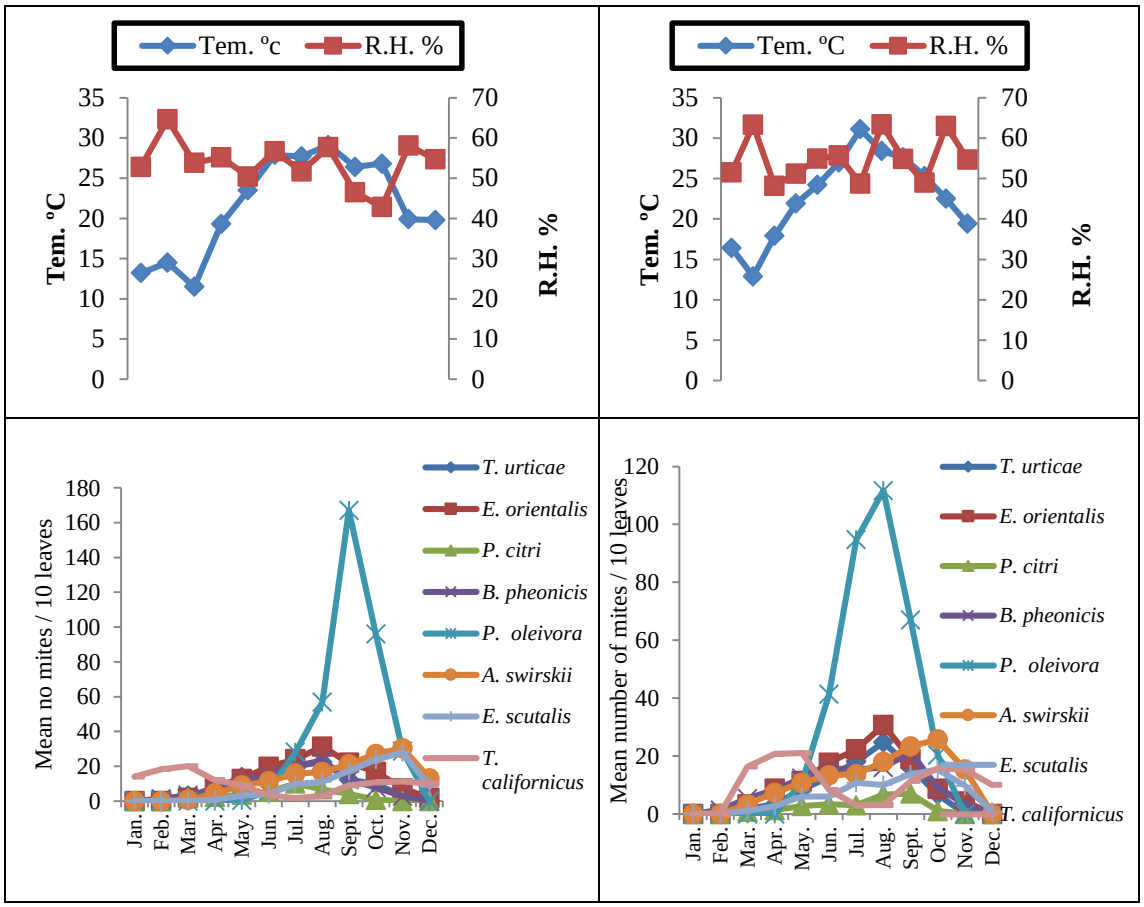
The obtained data in Fig. 3 show the monthly population fluctuation of *T. urticae*. The highest population density was recorded in August during both years, 2022 and 2023, with mean numbers of 22.3 and 24.7 individuals, respectively. The lowest population density of T. urticae was recorded in January, February, and December 2022 (0.0 individuals/10 leaves) and in January, February, November, and December 2023 (0.0 individuals/10 leaves) and the rest of the months of the year recorded intermediate numbers of T. urticae populations in 2022 and 2023, ranging from 3.0 to 20.0 and 1.7 to 18.0 individuals per 10 leaves, respectively.

About the monthly fluctuations in the population of E. orientalis, the results in Fig. 3 indicate that the highest population density was recorded in August in both 2022 and 2023, with an average of 31.3 and 30.7 individuals per 10 leaves, respectively. The lowest population density of E. orientalis was recorded in January and February 2022 (0.0 individuals per 10 leaves) and in January, February, and December 2023 (0.0 individuals per 10 leaves).

The European red mite, *P. citri*, was present in moderate numbers throughout 2022 and 2023, with a total mean of 34.4 individuals per 10 leaves per year, and an average of 2.9 individuals /10 leaves /month during 2022, while the total mean numbers were 25.7 individuals /10 leaves/ year, with an average of 2.1 individuals /10 leaves /month during 2023. Regarding the citrus flat mite, B. pheonicis, the total mean number was 101.6 individuals /10 leaves/year, with a monthly average of 8.5 individuals /10 leaves during 2022, while the total mean numbers were 107.8 individuals /10 leaves/year with a monthly average of 9.0 individuals /10 leaves during 2023, Fig (3), while the infestation with *P. oleivora* reaches its maximum numbers during August, September and October (56.7, 167.0 and 96.0 individuals /10 leaves) and July, August and September (94.7, 111.7 and 67.0 individuals /10 leaves) during 2022 and 2023, respectively, with a monthly average of 31.9 and 28.8 individuals /10 leaves during 2022 and 2023, respectively.

Concerning the predatory mites, *A. swirskii* and *E. scutalis* were observed on the foliage of Sweet orange trees in the majority of the

collected samples. The data in Fig. 3 show that the total mean number of A. swirskii was 149.0 individuals per 10 leaves per year, with a monthly average of 12.4 individuals per 10 leaves per month in 2022. The total mean numbers were 130.6 individuals /10 leaves/year, with a monthly average of 10.9 individuals per 10 leaves during 2023. Also, the total mean number of *E. scutalis* was 105.7 individuals /10 leaves/year, with a monthly average of 8.8 individuals /10 leaves during 2022, while the total mean numbers were 75.8 individuals / 10 leaves/year, with a monthly average of 6.3 individuals. /10 leaves /month during 2023. The other mites, *T. californicus*, have monthly average numbers of 10.2 and 10.4 individuals per 10 leaves during 2022 and 2023.



Alshohadaa- Sweet orange -2022 Alshohadaa- Sweet orange -2023

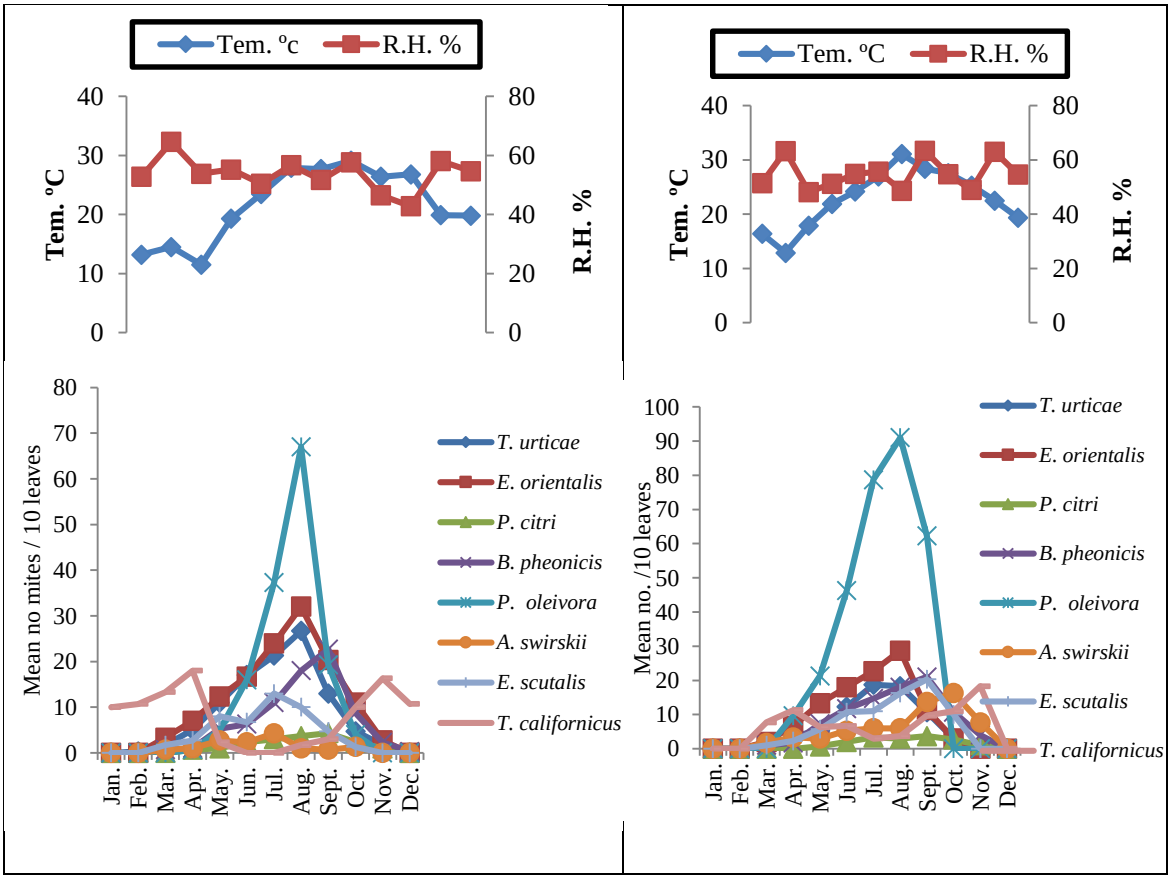
Fig. (3): Population fluctuation of mite species associated with leaves of Sweet orange and its predators during 2022-2023 at Alshohadaa region, Menoufia governorate.

1.4. Mandarin, *Citrus reticulata* var. Balady

The data presented in Fig. 4 show the monthly population fluctuations of *T. urticae*. The highest population density was recorded in August 2022, with a mean of 26.7 individuals per square kilometer. /10 leaves, and in July and August 2023, with a mean of 18.7 and 18.3 individuals. /10 leaves. The lowest population density of T. urticae was recorded in January and December 2022 (0.0 individuals/10 leaves), as well as in January, February, November, and December 2023 (0.0 individuals/10 leaves) and the rest of the months of the year recorded intermediate numbers of T. urticae populations in 2022 and 2023, ranging from 0.3 to 21.3 and 0.3 to 12.3 individuals per 10 leaves, respectively.

Regarding the monthly fluctuations in the population of E. orientalis, the results in Fig. 4 indicate that the highest population density was recorded in August of both 2022 and 2023, with averages of 32.0 and 28.7 individuals per 10 leaves, respectively. The lowest population density of E. orientalis was recorded in January, February, and December 2022 (0.0 individuals per 10 leaves) and in January, February, November, and December 2023 (0.0 individuals per 10 leaves).

The European red mite, *P. citri*, was present in moderate numbers during the period from April to November 2022 and 2023, with a total mean of 18.3 individuals per 10 leaves per year and a monthly average of 1.5 individuals /10 leaves during 2022, while the total mean numbers were 16.4 individuals /10 leaves/year with a monthly average of 1.4 individuals. /10 leaves during 2023. Regarding the citrus flat mite, B. pheonicis, the total mean number was 76.3 individuals /10 leaves/year with a monthly average of 6.4 individuals /10 leaves during 2022, while the total mean numbers were 90.1 individuals per 10 leaves/ year, with a monthly average of 7.5 individuals /10 leaves during 2023, Fig (4), while the infestation with *P. oleivora*, reach its maximum numbers during July and August (37.3 and 67.0 individuals per 10 leaves) and July, August and September (78.7, 91.0 and 62.3 individuals per 10 leaves) during 2022 and 2023, respectively, with an average 12.4 and 25.8 individuals per 10 leaves per month during 2022 and 2023, respectively.



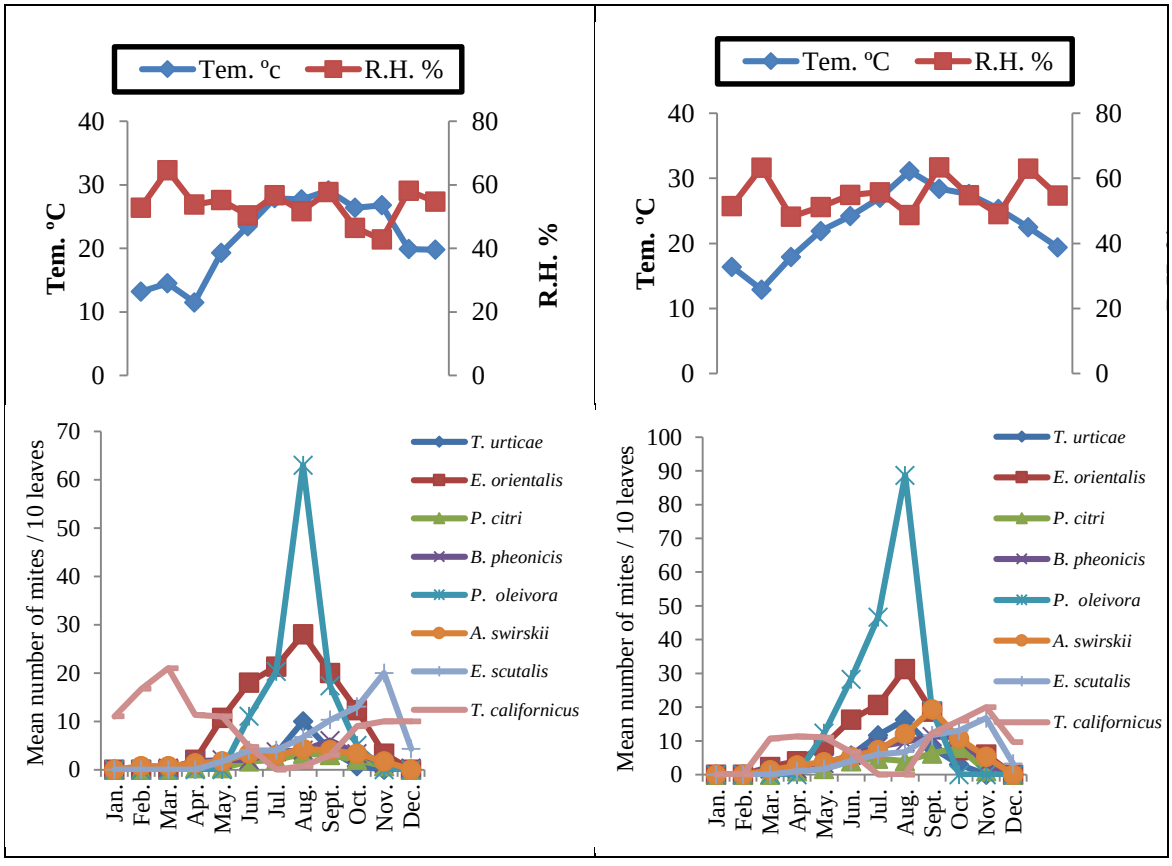
Alshohadaa- Mandarin -2022 Alshohadaa- Mandarin -2023

Fig. (4): Population fluctuation of mite species associated with leaves of Mandarin and its predators during 2022-2023 at Alshohadaa region, Menoufia governorate.

Concerning the predatory mites, *A. swirskii* and *E. scutalis* were observed on the foliage of Mandarin trees in the majority of the collected samples. The data in Fig. 4 show that A. swirskii exhibited moderate numbers during the period from March to October 2022. However, these numbers increased in the second year, 2023, with a total mean of 14.0 individuals per 10 leaves per year, and a monthly average of 1.2 individuals /10 leaves during 2022, while the total mean numbers were 63.0 individuals /10 leaves/year with a monthly average of 5.3 during 2023. Additionally, the total mean number of E. scutalis was 48.1 individuals per 10 leaves per year, with a monthly average of 4.0 individuals /10 leaves during 2022, while the total mean numbers were 77.3 individuals /10 leaves/year, with a monthly average of 6.4 individuals /10 leaves /month during 2023. The other mites, *T. californicus*, have monthly average numbers of 8.0 and 6.5 individuals per 10 leaves during 2022 and 2023.

1.5. Citrus lime, *Citrus aurantifolia* var. Lime

The data presented in Fig. 5 show the monthly population fluctuations of *T. urticae*. The highest population density was recorded in August 2022 and 2023, with mean numbers of 10.0 and 16.3 individuals /10 leaves. The lowest population density of T. urticae was recorded in January, February, November, and December 2022 and 2023 (0.0 individuals/10 leaves) and the rest of the months of the year recorded intermediate numbers of T. urticae populations in 2022 and 2023, ranging from 0.3 to 4.0 and 1.0 to 11.7 individuals per 10 leaves, respectively.



Alshohadaa- lime -2022 Alshohadaa- lime -2023

Fig. (5): Population fluctuation of mite species associated with leaves of citrus lime and its predators during 2022-2023 at Alshohadaa region, Menoufia governorate.

Regarding the monthly fluctuations in the population of E. orientalis, the results in Fig. 5 indicate that the highest population density was recorded in August of both years, 2022 and 2023, with averages of 28.0 and 31.3 individuals per 10 leaves, respectively. No infestation was recorded in January, February, March, and December of 2022 and 2023 (0.0 individuals /10 leaves).

The European red mite, *P. citri*, exhibited moderate numbers during the period from April to November 2022 and 2023, with a total mean of 13.3 individuals per 10 leaves per year and a monthly average of 1.1 individuals during 2022, while the total mean numbers were 30.7, with a monthly average of 2.6 during 2023. Regarding the citrus flat mite, B. pheonicis, the total mean number was 24.6 individuals /10 leaves/ year with a monthly average of 2.1 during 2022, while the total mean numbers were 55.7 individuals /10 leaves/ year with a monthly average of 4.6 individuals /10 leaves during 2023, Fig. (5), while the infestation with *P. oleivora* reaches its maximum numbers in August (63.0 and 88.7 individuals /10 leaves) during 2022 and 2023, respectively, with a monthly average of 9.7 and 16.3 individuals /10 leaves during 2022 and 2023, respectively.

Concerning the predatory mites, *A. swirskii* and *E. scutalis* were observed on the foliage of citrus lime trees in most of the collected samples. The data in Fig. 5 show that A. swirskii exhibited moderate numbers in 2022, with a total mean of 24.0 individuals per 10 leaves per year, and a monthly average of 2.0 individuals /10 leaves during 2022, while these numbers increased in the second year of 2023, where the total mean number of *A. swirskii* was 67.6 individuals /10 leaves/year, with an average of 5.6 individuals /10 leaves /month during 2023. Additionally, the total mean number of E. scutalis was approximately 64.0 individuals /10 leaves/year, with a monthly average of 5.3 individuals /10 leaves during 2022 and 2023. The other mites, *T. californicus*, have monthly average numbers of 9.0 and 8.1 individuals per 10 leaves during 2022 and 2023.

1.6. Citrus Lemon, *Citrus aurantifolia* var. Balady

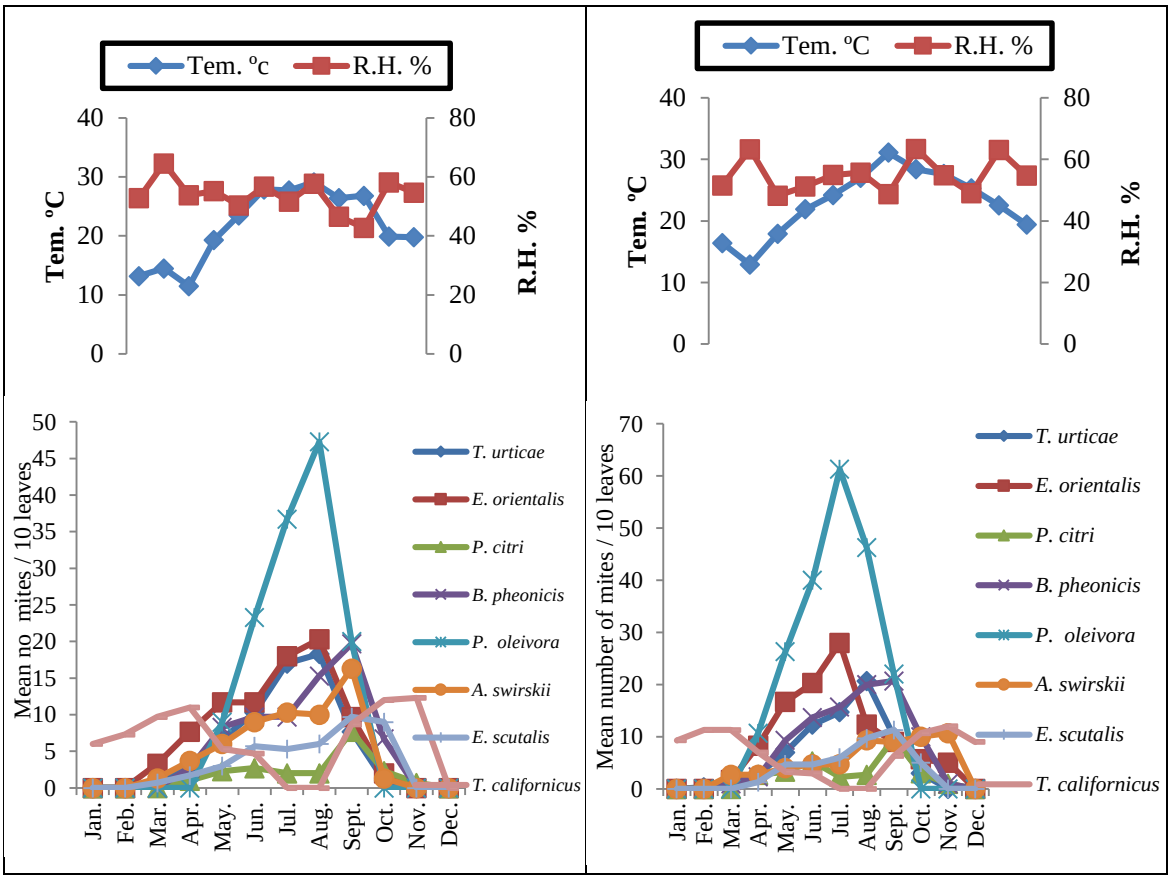
The data illustrated in Fig. 6 show the monthly population fluctuations of *T. urticae*. The highest population density was recorded in August 2022 and 2023, with mean numbers of 18.3 and 20.7 individuals. /10 leaves, while no infestation of T. urticae was recorded in January, February, November, and December of 2022 and 2023.

As for the monthly fluctuation of the population of *E. orientalis*, the results in Fig. (6) show that the highest population density was recorded in the month of August with mean number of (20.3 individuals /10 leaves) during 2022 and in the month of July with mean number of (28.0 individuals /10 leaves) during 2023 year.

The European red mite, *P. citri*, infested Lemon trees in small numbers during 2022 and 2023, with a total mean number of 20.7 individuals per 10 leaves per year, and a monthly average of 1.7 individuals per 10 leaves per month during 2022. The total mean numbers were 30.0 individuals. /10 leaves/ year with a monthly average of 2.5 individuals. /10 leaves /month during 2023. Concerning the citrus flat mite, B. pheonicis, the total mean count was 72.1 individuals per 10 leaves per year, with an average of 6.0 individuals per 10 leaves per month in 2022. In contrast, the total mean count was 93.7 individuals per 10 leaves per year, with an average of 7.8 individuals per 10 leaves per month in 2023, as illustrated in Fig. 6. The infestation of P. oleivora peaks in August, with 47.3 and 46.3 individuals per 10 leaves in 2022 and 2023, respectively, and monthly averages of 11.4 and 17.2 individuals per 10 leaves for the same years. The infestation is absent from January to March and from October to December in both years.

The predatory mites A. swirskii and E. scutalis were found on the leaves of Lemon trees in most of the collected samples. The data in Fig. 6 show that the total mean number of A. swirskii during 2022 and 2023 was almost equal, at approximately 57.9 and 57.8 individuals, respectively. /10 leaves/year with a monthly

average of 4.8 individuals. /10 leaves /month during 2022 and 2023. Also, the total mean number of *E. scutalis* was 41.1 individuals. /10 leaves/year with a monthly average of 3.4 individuals. /10 leaves /month during 2022, while the total mean numbers were 42.7 individuals. /10 leaves/year with a monthly average of 3.6 individuals /10 leaves /month during 2023. The other mite, T. californicus, had monthly average numbers of 6.4 and 6.9 individuals per 10 leaves per month in 2022 and 2023, respectively.



Alshohadaa- Lemon -2022 Alshohadaa- lemon -2022

Fig. (6): Population fluctuation of mite species associated with leaves of citrus lemon its predators during (2022-2023) at Alshohadaa region, Menoufia governorate.

2- Identification of mite species associated with citrus varieties during 2022 and 2023 at Alshohadaa region.

In this study, we investigated the Population density of certain citrus varieties in relation to infestation with phytophagous mites and their predators during 2022 and 2023 at the Alshohadaa region under field conditions. According to the mean number of phytophagous mites and their predators that existed during the two successive seasons of 2022 and 2023, the obtained results showed that the different citrus varieties significantly ($P > 0.05$) differed in their Population density of mite species infestation and their associated predators (Table 1). Data presented in Table 1 indicate that the mean annual infestation with Tetranychus urticae in 2022 was the highest on Sweet orange, followed by Mandarin, Navel orange, Balady orange, and then Lemon and Lime. It recorded 9.0, 8.5, 8.1, 5.5, 5.4, and 1.9, respectively. The mean 2023 annual infestation with T. urticae was the highest on Sweet orange, Navel orange, Lemon, and

Mandarin, respectively, followed by Balady orange and Lime. It recorded 7.6, 6.9, 6.1, 6.0, 5.9, and 4.2, respectively.

As for the Citrus brown mite, Eutetranychus orientalis, the data presented in Table 1 indicate that the highest infestation rates were recorded with Balady orange, with an average number of 17.0 and 17.5 individuals. In the consecutive years of 2022 and 2023, the lowest counts were documented, with Lemon at 7.0 individuals in 2022 and Mandarin at 8.8 individuals per 10 leaves in 2023.

Regarding the European red mite, Panonychus citri, the results in Table 1 indicate that the highest annual mean average was recorded for Balady orange, at 4.1 individuals, followed by Navel orange, at 3.8 individuals. In contrast, the lowest was recorded with Lime, at 1.1 individuals in 2022. The Lime 2.6 individuals, compared to the Mandarin 1.4 individuals in 2023.

Regarding the flat mite, Brevipalpus pheonicis, the results in Table 1 show that the highest annual mean average was found in 2022 with navel oranges, at 9.2 individuals, and in 2023 with Balady orange at 8.8 individuals. However, in 2022 and 2023, the lowest infestation percentages were seen with Lime 2.1 and 4.6 individuals, respectively.

Table 1: Population density of mite species associated with citrus varieties during 2022 and 2023 at Alshohadaa region.

Mite species	Average number of mite species associated with Citrus varieties per 10 leaves					
	Balady	**Navel**	**Sweet**	**Mandarin**	**Lime**	**Lemon**
	2022					
T. urticae	5.5	8.1	9.0	8.5	1.9	5.4
E. orientalis	17.0	11.2	12.0	10.8	9.6	7.0
P. citri	4.1	3.8	2.9	1.5	1.1	1.7
B. pheonicis	9.0	9.2	8.5	6.4	2.1	6.0
P. oleivora	28.8	32.7	31.9	12.4	9.7	11.4
T. californicus	10.4	13.0	10.2	8.0	9.0	6.4
A. swirskii	11.6	12.0	12.4	1.2	2.0	4.8
E. scutalis	10.2	13.5	8.8	4.0	5.3	3.4
overall mean	96.6[a]	103.5[a]	95.7[a]	52.8[b]	40.7[b]	46.1[b]
L.S.D 0.05				13.0		
	2023					
T. urticae	5.9	6.9	7.6	6.0	4.2	6.1
E. orientalis	17.5	11.8	10.5	8.8	9.6	8.9
P. citri	2.3	2.2	2.1	1.4	2.6	2.5
B. pheonicis	8.8	7.6	9.0	7.5	4.6	7.8
P. oleivora	30.5	29.3	28.8	25.8	16.3	17.2
T. californicus	7.5	6.3	10.4	6.5	8.1	6.9
A. swirskii	7.3	7.2	10.9	5.3	5.6	4.8
E. scutalis	5.4	5.6	6.3	6.4	5.3	3.6
overall mean	85.2[a]	76.9[ab]	85.6[a]	67.7[bc]	56.3[c]	57.8[c]
L.S.D 0.05	11.8					

Means in each row followed by the same letter (s) are not significantly different at the 5% level.

As for the rust mite, *Phyllocoptruta oleivora*, data in Table 1 showed that the highest annual mean average was observed in 2022 for Navel orange, followed by Sweet orange with 32.7 and 31.9 individuals, and in 2023 for Balady orange, followed by Navel orange with 30.5 and 29.3 individuals. In contrast, the lowest annual mean average was found in Lime during the two consecutive years 2022 and 2023, with an average of 9.7 and 16.3 individuals, respectively.

For the other mites, *the data in Table 1 for Tydeus californicus indicate that the highest Population density was recorded with Navel orange in 2022 and 2023, while the lowest population* density was recorded with Lemon in 2022 and Sweet orange in 2023.

As for the predatory mite, *Amblyseius swirskii* results in Table (1) indicated that the highest annual mean average was recorded with Sweet orange followed by Navel orange in 2022 and in 2023 in Sweet orange followed by Balady and Navel orange, while the least one was recorded with Mandarin in 2022 and Lemon in 2023. The predatory mite *Euseius scutalis* recorded the most excellent annual mean average in 2022 with Navel orange and in 2023 with Mandarin. On the other hand, Lemon had the lowest one in 2022 and 2023.

Statistical analysis of the data in Table 1 revealed no significant differences in the total overall mean numbers of mites among Balady, Navel, and Sweet orange in 2022. However, significant differences were observed between Balady orange and Lime & Lemon in 2023.

3- Population density of mite species associated with citrus varieties in 2022 and 2023 at the Sadat City region

Leaf samples of Orange (Balady, Navel, and Sukkari), mandarin (Balady), lime (Key lime), and lemon (Citrus lemon) were collected and analyzed for mite populations throughout two years for the current study.

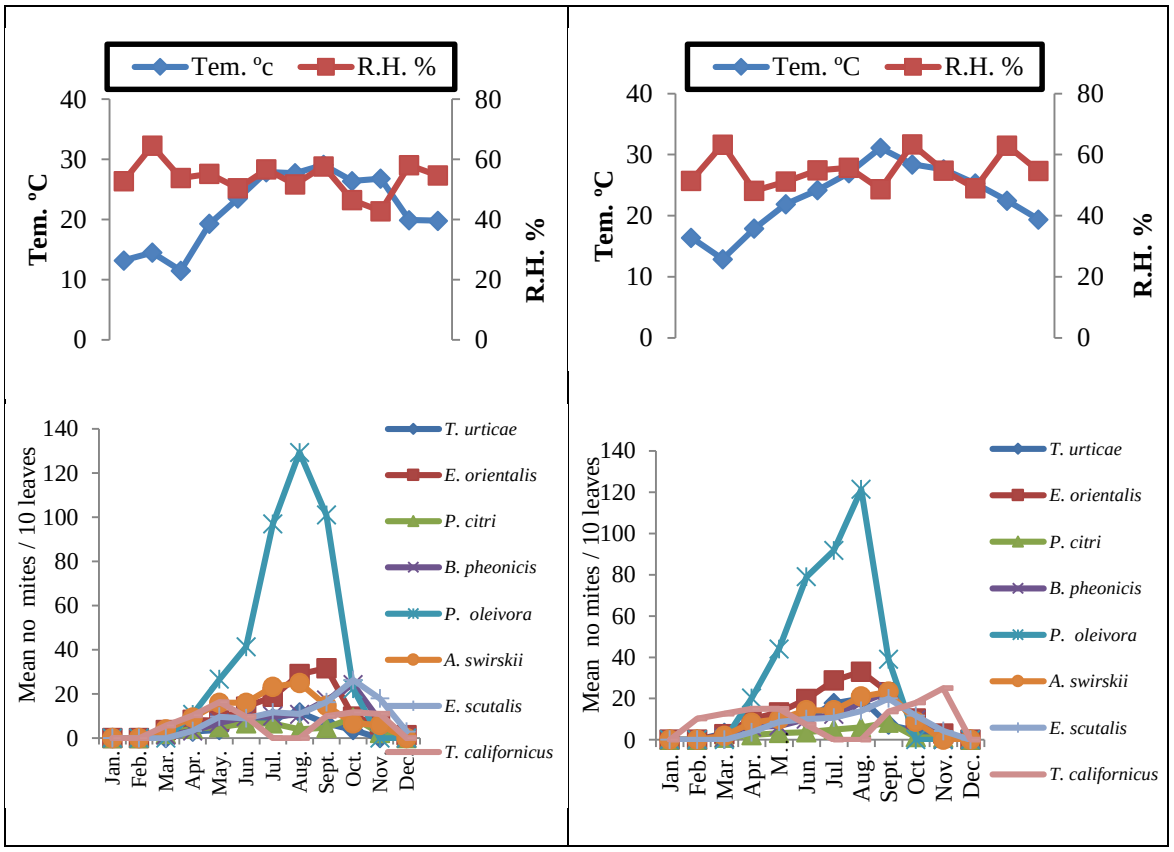
3.1. Balady orange, *C. sinensis* var. Balady

The monthly population fluctuations of *T. urticae* are displayed in Fig. 7 and were recorded for every month except January through March, November, and December of 2022, as well as January and February and December of 2023, when there was no infestation. The findings showed that August 2022 and 2023 had the highest population density, with mean numbers of 11.7 and 20.0 individuals per 10 leaves, respectively. In 2022 and 2023, the average monthly number of *T. urticae* individuals per leaf was 3.9 and 6.7, while the total mean number of individuals per leaf was 47.1 and 80.3 per year. According to the results in Fig. 7, the *E. orientalis* population exhibited monthly fluctuations. The highest population density was observed in September 2022 and August 2023, with mean numbers of 31.7 and 33.0 individuals per 10 leaves, respectively. The total mean numbers were 131.0 and 143.7 individuals. /10 leaves /year, with monthly averages of 10.9 and 12.0 individuals /10 leaves /month in 2022 and 2023, respectively.

Regarding *P. citri*, the data gathered showed that the total mean numbers of Balady orange trees infested with European red mites were 45.0 and 31.9 individuals. /10 leaves/year, with a monthly average of 3.8 and 2.7 individuals /10 leaves/month in 2022 and 2023. However, in January and February of 2022 and 2023, no infestation was found. In 2022 and 2023, the citrus flat mite, *B. pheonicis*, had monthly averages of 7.6 and 7.3 individuals /10 leaves/month, respectively, with total mean numbers of 91.6 and 87.3 individuals /10 leaves /year, as shown in Fig. (7). However, the highest population density was noted in October 2022 and September 2023, with mean numbers of 24.3 and 23.3 individuals /10 leaves. In August 2022 and 2023, the P. oleivora infestation peaked at 129.3 and 121.3 individuals per 10 leaves, respectively. However, in both years, there was no infestation from January to March.

A. swirskii and *E. scutalis* were observed on the leaves of Balady orange trees in most of the samples collected, except in January and February 2022 and 2023, when no individuals were found. According to the data in Fig. 7, A. swirskii exhibited high numbers in 2022, with a total mean of 121.0 individuals /10 leaves/year

and a monthly average of 10.1 individuals /10 leaves /month. In 2023, however, these numbers declined, with a total mean of 101.9 individuals per 10 leaves per year and a monthly average of 8.5 individuals per 10 leaves per month. As for the total mean numbers of *E. scutalis*, they were 108.3 and 83.1 individuals per 10 leaves per year, with a monthly average of 9.0 and 6.9 individuals per 10 leaves per month in 2022 and 2023. The average monthly numbers for the other mites, *T. californicus*, were 6.2 and 9.8 individuals per 10 leaves per month.



Sadat City- Balady orange-2022 Sadat City- Balady orange-2023

Fig. (7): Population fluctuation of mite species associated with leaves of Balady orange and its predators during 2022-2023 at Sadat City region, Menoufia governorate.

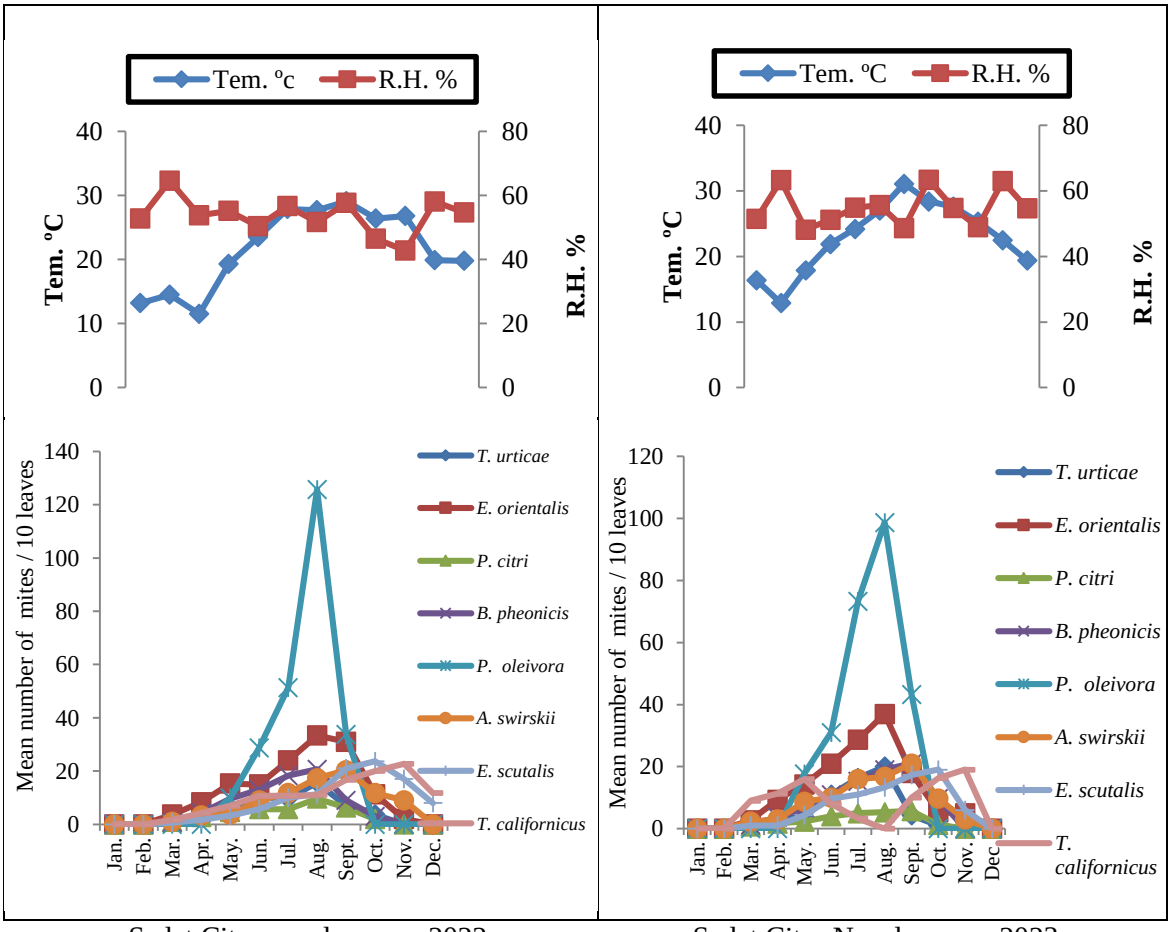
3.2. Navel orange, *C. sinensis* var. Navel (Seedless orange)

Based on the data in Fig. 8, the monthly population fluctuation of *T. urticae*. In 2022 and 2023, the highest population density was recorded in August of both years, with mean numbers of 15.7 and 20.0 individuals per 10 leaves, respectively. Then the numbers gradually declined, and the average monthly numbers were 4.6 and 5.1 individuals/10 leaves. In terms of the monthly variation of the *E. orientalis* population, Fig. 8 shows that August 2022 and 2023 had the highest population density, with mean numbers of 33.3 and 37.0 individuals per 10 leaves, respectively. The leaf samples from January and February of 2022 and 2023 showed no signs of *E. orientalis* mite infestation. The average monthly mite populations in 2022 and 2023 were 12.0 and 11.8 individuals /10 leaves, respectively. For the European red mite, *P. citri*, monthly population variation (Fig. 8) revealed modest numbers for every month of 2022 and 2023, except for January and February, and November and December, where no individuals were recorded in either year. Meanwhile, the total mean numbers were 37.8 and 26.0

individuals /10 leaves/year, with a monthly average of 3.2 and 2.2 individuals /10 leaves /month during 2022 and 2023.

The total mean number of the citrus flat mite, *B. pheonicis*, was 78.7 individuals /10 leaves /year with a monthly average of 6.6 individuals /10 leaves/month in 2022, and 87.7 individuals /10 leaves /year with a monthly average of 7.3 individuals /10 leaves /month in 2023. Meanwhile, the infestation of P. oleivora peaked in August 2022 and 2023 (125.7 and 98.7 individuals per 10 leaves, respectively), with no individuals discovered between January and April or October and December in either year. Furthermore, the average monthly mite population of P. oleivora was 20.8 and 22.0 individuals per 10 leaves, respectively.

Most of the samples collected showed the presence of two predatory mites on the leaves of Navel orange trees: *Amblyseius swirskii* and *E. scutalis*. Data in Fig. 8 shows that the total mean number of *A. swirskii* was 87.0 and 90.4 individuals /10 leaves /year, with a monthly average of 7.3 and 7.5 individuals. /10 leaves /month in 2022 and 2023. The total mean number of E. scutalis was 102.4 individuals /10 leaves/year, with a monthly average of 8.5 individuals /10 leaves /month in 2022, and the total mean number of *E. scutalis* was 82.6 individuals. /10 leaves /year with a monthly average of 6.9 individuals /10 leaves /month during 2023. The Tydeid mite, *T. californicus*, has monthly average numbers of 9.7 and 7.7 individuals. /10 leaves /month in 2022 and 2023.



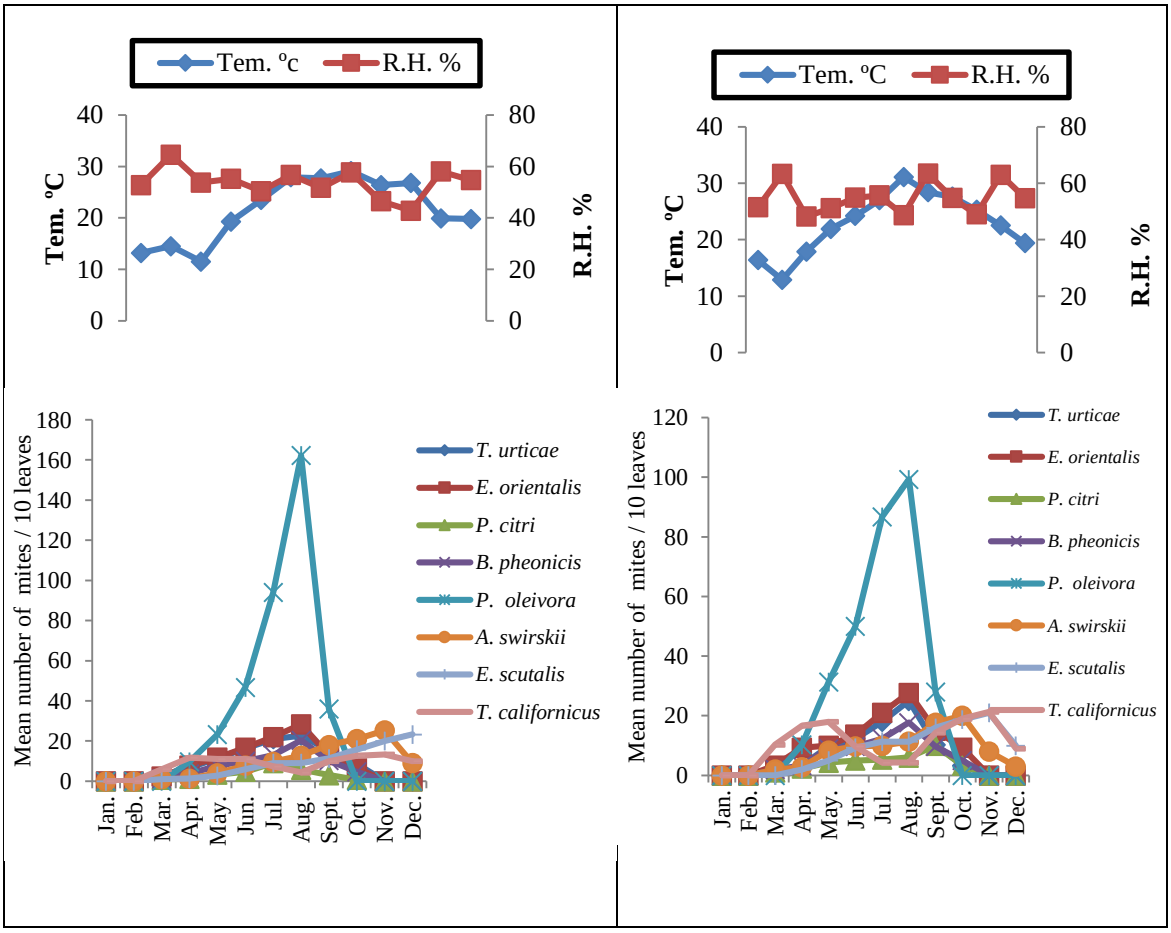
Sadat City- navel orange-2022 Sadat City- Navel orange-2023

Fig. (8): Population fluctuation of mite species associated with leaves of Navel orange and its predators during (2022-2023) at Sadat City region, Menoufia governorate.

3.3. Sweet orange, *C. sinensis* var. sweet orange

The data obtained in Fig. 9 shows the monthly population fluctuation of *T. urticae*. The highest population density was recorded in August 2022 and 2023, with mean numbers of 22.7 and 25.0 individuals per 10 leaves, respectively. Then the numbers again decreased in September and October, after which no numbers were recorded in November and December in either year; the average monthly numbers were 8.6 and 6.9 individuals /10 leaves, respectively. Regarding the monthly fluctuations of E. orientalis populations, Fig. 9 shows that in both 2022 and 2023, August had the highest population density, with mean numbers of 28.3 and 27.7 individuals, respectively. /10 leaves. In 2022 and 2023, the average monthly number of mite populations was 9.0 and 9.1 individuals/10 leaves, respectively.

Except for January, February, and November and December, when no individuals were found in either year, the data in Fig. 9 regarding the monthly variation in the population of the European red mite, *P. citri*, showed lower numbers for every month of the 2022 and 2023 years. The monthly averages for 2022 and 2023 were 2.4 and 3.1 individuals per 10 leaves, respectively, while the total mean numbers were 28.4 and 37.2 individuals per 10 leaves per year.



Sadat City- Sweet orange-2022 Sadat City- Sweet orange-2023

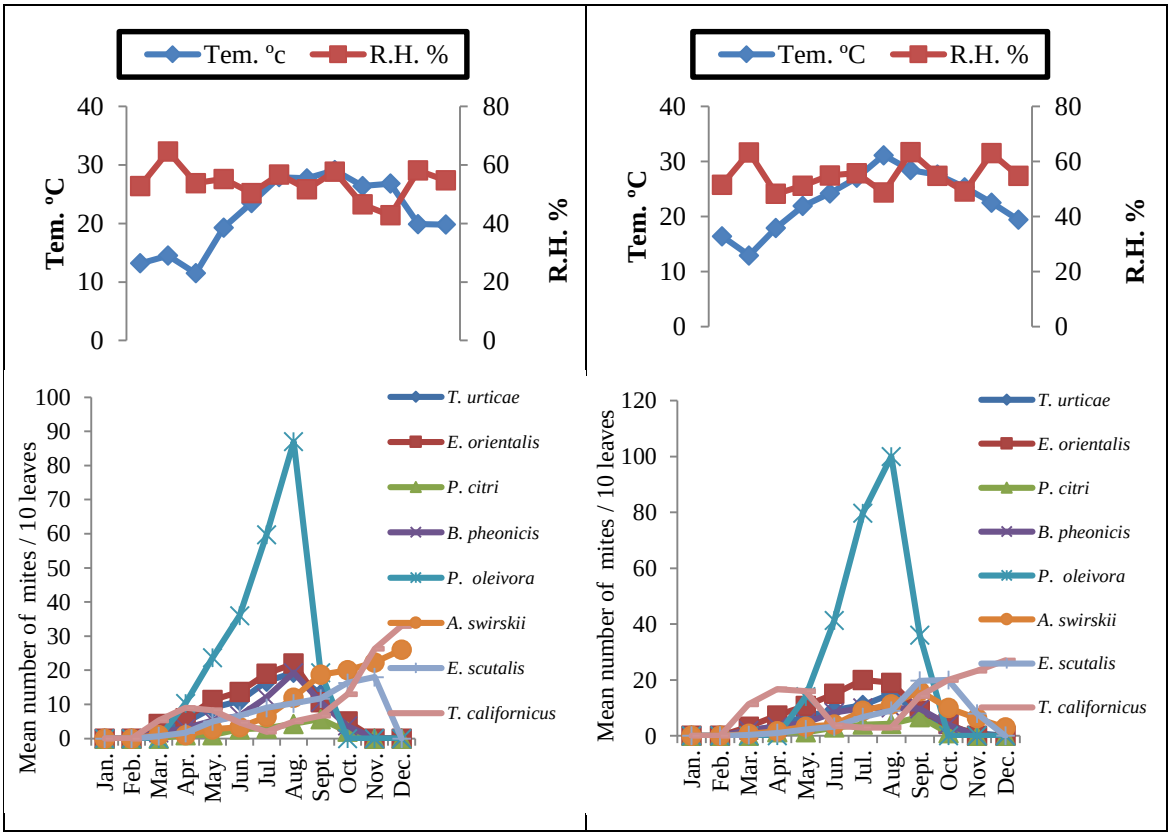
Fig. (9): Population fluctuation of mite species associated with leaves of Sweet orange and its predators during (2022-2023) at Sadat City region, Menoufia governorate.

Regarding the citrus flat mite, *B. pheonicis*, the total mean number was 71.0 and 68.7 individuals. /10 leaves/year in both years, with a monthly average of 5.9 and 5.7 individuals. /10 leaves /month during 2022 and 2023. In the meantime, the infestation of *P. oleivora* peaked in August 2022 and 2023 (162.3 and 99.3 individuals per 10 leaves, respectively), while no individuals were found between January and March and October and December of 2022 and 2023. In 2022 and 2023, the average monthly mite numbers of *P. oleivora* were 31.0 and 25.5 individuals /10 leaves /month, respectively.

In most of the collected samples, two predatory mites, *A. swirskii* and *E. scutalis*, were found on the leaves of sweet orange trees. The total mean number of A. swirskii leaves in 2022 and 2023 was 109.7 and 92.7 individuals. /10 leaves, respectively, with a monthly average of 9.1 and 7.7 individuals. /10 leaves. In both years, the total mean number of E. scutalis was 99.3 and 104.6 individuals. /10 leaves/year, with a monthly average of 8.3 and 8.7 individuals. /10 leaves /month. The Tydeid mite, *T. californicus*, averaged 8.1 and 10.6 individuals. /10 leaves/month in 2022 and 2023.

3.4. Mandarin, *Citrus reticulate* var. mandarin

The monthly population fluctuations of T. urticae are displayed in Fig. 10. March marked the beginning of the T. urticae infestation in both years, while August 2022 and 2023 saw the highest population densities, with mean numbers of 19.3 and 15.0 individuals per 10 leaves, respectively. The average monthly counts were 6.6 and 5.0 individuals per 10 leaves, respectively, and then progressively declined in September and October until they became undetected in November and December of both years.



Sadat City- Mandarin -2022 Sadat City- Mandarin -2023

Fig. (10): Population fluctuation of mite species associated with leaves of Mandarin and its predators during 2022-2023 at Sadat City region, Menoufia governorate.

In terms of the monthly changes in the E. orientalis population, Fig. 10 shows that August and July have the highest population density in both years, 2022 and 2023, with mean numbers of 22.0 and 20.0 individuals, respectively./10 leaves, respectively, with monthly average numbers of 7.7 and 7.4 individuals./10 leaves. Fig. 10 displays the low numbers for each month of 2022 and 2023 for the European red mite, P. citri, in terms of monthly population variation. The overall mean values were 19.7 and 21.6 individuals per 10 leaves per year, with a monthly average of 1.6 and 1.8 individuals per 10 leaves per month, respectively. Conversely, no infestations were detected from January to March or during November and December in either year.

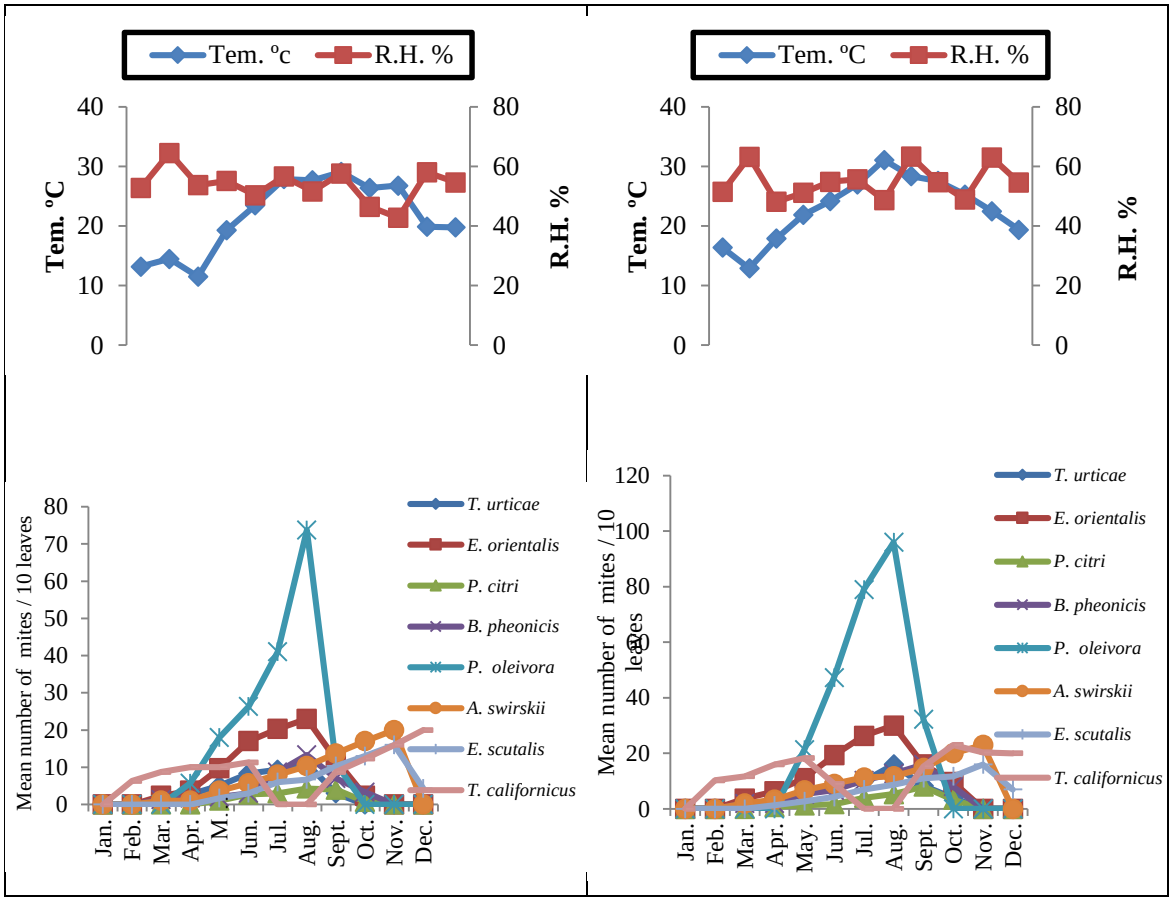
In contrast, the total mean number of the citrus flat mite, *B. pheonicis*, was 62.4 and 52.0 individuals. /10 leaves /year with a monthly average of 5.2 and 4.3 individuals /10 leaves /month in 2022 and 2023, respectively. Meanwhile, *P. oleivora* infestation peaked in August of 2022 and 2023 years (87.0 and 100.0 individuals /10 leaves), respectively whereas, the numbers were discovered beginning in April of 2022 and continuing through May 2023 until September of 2022 and 2023, while no *P. oleivora* individuals were found in the remaining months in either year.

On the leaves of Mandarin trees, *A. swirskii* and *E. scutalis* were discovered. *A. swirskii* was more prevalent in the first year than in the second, with total mean numbers of 113.3 and 65.3 individuals /10 leaves and monthly averages of 9.4 and 5.4 individuals/10 leaves in 2022 and 2023, respectively. In the meantime, the monthly average of *E. scutalis* was 6.6 and 5.9 individuals /10 leaves/month in both years, while total mean numbers were 79.4 and 70.3 individuals /10 leaves. In 2022 and 2023, the average number of Tydeid mites, *T. californicus*, was 9.4 and 11.5 individuals /10 leaves, respectively.

3.5. Citrus lime, *Citrus aurantifolia* var. Lime

According to data reported in Fig. 11, the highest population densities of Tetranychus urticae infestations in the Sadat City region were 11.0 and 16.0 individuals per 10 leaves in August 2022 and 2023, with monthly averages of 3.4 and 4.7 individuals per 10 leaves per month, respectively. Fig. 11 indicates that August 2022 and 2023 had the highest population densities, with mean numbers of 23.0 and 30.0 individuals per 10 leaves, respectively, related to the monthly fluctuations of E. orientalis populations. Additionally, the average monthly mite population in 2022 was 7.5 individuals, while in 2023, it was 10.2 individuals per 10 leaves per month. The European red mite, P. citri, exhibited low numbers throughout both years, with mean counts of 4.3 and 5.3 individuals per 10 leaves. This species first appeared in May 2022 and April 2023, then increased steadily to reach peak numbers in August 2022 and September 2023. In 2022 and 2023, the total mean counts were 15.7 and 24.3 individuals per 10 leaves per year, with monthly averages of 1.3 and 2.0 individuals per 10 leaves per month during those years. The citrus flat mite, B. phenolicis, had a total mean count of 40.3 individuals per 10 leaves per year, with a monthly average of 3.4 individuals per 10 leaves per month in 2022, and 63.0 individuals per 10 leaves per year, with a monthly average of 5.3 individuals per 10 leaves per month in 2023 (Fig 11). The infestations of P. oleivora appeared only during April through September in 2022 and May through September in 2023. In both years, August recorded the largest infestations, with mean numbers of 73.7 and 96.0 individuals per 10 leaves, respectively, and monthly averages of 14.6 and 23.0 individuals per 10 leaves per month.

A. swirskii and *E. scutalis*, two predatory mites, were found to be moderately prevalent on the leaves of citrus lime trees in the majority of the samples collected. With a total mean number of 80.4 individuals /10 leaves/year and a monthly average of 6.7 individuals /10 leaves/ month in 2022. *A. swirskii* was less common in 2022 than in 2023, according to data on Fig. 11. On the other hand, the second year of 2023 saw a rise in these numbers, with a monthly average of 8.5 individuals per 10 leaves per month and a total mean of 101.7 individuals per 10 leaves per year. The total mean numbers of *E. scutalis* were 61.0 and 69.7 individuals. /10 leaves/year. The other mites, *T. californicus*, have monthly average numbers of 8.6 and 12.0 individuals per 10 leaves per month during 2022 and 2023.



Sadat City- Lime-2022 Sadat City- Lime-2023

Fig. (11): Population fluctuation of mite species associated with leaves of citrus lime and its predators during 2022-2023 at Sadat City region, Menoufia governorate.

3.6. Citrus Lemon, *Citrus aurantifolia* var. Balady:

The monthly population variation of the two-spotted spider mite, T. urticae, is displayed in Fig. 12. July and August had the highest population density, with mean numbers of 14.3 and 17.0 individuals, respectively. /10 leaves for the 2022 and 2023 years, respectively. Furthermore, the total mean number of *T. urticae* was 56.9 and 56.7 individuals per 10 leaves per year, with a monthly average of 4.7 individuals per 10 leaves per month in 2022 and 2023, respectively, showing no discernible changes between the two years. According to the results in Fig. 12, which show the monthly fluctuations of the E. orientalis population, July and August had the highest population density, with mean numbers of 18.3, 23.0, 25.7, and 22.0 individuals, respectively. /10 leaves, respectively, during the 2022 and 2023 years. In 2022 and 2023, the average monthly mite population was 7.5 and 9.3 individuals per 10 leaves per month, respectively. In 2022 and 2023, the European red mite, *P. citri*, had a total mean of 23.3 and 30.0 individuals per 10 leaves per year, with a monthly average of 1.9 and 2.5 individuals /10 leaves /month during 2022 and 2023, respectively. Furthermore, throughout the first three months of both years, no infestations were found.

However, for both years, the citrus flat mite, B. pheonicis, achieved a total mean number of 60.9 and 82.9 individuals per 10 leaves per year, with a monthly average of 5.1 and 6.9 individuals, respectively /per 10 leaves/month. Meanwhile, the highest infestation of *P. oleivora*

was noted in June, July, and August of both years, with mean numbers of 31.7, 47.0, and 56.7 individuals per 10 leaves, respectively.

On the other hand, the majority of the samples collected contained *A. swirskii* and *E. scutalis* on the leaves of citrus lemon trees. The data in Fig. 12 indicate that there were no appreciable differences in A. swirskii numbers between the two years, with total mean numbers of 69.6 and 69.0 individuals per 10 leaves/year in 2022 and 2023, respectively. The monthly average was 5.8 individuals per 10 leaves per month in both years. Similar trends were also observed for the predatory mite *E. scutalis*, whose monthly averages were 4.6 and 4.5 individuals. /10 leaves /month, respectively, and overall mean numbers for the 2022 and 2023 years were 55.6 and 54.0 individuals /10 leaves /year. Additionally, for both years, the average monthly numbers of the tydeid mite, *T. californicus*, were 6.1 individuals. /10 leaves /month, with no discernible population fluctuations.

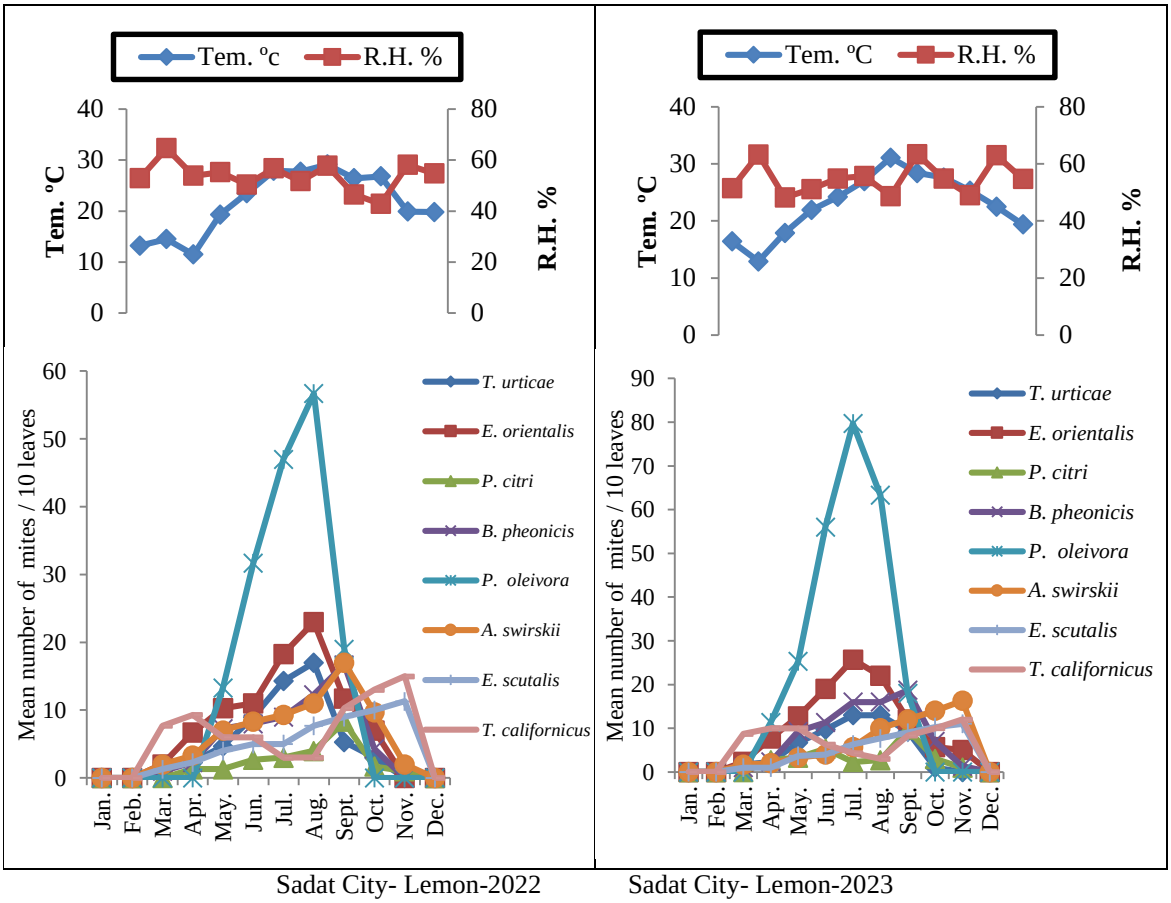


Fig. (12): Population fluctuation of mite species associated with leaves of citrus lemon and its predators during 2022-2023 at Sadat City region, Menoufia governorate.

4- Identification of mite species associated with Citrus varieties during 2022 and 2023 at the Sadat City region.

The present study examined the susceptibility of specific citrus varieties to infestation with phytophagous mites and their predators in the Sadat City region under field conditions during 2022 and 2023. The results obtained indicated that the various citrus varieties were significantly ($P > 0.05$) different in their Population density of mite species infestation and their associated predators, based on the mean number of phytophagous mites and their predators that

existed during the two consecutive seasons of 2022 and 2023 (Table 2). The data obtained in Table 2 showed that the mean annual Population density of Tetranychus urticae in 2022 was highest on sweet orange, 8.6 and 6.9 individuals. During two successive seasons, 2022 and 2023, the less infested variety was Lime in 2022 and Lime & Lemon in 2023, with annual means of 3.4 and 4.7 individuals, respectively.

According to the data in Table 2, the highest Population density rates of the Citrus brown mite, Eutetranychus orientalis, were found in Navel and Balady oranges, which had an average of 12.0 individuals each. during the two consecutive years 2022 and 2023, respectively. The lowest Population density rates were found in Lime and Lemon, which had 7.5 individuals each. In 2022, Mandarin had 7.4 individuals in 2023.

According to the results in Table 2, the European red mite, Panonychus citri, had the highest annual mean average in 2022 with Balady orange, 3.8 individuals and in 2023, with Sweet 3.1, the lowest population density was found in Lime 1.3 and Mandarin 1.8 individuals/leaf in 2022 and 2023, respectively.

Results for the flat mite, *Brevipalpus pheonicis*, in Table 2 showed that in 2022 and 2023, Balady orange had the highest Population density, with 7.6 and 7.3 individuals, respectively. On the other hand, Lime and Mandarin 3.4 and 4.3 individuals had the lowest Population density during 2022 and 2023, respectively.

According to the data in Table 2, the highest infestation of the rust mite, P. oleivora, was recorded in 2022 and 2023 for Balady orange, with 35.7 and 32.9 individuals, respectively. On the other hand, the lowest infestation was recorded in Lemon 14.0 and 21.1 individuals. During 2022 and 2023, respectively. Regarding Tydeus californicus data in Table 2, it indicates that the highest Population density rates were observed for Navel orange in 2022 and Lime in 2023, while the lowest Population density rates were recorded for Lemon in both 2022 and 2023.

The data in Table 2 demonstrated that the predatory mite, *Amblyseius swirskii* had the highest Population density average in 2022 and 2023 in Balady orange, while Lemon had the lowest in 2022 and Lime & Lemon in 2023. In 2022 and 2023, the predatory mite, *Euseius scutalis*, recorded the most excellent annual mean average with Balady and Sweet orange, respectively. In contrast, Lemon had the least amount of infestation in 2022 and 2023.

Statistical analysis of the data in Table 2 revealed significant differences in the total overall mean numbers of mites between Balady orange and the other tested varieties (Navel, Mandarin, Lime, and Lemon) in 2022. However, there were no significant differences between Balady and Sweet orange. In 2023, there were significant differences in total overall mean numbers of mites between Balady orange, Mandarin, and Lemon.

The obtained results are in harmony with those of Yassin (2004), who recorded several predatory mites as *A. swirskii*, *Typhlodromus pyri* Scheuten (Phytoseiidae), and *A. exsertus* (Stigmaeidae) to be the most abundant predatory species inhabiting leaves of mandarin, lime, and orange, while *Cheletogenes ornatus* (Canestrini and Fanzago) and *Hemicheyletia bakeri* (Ehara) (Cheyletidae) were primarily observed on the fruits. The tydeid mites, *Orthotydeus californicus* (Banks), *O. kochi* (Oudemans), and Pronematus ubiquitous (McGregor), were observed on citrus leaves in Menoufia governorate during early May 1998 and 1999. The mite population then increased gradually, reaching its maximum level during early October of the two seasons. Karmaker and Saha (2005) showed significant correlations between the population densities of B. phoenicis and meteorological factors, including temperature and precipitation. Ledesma *et al.* (2011) reported that the phenology of *E. orientalis* took place in autumn, which is in agreement with the second peak of the predator, Euseius stipulatus (Athias-Henriot). An effect of *E. stipulatus* on *E. orientalis* is likely occurring, but abiotic variables are also influencing the populations of this mite pest. Silva *et al.* (2012) studied the diversity of mites and population dynamics attacking Citrus sinensis in São Paulo, Brazil, and found significant correlations between population densities of these mites and meteorological factors such as temperature and precipitation. In addition, *Euseius concordis* (Chant) acts as a natural enemy of *P. citri*, *B. phoenicis*, and *P.*

oleivora in the citrus orchard. Barbar, (2014). studied the bio-ecological aspects of phytoseiid and tetranychid mites in Syrian citrus orchard conditions as a dominant species on citrus leaves and seemed to have different population dynamics, different overwintering sites, and phenology in winter, apparently due to differences in climatic requirements. Abu Bakar (2015). reported that abiotic factors affect mites' population and gave a pattern to manage the mites on citrus at the required time and season. Also in 2016, he found that the relative humidity and rainfall showed a significant negative correlation to the population of *E. orientalis*. Mariam *et al.* (2016) investigated the population dynamics of mite species inhabiting the leaves and debris of navel oranges and mandarins in Fayoum Governorate, focusing on biotic factors (predator mites) and abiotic factors (temperature and relative humidity). Our results are in parallel with those of Abdelgayed *et al.* (2015, 2017). who studied the occurrence of phytophagous and predatory mites inhabiting citrus trees at Assuit governorate (Upper Egypt) and found *E. orientalis, B. phoenicis,* and *Polyphagotarsonemus latus* (Banks) (Tarsonemidae) seemed to be the most common phytophagous species found in citrus orchards. Sabrine *et al*. (2022) investigated the population dynamics of Tetranychus urticae, Panonychus citri, and Eutetranychus orientalis in a Tunisian citrus field. They found that the population dynamics of these three mites varied with temperature. Furthermore, it was found that the fauna of predatory mites linked to these three phytophagous mites (Neoseiulus californicus, Phytoseiulus persimilis, Euseius stipulatus) of the Phytoseiidae family.

Table 2: Identification of mite species associated with Citrus varieties during 2022 and 2023 at the Sadat City region.

Mite species	Average number of mite species associated with Citrus varieties per 10 leaves					
	Balady	**Navel**	**Sweet**	**Mandarin**	**Lime**	**Lemon**
2022						
T. urticae	3.9	4.6	8.6	6.6	3.4	4.7
E. orientalis	10.9	12.0	9.0	7.7	7.5	7.5
P. citri	3.8	3.2	2.4	1.6	1.3	1.9
B. pheonicis	7.6	6.6	5.9	5.2	3.4	5.1
P. oleivora	35.7	20.8	31.0	19.7	14.6	14.0
T. californicus	6.2	9.7	8.1	9.4	8.6	6.1
A. swirskii	10.1	7.3	9.1	9.4	6.7	5.8
E. scutalis	9.0	8.5	8.3	6.6	5.1	4.6
overall mean	87.2^{a}	72.7^{bc}	82.4^{ab}	66.2^{c}	50.6^{d}	49.7^{d}
L.S.D 0.05	13.0					
2023						
T. urticae	6.7	5.1	6.9	5.0	4.7	4.7
E. orientalis	12.0	11.8	9.1	7.4	10.2	9.3
P. citri	2.7	2.2	3.1	1.8	2.0	2.5
B. pheonicis	7.3	7.3	5.7	4.3	5.3	6.9
P. oleivora	32.9	22.0	25.5	22.6	23.0	21.1
T. californicus	9.8	7.7	10.6	11.5	12.0	6.1
A. swirskii	8.5	7.5	7.7	5.4	8.5	5.8
E. scutalis	6.9	6.9	8.7	5.9	5.8	4.5
overall mean	86.8^{a}	70.5^{ab}	77.3^{ab}	63.9^{b}	71.5^{ab}	60.9^{b}
L.S.D 0.05	11.8					

Means in each row followed by the same letter (s) are not significantly different at the 5% level.

From the obtained results, the Balady orange variety proved to be the most susceptible to infestation during the two successive years. This difference in infestation rates of the phytophagous mites to citrus varieties may be due to the preference for host selection or the tendency of varieties to tolerate physical and chemical characteristics of the varieties, environmental effects, and genetic resistance.

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الديناميكية الشهرية وكثافة أعداد أنواع الأكاروسات المفترسة والمتطفلة علي النبات المرتبطة ببساتين الموالح في محافظة المنوفية

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الملخص العربي

تم حصر الأنواع الأكاروسية النباتية التغذية والأكاروسات المفترسة الأكثر انتشاراً علي أوراق ستة أصناف مختلفة من أشجار الموالح وهي البرتقال البلدي والبرتقال السرة والبرتقال الحلو واليوسفي البلدي والليمون البلدي والليمون الأضاليا في محافظة المنوفية.

وكانت الأنواع التي تم حصرها شهريا من بداية يناير ٢٠٢٢ حتى نهاية ديسمبر ٢٠٢٣ بمنطقة الشهداء ومنطقة السادات بمحافظة المنوفية هي أكاروس العنكبوت الاحمر ذو البقعتين وأكاروس الموالح البني وأكاروس الموالح المبطط وأكاروس صدأ الموالح واكاروس ال *Tydeus* وجنسين من المفترسات المصاحبة لهم.

و بشكل عام، كان الصنف الأكثر عرضة للإصابة بالأكاروسات نباتية التغذية في الشهداء هو البرتقال أبو سرة (١٣٪) يليه البرتقال البلدي (١٢,٩٪) وذلك خلال عام ٢٠٢٢، بينما خلال عام ٢٠٢٣ تم تسجيل أعلى معدل إصابة بالأكاروسات النباتية التغذية علي البرتقال البلدي (١٣٪) يليه البرتقال أبو سرة والبرتقال السكري (١١,٦٪) ،وكان صنف البرتقال البلدي هو الأكثر عرضه للإصابة بالأكاروسات نباتية التغذية في منطقة مدينة السادات خلال عامي الدراسة.

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