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FLUCTUATION DYNAMICS OF *Tetranychus urticae* KOCH AND THE ASSOCIATED PREDATOR *Amblyseius gossypii* ELBADRY ON GUAVA TREES IN NORTH SINAI, EGYPT (ACARI: TETRANYCHIDAE AND PHYTOSEIIDAE)

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ABSTRACT

The present study aimed to clear the fluctuation dynamics for both *Tetranychus urticae* Koch and the associated predatory mite *Amblyseius gossypii* ElBadry to show their active periods that advantageously in controlling *T. urticae* biologically. It was occurred on guava trees (*Psidium guajava* L). Guava trees were seven years old in an orchard in Beer El-Abd city, North Sinai Governorate, Egypt were studied during April 2019 to March 2021. Observation was done fortnightly on both mite species density per leaf by selecting ten guava trees each of four accessions and five branches from each plant with the help of 20x hand lens. Both year the population of *T. urticae* showed its highest density through two essential periods in early and mid- summer, while the predatory mite, *A. gossypii* began its activity with the beginning of the prey activity. At winter season, the population of both the prey and the predator dropped.

INTRODUCTION

Guava is considered one of the most important fruit crops throughout the tropical and subtropical zones. In Egypt, guava is a popular fruit, because of low price and rich source of vitamins and minerals. Under new reclamation desert, guava is one of the leading fruit trees due to its high adaptability and thrives in these soils **Ibrahim *et al.* (2010).**

Tetranychus urticae Koch is a polyphagous pest and attacks broad range of crops, limiting the yield and thus, leading to huge economic losses. Understanding *T. urticae* populations, their life cycle patterns and outbreaks require a knowledge of many factors which include the biotic potential of the species, the influence of meteorological factors, the availability and relative susceptibility of hosts, competition between mite species, structural and chemical adaptations of mite species.

Documentation of the population abundance and spatial distribution of this pest in host plants and selection of newer management practices would open up new scope for farmers to combat spider mites and thus gain higher profits. **Tehri *et al.* (2014).**

The predator, *Amblyseius gossypii* ElBadry is common on plants and of widespread distribution. This predator feeds on *T. urticae*, *Tetranychus cucurbitacearum* (Sayed), *Eutetranychus orientalis* Klein, *Oligonychus mangiferus* R. and S., *Tenuipalpus punicae* P. and B., nymphs of the white fly and *Chrysomphalus ficus*. In addition, it feeds on pollen grains of date palm, maize and cotton (**Zaher, 1986**).

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The present study aimed to clear the fluctuation dynamics for both *T. urticae* and *A. gossypii* to show their active periods that advantageously in controlling *T. urticae* biologically.

MATERIALS AND METHODS

A guava orchard in Beer El-Abd city, North Sinai Governorate, was selected for this study. The trees were seven years old and monitoring continued for two years, during April beginning 2019 to March 2021.Ten guava trees from the orchard with inhabited mites were randomly selected representing around all directions of the orchard. Ten leaves showing symptoms of mites were taken from each tree. Samples were taken every two weeks in a random way representing all directions of the tree over two continuous years. The collected samples were singly kept in tightly closed polyethylene bags. Labels including all necessary information concerning habits, locality and date of collection was stuck on each bag, then transferred to the laboratory. The samples were directly examined using a stereoscopic binocular microscope. Phytophagous mite, *T. urticae* and predatory mite *A. gossypii* were counted and the data was recorded in a table over the study period. Then this data was figured, showing the relationship between temperatures, Phytophagous mite and predatory mite.

RESULTS AND DISCUSSION

The two spotted spider mite, *Tetranychus urticae* Koch is the dominant phytophagous species accompanied with the predatory phytoseiid species, *Amblyseius gossypii* ElBadry on guava trees in North Sinai in all sampling sites for both years through April 2019 to March 2021. In the first year (April 2019- March 2020), the highest density of *T. urticae* appeared in two essential periods in early summer (May and June 2019) with temperature ranging from (28 to 30)℃, respectively. And mid-summer (Jul. to Sep. 2019) with temperature (32-35)℃. Temperature with the summit in Aug. 2019 was 36℃.

The predatory mite *A. gossypii* started its activity along with *T. urticae* through April 2019 reaching its top number at Aug. 2019. The population of both *T. urticae* and *A. gossypii* dropped at the beginning and middle of winter (Dec. 2019- Feb. 2020) where the temperature degree was (21 and 16)℃ (Fig. 1)

In the second year (Apr. 2020-Mar. 2021), the highest density of *T. urticae* and *A. gossypii* appeared in two essential periods also, in early and mid – summer through Apr. 2020 temperature was 25℃ where it's top occurred in Aug. and Sep. 2020 temperature was 35℃. The population of both *T. urticae* and *A. gossypii* dropped at the beginning and middle of winter (Jan. -Feb. 2021), temperature was 16℃ (Fig. 2).

Kumral and Kovaci (2005) investigated the distribution and population dynamics of *Tetranychus urticae* Koch in the sprayed eggplant fields in Turkey. The mite *T. urticae* was the only damaging species of tetranychid found, and *Amblyseius bicaudus* (Wainstein) the only phytoseiid present in these fields. *A. bicaudus* abundance had significant correlation and synchrony with population densities of *T. urticae.* The activity of females of *T. urticae* was first recorded on various weeds at the end of March and February in 1999 and 2000, respectively, but the mites appeared on eggplant fields in early June and late May in the same years, respectively. The population of *T. urticae* peaked twice in both years, the first peak occurred from late June to late August and the second was observed from late September to late October. The occurrence of mites on the eggplants ended in early of mid-November when the eggplant fields were mowed, although all stages of *T. urticae* were observed on these fields at this time. *T. urticae* population was positively correlated

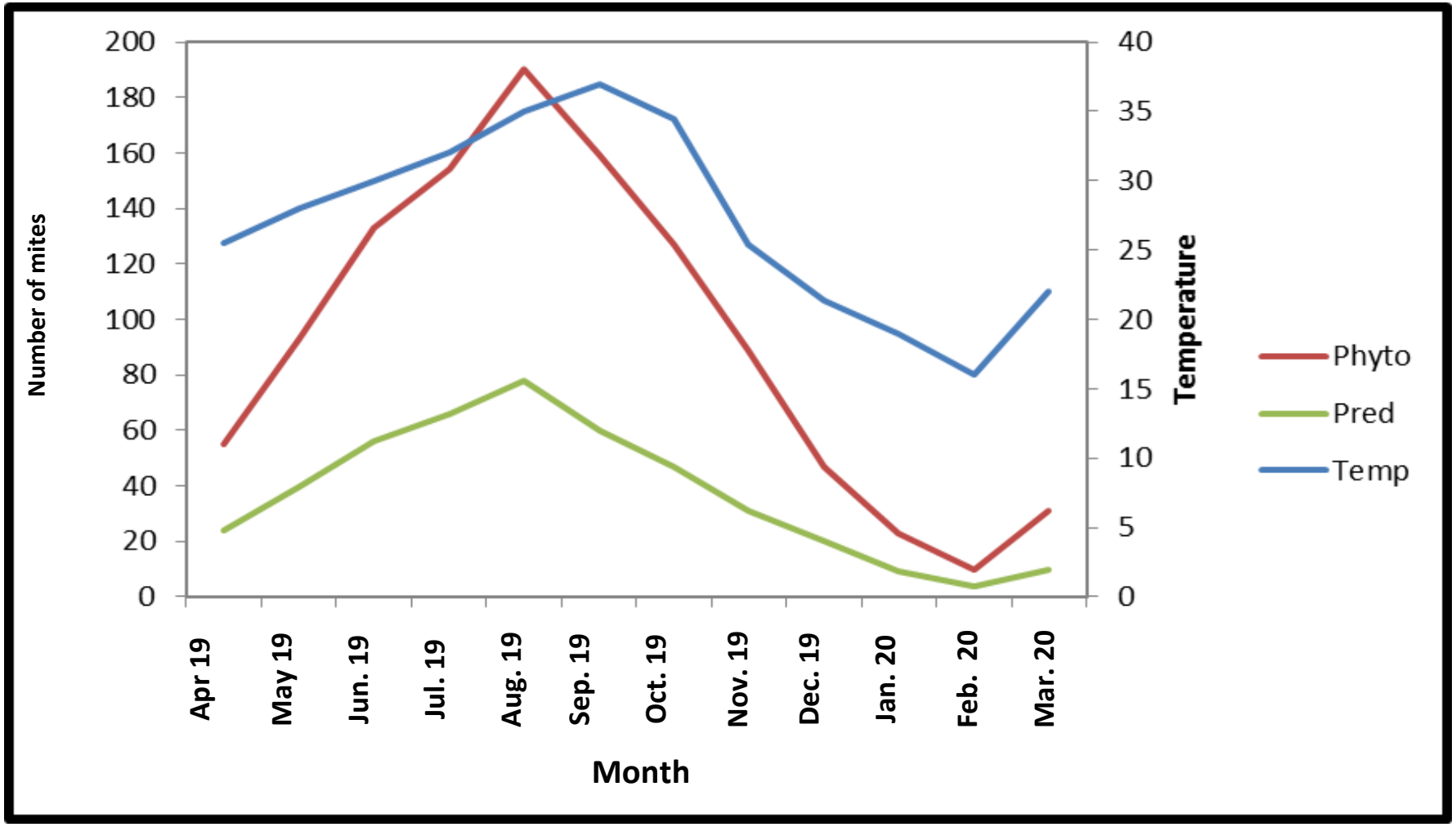

Fig. 1. Distribution of Phytophagous mite (*Tetranychus urticae* Koch) and predatory mite *Amblyseius gossypii* ElBadry with temperature during April 2019 to March 2020

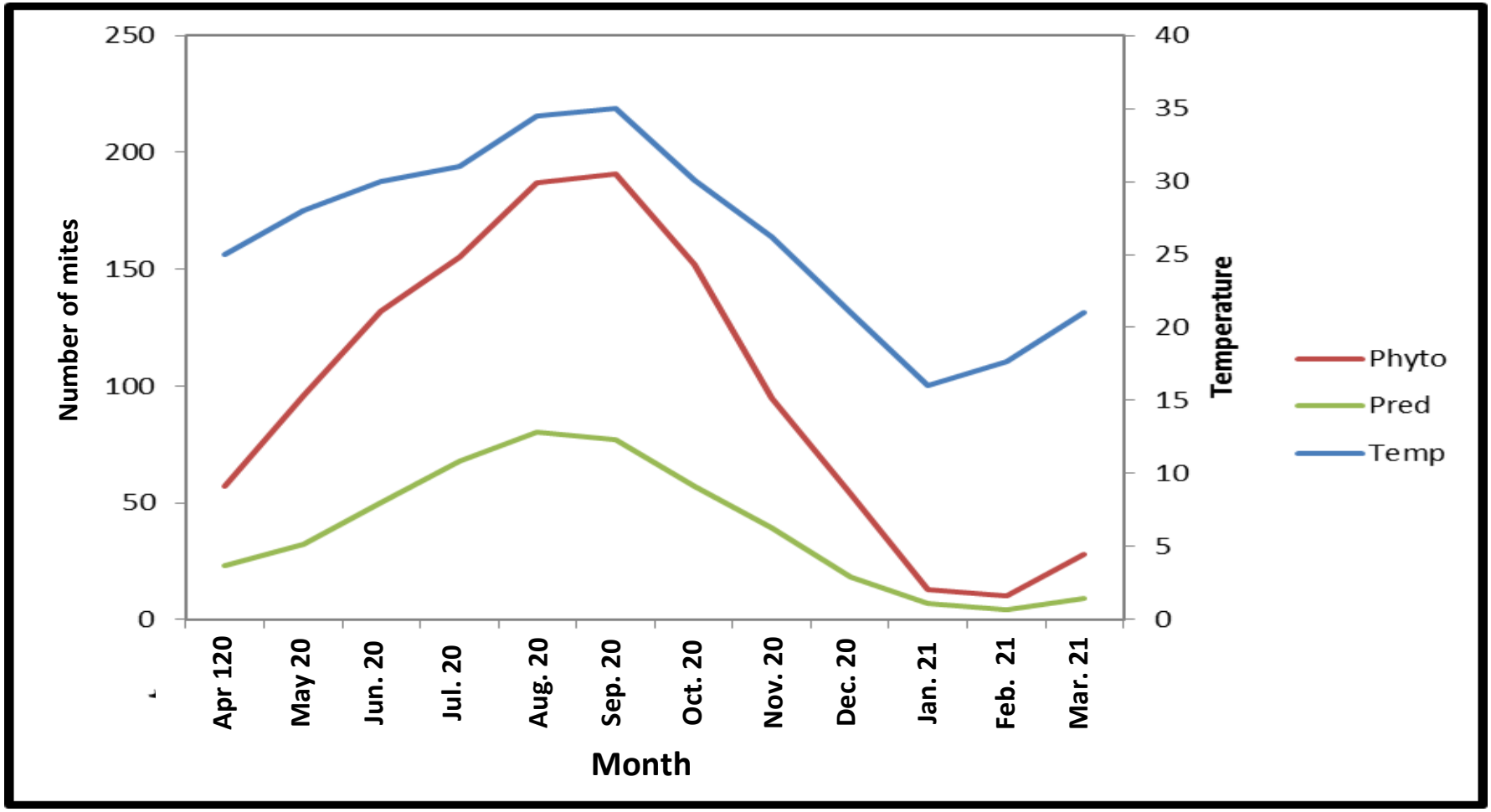

Fig. 2. Distribution of Phytophagous mite *T. urticae* and predatory mite *A. gossypii* with temperature during April 2020 to March 2021

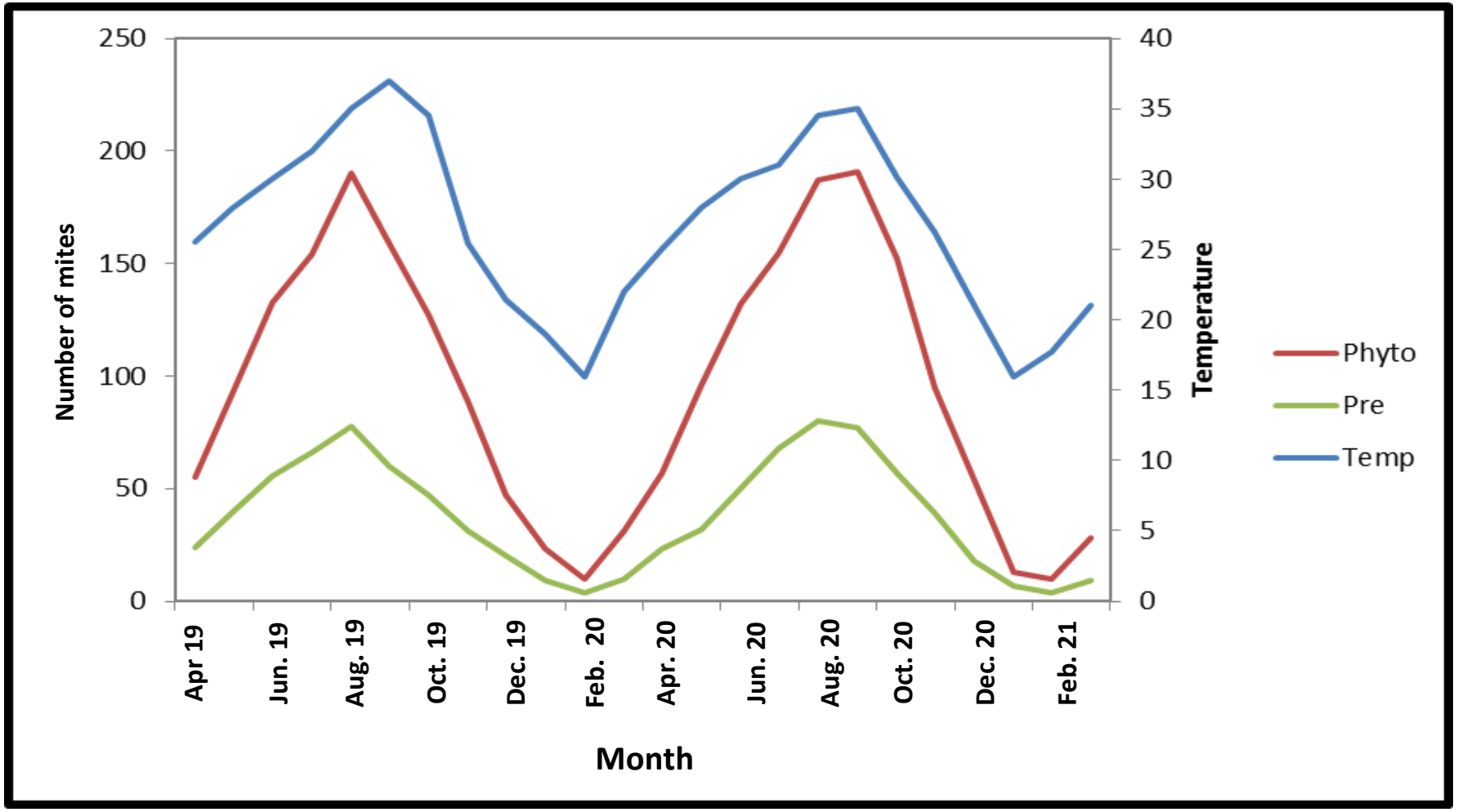

Fig. 3. Distribution of Phytophagous mite *T. urticae* and predatory mite *A. gossypii* with temperature during April 2019 to March 2021

with mean temperature. While negative relationship was found between mean humidity and mite population.

El-Halawany and Abou-Seta (2013) recorded *Tetranychus urticae* and *Amblyseius swirskii* A-H and some other mite species on guava trees at Qalyoubia Governorate, Egypt. They found that the population of *T. urticae* peaked in mid-June and Oct.. Significant relation occurred between mites' population and temperature increasing, while the relation with relative humidity was not significant. The dynamics of the phytophagous mites population densities seemed to follow the plant phenology (specially the leaves). That of the predacious mites seemed to follow their prey dynamics with lag of time.

Goto *et al.* (2007) studied the populations of spider mites (*Tetranychus pueraricola* Ehara and Gotoh, *T. ludeni* Zacher, *T. parakanzawai* Ehara and *T. piercei* McGregor) from Kudzu vine *Pueraria lobata* (Willd.) during 1997 to 1999 at 2 study sites in Ibaraki, central Japan. The populations peaked in June, September and October. Predators associated with spider mite populations were phytoseiid mites such as (*Amblyseius tsugawai* Ehara, *Phytoseius nipponicus* Ehara, *Neoseiulus womersleyi* (Schicha), *Scolothrips takahashii* Priesner, *Oligota* spp., *Feltiella* spp. and stigmaeid mites such as *Agistemus exsertus* Gonzalez and *A. terminalis* (Quayle), which were well synchronized with spider mite density. Overwintered females began to appear and oviposit on some herbaceous weeds growing at the study sites in early April. Spider mites appeared on kudzu vine leaves in early May just after flushing. Most colonies (defined as areas surrounded with silky spider mite threads) had only one species but a small percentage had two or three species.

Esmaeel *et al.* (2018) studied abundance of *Tetranychus urticae* Koch and the most common predatory phytoseiid species, *Typhlodromips capsicum* Mostafa (Acari: Phytoseiidae) on four cotton cultivars *viz*. Giza (45, 86, 87 and 92) mostly cultivated in Egypt during 2 successive growing seasons 2016 and 2017 at Aga district, Dakahlia Governorate, Egypt in relation to prevailing atmospheric temperature and RH. Results showed that positive correlations between the changes of two spotted spider mite (TSM) and *T. capsicum* populations and temperature while the correlations with R.H. were positively insignificant during the two investigated growing seasons. Good synchronization between TSM and *T. capsicum* populations on tested cotton cultivars was detected during the first and second seasons. These results showed that cotton cultivars, predatory mites and weather factors are of the most important factors affecting the populations of TSM on the investigated cotton cultivars.

Kumar *et al.* (2015) recorded (*Tetranychus urticae* Koch) on okra and its relation with different weather variables during 2010 and 2011crop seasons under unprotected conditions Varanasi region. They showed that the population of *T. urticae* commenced from 9^{th} and 10^{th} standard week in 2010 and 2011 respectively. The highest population mites per 2.5 cm^2 leaf area was recorded on 21^{st} standard week (47.75) in 2010 while the maximum population was recorded in 18^{th} standard week (45.99) during 2011. It was found that the mite infestation was heavy during May in both the years. The maximum number of predatory mites was recorded on 15^{th} standard week (11.86) in 2010 while in 2011 population of predatory mite was highest in 18th standard week (15.98).

Sakr *et al.* (2015) studied seasonal changes communities of spider mites and predatory mites *Typhlodromus athiasae* Porath and Swirski on 2 apple cultivars (Golden and red Delicious) from orchards located in 2 regions: Al-Mokharam and Al-

Qusayr during the beginning May 2013 and the end of October 2014. The results showed that the highest density of the spider mites was in two essential period in early and mid-summer, while *T. athiasae* started its active with started prey active, that started appear in May and the top of its number was in July. The mean density of the mite predator and spider mites was higher on the red Delicious apple cultivar compared to Golden Delicious with significant differences, and its presence was higher in the Al-Qusayr region compared to the Al-Mokharam region with significant differences, also remarked this predator on some surrounding vegetation in these orchards.

Anber *et al.* (2020) recorded *Tetranychus urticae* Koch and *Euseius scutalis* (A.-H.) on 3 soybean cultivars at Gharbia Governorate. They found that the predatory mite *E. scutalis* was the main important predator for suppressing population density of *T. urticae* population during the two successive seasons of 2015 and 2016. The insignificant positive effect of maximum and minimum temperatures on the population of *T. urticae* infested the 3 soybean varieties during the two successive seasons. The combined effect of the tested weather factors (max temp., mini temp. and R.H. %) and the plant age together on *T. urticae* population were studied. The plant age and phenology were more effective on *T. urticae* population as compared with the weather factors.

Abo-Elmaged *et al.* (2021) recorded *Tetranychus urticae* (Koch) infesting cucumber plants in Upper Egypt during 3 seasons of 2014, 2015 and 2016 in Assiut Governorate. They showed that the population of *T. urtica* during spring plantations fluctuated in relatively high densities during whole season with a peak during the middle of May when the plant age was 43 day-old and the presence of an average level of temperature and relative humidity. They indicated that the number of predators was not significantly correlated with pest populations during the spring plantations of 2015 and 2016 seasons, probably because of the lowest numbers of predators recorded in the studied area. Also, they showed that the cucumber plants severely affected by the two spotted spider mite, *T. urticae*. The scarce numbers of predators recorded during spring and summer plantations.

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الملخص العربي

تذبذب أعداد حلم *Tetranychus urticae* Koch والحلـــم المفتـــرس المرتبط به *Amblyseius gossypii* ElBadry على أشجار الجوافة في شمال سيناء، مصر (Acari: Tetranychidae and phytoseiidae)

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تهدف هذه الدراسة إلى توضيح تذبذب أعداد حلم *Tetranychus urticae* Koch والحلم المفترس المرتبط به *Amblyseius gossypii* ElBadry لإظهار فترات نشاطها التي تكون مفيدة في السيطرة على الحلم. وقد حدث ذلك علي أشجار الجوافة (*Psidium guajava* L.) التي عمرها سبع سنوات في بستان في مدينة بئر العبد، محافظة شمال سيناء، مصر خلال الفترة من أبريل 2019 إلى مارس 2021. وأجريت عمليات المراقبة كل أسبوعين على كثافة أنواع الحلم في كل ورقة من خلال اختيار عشرة أشجار جوافة من كل أربع مجموعات وخمسة فروع من كل نبات بمساعدة عدسة مكبره 20x. وجد خلال العامين أن حلم *T. urticae* أعلي كثافة له خلال فترتين أساسيتين في أوائل ومنتصف الصيف، في حين أن الحلم المفترس بدأ نشاطه مع بداية نشاط الفريسة. في فصل الشتاء، تقل الكثافة العددية لكل من الفريسة والمفترس.

الكلمات الاسترشادية: *Tetranychus urticae*، *Amblyseius gossypii*، تذبذب أعداد، أشجار الجوافة، شمال سيناء.

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