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: incidence rate of species and higher taxa of mites associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt

Ahmed, R. Aly Taha ; Seham, A. Ezz El-Dein and Wafaa, M. Gager
Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt.

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Abstract

This work was conducted to study some environmental aspects of mite species associated with three date palm cultivars in the Bahariya Oasis region, where it was confirmed that there are 18 species belonging to 14 genera under 10 families of mites, whose degrees of fluctuation as well as their dominance varied throughout the examination periods. It turns out that predators can stay in trees for longer periods, frequencies studies have shown, like (Cunaxidae, Cheyletidae, and Phytoseiidae) which individuals belonging to these families were present at all examination times. Meanwhile, the Stigmaied mites had recorded the higher abundance**.** Both phytophagous families (Eupalopsellidae, Tenuipalpidae, and Tetranychidae) reached the higher values of the frequencies. While the family Raphignathidae recorded the lowest level, and the acarid mite *Sarcophagus putrescentiae* fluctuated with a moderate value.

Introduction

Mites are positively or negatively associated with some important crops, including date palm, on the other hand, the palm and dates sector represents great economic importance for all countries. Palm cultivation is very old in the East and Gulf regions of Africa. The date crop in Egypt is a strategic crop in the past and the future Egypt currently occupies the first place in the production of dates (4.1 million tons). Regarding the importance of ecological studies, including the study of population abundance, as stated in a report by Verberk (2011).

These studies give an insight into the internal relationships between species, such as competition and predation, which may lead to an increase or decrease in pests. The importance of dates is not only in terms of nutritional value, but also has other environmental importance, as they play a role in combating desertification and reducing environmental pollutants, in addition they tolerate salinity (Ibrahim, 2010).

The abundance of the species was studied *Oligonychus afrasiaticus* McGregor on different places of the date palm, to show that the mites move on the fronds according to the different environmental conditions (Mirza, 2021). It was reported also that the families Tetranychidae and Phytoptidae were more abundant when twenty-six mite species in 22 genera and 17 families were collected from date palm trees (Mesbah, 2014).

On the other hand, this crop is often threatened by pests under many factors such

as climate change and incorrect applications of pesticides. In addition to the date palm trees have an important economy in Egypt, it is considered a main food therefore the agricultural role must be under the attention in the oases (Bekheet and El-Sharabasy, 2015).

The aim of this study was to shed light on some of the environmental aspects of the mite species that were counted and collected from palm trees, to find out which species continue to exist by studying fluctuations and which ones are abundant by studying the abundance of these mites.

Materials and methods

Each of the three varieties of crop was examined 12 times during the year 2022, starting from April to September, at a rate of twice a month. In each examination, 60 fronds were randomly selected, and then the individuals were picked up and placed in Nesbit solution in preparation for the identification procedures. This survey was conducted during the season 2022, the samples were collected and then transported to the plant protection research institute Lab., The mites were cleared in Nesbitts fluid, Hoyers was used to mount the mites on the slides and then they were identified (Krantz and Walter, 2009).

Statistical analyses

The relative representation and the levels of abundance were calculated and divided into to 3 levels according to Emmanouel *et al.* method (1994).

Dominant level =families or species forming more than 10% of total population. Influent level=families or species forming between 5%- 10% of total population. Recedent level =families or species form less than 5% of total population.

$$\text{Relative representation} = \frac{\text{No.individuals of a species}}{\text{total No.of the individuals of all the species}} \text{X100 (Preston, 1948)}$$

$$\text{Frequency of occurrence (F.O)} = \frac{\text{No.of samples containing a species}}{\text{Total No.of collected samples}} \times 100$$

Results and discussion

Data that inserted in Table (1) and Figures (1, 2, 3 and 4) showed the following results:

1.The Acarid mite:

The acarid mites or the family Acaridae that belong to order Astigmata are fungal animals and are commonly found in stored food products and decaying organic matter. One of the most important of this genus is Tyrophagus which the most abundant and economically important moths that inhabit stored foods and produce. Some of Tyrophagus species can cause economic damage to plants, including ornamental flowers and greenhouse-grown vegetables (Zhang, 2003). This family was represented by one species *Tyrophagus putrescentiae*; the results indicate that it was present in almost half of the samples examined, with reference to the frequency ratio (41.7%, 50% and 58.3%). Also, studies of relative abundance indicate that it did not represent a large proportion of the total number of mites that were counted, most of the percentages shown indicate that this species was declining compared to the rest of the types of dreams that were examined This may be due to the presence of predators in this environment that feed on this species. This species did not prove common or numerical dominance over the rest of the species. Perhaps this is due to the presence of predators, as the proportions of its presence were either low or medium, as it was recorded (4.5, 3.1 and 4.3) on the three verities (Zaghloul ,Hayanny and Semmany) respectively.

2.The Cheyletid mite:

The Cheyletid mites are free-living predators, thus associated with nests of vertebrates. These mites as predators have numerous pre-adaptations to the parasitic mode of life and they possess high ecological plasticity (Bochkov, 2004). That family were

represented in this work by three species; noted that these family was present on Hayanny variety throughout the examination periods (100%) frequency. But at the level of species, the species *Cheyletus malaccensis* was the most present in time scale. The increased prevalence of this species over the course of the season may be due to what (*Elhalawany et al.*, 2022) confirms that this species has the ability to evolve within a wide range of prey and temperatures.

3.The Eupalopsellid mite:

Noted that one species *Saniosulus nudus* was found belongs to this family that occurred in percentage 85.3 % during the number of examination times, on the other hand this species extends its life when it feeds on date palm pollen (Halawa and El-Safty, 2008).

4.The Cunaxid mite:

This family is represented by three species (Cunaxa sitirostris, *Neocunaxoides andrei* and Pulmaeus music) meanwhile the family in general was dominant on all over the three vitiates. It also had a relatively wide chronological presence, especially on the Semmany and Zaghloul varieties which frequented (91.7% and 100%) respectively. This family is characterized by its commonness in various environments and ecosystems, as Mejía-Recamier et al. (2013) confirmed when they provide that the members of this family spread even after harvesting the garlic crop and have a wide presence in the soil.

5.The Raphignathid mite:

The calculations of relative abundance and frequency indicate that this family does not have an influential presence, neither on the level of population density nor on the continuous presence on the date palm.

6.The Stigmaied mites:

The species *Agistemus exsertus* it had the highest representation in terms of temporal horizontal spread or in terms of vertical spread "density"; where this family group feeds on a lot of prey (Fan and Flechtmann, 2015) this may be the reason for the dominance of this species during periods of experimentation. These results were close to the results of other research indicating its spread on palm trees, where (*Elhalawany et al.*, 2020) reported it when they studied the dynamics of mites on date palms in Qalyubia. On the other hand, it is not excluded that this type is very common due to the Stigmaied mites is distributed worldwide and are found in variety of different habitats i.e. plant canopy, soil, leaf litter and crevices etc. (Gerson *et al*., 2003; Fan and Zhang, 2005 and Dönel and Doğan, 2011).

7.*The Phytoseiid *mite:

The density of species belonging to this family may not differ from one time period to another on the same plant that was examined, and this is confirmed by Marie-Stephane *et al*. (2007) where it was present in close densities on the same trees for a period of four months, when it was examined five times during the experimental periods. That is also confirmed during this work through the close frequency ratios as well as the degrees of dominance, that family which were represented by three species meanwhile this family did not differ from the previous family in terms of frequency and density of individuals in relation to the rest of the mite species.

8. The Tenuipalpid mite:

The numbers indicate that this family existed almost continuously during the season, with the three different species belonging to it (*Phytoptipalpus paradoxus, Brevipalpus phoenicis and Brevipalpu sessigi*) Species belonging to this family prefer to survive in the bark of plants and have a wide distribution on palm trees**.**

9. The Tetranychid mite:

This family has a known prevalence on this type of crop and the numbers in this work are consistent with some reports where several species of the genus *Eutetranychus*

have been reported spreading on palm trees as like *Eutetranychus palmatus* which was described in Egypt (Attiah, 1967), then noted in other countries (Kamali, 1990).

10. The Tydeid mite:

The species *Tydeus californicus* is the only species that existed from members of this family, and its representation was average, whether at the level of fluctuation in numbers or the dominant of its members.

Table (1): Incidence rate of species and higher taxa of mites associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt during season 2022.

Families and species of spiders	Hayanny variety		Semmany variety		Zaghloul variety	
	Frequency	Relative abundance	Frequency	Relative abundance	Frequency %	Relative abundance
1-Family: Acaridae	50 %	(R.) 4.3%	58.3%	(R.) 3.1%	41.7%	(I.) 5.4%
Tyrophagus putrescentiae	50 %	(R.) 4.3%	58.3%	(R.) 3.1%	41.7%	(I.) 5.4%
2- Family: Cheyletidae	100 %	(D.)11.6 %	83.4%	(D.)10.7%	83.4%	(I.) 5.6%
a- *Cheyletus malaccensis*	66.7%	(I.) `9.3%	50%	(I.) 7.1%	75%	(R.) 1.5%
b- Cheyletus ornatus	25%	(R.) 1.1%	41.7%	(R.) 1.7%	50%	(R.) 2.0%
c- Eutogenus africanus	25%	(R.) 1.3%	25%	(R.) 1.8%	33.3%	(R.) 2.2%
3- Family: Eupalopsellidae	85.3%	(I.) 5.4%	66.7%	(I.) 6.8%	41.7%	(R.) 2.8%
Saniosulus nudus	85.3%	(I.) 5.4%	66.7%	(I.) 6.8%	41.7%	(R.) 2.8%
4- Family: *Cunaxidae*	75%	8.6%	91.7%	(D.)12.6%	100%	(D.)11.0%
a- *Cunaxa sitirostris*	50%	(R.) 3.6%	58.3%	(R.) 4.8%	58.3%	(R.) 4.7%
b- *Neocunaxoides Andrei*	25%	(R.) 3.7%	33.3%	(I.) 5.5%	16.7%	(R.) 3.6%
c-*Pulmaeus music*	33.3%	(R.) 1.2%	41.7%	(R.) 2.3%	16.7%	(R.) 2.8%
5- Family: Raphignathidae	33.3%	(R.) 1.8%	50%	(R.) 2.4 %	50%	(R.) 3.4%
Raphignatus niloticus	33.3%	(R.) 1.8%	50%	(R.) 2.4 %	50%	(R.) 3.4%
6- Family: Stigmaeidae	100 %	(D.)18.9%	83.3%	(D.)21.3%	91.7%	(D.)21.6%
Agistemus exsertus	100%	18.9%	83.3%	(D.)21.3%	91.7%	(D.)21.6%
7- Family: Phytoseiidae	100%	(D.)19.01%	83.4%	(D.)25.7%	100%	(D.)17.5%
a-*Amblyseius cucumeris*	91.7%	(D.)17.1%	83.3%	(D.)22.8%	83.3%	(D.)11.7%
b-*Amblyseius longispinosus*	33.3%	(R.) 2.0%	41.7%	(R.) 2.8%	50%	(D.) (I.) 5.7%
Tenuipalpidae	91.7%	(D.)15.5%	50.0%	(I.) 5.5%	100%	(D.)18.7%
a-*Phytoptipalpus paradoxus*	75%	(D.)12.0%	25%	(R.) 1.7%	66.7%	(I.) 8.2%
b-*Brevipalpus phoenicis*	41.7%	(R.) 0.3%	41.7%	(R.) 2.4%	50%	(I.) 5.9%
c-*Brevipalpu sessigi*	33.3%	(R.) 1.7%	50%	(R.) 1.4%	58.3%	(R.) 4.6 %
9- Family: Tetranychidae	100%	(D.)13.3%	75%	(D.)10.7%	41.7%	(D.)11.9%
a-Eutetranychus africanus	58.3%	(I.) 6.8%	66.7%	(R.) 2.1%	33.3%	(I.) 9.9%
b-*Tetranychus armemychus*	66.7%	(I.) 6.5%	25%	(I.) 8.6%	41.7%	(R.) 2.0%
10-Family: Tydeidae	41.7%	(R.) 1.5%	58.3%	(R.) 1.5%	58.3%	(R.) 2.1%
Tydeus californicus	41.7%	(R.) 1.5%	58.3%	(R.) 1.5%	58.3%	(R.) 2.1%

(D.): Dominant level **(I.) : Influent level** **(R.) : Resident level**

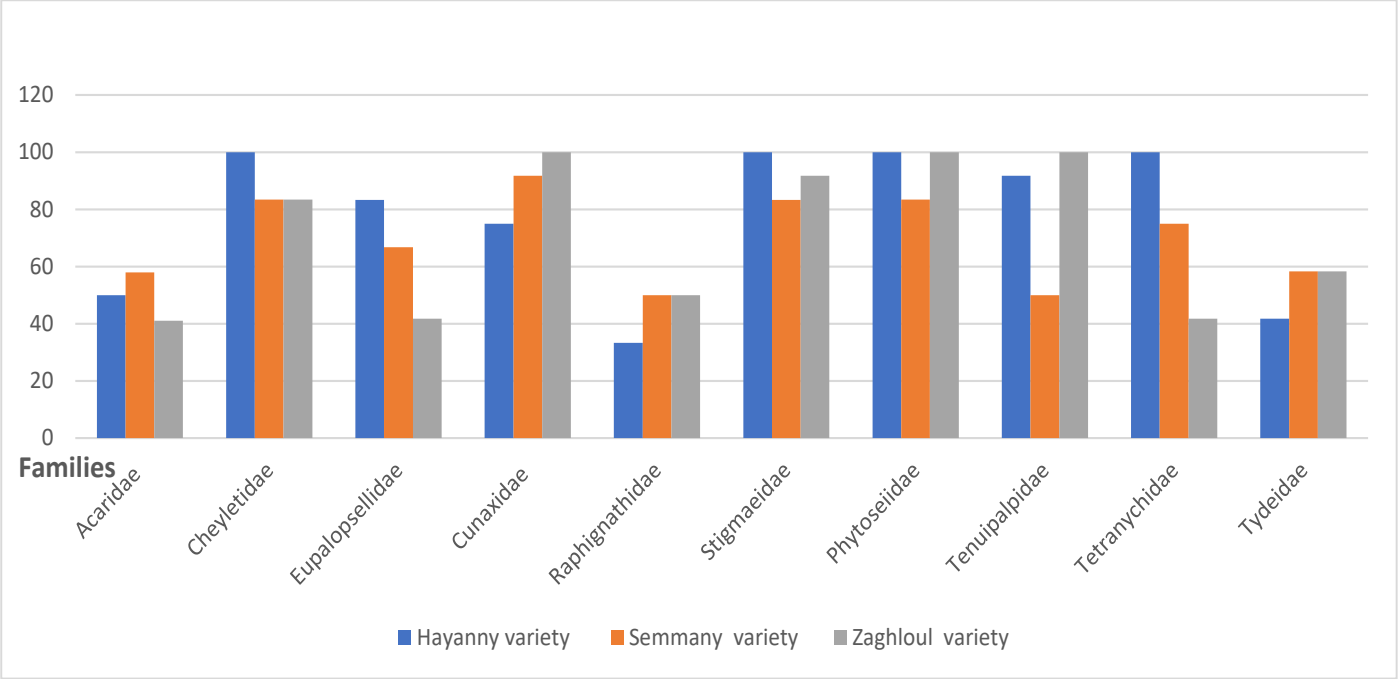

Figure (1): Frequencies percentages families of mites associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt during season 2022.

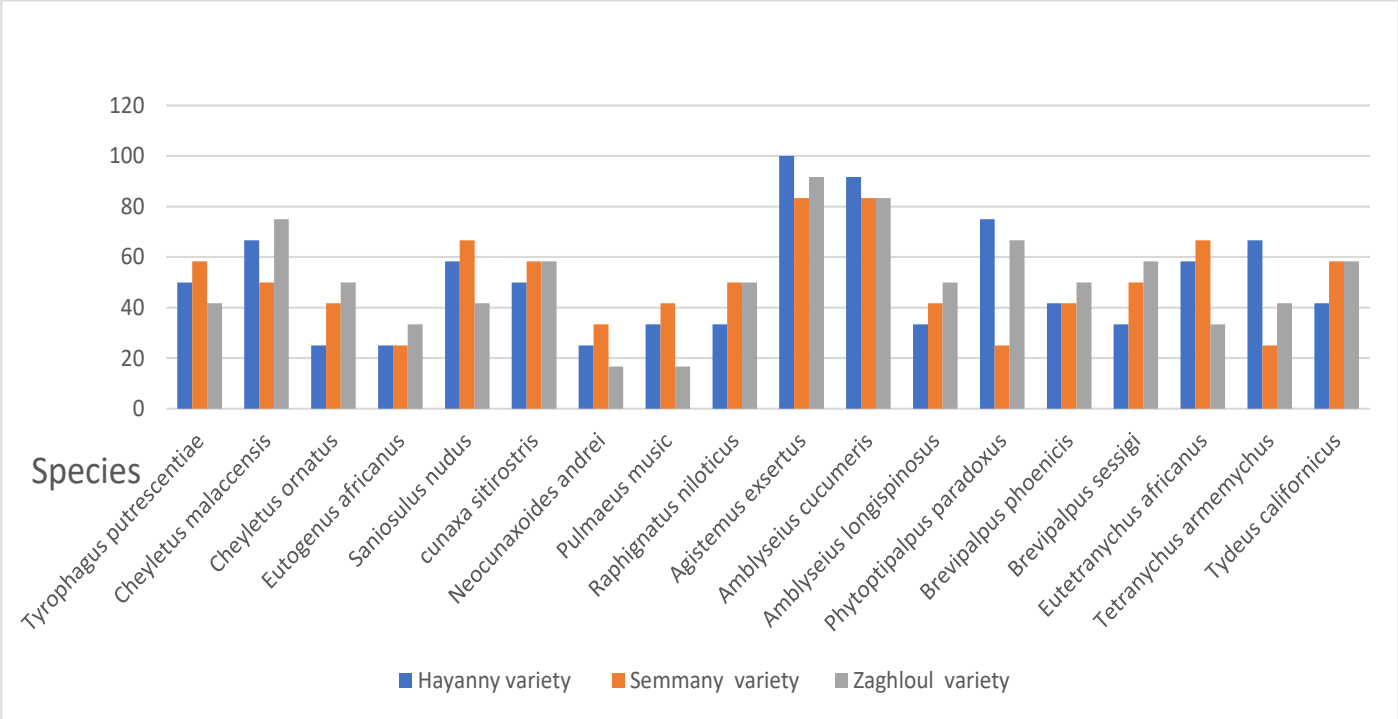

Figure (2): Frequencies percentages species of mites associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt during season 2022.

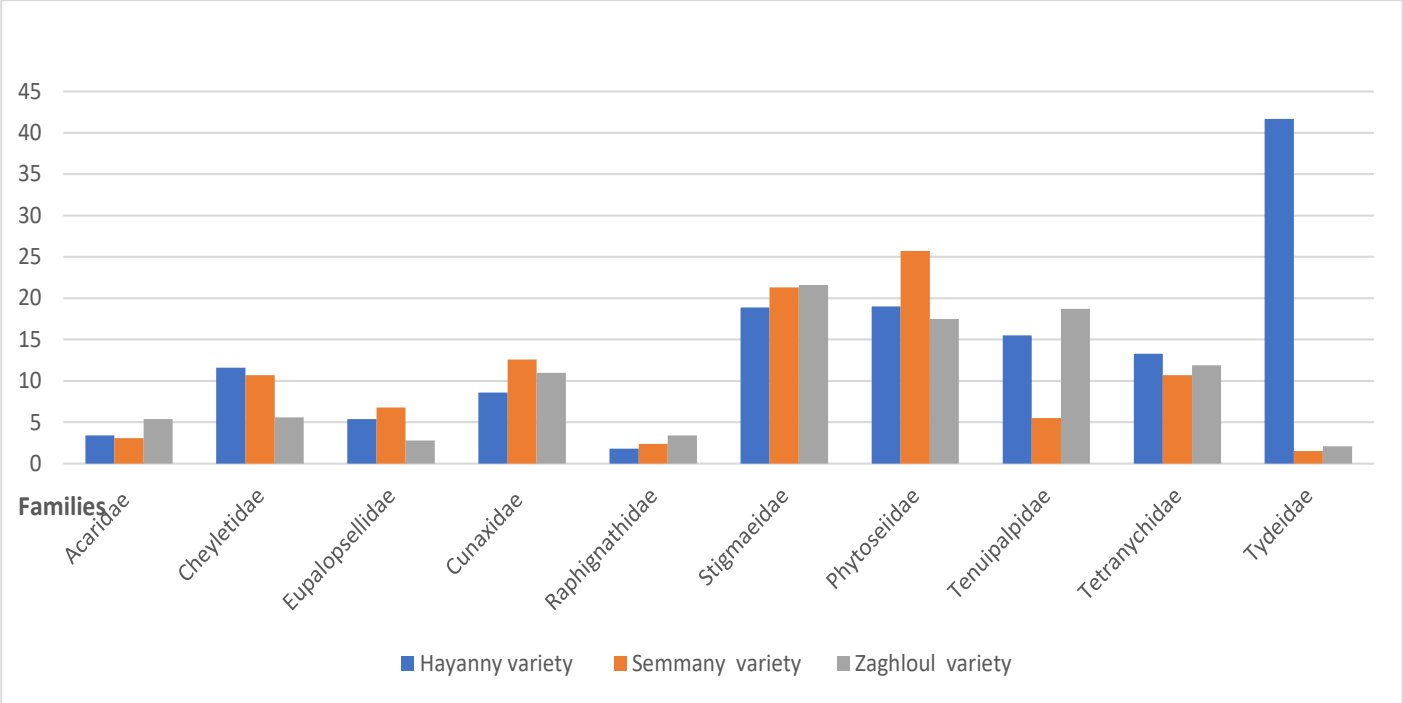

Figure (3): Relative abundance of mites families associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt during season 2022.

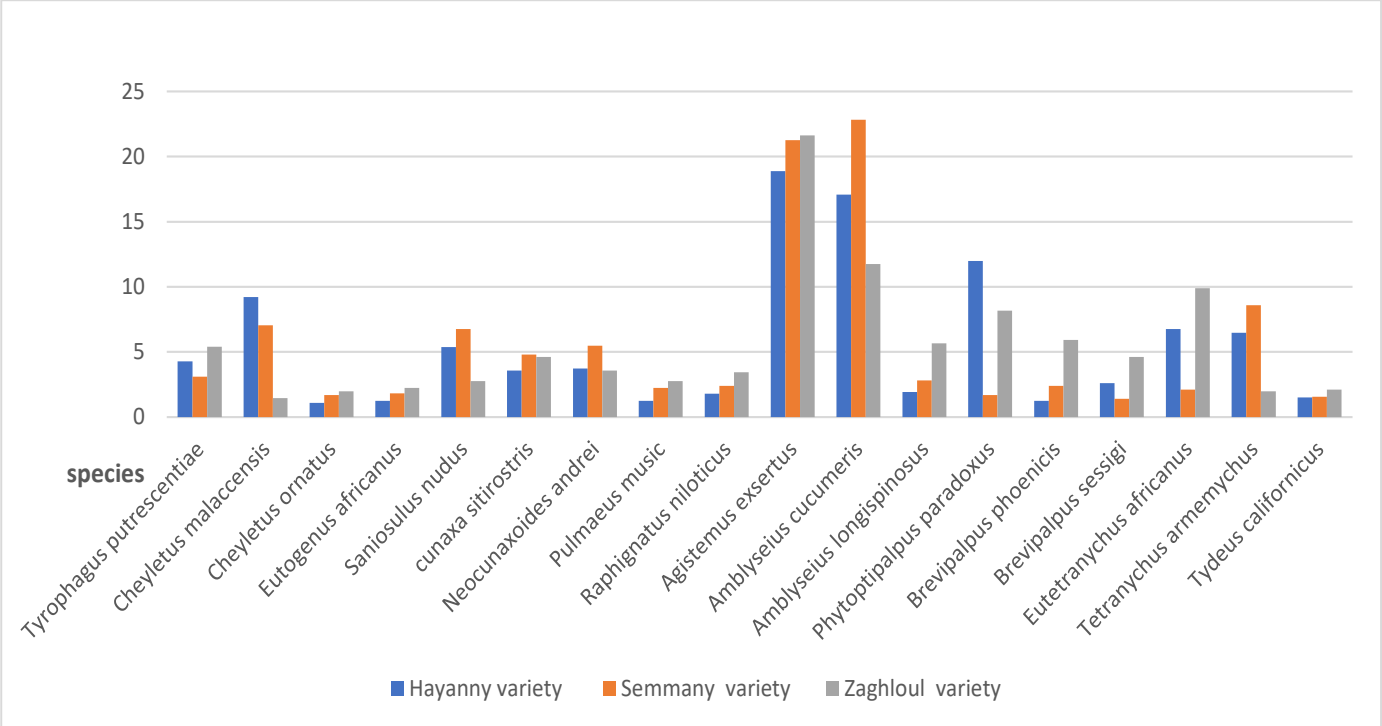

Figure (4): Relative abundance of mites species associated with three varieties of date palm trees in El-Wahat El-Bahariya district, Egypt during season 2022.

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