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SOIL-ACARI ASSOCIATED WITH *CESTRUM DIURNUM* L. AND *NERIUM OLEANDER* L. PLANTS IN ASSIUT GOVERNORATE

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ABSTRACT: *The species richness, density, life style and monthly fluctuation of soil mites of Day Jessamine, Cestrum diurnum L., (Fam: Solanaceae) and Oleander, Nerium oleander L., (Fam: Apocynacea) plants at cultivated land and newly reclaimed area in Assiut Governorate throughout whole year of 2011 were investigated. Eleven soil mite species pertaining to ten families were recorded. The oribatid mites were the most abundant taxa, followed by acaridid and gamasid mites, while the lower abundant was recorded with actinedid mites in cultivated and newly reclaimed area. As for life style, parasitic soil mites exhibited the highest density followed by fungivorous and saprophagous soil mites, whereas the predaceous soil mites recorded the lowest density. Monthly fluctuation of soil mites varied according to location, plants and mite suborders.*

Key words : *Soil-acari, Soil mites. of Cestrum diurnum L. and Nerium oleander L. plants*

INTRODUCTION

Mites and other microarthropods, part of the mesofauna play a crucial role in the context of soil biodiversity, decomposition and mineralization processes (Seastedt, 1984; Tian *et al.*, 1998).

There have been many studies reporting the impact of agricultural practices on the soil fauna, many of which focused on mites (Arachnida: Acari); however few authors have described the mite community of natural soils adjacent to arable fields. Fox *et al.* (1996) and Paoletti (1999) suggested that an important step in bioindicator identification studies is to select, in the area to be investigated, potentially less disturbed sites as a natural reference. Behan-Pelletier (1999) stated that uncultivated areas adjacent to cultivated plots are poorly researched, and this confounds our ability to predict changes in mite populations following cultivation. As a result, we need to obtain preliminary information on the mite fauna in natural soils, and use these as reference sites in soil degradation studies.

Additionally, uncultivated areas can serve as refuges for mesofauna in the agricultural landscape, functioning as a source of colonizing species (Behan-Pelletier 1999) and thus playing a key role in maintaining biological diversity on farmlands (Fry 1994).

Day Jessamine, *Cestrum diurnum* and oleander, *Nerium oleander* often used to screening, shrub border, container gardens and informal hedges. In Egypt, these ornamental plants are planting as hedges adjacent to farms and soil under these plant hedges considered natural soil, where it is less disturbed of agricultural processes.

The aim of this study is providing information about the soil mite population in natural soils under day Jessamine and oleander hedges margins adjacent to farms in cultivated land and newly reclaimed area, which can provide base line data for studies of bioindicator of soil quality.

MATERIALS AND METHODS

The present study was carried at two locations in Assiut Governorate during the whole year of 2011. The first one represented a traditional cultivated land (Fac. Agric. Expt. Farm, Assiut univ.) and the second one represented newly reclaimed area ((Arab-Alawamer Agric. Res. Station). In each experimental site, samples were collected throughout the year to survey the mites associated with Day Jessamine and Oleander hedges margin to the farms.

Soil of 500g with three replicates from each plant species was fortnightly taken using a metal cylinder of one cubic liter at depth of 20 cm under the plants. The mites were extracted using a modified Berlese's extractor apparatus and allowed to fall into small jar containing 75% ethyl alcohol + 5% glycerol.

After one week, mites were isolated in small vials using a camel hair brush to avoid destruction of mite individuals, and then mites were counted using stereomicroscope and transferred into concaved slide containing lactic acid for clearing. The permanent preparations of mites were used before identification. The identification of mites was based on illustrated keys by: Krantz (1978); Zaher (1986a and b) and Evans (1992).

Statistical analysis adopted for this study was the analysis of variance (ANOVA) procedure. The software used was SAS package and StatView SE ± graphic software package (Abacus Concept, Inc. Calabasas,CA).

RESULTS AND DISCUSSION

A. Survey of soil mites:

A partial taxonomic list (Table 1) illustrated the recovered suborders, families, scientific name and the life style of mites inhabiting day Jessamine and oleander soil at cultivated land and newly reclaimed area. Results, revealed the presence of eleven soil mite species belonging to four suborders and ten families at both locations of study. Parasitic mites comprised three species belonging to three families (*Caloglyphus* sp., Acaridae; *Parasitus* sp., Parasitidae and *Pediculochelus* sp., Pediculochelidae). Saprophagous mites composed two species of two families (*Euphthiracarus* sp., *Euphthiracaridae* and *Galumna* sp., Galumnidae). Fungivorous mites included two species pertaining to one family (*Sterroppia* sp. and *Oppiella* sp., Oppiidae). While, predaceous mites represented four species belonging to four families (*Ololaelaps bregetovae*, Laelapidae; *Lasioseius quinisetosus*, Ascidae; *Acaropsella notchi*, Cheyletidae and *Spinibdella* sp., Bdellidae). In Nigeria, Gbarakoro *et al* (2010) recorded twenty three mite species in the rainy season and thirteen mite species in the dry season pertaining to three suborders (oribatida, gamasida and actinedida).

Table (1): A partial taxonomic list of mites inhabiting soil of *Cestrum diurnum* and *Nerium oleander* plants in Assiut Governorate throughout the whole 2011's year.

Suborder	Family	Scientific name	Life style [a]
Acaridida	Acaridae	*Caloglyphus* sp.	Pa
Oribatida	Euphthiracaridae	*Euphthiracarus* sp.	S
	Galumnidae	*Galumna* sp.	S
	Oppiidae	*Sterroppia* sp.	F
		Oppiella sp.	F
Gamasida	Laelapidae	*Ololaelaps bregetovae* Shereef & Soliman	Pr
	Ascidae	*Lasioseius quinisetosus* Lindquist and Karg	Pr
	Parasitidae	*Parasitus* sp.	Pa
Actinedida	Cheyletidae	*Acaropsella notchi* Leach	Pr
	Pediculochelidae	*Pediculochelus* sp.	Pa
	Bdellidae	*Spinibdella* sp.	Pr

[a] Indicates primary feeding guild. Pa, parasitic; S, saprophagous; F, fungivorous; Pr, predaceous.

B. Population density of soil mites:

1- Oleander:

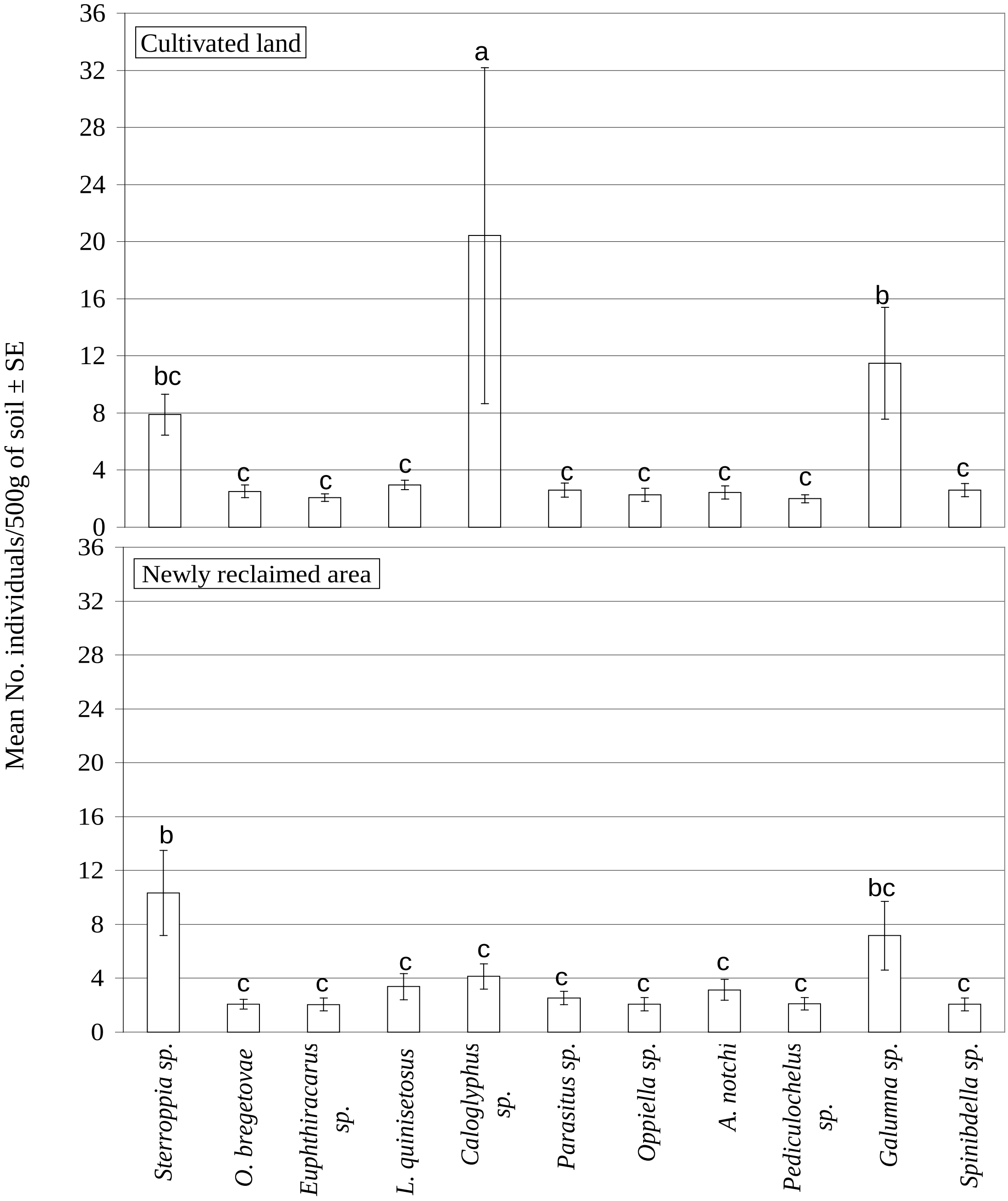
Soil mite species densities of oleander plant at two locations are depicted in Fig. (1). In the cultivated land, the highest population density was recorded with the parasitic mite, *Caloglyphus* sp. (20.42±11.75 individuals / 500g soil) followed with significant differences by the saprophagous mite, *Galumna* sp. and the fungivorous mite species, *Sterroppia* sp. (11.49±3.91 and 7.89±1.43 individuals / 500g soil). While, predaceous mite species, *Acaropsella notchi*, *Ololaelaps bregetovae*, *Spinibdella* sp. and *Lasioseius quinisetosus* were harbored lower population density (2.42±0.46, 2.51±0.45, 2.60±1.43 and 2.96±0.32 individuals / 500g soil, respectively) with significant differences than the previous three species. However, in the newly reclaimed area, the fungivorous mite, *Sterroppia* sp. had the highest population density (10.33±3.15 individuals / 500g soil) followed with insignificant difference by the saprophagous mite, *Galumna* sp. (7.17±2.55 individuals / 500g soil). The predaceous mite species showed lower population densities with significant differences than the previous two species. Whereas, the predaceous mite species, *Lasioseius quinisetosus* achieved the highest population density (3.38±0.98 individuals / 500g soil) followed with insignificant differences by the three predaceous mite species, *Acaropsella notchi*, *Ololaelaps bregetovae* and *Spinibdella* sp. (3.14±0.78, 2.06±0.36 and 2.06±0.49 individuals / 500g soil).

2- Day Jessamine:

The population densities of soil mite species inhabiting day Jessamine plants at two locations are illustrated in Fig.(2). The fungivorous mite, *Sterroppia* sp. Harbored the highest population density (17.26±6.34 individuals / 500g soil) followed with insignificant difference by the parasitic mite, *Caloglyphus* sp. (12.63±5.13 individuals / 500g soil). Also, the predaceous and saprophagous mite species were achieved lower population density with insignificant differences among them and significant differences than the previous two species in the cultivated land. The general picture of the population densities in the cultivated land was almost the same that in the newly reclaimed area. The two soil mite species, *Caloglyphus* sp. and *Sterroppia* sp. adding to the saprophagous mite, *Galumna* sp. were recorded the highest population density with insignificant differences (16.85±10.80, 16.42±2.40 and 10.87±2.83 individuals / 500g soil) followed with significant differences by all predaceous mite species. In harmony with these results, Banerjee (1986) reported that the cryptostigmatid mites, in the soil of uncultivated and well vegetated plots, were found to be predominated over other groups of mites such as mesostigmata, prostigmata and astigmata.

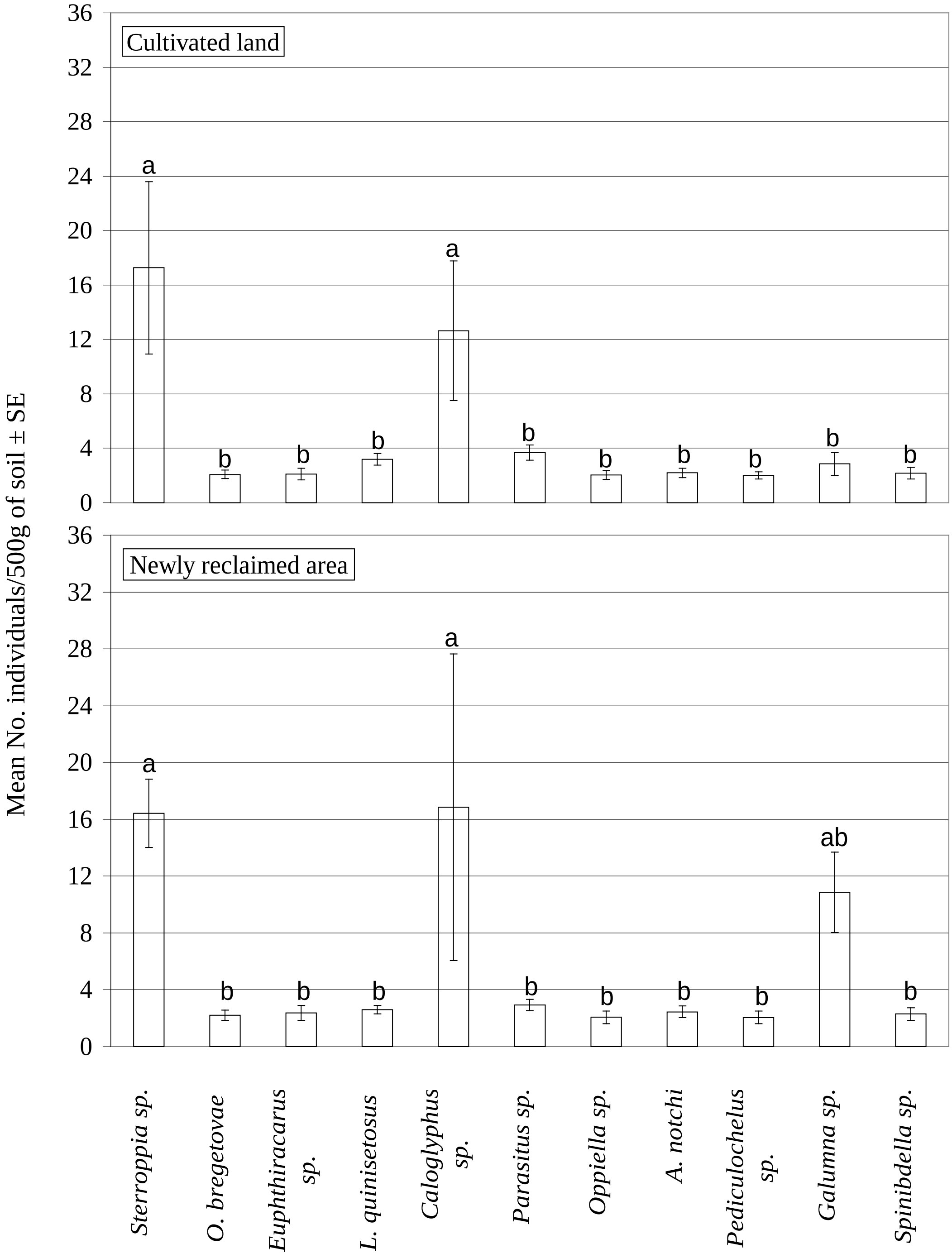
Concerning the life style of soil mites, regardless suborders, locations and plants, data (Table 2) indicate significant differences among life styles. The parasitic soil mite species harbored the highest population density (18.49 individuals / 500g soil) followed with insignificant difference by the fungivorous soil mite species (15.09 individuals / 500g soil) and significant differences than the saprophagous and predaceous soil mite species. The predaceous soil mite species had the lowest population density (10.09 individuals / 500g soil) with insignificant difference than the saprophagous soil mite species. The life style of soil mites in each location were taken the same trend comparing to the grand mean of life style.

On oleander plants, in the cultivated land, the parasitic soil mite species were the most dominant (25.02 individuals / 500g soil) followed with insignificant difference by saprophagous soil mite species (13.55) and significant difference by the predaceous soil mite species (10.49), while the fungivorous mite species were the lowest one (10.16) with insignificant difference than the predaceous soil mite species. Whereas, in the newly reclaimed area, the most dominant was achieved with the fungivorous soil mite species (12.41) followed with insignificant differences by the predaceous soil mite species (10.65) and the saprophagous soil mite species (9.23), then the parasitic soil mite species. For day Jessamine plants, in the cultivated land, the fungivorous soil mite species exhibited the highest dominant (19.30



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

Fig. (1): Soil mite species densities of *Nerium oleander* plants at cultivated land and newly reclaimed area in Assiut Governorate throughout the whole 2011's year.



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

Fig. (2): Soil mite species densities of *Cestrum diurnum* plants at cultivated land and newly reclaimed area in Assiut Governorate throughout the whole 2011's year.

Table (2): Mean number of mites for each life style inhabiting soil of _Cestrum diurnum_ and _Nerium oleander_ plants in Assiut Governorate throughout the whole 2011's year.

Location	Plant	Life style				Grand mean of location	Grand mean of Plant
		Parasitic	Fungivorous	Saprophagous	Predaceous		
Cultivated land	*Cestrum diurnum*	18.33 *ab*	19.30 *ab*	4.96 *c*	9.65 bc	13.93 (a)	14.42 **a**
	Nerium oleander	25.02 *a*	10.16 *bc*	13.55 *abc*	10.49 *bc*		12.53 **a**
Newly reclaimed area	*Nerium oleander*	8.77 *bc*	12.41 *abc*	9.23 *bc*	10.65 *bc*	13.02 (a)	
	Cestrum diurnum	21.83 *ab*	18.49 *ab*	13.24 *abc*	9.56 *bc*		
Grand mean Of Location × Life style	*Assiut*	21.67 A	14.73 AB	9.25 B	10.07 B		
	Al-Awamer	15.30 AB	15.45 AB	11.23 B	10.10 B		
Grand mean of life style		18.49 **(A)**	15.09 **(AB)**	10.24 **(B)**	10.09 **(B)**	13.48	

(1) Means followed by the same small letter do not significantly different at 0.05 level of probability.
(2) Means followed by the same small letter (in parentheses), do not significantly different at 0.05 level of probability.
(3) Means followed by the same capital letter(s), do not significantly different at 0.05 level of probability.
(4) Means followed by the same capital letter(s) (in parentheses) do not significantly different at 0.05 level of probability.

individuals / 500g soil) followed with insignificant differences by the parasitic soil mite species (18.33) and the predaceous soil mite species, while the saprophagous soil mite species showed the lowest dominant (4.96) with insignificant difference than the predaceous soil mite species. As for the newly reclaimed area, the parasitic soil mite species recorded the highest dominant (21.83) followed with insignificant differences by the fungivorous soil mite species (18.49) and the saprophagous soil mite species (13.24) then lastly the predaceous soil mite species (9.56). The high dominance of astigmatid and cryptostigmatid mites in the soil may be due to astigmatid mites are free-living or parasites, while cryptostigmatid mites are particulate-feeding saprophagous and mycophagous mites, feeding on living and dead rganic material (Benhan-Pelletter, 1999; Walter and Proctor, 1999).

C- Mite suborders inhabiting soil:

Data in (Table 3) showed the sub orders of soil mite species and the population densities from oleander and day Jessamine plants in the cultivated land and newly reclaimed area. The population densities of soil mite species for oleander and day Jessamine plants, regardless suborders and locations were (12.53 and 14.42 individuals / 500g soil) with insignificant difference. The obtained data are in agreement with those of Mark *et al* (2006) who stated that soil mite species were not specific to individual species of plants, but are possibly more influenced by characteristics of the plant assemblage as a whole, prevailing soil conditions, or predation. As for location, regardless suborders and plants, the population densities were (13.93 and 13.02 individuals / 500g soil) in cultivated land and newly reclaimed area with insignificant difference. By regarding soil mite suborders, regardless plants and locations, data also indicate that the highest population density was manifested with oribatida suborder (25.33 individuals / 500g soil) followed with significant differences by the two suborders of acaridida and gamasida (13.50 and 8.19 individuals / 500g soil), while the lowest density was acquired with actinedida suborder (6.88 individuals / 500g soil) with significant differences than oribatida and acaridida suborders. Similar trend of the population densities of mite suborders in each location was true comparing to the grand mean of suborder. Concerning of oleander and day Jessamine plants at two locations, oribatida suborder attained the highest population densities at the two locations. At cultivated land, oribatida suborder realized the highest population density followed with insignificant difference by acaridida suborder then significant differences with gamasida and actinedida suborders. The means were (23.70, 20.42, 8.07 and 7.02 individuals / 500g soil, respectively) for oleander plant, and (24.26, 12.61, 8.98 and 6.38 individuals / 500g soil, respectively) for day Jessamine plant. At newly reclaimed area, oribatida suborder executed the highest population density for oleander and day Jessamine plants (21.64 and 31.72 individuals / 500g soil) followed with significant differences by gamasida, actinedida and acaridida suborders (7.99, 7.31 and 4.13 individuals / 500g soil, respectively) for oleander plant, while followed with significant differences by acaridida, gamasida and actinedida suborders (11.85, 7.74 and 6.80 individuals / 500g soil, respectively) for day Jessamine plant. It can conclude from the obtained data of the mite suborders inhabiting soil that oribatid mites exhibited the highest density. This may be due to many oribatida species feed directly on decomposing litter, while many others feed on soil fungi (Mosadoluwa and Buny, 2000). Although their fecundity is low and development slow (Behan-Pelletier, 1999), their high numbers might be associated with the diversity of their feeding habits. Also, soil moisture (water content) is one of the most decisive factors affecting the life of oribatid communities; oribatid mites generally like habitats with elevated humidity and are susceptible to drought (Gregocs and Hufnagel, 2009). Adult mites are more tolerant to a wide range of water content (Walter and Proctor, 1999; Taylor *et al*, 2002; Taylor and Wolters, 2005) but nymphs are quite susceptible to drought (Taylor and Wolters, 2005).

Table (3): Mean number of mites for each subrder inhabiting soil of *Cestrum diurnum* and *Nerium oleander* plants in Assiut Governorate throughout the whole 2011's year.

<table>
<tr><th rowspan="2">Location</th><th rowspan="2">Plant</th><th colspan="4">Suborder</th><th rowspan="2">Grand mean of location</th><th colspan="2" rowspan="2">Grand mean of plant</th></tr>
<tr><th>Acaridida</th><th>Oribatida</th><th>Gamasida</th><th>Actinedida</th></tr>
<tr><td rowspan="2">Cultivated land</td><td>Cestrum diurnum</td><td>12.61 bcd</td><td>24.26 ab</td><td>8.98 cd</td><td>6.38 d</td><td rowspan="2">13.93 (a)</td><td></td><td rowspan="4">14.42 a</td></tr>
<tr><td>Nerium oleander</td><td>20.42 abc</td><td>23.70 ab</td><td>8.07 d</td><td>7.02 d</td><td rowspan="2">12.53 a</td></tr>
<tr><td rowspan="2">Newly reclaimed area</td><td>Nerium oleander</td><td>4.13 d</td><td>21.64 ab</td><td>7.99 d</td><td>7.31 d</td><td rowspan="2">13.02 (a)</td></tr>
<tr><td>Cestrum diurnum</td><td>16.85 bcd</td><td>31.72 a</td><td>7.74 d</td><td>6.80 d</td><td></td></tr>
<tr><td rowspan="2">Grand mean Of Location × Life style</td><td>Assiut</td><td>16.52 BC</td><td>23.98 AB</td><td>8.52 CD</td><td>6.70 D</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Al-Awamer</td><td>10.49 CD</td><td>26.68 A</td><td>7.86 D</td><td>7.06 D</td></tr>
<tr><td colspan="2">Grand mean of suborder</td><td>13.50 (B)</td><td>25.33 (A)</td><td>8.19 (BC)</td><td>6.88 (C)</td><td colspan="3">13.48</td></tr>
</table>

(1) Means followed by the same small letter do not significantly different at 0.05 level of probability.
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(4) Means followed by the same capital letter(s) (in parentheses) do not significantly different at 0.05 level of probability.

The estimated monthly population densities of soil mite suborders at two locations, regardless plant species, are depicted in Fig. (3). At cultivated land, acaridid mites density exhibited a maximum peak in November and one smaller peak in August. The minimum population density was observed in June. Oribatid mite density was highest in August and lowest in April. The peak density of gamasid mites was observed in August and July, while the minimum density was recorded in December. Actinedid mites showed the maximum density in May and the minimum density in February. Total mites density was greater IN November and two smaller peaks in August and May, while the smaller density was in December. Moreover, at newly reclaimed area, acaridid mite density executed the highest peak in November like at cultivated land, whereas the lowest peak occurred in October. Oribatid mites achieved the maximum density in November and the minimum one recorded in October. Gamasid mite density was highest in March and lowest in November. The maximum density of Actinedid mites was acquired in June and the minimum one in October. As for total mite density, the greater density was accomplished in November and two smaller peaks in March and June, while the smaller density was recorded in October. In general, (Bardgett and Cook, 1998) reported that the fluctuation of Acari densities are associated with soil moisture, temperature, and litter availability. (Hijii, 1987; Narula *et al* 1998) indicated that various abiotic factors viz., temperature, relative humidity, soil moisture, inorganic nutrients, vegetation, cultivation practices etc. are known to influence population of soil microarthropods.

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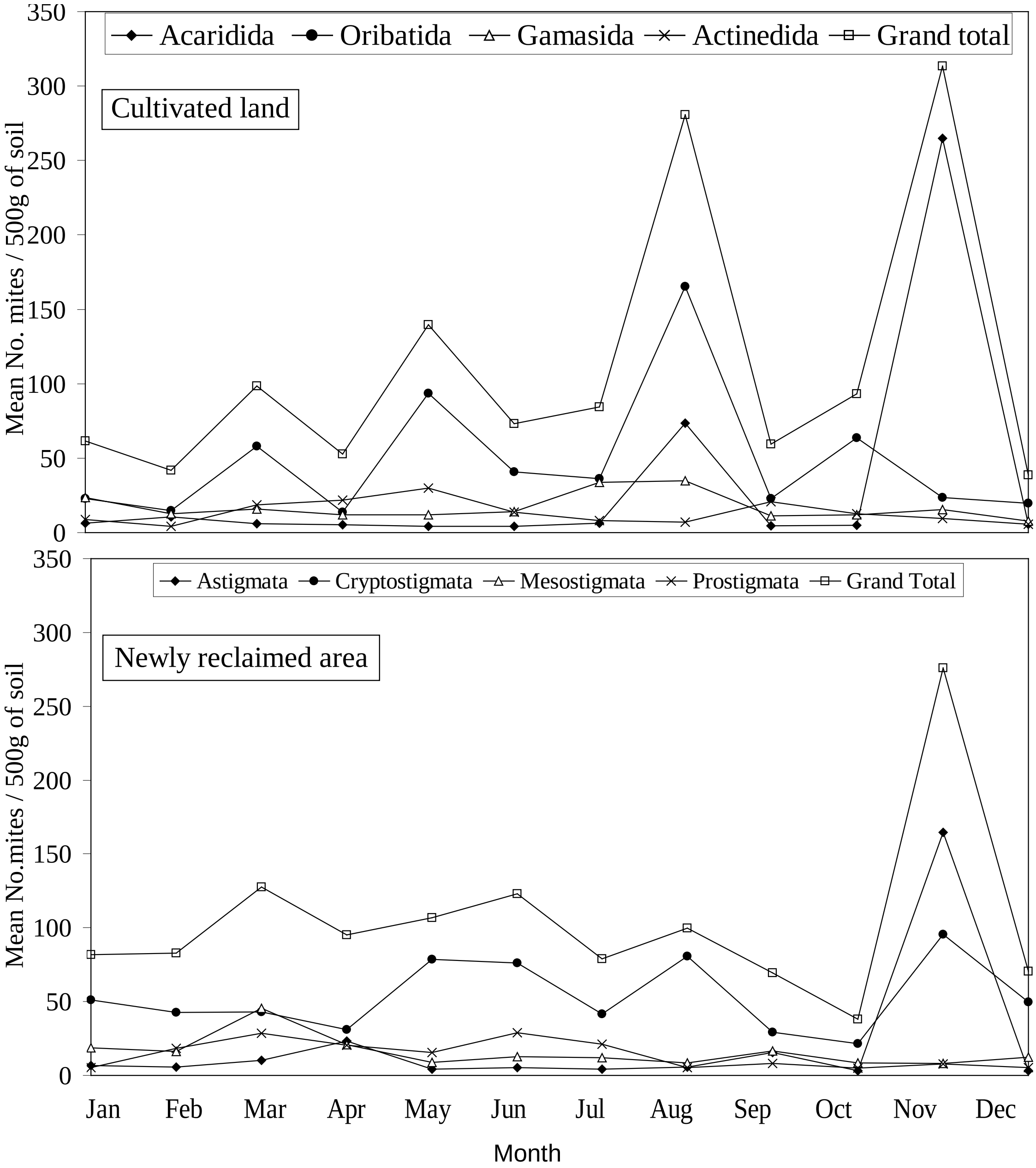

Fig. (3): Monthly population density of soil mite suborders at cultivated land and newly reclaimed area in Assiut Governorate throughout the whole 2011's year.

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الآكاروسات المتواجدة بتربة نباتات البوستاشيا والدفلة في محافظة أسيوط

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الملخص العربي

أجريت هذه الدراسة بهدف حصر الآكاروسات المتواجدة بتربة نباتات البوستاشيا والدفلة. وكذلك دراسة كثافتها ، أساليب حياتها وتذبذباتها العددية وذلك في الأراضي الزراعية القديمة والمناطق الحديثة الاستصلاح بمحافظة أسيوط على مدار عام ٢٠١١ بالكامل.

كان أهم النتائج المتحصل عليها هو وجود ١١ نوعا من الحلم متواجدة بالتربة أسفل نباتات البوستاشيا والدفلة تنتمي إلي عشرة عائلات. . وقد احتلت تحت رتبة Oribatida أعلى تعداد متبوعة بكل من تحت رتبتي Acaridida, Gamasida بينما سجلت تحت رتبة Actinedida اقل تعداد وذلك في كل من الأراضي الزراعية القديمة والمناطق الحديثة الاستصلاح.

بالنسبة لأساليب الحياة، فقد سجلت الآكاروسات المتطفلة اعلي كثافة يليها الآكاروسات المتغذية على الفطريات ثم الآكاروسات المترممة، بينما سجلت الآكاروسات المفترسة اقل كثافة.

أوضحت النتائج ان التذبذبات العددية للآكاروسات المتواجدة بالتربة على مدار العام تختلف باختلاف النوع النباتي وأيضا باختلاف الأماكن.

الآكاروسات المتواجدة بتربة نباتات البوستاشيا والدفلة في محافظة أسيوط

ماجد زاهي إمبارك[١] ، صافينازعبد العزيز احمد[١] ، محمد محروس يوسف الشاذلى[٢]

[١] معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الجيزة- مصر

[٢] قسم وقاية النبات – كلية الزراعة – جامعة الاسكندرية – مصر

الملخص العربي

أجريت هذه الدراسة بهدف حصر الآكاروسات المتواجدة بتربة نباتات البوستاشيا والدفلة. وكذلك دراسة كثافتها ، أساليب حياتها وتذبذباتها العددية وذلك في الأراضي الزراعية القديمة والمناطق الحديثة الاستصلاح بمحافظة أسيوط على مدار عام ٢٠١١ بالكامل.

كان أهم النتائج المتحصل عليها هو وجود ١١ نوعا من الحلم متواجدة بالتربة أسفل نباتات البوستاشيا والدفلة تنتمي إلي عشرة عائلات. . وقد احتلت تحت رتبة Oribatida أعلى تعداد متبوعة بكل من تحت رتبتي Acaridida, Gamasida بينما سجلت تحت رتبة Actinedida اقل تعداد وذلك في كل من الأراضي الزراعية القديمة والمناطق الحديثة الاستصلاح.

بالنسبة لأساليب الحياة، فقد سجلت الآكاروسات المتطفلة اعلي كثافة يليها الآكاروسات المتغذية على الفطريات ثم الآكاروسات المترممة، بينما سجلت الآكاروسات المفترسة اقل كثافة.

أوضحت النتائج ان التذبذبات العددية للآكاروسات المتواجدة بالتربة على مدار العام تختلف باختلاف النوع النباتي وأيضا باختلاف الأماكن.

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