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SHORT COMMUNICATION

MITE FAUNA ASSOCIATED WITH DATE PALM (*PHOENIX DACTYLIFERA* L.) AT BEHEIRA GOVERNORATE, EGYPT

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ABSTRACT

The objective of this research was to study the mite species occurring on date palm *Phoenix dactylifera* L. in Beheira governorate, Egypt, during the years 2022 and 2023. The results revealed the presence of two phytophagous, five predaceous, and two miscellaneous feeding habit mite species, on date palm trees. The dominance and frequency occurrence of the surveyed species were discussed. The tetranychid species *Oligonychus afrasiaticus* (McGregor) was found to be the most abundant phytophagous mite on this economic crop. Phytoseiid species formed the majority of predaceous mites inhabiting date palm trees, with *Typhlodromips swirskii* Athias-Henriot and *Phytoseiulus persimilis* Athias-Henriot appeared being the widest spread predatory mite species. On defected dry fruits of date palm fallen under trees, the dominant mite species were *Tyrophagous putrescentiae* Schrank and *Caloglyphus berlesi* Michael, along with five predatory mite species, where the ascid species *Lasioseius bispinosus* Evans was the dominant one. These findings may provide useful information for the management program of acarine pests affecting the date palm.

INTRODUCTION

A considerable number of arthropod fauna including mites have been reported to inhabit date palm trees, *Phoenix dactylifera* L. Several species are phytophagous and well known as damaging pests causing various types of injuries and significant effects on production. Among the most important acarine pests populating date palm trees was the plant feeder mite *Oligonychus afrasiaticus* (McGregor) of the family Tetranychidae[1-5]. The damage caused by arthropod pests not only affected crops in the field, but also extended to fruits in storage[6]. In addition to acarine pests attacking date palm trees in the field or in the storage, several natural enemies particularly predacious mites play an important role in the biological control of these pests were reported[7,8]. Therefore, the objective of the present investigation was to survey the mite species occurring on date palm trees together with those associated with defected dry fruits fallen under trees to assist in the identification and control of acarine pests damaging this economic crop.

MATERIAL AND METHODS

This work was carried out in Kom-Hamada district, Beheira governorate, Egypt, during the years 2022 and 2023 to study the faunal

composition of mites on date palm (cultivar Zaghloul) *Phoenix dactylifera* trees, together with those found on defected dry fruits that had fallen under the trees. A total of twenty five leaf samples (50 leaves each) were randomly collected from date palm trees during the two seasons 2022 and 2023, placed in polyethylene bags, and carefully examined by a Russian m6c-9 n875561 microscope in our laboratory. The studying of mites on the defected dry fruits, which were fallen under the trees, was performed as described previously[6]. Twenty five samples (500 g each) of the defected dry fruits, which were fallen under the trees, were randomly collected during the study period. Mite individuals were extracted using a Berlese modified funnel. All mite individuals were cleared in lactophenol solution, mounted in Hoyer's medium on microscopic glass slides, and dried in a laboratory oven at 30°C. The identification of mounted mite species was carried out under a research microscope according to the taxonomic concepts of Hughes[9] and Krantz[10]. Mite species were categorized based on frequency percent[11], as well as dominance[12].

Frequency occurrence (%) = (Number of samples with present species A / Total number of sampling units) × 100

Mite species are classified as constant, accessory, or accidental if they are found in >50, 25-50, and <25% of the total number of collected samples, respectively. According to Palyvos, *et al*.[12], dominance indicates the percentage of individuals of a given species compared with the total number of individuals of all found species. Categories of dominance are designed as dominant, influent, or recedent if they constitute >10, 5-10, or <5% of the total number of collected individuals, respectively. All mite specimens were deposited in the collection of Acarology of the Plant Protection Department, Faculty of Agriculture, Zagazig University. The experimental design of the current study on mites are in commitment with the ethical procedures of Faculty of Agriculture, Zagazig University.

RESULTS AND DISCUSSION

Incidence of mite species inhabiting date palm trees

A total of nine mite species belonging to six families in the subclass Acari were identified from leaf samples taken from date palm trees. Regarding the feeding habits of the collected species, the following functional forms have been distinguished as phytophagous mites (2 species), predaceous mites (5 species), and two species with miscellaneous feeding habit mites. The frequency of occurrence and dominance of the surveyed species are shown in Table (1).

Phytophagous mites

Two species of plant feeding mites belong to the families Tetranychidae (*Oligonychus afrasiaticus* McGregor) and Tenuipalpidae (*Brevipalpus obovatus* Donnadieu) were surveyed on leaves of date palm trees. Based on criteria of frequency and dominance percentages, the tetranychid species *O. afrasiaticus* was considered constant and dominant, where it was found to be the frequent and dominant phytophagous mite species on date palm trees with high values of frequency (64%) and dominance (26.43%). The tenuipalpid species *B. obovatus* was classified as accessory, where it recorded 46% of the total collected samples. Based on criteria of dominance, *B. obovatus* was scored as dominant, forming 19.29% of the total number of collected mite individuals (Table 1). Helle and Sabelies[13] reported that Tetranychidae and Tenuipalpidae families contain most of the known mite species, which had worldwide economic importance and plant pests. Other scientists reported that the tetranychid species *O. afrasiaticus* was considered the most damaging phytophagous mite species to date palm trees[3,4]. Roshdy *et al*.[8] and Mesbah[14] mentioned that the two phytophagous mite species *O. afrasiaticus* and *B. obovatus* occur together and have the potential to cause severe damage to date palm.

Table (1): Frequency and dominance percentages of mite species found on date palm trees at Beheira governorate, Egypt during 2022 and 2023 years.

Mite species	Family	Frequency (%)	Dominance (%)
I. Phytophagous mites			
1. *Oligonychus afrasiaticus* (McGregor)	Tetranychidae Donnadieu	64 C	26. 43 D
2. *Brevipalpus obovatus* Donnadieu	Tenuipalpidae Berlese	46 A	19.29 D
Total			45.72
II. Predaceous mites			
1. *Agistemus exertus* Gouzalez	Stigmaeidae Oudemans	28 A	7.14 In
2. *Bawus aegypticus* Basha and Yousef	Phytoseiidae Berlese	12 Ac	3.57 R
3. *Phytoseiulus persimilis* Athias-Henriot	Phytoseiidae Berlese	36 A	10.71 D
4. *Typhlodromips swirskii* Athias-Henriot	Phytoseiidae Berlese	40 A	12.86 D
5. *Typhlodromus malus* Basha and Yousef	Phytoseiidae Berlese	32 A	7.86 In
Total			42.14
III. Miscellaneous feeding mites			
1. *Tarsonemus smithi* Ewing	Tarsonemidae Kramer	12 Ac	2.86 R
2. *Tydeus californicus* Banks	Tydeidae Kramer	32 A	9.28 In
Total			12.14

Frequency of occurrence: collected mite species are classified as constant (C), accessory (A), or accidental (Ac), if they occurred in >50, 25-50, or <25% of the total number of samples, respectively. Dominance: mite species are classified as dominant (D), influent (In), or recedent (R) if they occurred >10, 5-10, or < 5% of the total number of individuals, respectively.

Predaceous mites

Five species of predaceous mites belonging to the families Phytoseiidae and Stigmaeidae were found to inhabit date palm trees in association with the above mentioned plant feeder mite species. Members of the family Phytoseiidae formed the majority of these predators, as it included four species *Bawus aegypticus*, *Phytoseiulus persimilis*, *Typhlodromips swirskii*, and *Typhlodromus malus*. Family Stigmaeidae was represented by only one species *Agistemus exertus*. The identified species of mites markedly differed in their frequency and dominance (Table 2). The lowest values of frequency (12%) and dominance (3.57%) were recorded with *B. aegypticus*, therefore it was classified as accidental and recedent. Remaining predaceous mite species were scored as accessory with moderate values of frequency ranging from 28% for *A. exertus* to 40% for *T. swirskii*. Based on criteria of dominance, the two phytoseiids *T. swirskii* and *P. persimilis* were found to be dominant species recording higher dominance values of 12.86 and 10.71%, respectively. The stigmaeid *A. exertus* and the phytoseiid *T. malus* were scored as influent with moderate values of dominance averaging 7.14 and 7.86%, respectively (Table 2). Similar results on phytophagous and predaceous mites on many crops including date palm trees were recorded in accordance with fact that phytoseiid species were found to be common predators associated with phytophagous mites in crop fields[15,16].

Table (2) Frequency and dominance percentages of mite species associated with defected dry fruits of date palm fallen under trees at Beheira governorate, Egypt during 2022 and 2023 years.

Mite species	Family	Frequency (%)	Dominance (%)
I. Miscellaneous feeding mites			
1. *Caloglyphus berlesei* Michael	Acaridae Leach	52 C	30.98 D
2. *Tyrophagus putrescentiae* Schrank	Acaridae Leach	56 C	26.76 D
Total			57.74
II. Predaceous mites			
1. *Cheyletus badryi* Zaher and Hassan	Cheyletidae Leach	48 A	7.04 In
2. *Cosmolaelaps keni* Hafez, El-Badrya and Nasr	Laelapidae Berlese	28 A	9.86 In
3. *Lasioseius bispinosus* Evans	Ascidae Voigts and Oudemans	52 C	12.68 D
4. *Neoseiulus seminudus* Basha and Yousef	Phytoseiidae Berlese	12 Ac	4.23 R
5. *Proctolaelaps aegyptiaca* Nasr	Ascidae Voigts and Oudemans	36 A	8.45 In
Total			42.26

Frequency of occurrence: collected mite species are classified as constant (C), accessory (A), or accidental (Ac), if they occurred in >50, 25-50, or <25% of the total number of samples, respectively. Dominance: mite species are classified as dominant (D), influent (In), or recedent (R) if they occurred >10, 5-10, or < 5% of the total number of individuals, respectively.

Miscellaneous feeding mites

These mites were represented by two species *Tydeus californicus* (Banks) of the family Tydeidae and *Tarsonemus smithi* Ewing of the family Tarsonemidae (Table 1). The tydied *T. californicus* was classified as accessory and influent recording moderate values of frequency (32%) and dominance (9.28%). The tydieds are fast moving mites, commonly found in the soil and on plants, and feed on diversity of natural food[17]. Liguori *et al*.[18] reported that *T. californicus* was a very common tydeid species on many economically important crops in Italy, highlighting the importance of pollen for increasing of mite population, as this species did not exhibit phytophagous habits. *T. californicus* was surveyed on date palm trees[8]. The tarsonemid species *T. smithi* was scored in the current study as accidental and recedent, where it was found in 12% of the total collected samples and formed 2.86% of the total number of collected mite species. Gerson and Smiley[17] noted that tarsonemids have highly variable diets with some feeding on green plants (a few of which are important pests), others preferring fungi, and several being associates of arthropods. The two tarsonemids *Tarsonemus stiffer* and *T. gladifer* were found on leaves of date palm[8].

Mite species associated with defected dry fruits of date palm fallen under trees

Two mite species of the family Acaridae (*Tyrophagus putrescentia*e and *Caloglyphus berlesei*) and five predatory mite species belonging to families Ascidae (*Lasioseius*

bispinosus and *Proctolaelaps aegyptica*), Phytoseiidae (*Neoseiulus seminudus*), Laelapidae (*Cosmolaelaps keni*), and Cheyletidae (*Cheyletus badryi*) were recorded in the current study in association with defected dry fruits of date palm that were fallen under the trees. Based on criteria of frequency and dominance percentages of the collected species, data in Table (2) indicated that members of the family Acaridae were found to be the frequent and dominant species recording high values of frequency and dominance percentages averaging 56 and 26.76, and 52 and 30.98%, for *T. putrescentiae* and *C. berlesei*, respectively. Bibars *et al*.[6] recorded nine mite species of the family Acaridae from date palm fruits in various locations of Egypt. Concerning predatory mite species associated with the aforementioned surveyed acaridid species, data in Table (2) showed that the frequent and dominant predatory mite species was *L. bispinosus*. This species was scored as constant and dominant giving high frequency and dominance values of 52% and 12.68%, respectively. Nawar *et al*.[19] reported that the bulb mite *Rhizoglyphus echinopus* was the favorite prey for the predatory mite *Lasioseius bispinosus*. Members of the families Ascidae, Cheyletidae, and Macrochelidae are the most common predaceous mite species associated with onion bulbs in storage[20]. The cheyletid species *C. badryi*, the ascid species *P. aegyptica*, and the laelapid species *C. keni* recorded in the current study have been reported as accessory and influent, where they gained moderate values of the frequency and dominance percentages. The phytoseiid species *N. seminudus* was classified as accidental and recedent resulting the lowest value of frequency (12%) and dominance (4.23%). Pratt *et al*.[21] mentioned that the phytoseiid species *Neoseiulus fallacis* is able to survive, reproduce, and develop on the acaridid species *T. putrescentiae*. In Greece, Palyvos *et al*.[12] recorded the phytoseiid species *Neoseiulus barkeri* in the inspected stored products. Generally, the two astigmatid species *T. putrescentiae* and *C. berlesei* proved to be abundant acaridid species associated with defected dry fruits of date palm. The damage caused by these species may extend to these fruits in the store. The acarine predators recorded with this acaidid species may play an important role in the biological control of acarine pests damaging date palm fruits in the store.

In conclusion, the results of the current study indicated that among the injurious arthropod pests damaging date palm trees in Egypt, the tetranychid species *O. afrasiaticus* was the abundant phytophagous mites on this crop. The members of the family Phytoseiidae formed the majority of predaceous mites inhabiting date palm trees, of which *T. swirskii* and *P. persimilis* have been found to play a significant role as natural enemies of some small insects and mites that are agricultural pests of this economic crop. On the other hand, mites are among the important pests attacking dry fruits of date palm in storage in association with a number of predaceous mites that have potential role in the biological control of these pests. The predaceous mites identified in this work should be conserved, so that they can exert natural suppression of some agricultural pests including mites minimizing the need for use of chemical control.

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CONFLICT OF INTEREST

There are no conflicts of interest

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فونا الحَلَمْ المرتبطة بنخيل البلح (*Phoenix dactylifera* L.) بمحافظة البحيرة، مصر

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الهدف من هذا البحث هو دراسة أنواع الحَلَمْ الموجودة على نخيل البلح "*Phoenix dactylifera* L." بمحافظة البحيرة، مصر، خلال عامي 2022 و 2023. أظهرت النتائج وجود نوعين من الحَلَمْ نباتية التغذية، وخمسة أنواع من الحَلَمْ المفترسة، ونوعين من الحَلَمْ متنوعة التغذية، على أشجار نخيل البلح. وتمت مناقشة سيادة وتكرار الأنواع التي شملتها الدراسة. وقد ظهر جليًا أن الحَلَمْ "*Oligonychus afrasiaticus* (McGregor)" هو أكثر أنواع الحَلَمْ النباتي وفرة وتواجدًا على هذا المحصول الاقتصادي. وشكلت أنواع "Phytoseiid" غالبية الحَلَمْ المفترس الذي يعيش على أشجار نخيل البلح، حيث يعتبر *Typhlodromips swirskii* Athias-Henriot و *Phytoseiulus persimilis* Athias-Henriot أكثر أنواع الحَلَمْ انتشارًا. وعلى ثمار البلح الجافة والمتحللة المتساقطة تحت الأشجار، كانت أنواع الحَلَمْ السائدة هي *Tyrophagous putrescentiae* Schrank و *Caloglyphus berlesi* Michael، إلى جانب خمسة أنواع من الحَلَمْ المفترس كان السائد منها هو النوع *Lasioseius bispinosus* Evans. وقد توفر هذه النتائج معلومات مفيدة لبرنامج إدارة آفات الحَلَمْ التي تصيب نخيل البلح.