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Survey of Scale Insect Species and Mealybugs on Date Palm Trees in Kufra City

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A B S T R A C T

The date palm (Phoenix dactylifera L.) is a major fruit crop in most Arab countries. It has historically been associated with sustaining human life and traditions of the people in the Old World as a significant agricultural crop. Date palms are susceptible to attack by many pests and diseases, with their nature and severity varying based on cultivar, location, weather, and cultural practices. Four different sites were used for random sampling of scale insects and mealybugs on date palm trees in Kufra city. Hand sampling was conducted from January 2023 until December 2024 at these sites: Western Jouf, Northern Jouf, Southern Jouf, and Eastern Jouf. The most commonly surveyed insects belonged to the order Homoptera and the families Diaspididae and Margarodidae. Two species were recorded: Parlatoria blanchardi and Pseudospidoproctus hyphaniacus, which attack various parts of the date palm (leaves, stem, bark, and crown) in Kufra and cause significant damage. Both immature and adult females are involved in the attacks, while males have wings; immature stages and adult females are wingless. P. hyphaniacus had peak activity levels, particularly in the Northern and Western Jouf regions, while population density in the Eastern and Southern Jouf regions was low. The infestation level of P. blanchardi in the Northern and Western Jouf districts was medium, whereas it was lower in the Eastern and Southern Jouf districts. The most affected varieties by these pests are the Dakla and Saidi, both planted in Kufra city, with infestations recorded in all fields during 2023 and 2024.

Key word: Libya, Mealy bugs, *Phoenix dactylifera*, Scale insects, Survey.

مسح أنواع الحشرات القشرية والبق الدقيقي على أشجار النخيل في مدينة الكفرة.

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الملخص

نخيل التمر (Phoenix dactylifera L.) هو محصول فاكهة رئيسي في معظم الدول العربية. وقد ارتبط تاريخيًا بدعم حياة الإنسان وتقاليد الناس في العالم القديم كمحصول زراعي رئيسي. تتعرض أشجار النخيل للهجوم من قبل العديد من الآفات والأمراض التي تختلف طبيعتها وشدتها باختلاف الصنف والموقع والطقس والممارسات الثقافية. تم استخدام أربعة مواقع مختلفة لأخذ عينات عشوائية من حشرات القشرية والبق دقيق على أشجار نخيل التمر في مدينة الكفرة، باستخدام اليد خلال الفترة من يناير 2023 حتى ديسمبر 2024، تم جمع الاطوار وتخزينها في العلب بلاستيكية منفصلة مملوءة بمحلول إيثانول بنسبة 75٪، وتم كتابة التاريخ واسم الموقع على كل علبة, وكانت هذه المواقع هي الجوف الغربي, الجوف الشمالي, الجوف الجنوبي والجوف الشرقي. وثقت النتيجة أن رتبة واحدة وهي Homoptera وعائلتين هما Diaspididae وMargarodidae، تم تسجيل نوعين:

Parlatoria blanchardi (Targ) و Pseudospidoproctus hyphaniacus (Hall), تهاجم هذه الأنواع أجزاء مختلفة من أشجار النخيل (الأوراق والساق واللحاء والتاج والثمار والجذور) في الكفرة وتمتص هذه الحشرات العصارة بأجزاء فمها ثاقبه وتفرز لعابًا

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سامًا أثناء التغذية وتسبب أضرارًا جسيمه حيث تهاجمها كل من الإناث غير الناضجة والبالغة. كانت ذروة نشاط P. hyphaniacus عاليه وخاصة في منطقة الجوف شمالي والغربي، بينما كانت الكثافة السكانية في منطقة الجوف شرقي والجنوبي منخفضة.
لوحظ أن مستوى الإصابة في منطقة الجوف شمالي والغربي كان متوسطًا، بينما كان أقل في منطقة الجوف P. blanchardi شرقي والجنوبي، فإن أكثر الأصناف إصابة بهذه الآفات هما دقلة والصعيدي المزروعان في مدينة الكفرة. وقد لوحظ في جميع الحقول عامي 2023 و2024. وفي الدراسات المستقبلية ينبغي التركيز على استراتيجيات إدارة الآفات المتكاملة بما في ذلك المكافحة بيولوجيه وأصناف.

الكلمات المفتاحية: البق دقيق, حشرة القشرية, ليبيا, مسح, نخيل التمر.

Introduction

The date palm tree (Phoenix dactylifera L.) is mentioned in the Holy Quran. It holds special significance in the hearts of Muslims and Arabs [1]. The date palm tree is one of the most important horticultural crops in Libya, and the construction of date palm farms has increased, especially in the oases region in the central part of Libya, including Jalo, Aujla, Ejkara, Tazerbo, and Kufra [2]. The oasis cities in Libya, particularly Kufra, are renowned for cultivating high-quality date palm varieties such as Dakla and Saeedi. These dates are distinguished by their superior taste, texture, and market value. The arid climate of Kufra, characterized by low humidity, provides an optimal environment for their cultivation. Statistics indicate that date palm production in Libya amounted to about 63,177 tons in 2020, with the number of date palm trees in Libya estimated at about 6 million [3]. Date palms are subject to infestation by various insects, some of which can be classified as serious pests. Among these pests are scale insects and mealybugs. Frequent observations reveal that the scale insect Parlatoria blanchardii (Targioni-Tozzetti), belonging to the order Homoptera and the family Diaspididae, is one of the major pests affecting date palms and is distributed worldwide, attacking all date palm-growing areas [4]. Immature and mature female scale insects often occur on various parts of offshoots and palms [5]. The mealybug Pseudospidoproctus hyphaniacus (Hall) belongs to the order Homoptera and the family Monophlebidae [6]. P. hyphaniacus usually infests neglected date palms and newly transferred offshoots with bundled and roped fronds. The mealybugs feed on the petiole base and are rarely found on the leaflets; however, in some areas, they have been found on the fruits.

MATERIALS AND METHODS

1. Study Area:

The survey study was conducted on date palm trees planted in and around Kufra city. Additionally, scale insects and mealybugs were randomly sampled at four different locations from January 2023 until December 2024. All sites were subjected to the same agricultural applications, including irrigation, ploughing, and pesticide treatments.

Site I: Western Jouf, 20 km from Kufra city. The field area, approximately 1.5 hectares, consisted of 700 actively growing date palm trees.

Site II: Northern Jouf, 10 km from Kufra city. The field area was about 10 hectares and consisted of 600 date palm trees.

Site III: Southern Jouf, 15 km from Kufra city. The field area was about 9.5 hectares and consisted of 400 date palm trees.

Site IV: Eastern Jouf, 10 km from Kufra city. The field area was about 7.6 hectares and consisted of 500 date palm trees.

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2. Survey and Sampling Method:

The survey was conducted using hand collection of fresh scale insects and mealybugs. Samples were taken every two weeks during the study period, starting from January 1, 2023, up to December 29, 2024. Throughout this period, samples were randomly collected from various plant parts, including leaflets, leaf bases, trunks, female flowers, and fruits. Whenever possible, infestation symptoms were identified on-site before laboratory processing. Collected specimens were stored in separate plastic containers filled with a 75% ethanol solution, with the date and site name written on each container. Samples were then transferred to the laboratory for proper identification.

3. Pest Identification:

All samples were characterized both in the field and in the laboratory using date palm pest identification guidebooks. Laboratory identification of the specimens was performed either under a stereoscopic binocular microscope or after mounting on microscopic slides.

RESULTS

A survey of scale insects and mealybugs infesting date palm trees was carried out in private orchards in Kufra City, as well as in Western Jouf, Northern Jouf, Southern Jouf, and Eastern Jouf (Figure 1). The most surveyed insects belonged to one order, namely Homoptera, and two families, Diaspididae and Margarodidae. Two species were recorded: Parlatoria blanchardii (Targ.) and Pseudospidoproctus hyphaniacus (Hall), as shown in (Table 1). The males have wings, while the immature stages and adult females are wingless (Figure 2, 4). The survey was conducted in Kufra City during 2023 and 2024.

Table 1: Insect pests associated with date palm trees cultivated in the kufra region, Libya, 2023 and 2024.

No.	Common name	Scientific name	Family	Orde
1	Date palm White scale	*Parlatoria. blanchardi* Targ.	Diaspididae	Homoptera
2	Giant mealy bugs	Pseudospidoproctus. *hyphaniacus* Hall	Margarodidae	Homoptera

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Figure 1: General view of Kufra date palm trees

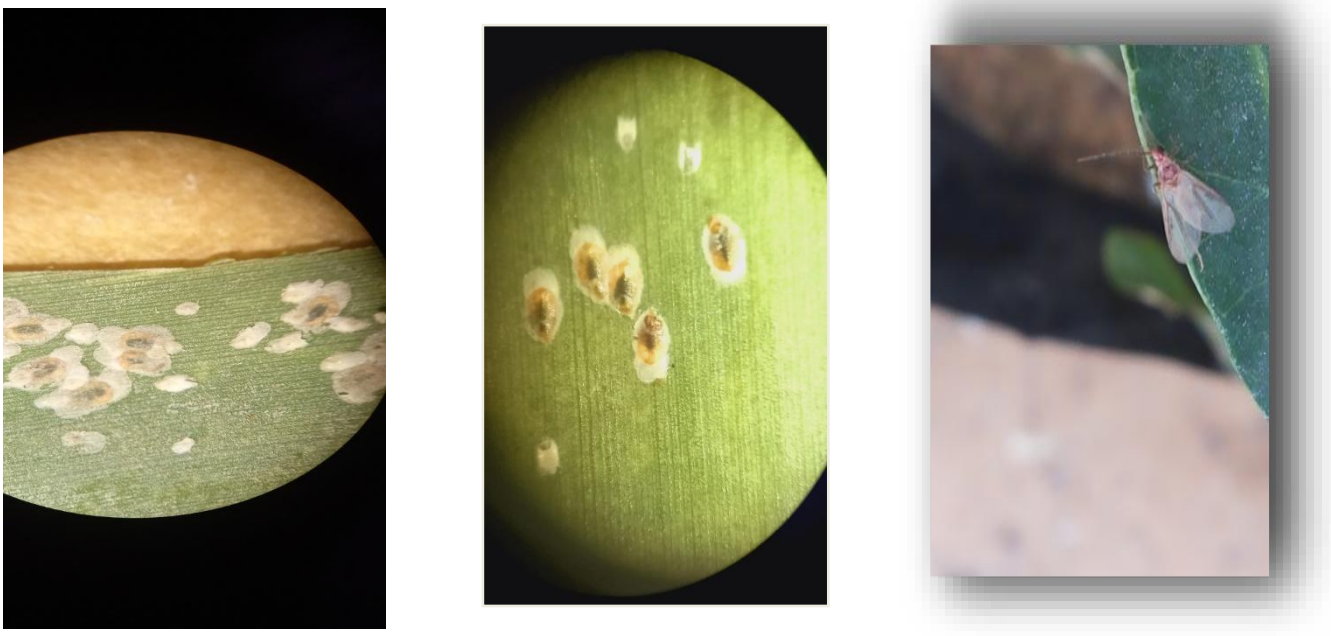

Figure 2*: P.blanchardi* Adult female and Nymphs and Adult male

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Figure 4: collection of fresh mealybugs (Adult and Male) used hand

Figure 5 : General view of kufra date palm with infestation of *Pseudospidoproctus hyphaniacus*

Parlatoria blanchardii was observed on various parts of the date palm tree, including leaflets (particularly the basal section), stems, crowns, and fruits. Infestation persisted throughout all seasons. *P. blanchardii* is a highly polyphagous species, with both adults and nymphs responsible for damage by extracting sap, which leads to chlorotic spots and overall deterioration of plant health. The color of the infested parts changes from dark green to yellow, accompanied by the appearance of several spots (Figure 2, 3). The population density of severely affected date palms in the Kufra region was low,

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especially in the eastern and southern Jouf regions, while the population density in the northern and western Jouf regions was medium. This observation was made in all fields in Kufra during 2023 and 2024.

Pseudospidoproctus hyphaniacus recorded in all seasons and visited places in the Kufra between 2023 to 2024. And date palm trees were infested with ranging from high to medium levels of infestation. This pest was found on the bases of fronds and leaves and the newly planted offshoots were the most seriously affected and caused damage both at nymphs and adults stages by feeding, which resulted in yellowish, drying and this species secreted honeydew leading to black sooty mould grows as shown in(Figure 4,5). It was observed that infestation level was high in the north and western Jouf districts.

DISCUSSION

The scale insects and mealybugs collected from date palm trees in and around Kufra City are represented by two species: Parlatoria blanchardii (Targ.) and Pseudospidoproctus hyphaniacus (Hall), which belong to the orders Homoptera and the families Diaspididae and Margarodidae. The results of this survey align with findings from previous studies conducted in areas close to Kufra, including Jalo, Aujla, Ejkara, and Tazerbo [9], [10]. Similar results have also been reported from Saudi Arabia, Egypt, Iran, Iraq, the United Arab Emirates, Pakistan, Algeria, Sudan, Oman, and Tunisia, which share comparable climatic conditions [11], [12], [13]. All stages of the white scale insects and giant mealybugs were recorded attacking various parts of the date palm tree, including leaves, fruits, stems, bark, and roots. The main injuries caused by these pests result from their ingestion of plant sap, which leads to leaf and fruit drop, as well as the secretion of honeydew that promotes the growth of black sooty mold. Additionally, these pests negatively impact the normal physiological activities of the trees, findings that are consistent with those reported by [14], [15], and [11-4-7]. It was observed that adult females and nymphs are wingless, while males possess wings—results that corroborate earlier studies by [16], [17], and [18].

Pseudospidoproctus hyphaniacus and P. blanchardii typically infest neglected date palms and newly transferred offshoots with bundled and roped fronds [19], [20], and [7]. P. hyphaniacus is a monophagous species that exclusively feeds on date palm trees, a finding supported by numerous studies indicating that many species belonging to the Margarodidae family are monophagous [21], [22], [23]. On the other hand, Parlatoria blanchardii is the most widespread and highly polyphagous species in Libya and globally, representing a significant pest affecting date palm trees in the Kufra region [24], [25], [26].

These findings identify these pests as the primary threats to date palms in Kufra City. Understanding this pest population may contribute to future pest control strategies, including the use of chemical insecticides, the preservation of natural enemies, and agricultural practices aimed at preventing the spread of other scale insects and mealybugs from neighboring areas.

CONCLUSION

Planting date palm trees is an effective strategy to combat desertification in Kufra City. The current study confirmed the presence of the pests *Parlatoria blanchardii* and *Pseudospidoproctus hyphaniacus*, which negatively affect date palm production across all study areas in Kufra City. These white scales and giant mealybugs are found in numerous countries worldwide. Date palm trees are vulnerable to several insect pests, particularly *P. blanchardii* and *P. hyphaniacus*, which infest all parts of the tree and cause significant damage. Both immature and adult females attack leaflets, leaves, tender shoots, offshoots, twigs, and fruits.

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These insects extract sap using their mouthparts and secrete toxic saliva during feeding, impacting respiration, transpiration, and photosynthesis processes. This interference can obstruct growth and may contribute to the premature death of fronds in cases of high infestation levels.

Surveys of these mealybugs and scale insects in Kufra are essential to evaluate their distribution and the damage they cause. Future studies should focus on integrated pest management strategies, including biological control, the development of resistant date palm cultivars, and optimized pesticide application methods to mitigate infestations of *P. blanchardii* and *P. hyphaniacus* in the Kufra region.

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