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ORIGINAL ARTICLE

First record of the giant date palm mealybug, *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera: Monophlebidae), from Jordan

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Abstract

The giant date palm mealybug, *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera: Monophlebidae), is recorded from Jordan for the first time based on material collected from a farm located in Ghawr Kabid in the central Jordan Valley. Infestations were found on date palm, *Phoenix dactylifera* L., Canary Island date palm, *Phoenix canariensis* Hort. ex Chabaud and fan palms, *Washingtonia* sp. Photographs of the infestation in the field, different stages of the insect and slide preparations are provided. Specimens were deposited at the University of Jordan Insects Museum. A survey for the pest and its natural enemies in Jordan is needed to determine its distribution in the country and plan an integrated management program for the pest.

Premier signalement de la cochenille *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera : Monophlebidae), en Jordanie

La cochenille *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera: Monophlebidae) est signalée pour la première fois en Jordanie à partir de matériel collecté dans une ferme située à Ghawr Kabid, dans la région centrale de la vallée du Jourdain. Des infestations ont été observées sur des palmiers dattiers, *Phoenix dactylifera* L., des palmiers des Canaries, *Phoenix canariensis* Hort. ex Chabaud ainsi que sur *Washingtonia* sp. Cet article présente des photographies de l'infestation au champ, des différents stades de développement de l'insecte ainsi que d'insectes montés entre lame et lamelle. Les spécimens sont conservés à la Galerie d'Entomologie de l'Université de Jordanie. Une prospection visant cet organisme nuisible, et ses ennemis naturels, est nécessaire afin de déterminer sa répartition géographique en Jordanie et de développer un programme de lutte intégrée contre cet organisme nuisible.

Первый отчет о гигантском мучнистом червеце финиковой пальмы, *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera: Monophlebidae), из Иордании

Гигантский мучнистый червец финиковой пальмы, *Pseudaspidoproctus hyphaeniacus* (Hall 1925) (Hemiptera: Monophlebidae), впервые зарегистрирован в Иордании на основе материала, собранного на ферме, расположенной в Гавр Кабид в центральной части Иорданской долины. Заражения были обнаружены на финиковой пальме,

Phoenix dactylifera L., финиковой пальме Канарских островов, *Phoenix canariensis* Hort. ex Chabaud и веерных пальмах, *Washingtonia* sp. Представлены фотографии заражения в полевых условиях, различных стадий развития насекомого и микропрепаратов. Особи были переданы на хранение в Музей насекомых Иорданского университета. Необходимо провести обследование на этого вредителя и его естественных врагов в Иордании, чтобы определить его распространение в стране и спланировать программу интегрированного управления этим вредным организмом.

1 | INTRODUCTION

Pseudaspidoproctus hyphaeniacus (Hall, 1925) was described in the genus *Aspidoproctus* from Egypt (Kharga Oasis) on the fronds of the donum palm, *Hyphaene thebaica* (L.) Mart. (Arecaceae). Morrison (1927) moved the species name to the genus *Pseudaspidoproctus*. Jashenko (1999) synonymized *Pseudaspidoproctus armeniacus* Borchsenius (1949) with *Pseudaspidoproctus hyphaeniacus* (Hall, 1925).

P. hyphaeniacus is found in Armenia, Azerbaijan, Egypt, India (Punjab), Iran, Libya, Saudi Arabia, United Arab Emirates and Yemen (García *et al.*, 2016). Kinawy (2012) reported that the insect was found in Oman.

The recorded hosts of *P. hyphaeniacus* are *Hyphaene thebaica*, *Phoenix dactylifera* (Arecaceae), *Stipa* sp. (Poaceae), *Malus sylvestris* (Rosaceae) and *Verbascum* sp. (Scrophulariaceae).

The characters of *Pseudaspidoproctus* can be summarized as follows: adult female with the simple abdominal spiracles without disk pores within atrium, three ventral cicatrices, no elongate tubular bilocular pores at body margin, derm with cylindrical spines and with a ventral marsupium having a U- or V-shaped opening (Morrison, 1927). Gavrilov-Zimin (2018) provided a female drawing for the microscopic features of *P. hyphaeniacus* and coloured photos for alcohol-preserved specimens from Turkey. Gavrilov-Zimin (2018) reported that the females of *Pseudaspidoproctus* have an internal marsupium in which eggs are laid until hatching. The oviduct opens inside the marsupium and the eggs are passed into a marsupial pouch. After hatching, the crawlers exit through a narrowed marsupial opening.

Foldi and Harten (2004) mentioned that the giant date palm mealybug was found on apple trees in Yemen. They described the living adult female as shiny reddish brown, with white waxy secretions, denser along certain lines. Legs and antennae black. Kinawy (2012) reported that *P. hyphaeniacus* attacks neglected date palms or newly planted offshoots and is rarely found on the leaflets or fruits but feeds on the petiole base.

The objectives of this paper are to officially record the giant date palm mealybug, *P. hyphaeniacus* from Jordan, and to provide original photos for the infestation in the field and the different morphological features of the mealybug.

2 | MATERIALS AND METHODS

Infested fronds of date palm were sent to the University of Jordan Insect Museum for Identification on 19 November 2020. A field trip was conducted on 6 January 2021 to collect specimens and record observations. Insects were removed from the fronds with a fine brush and kept in 75% alcohol. Some specimens were soaked in 10% KOH for 1–2 days, washed in distilled water, stained with acid fuchsin, fixed with absolute alcohol and cleared with clove oil then slides were mounted in glycerin. Mealybugs were photographed using a 65 mm macro lens mounted on a Canon (Tokyo, Japan) 5D Marl IV camera with an LED ring light. The slide-mounted specimens were photographed by attaching the camera to a dissecting microscope (Leica M165 C, Wetzlar, Germany) provided with a dome illumination unit. Microscopic enlargements were carried out under light microscope by a digital camera (CMEX 5.0 M pixel digital USB2 camera Euromex, Arnhem, Holland) attached to the eye tube. Images were stacked using Helicon Focus software. The specimens were identified according to the original description of the species by Hall (1925) and the female drawing provided by Gavrilov-Zimin (2018). Voucher specimens of the collected samples were preserved in the University of Jordan Insect Museum.

3 | RESULTS AND DISCUSSION

The visited date farm was about 60 dunums (6 ha) and located in Gawr Kabid in the Central Jordan Valley at 280 m below sea level. It contained 165 date palm trees, *Phoenix dactylifera* L. (Arecaceae), 180 Canary Island date palms, *Phoenix canariensis* Hort. ex Chabaud and 10 fan palms, *Washingtonia* sp. Almost all trees were infested with the giant mealybugs, ranging from low to heavy levels of infestation. The newly planted offshoots were the most seriously affected, which resulted in drying and the death of some of

FIGURE 1 *Pseudaspidoproctus hyphaeniacus* infestation on offshoots (upper left), rachis (upper right), trunk and leaf basis (lower left) and leaflets (lower right)

FIGURE 2 *Pseudaspidoproctus hyphaeniacus*: dorsal (upper), lateral (middle) and ventral (lower) views

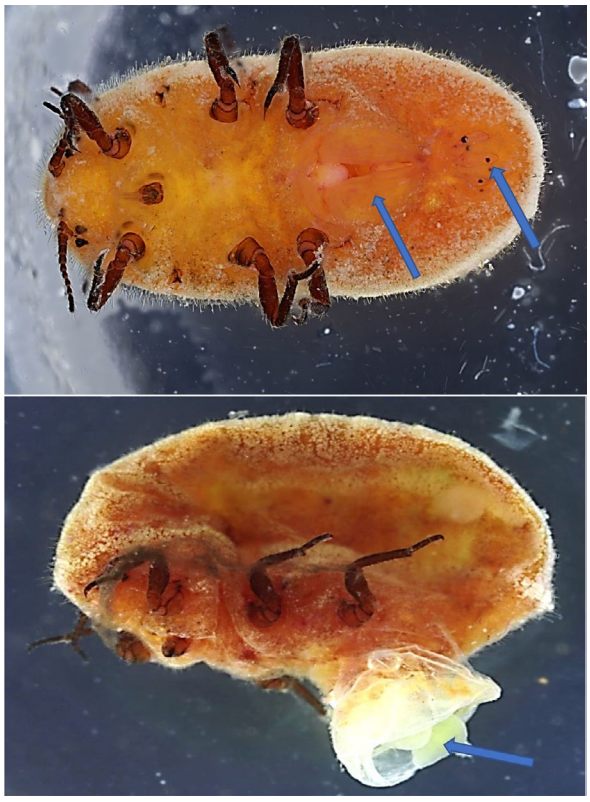

FIGURE 3 V-shaped marsupium of *Pseudaspidoproctus hyphaeniacus* and three cicatries at the end of the abdomen (one whitish egg at the exit) (upper); everted marsupium after squeezing the mealybug laterally showing eggs at the opening (lower)

them (Figure 1). All stages of the mealybugs were seen concealed in the folds of leaves, on the trunks of all palms in the crevices and the leaf bases. Heavy secretions of honey dew were observed to which many ants were attracted.

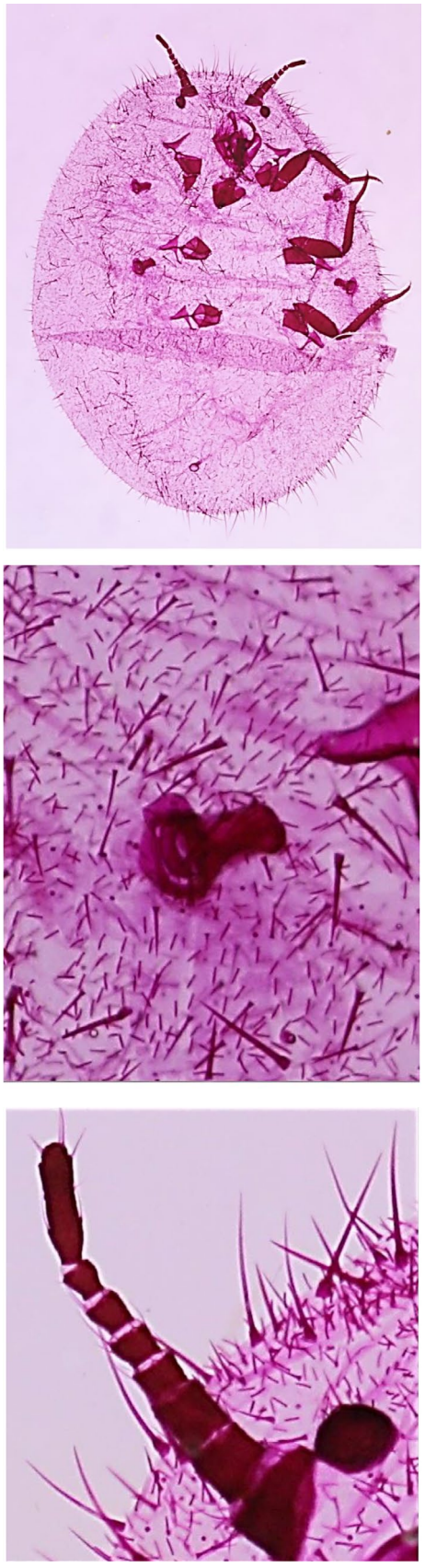

FIGURE 4 *Pseudaspidoproctus hyphaeniacus* adult female (upper), anterior spiracle (middle), and antenna, eye and different shapes of setae (lower)

FIGURE 5 *Pseudaspidoproctus hyphaeniacus* life and/or size stages (upper), immature with wax secretions (lower left), same insect, dorsal view after removing wax in alcohol (lower middle), ventral view (lower right)

The morphology of all stages of the collected specimens matched the descriptions of *P. hyphaeniacus* by Hall (1925) and Gavrilov-Zimin (2018). The adult female (Figure 2) is large, about 7–8 mm in length, oval, flat ventrally, convex dorsally, covered with powdery white wax and looks shiny reddish brown when the wax is removed. The marsupium is V-shaped (Figure 3). Antennae, legs, spiracles, setae types and distribution on body surface are shown in Figure 4. The different size and/or age stages are shown in Figure 5. The male is orange-brown with yellowish brown markings of the wings (Figure 6). Immature stages are oval, with lower wax secretions compared to adults. Adults as well as immature stages can walk around on the host. Contrary to observations by Kinawy (2012) which noted that no males were seen for this mealybug, we saw several males, which suggests that Jordanian populations are reproducing sexually.

The wide spread of the mealybug in the examined farm suggests that the infestation is several years old, and the source of infestation is possibly due to the importation of infested transplants. All countries around Jordan are free of the insect except Saudi Arabia, but it is highly unlikely that the insect dispersed naturally into Jordan due to the vast distances free of date palms between the two countries. A survey for this mealybug and its natural enemies in Jordan is urgently needed to evaluate the distribution and damage caused by this pest and to develop an integrated management program.

FIGURE 6 Male of *Pseudaspidoproctus hyphaeniacus* lateral view (upper) and dorsal view (lower)

4 | CONCLUSION

The giant date palm, *P. hyphaeniacus*, is recorded from Jordan for the first time. Original photos are provided for field infestations, and adult and immature stages. The distribution of the mealybug in Jordan and its natural enemies are currently unknown.

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