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First record and host plants of *Solenopsis* Mealybug, *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera: Pseudococcidae) from Iraq

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Abstract

The solenopsis mealybug, *Phenacoccus solenopsis* (Hemiptera, Pseudococcidae) recorded as a new insect pest on ornamental plant *Lantana camara* (Verbeneceae) as well as other host plants for the first time in Iraq. Those insects observed initially during August 2014 up to July 2015 in residential gardens on the outskirts of Baghdad city, suburbs of Al-Ghadir and Al- Karrada Al-Sharqiya.

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Introduction

The mealybug collected by the first author was found on *Lantana camara* (Verbenaceae) and other plants growing in his private garden in Al-Ghadeer, Baghdad province during August 2014. It was described by the second author as *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera, Pseudococcidae) depending on the presence of paired dark spots and stripes on the dorsal part of the body (Fig.1) and was confirmed later by Dr. G. Watson of Plant Pest Diagnostic Branch, California Department of Food and Agriculture, USA. It is most probable that it entered Iraq from neighboring countries with infested ornamental plants.

A study of the literatures shows that *Phenacoccus solenopsis* Tinsley, 1898 is commonly known as solenopsis mealybug or cotton mealybug (Ben-Dov *et al.* 2015). It is an aggressive invasive species, native to the Neartic region, originally described from USA by Tinsley (1898) and has been reported from 37 countries in various biogeographical zones (Ben-Dov *et al.* 2015) such as the Caribbean and Ecuador (Ben-Dov, 1994), Chile (Larrain, 2002), Argentina (Granara de Willink, 2003), Brazil (Culik and Gullan, 2005), Pakistan (Abbas *et al.* 2005), India (Yousuf *et al.* 2007), Thailand and Taiwan (Hodgson *et al.* 2008), Nigeria (Akintola and Ande, 2008), Sri Lanka (Prishanthini and Laxmi, 2009), China (Wu & Zhang, 2009), Australia (Admin, 2010), Egypt (Abd-Rabou *et al.* 2010), Indonesia (Munniappan *et al.* 2011), Iran (Moghddam and Bagheri, 2011), Cyprus (EPPO, 2011), Turkey (Kaydan *et al.* 2013) and Japan (Tanaka & Tabata, 2014).

Ph. solenopsis is a polyphagous insect, feeding on at least 213 host plant species belonging to 56 plant families, with a preference for the families Asteraceae, Solanaceae, Malvaceae and Fabaceae (Ben-Dov *et al.* 2015) and those families include species of economical importance, such as cotton (Culik & Gullan, 2005; Afzal *et al.* 2009; Wang *et al.* 2009 and 2010; Yi-Yong *et al.* 2011).

Ph. solenopsis is reported as a serious pest, causing damage to various crops such as cotton, *Gossypium hirsutum*, tomato, *Solanum lycopersicum*, Chinese hibiscus, *Hibiscus rosa-sinensis*, ornamental plants (Fuchs *et al.* 1991; Abbas *et al.* 2005; Yousuf *et al.* 2007; Hodgson *et al.* 2008; Akintola, *et al.* 2008; Silva, 2012; and Kaydan *et al.* 2013). The economic impact of those mealybug has become a major problem for cotton production, this pest has caused severe economic reduction in cotton production in India and Pakistan as up to 1.3 million bales have been lost in Pakistan during 2006 (Abdullah, 2009). However, it is expected to invade other cotton productive countries of the world (Muhammed, 2007; Hodgson *et al.*, 2008; and Nagrare *et al.*, 2009).

Mealybugs attack all parts of the plant, particularly growing tips or leaves that join stems or along leaf veins (Fig. 2) causing both direct and indirect damage to the plant, direct damage is caused by sucking sap from leaves, twig stem roots and fruiting bodies, and indirectly by deposition of honeydew that gives rise to sooty mold growth blocking light and air from the leaves and reducing photosynthesis productivity (Williams & Granara de Willink, 1992). The mealybug cause yellowing and falling of leaves, reduced growth and sometimes lead to the death of the plant (Culik & Gullan, 2005).

The mealybug is small, oval, soft-bodied insects cottony in appearance covered with powdery or mealy wax secretion.

Adult females and nymphs are wingless and the adult males are winged, the female is parthenogenetic and can produce between 128 to 812 crawlers (Vennila *et al.* 2010), and can produce about 150-600 eggs, that are laid in groups in cottony structures called ovisacs. This mealybug has a life cycle of 24-30 days and the female can produce 10-15 generations per year (Hanchinal *et al.* 2011).

Hodgson *et al.* (2008) provided descriptions of all the stages of this mealybug; the female has three nymphal stages called instars while the male has four.

The aim of this study was to report the occurrence of the solenopsis mealybug, *Ph. solenopsis* for the first time on ornamental and weed plants in Iraq and to give some observation on the host plants and the types of infestation.

Materials and methods

In this study, infested plant *Lantana camara* by solenopsis mealybug, *Ph. solenopsis* were collected from private gardens in various locations in Baghdad province Al-Ghadir and Al- Karrada Al-Sharqiya during August, 2014 up to July 2015. The specimens

were carefully removed from the leaf surfaces and were put into a tube which contained 75% alcohol, and some of them were mounted on microscope slides using the method given by Kosztarab & Kozar (1988), and the identification was carried out by the second author using key provided by Williams (2004). Mounted slides are deposited in the collection of Iraq Natural History Museum.

Results

The results of this study have been summarized in the table (1) providing the list of host plant species in alphabetical order of species. The host plants divided into two categories: ornamental and weed plants, the new host records are denoted with asterisk (*).

Table 1. Host Plant Species of *Phenacoccus solenopsis* in Iraq.

Host Plant Name	Common Name	Family Name
Ornamental Plants		
* <i>Alternanthera amoena</i>	Alternanthera	Amaranthaceae
* <i>Cycas revoluta</i>	Sago Palm	*Cycadaceae
<i>Gardenia jasminoides</i>	Cape jasmine	Rubiaceae
* <i>Iresine herbstii</i>	Bloodleaf	Amaranthaceae
<i>Lantana camara</i>	Lantana	Verbenaceae
* <i>Pilea serpyllacea</i>	Pilea	*Urticaceae
<i>Portulaca grandiflora</i>	Moss-rose purslane	Portulacaceae
Weeds		
<i>Cynodon dactylon</i>	Bermuda Grass	Poaceae
<i>Oxalis corniculata</i>	Creeping Woodsorrel	Oxalidaceae
<i>Portulaca oleracea</i>	Common Purslane	Portulacaceae
* <i>Aster tripolium</i>	Aster	Asteraceae

In this study, the species *Ph. solenopsis* (Hemiptera, Pseudococcidae) was reported as a new record of the Iraqi fauna, which was collected from eleven species of ornamental and weed plants that grow in private gardens during August, 2014 up to July 2015 at Al-Ghadir and Al- Karrada Al-Sharqiya, Baghdad.

These host plants belong to nine families, five of these species and two of those families seems to be recorded for the first time in the world.

Field Description

Adult female of *P. solenopsis* (Fig.1) is wingless insect, flat, covered with powdery wax. It has an elongated oval body about 3 mm long and 1.5 mm in width, yellowish- green in color; furnished with 18

pairs of white lateral short-waxy filaments around the margin of the body, its posterior pairs longest.



Fig. 1. *Phenacoccus solenopsis* infested *Pilea serpyllacea*.



Fig. 2. *Phenacoccus solenopsis* infested *Portulaca grandiflora*.



Fig. 3. *Lantana camara* planted in private gardens.



Fig. 4. *Phenacoccus solenopsis* infested *Lantana camara*.

Body with dark dorsosubmedial bare spots on intersegmental areas of thorax and abdomen, these areas forming one pair of dark longitudinal lines on dorsum, white lateral short. It also has a pair of brownish, short eight segmented antennae and three pairs of red colored legs. Ovisac absent from dorsum, but well developed ventrally. Adult male of *P. solenopsis* is a tiny winged insect; with an elongate body, about 2.5 mm in length, yellowish-brown in color; with pair of milky white wings and two pairs of long caudal filaments present at the anal end of the body of which the inner pairs are long and the outer pair is short, in addition to a pair of ocelli.

Discussion

The current study revealed that there are eleven species belonging to nine families as a host plant for *P. solenopsis* in Iraq (Table 1). Five of which, *Alteranthera amoena* (Amaranthaceae), *Cycas revolute* (Cycadaceae), *Iresine herbstii* (Amaranthaceae), *Pilea serpyllacea* (Urticaceae) and *Aster tripolium* (Astraceae) and two families Cycdaceae and Urticaceae most probably new for the world following Ben-Dov *et al.* (2015). On the other hand, the finding of this mealybug on *Lantana camara* (Verbenaceae) agreed with Williams & Granard de Willink (1992) & Ben-Dov (1994); as well as on *Gardenia jasminoides* (Rubiaceae); *Portulaca grandiflora* (Portulacaceae); *P. oleraceae* and *Oxalis corniculata* are met with the results of Arif *et al.* (2009) in Pakistan.

The Recording of this pest on *Cynodon dactylon* is compatible with both Arif *et al.* (2009) and Fallafzadeh *et al.* (2014) in Iran. *L. camara* (Fig.3) harbored this pest round the year and acted as a persistent source of spread to other plants. Initially the solenopsis mealybug breeds on evergreen ornamental plants such as lantana *Lantana camara* and bloodleaf, *Iresine herbstii* and pilea, *Pilea serpyllacea* and later transferred to annual plants such as common purslane, *P. oleracea* and Moss-rose purslane, *P. grandiflora* and other plants, although mealybug nymphs spread from infected to healthy plants via wind, irrigated water, rain, ants and birds

or by sticking or clinging to equipment, animals or people (Tanwar *et al.* 2007), we observed them creeping in the ground until they found their other feeding plant. The solenopsis mealybug infest all parts of plant, particularly growing tips, along leaf veins, as well as on the leaves that join stem veins (Fig. 2) and they aggregated on the stem of the plant (Fig.4). The mealybug prefers fleshy leaf plants such as, *Pilea serpyllacea* (Urticaceae); *Portulaca grandiflora* (Portulacaceae) and *P. oleraceae* (Portulacaceae). Sticky honeydew is excreted on infested plants, when population levels are high.

Mild infestation reduces the vigor and growth of foliage plants such as *P. grandiflora* and *P. oleracea* while a severe infestation causes complete defoliation of the plants, leading to their death, and this is in agreement with Culik & Gullan (2005).

In Iraq, this insect pest has appeared in residential gardens of the above locality. In addition to its infestation of ornamental plants, it has also attacked weeds, and is probably spreading out from one region to another at an alarming rate; if left unchecked, this pest it will shift to cotton crops and may destroy most of the country's cotton plantations.

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References

Abbas G, Arif MJ, Saeed S. 2005. Systematic status of a new species of the genus *Phenacoccus* Cockerell (Pseudococcidae), a serious pest of cotton *Gossypium hirsutum* L. in Pakistan. Pakistan Entomologist **27**, 83-84.

Abd-Rabou S, Germain JF, Malausa T. 2010. *Phenacoccus parvus* Morrison, *P. solenopsis* Tinsley, deux *Cochenilles nouvelles* pour l'Égypte (Hemiptera: Pseudococcidae) Bulletin. de la Société Entomologique de France **115(4)**, 509-510.

Abdullah A. 2009. Analysis of mealybug incidence on the cotton crop using ADSS-OLAP(Online Analytical Processing) tool. Computers and Electronics in Agriculture **69(1)**, 59-72.

Admin 2010. Exotic mealybug species-a major pest in cotton. Published February 12, 2010 <http://thebeatsheet.com.au/mealybugs/exoticmealybugspeciesamajornewpestincotton/> Accessed on 25th May 2010.

Afzal M, Rehman SU, Siddiqui MT. 2009. Appearance and management of a new devastating pest of cotton, *Phenacoccus solenopsis* Tinsley, in Pakistan. Beltwide Cotton Conference, San Antonio, Texas, January 5-8, 2009, 1023-1039.

Akintola AJ, Ande AT. 2008. First record of *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) on *Hibiscus rosasinensis* in Nigeria. Agricultural Journal **3(1)**, 1-3.

Arif MI, Rafiq M, Ghaffar A. 2009. Host plants of cotton mealybug (*Phenacoccus solenopsis*): a new menace to cotton agroecosystem of Punjab, Pakistan. International Journal of Agriculture and Biology **11**, 163-167.

Ben-Dov Y, Miller DR, Gibson GAP. 2015. ScaleNet. <http://www.sel.barc.usda.gov/scalenet/scalenet.htm> [accessed 7 June 2015].

Ben-Dov Y. 1994. A Systematic Catalogue of the Mealybugs of the World (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with Data on Geographical Distribution, Host Plants, Biology and Economic Importance. Intercept Limited, Andover, UK 686 pp.

Culik MP, Gullan PJ. 2005. A new pest of tomato and other records of mealybugs (Hemiptera: Pseudococcidae) from Espirito Santo, Brazil. Zootaxa **964**, 1-8.

- EPPO.** 2011. New pest records in EPPO member countries. EPPO Reporting Service **4**, 2011/082.
- Fallahzadeh M, Abdimaleki R, Saghaei N.** 2014. Host Plants of the Newly Invasive Mealybug Species, *Phenacoccus solenopsis* (Hemiptera: Pseudococcidae), in Hormozgan Province, Southern Iran (In English; Summary in German). Entomofauna **35(9)**, 169-176.
- Fuchs TW, Stewart JW, Minzenmayer R, Rose M.** 1991. First record of *Phenacoccus solenopsis* Tinsley in cultivated cotton in the United States. Southwestern Entomology **16**, 215–221.
- Granara de Willink MC.** 2003. New records and host plants of *Phenacoccus* sp. for Argentina (Hemiptera: Pseudococcidae). Revista Sociedad Entomologia Argentina **62**, 80-82.
- Hanchinal SG, Patil BV, Basavangoud K, Nagangoud A, Biradar D, Janagoudar BS.** 2011. Incidence of invasive mealybug (*Phenacoccus solenopsis* Tinsley) on cotton. Karnataka Journal of Agriculture Sciences **24(2)**, 143-145.
- Hodgson C, Abbas G, Arif MJ, Saeed S, Karar H.** 2008. *Phenacoccus solenopsis* Tinsley (Sternorrhyncha: Coccoidea: Pseudococcidae), an invasive mealybug damaging cotton in Pakistan and India, with a discussion on seasonal morphological variation. Zootaxa **1913**, 1-35.
- Kaydan MB, Çaliskan AF, Ulusoy MR.** 2013. New record of invasive mealybug *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) in Turkey (In English; Summary In French, Turkish). EPPO Bulletin **43(1)**, 169-171.
- Kosztarab M, Kozar F.** 1988. Scale Insects of Central Europe. Akademiai Kiado, Budapest 456 pp.
- Larrain SP.** 2002. [Insect and mite pest incidence on sweet pepinos (*Solanum muricatum* Ait.) cultivated in the IV Region, Chile.] Incidencia de insectos y acaros plagas en pepino dulce (*Solanum muricatum* Ait.) cultivado en la IV Region, Chile. (In Spanish; Summary In English). Agricultura Técnica. Chile **62(1)**, 15-26.
- Moghaddam M, Bagheri AN.** 2011. A new record of mealybug pest in the south of Iran, *Phenacoccus solenopsis* (Hemiptera: Coccoidea: Pseudococcidae) Journal of Entomological Society of Iran **30(1)**, 67-69.
- Muhammed A.** 2007. Mealybug: Cotton Crop's Worst Catastrophe Centre for Agro-Informatics Research (CAIR), Pakistan Available on-line at http://agroict.org/pdf_news/Mealybug.pdf accessed JUL. 2008 (Verified 27 May 2009).
- Muniappan R, Shepard BM, Watson GW, Carner GR, Rauf A, Sartiami D, Hidayat P, Afun JVK, Goergen G, Ziaur Rahman AKM.** 2011. New Records of Invasive Insects (Hemiptera: Sternorrhyncha) in Southeast Asia and West Africa Journal of Agricultural and Urban Entomology **26(4)**, 167-174.
- Nagrare VS, Kranthi S, Biradar VK, Zade NN, Sangode V, Kakde G, Shukla RM, Shivare D, Khadi BM, Kranthi KR.** 2009. Widespread infestation of the exotic mealybug species, *Phenacoccus solenopsis* (Tinsley) (Hemiptera: Pseudococcidae), on cotton in India. Bulletin of Entomological Research **99(5)**, 537-541.
- Prishanthini M, Laxmi VM.** 2009. The *Phenacoccus solenopsis*. Department of Zoology, Eastern University, Sri Lanka. Available online: <http://www.dailynews.lk/2009/07/01/fea30.asp>.
- Silva CAD.** 2012. Occurrence of new species of mealybug on cotton fields in the States of Bahia and Paraíba, Brazil. Bragantia, Campinas **71(4)**, 467-470.
- Tanaka H, Tabata J.** 2014. A new record of *Phenacoccus solenopsis* Tinsley, 1898 from Kyushu

district, Japan. Japanese Journal of Entomology **17(3)**, 119-120 [TanakaTa2014].

Tanwar RK, Jeyakumar P, Monga D. 2007. Mealybugs and their management. Technical Bulletin **19**, NCIPM, New Delhi.

Tinsley JD. 1898. Notes on Coccidae with descriptions of new species. Canadian Entomologist **30**, 317-320.

Vennila S, Deshmukh AJ, Pinjarkar D, Agarwal M, Ramamurthy VV, Joshi S, Kranthi KR, Bambawale OM. 2010. Biology of the mealybug *Phenacoccus solenopsis* on cotton in the laboratory. Journal of Insect Science **10(115)**, 1-6.

Wang YP, Wu SA, Zhang RZ. 2009. Pest risk analysis of a new invasive pest, *Phenacoccus solenopsis* to China. Chinese Bulletin Entomology **46**, 101-106.

Williams DJ, Granara de Willink MC. 1992. Mealybugs of Central and South America. CAB International, London, England 635 pp.

Williams DJ. 2004. Mealybugs of Southern Asia. The Natural History Museum, London; Southdene SDN. BHD, Kuala Lumpur 896 pp.

Wu SA, Zhang RZ. 2009. A new invasive pest *Phenacoccus solenopsis* threatening seriously to cotton production. Chinese Bulletin of Entomology **46(1)**, 159-162.

Yi-Yong Z, Fung H, Yao-Bin L. 2011. Bionomics of mealybug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseud. ococcidae) on cotton. Acta Entomologica Sinica **54 (2)**, 246-252.

Yousuf M, Tayyib M, Shazia S. 2007. Mealybug problem on cotton in Pakistan. Pakistan Entomologist **24**, 49-50.