



First record of the cotton mealybug *Phenacoccus solenopsis* (Hemiptera: Coccoidea: Pseudococcidae) as a novel pest on new host plants in Alexandria, Egypt

Rania, S. Ammar; Demiana, H. Khalil and Suzan, A. Badr

Plant Protection Research Institute, Agricultural Research Center, Sabahia, Alexandria, Egypt.

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Abstract:

Recently, the cotton mealybug *Phenacoccus solenopsis* Tinsely (Hemiptera: Coccoidea: Pseudococcidae) is a major pest infested different economic crops in Egypt. This insect sucks plant sap, injects toxins and secretes “honeydew” stimulating the development of black sooty moulds which adversely affect photosynthesis. Following the monitoring of new host plants, the present study recorded the cotton mealybug *P. solenopsis* on bottle gourd *Lagenaria siceraria* L., Jerusalem artichoke *Helianthus tuberosus* L. and cowpea *Vigna unguiculata* (L.) at two locations in Alexandria. In addition, during the survey conducting through 2019-2020, the mealybug was recorded on two new ornamental plants and one fruit crop, with a total of seven new host plants. All belong to six families, Acanthaceae, Astraceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, and Rutaceae.

Introduction

The cotton mealybug *Phenacoccus solenopsis* Tinsely (Hemiptera : Coccoidea : Pseudococcidae) was a serious invasive pest. It was first recorded in Egypt by Abd-Rabou *et al.* (2010). It was revised in Egypt by Badr *et al.* (2020), as it has medium impact on some ornamental plants grown in urban area. The non-commercial products of urban areas had high impacts in spreading of the pest (Malumphy *et al.*, 2013).

The mealybug was easily recognized in the field according to its diagnostic features. Its distribution on the plant was mainly dependent on the differences in humidity. However, it's well above foliage and stems, in higher humidity, but in dry and hot regions, its

very close to the soil level (Hodgeson *et al.*, 2008).

Acalypha wilkesiana family Euphorbiaceae, common names copper-leaf and Jacob's coat, it is growing to 3 metres (9.8 ft) high and 2 metres (6 ft 7 in) across. It has a closely arranged crown, and an erect stem with many branches. Branches and leaves are hairy and plumule. Their leaves may be flat or crimped; large and broad; serrate around the edge. And it can be 10–20 c.m. (3.9–7.9 in) as long and 15 c.m. (5.9 in) in wide. Also leaves are coppery green with red blurring, giving them a mottled appearance. Separate male and female flowers appear on the same plant. The male flowers are in long tuft which hang downwards while the female flowers are in short tuft. The

flower shanks are 10–20 cm long (Airy Shaw, 1975 and Holdsworth, 1977).

Family: Cucurbitaceae is a wide family comprises many species of squashes, pumpkins, zucchinis and gourds. All the species with many economic importance and useful values. *Cucurbita* sp., the common species for field pumpkin and gourds in Egypt, however, currently, many new varieties of gourds were cultivated. More recently, based on broad cultivation, for example bottle gourd *Lagenaria siceraria* (Molina) Stand., the calabash gourd synonymy *Lagenaria vulgaris* Ser., as it was new implantation cultivation, the subject of the current study. Species were grown for their medicinal values. Moreover, they were cultivated at Alexandria and Nubaria district for their nutritional value. For instance, *Cucurbita pepo* can endure high levels of salt in the soil as well as difficult climates.

Helianthus tuberosus L. Family: Astraceae, the root vegetables common name Jerusalem artichoke was a perennial minor crop. The edible part was the root which resembles ginger. The plant grows to a height of 2 to 3 m and a width of 0.6 m and is grown in Egypt since about eight to ten years (Ismail and Moustafa, 2012). For consistency, the growth aspects of the plant may be affected by environmental conditions and genetics. The lower part of the plant has a hairy branches and stems which boost heavy infestation with mealybugs.

Lime (*Citrus aurantifolia*) Family: Rutaceae, is one of the most consumed and widely distributed fruits in the world. Citrus fruits might be classified into types: compressed mandarins, tangerines, oranges, pomelos, hybrids, lemons, limes, etc. citrus fruits, (Lime) , one of the most consumed fruits with great economic importance, has a smooth thin skin, greenish-yellow in color, with a very small neck, a flat

base, and a small nipple at the apex. However, lime ripens green to yellow and, hence, tends to become softer to perishable during storage .

Sanchezia (*Sanchezia nobilis*) of the family Acanthaceae is an evergreen semi-woody shrub that grown in tropical and sub-tropical regions for its handsome foliage. It has bright green leaves (up to 30cm in length) with prominently marked white veins. The flowers are narrowly tubular, yellow with reddish-orange bracts and are carried on stems in long spikes (Abdel-Razak, 2012). *Sanchezia* has potential as an ornamental pot plant, if the growth can be controlled.

Vigna unguiculate (L.) was an important legume crop of family Fabaceae. Common name cowpea vegetable crop was tolerant for sandy soil and low rain fall; which aligns with the criteria put by the Ministry of Agriculture to rationalize water usage as a new regulation in agriculture in Egypt. It has potential for soil reclamation in disturbed industrial sites, where its root system helps degrading organic and inorganic contaminant (El-Ghamery and Basuoni, 2018).

The aim of the study is to shed light on the gravity of *P. solenopsis* and its rapid adaptation, even regarding plants with special conditions in cultivation. Consequently, this article promotes the local markets of these three edible vegetables, Jerusalem artichoke, bottle gourd and cowpea.

Materials and methods

The field survey was carried out through 2019-2020 at two farms in Alexandria Governorate. The first farm was in Abis location, experimental farm of Agricultural Research center, and the second was in Nubaria location. Samples of different parts of each plant were randomly collected in polyethylene bags and carried to the laboratory for identification. Each part of the plants was examined under a

binocular microscope. Identification of the pest was done by the third author. In addition, literature studies were performed. The course of study was provided by pictures by the first and second authors. The surveyed plants were cultivated by Mohamed E. Abou Kamer Researcher at Cross Pollinated Vegetable Department, Horticulture

Research Institute, Agricultural Research Center.

Results and discussion

New records of the mealybug *P. solenopsis* encountered in association with inspected vegetables crops are given below (Table 1). Also, the study comprises fruits and ornamental plants at Alexandria locality, through the years 2019-2020.

Table (1): List of host plants, families and plant types infesting by the mealybug *Phenacoccus solenopsis* include seven different plants in Alexandria Governorate, during 2019 – 2020.

Families	Host plants	Common name	Plant type	Benefit part	Uses
Acanthaceae	<i>Sanchezia speciosa</i> L.	shrubby white vein	Ornamental plant	All	Ornamental
Astraceae	<i>Helianthus tuberosus</i>	Jerusalem artichoke	Vegetable	Root	Medical and public herb
Cucurbitaceae	<i>Lagenaria siceraria</i> (Molina) Standl.	Bottle gourd	Vegetable	Fruit	Medical
	<i>Cucurbita pepo</i>	Field pumpkin	Vegetable	Fruit	Edible
Euphorbiaceae	<i>Acalypha wilkesiana</i>	Copperleaf	Medical plant	Leaves	Medical
Fabaceae	<i>Vigna unguiculata</i> (L.)	Cowpea	Vegetables	Fruit	Edible
Rutaceae	<i>Citrus aurantium</i>	Lime	Citrus Fruit	fruit	Edible

The plants start to grow in March for Family Cucurbitaceae, and in May for Family Astraceae and Fabaceae. They attain their final colour and size in August and September. The numbers of crawlers begin to realize on leaves, branches and stems of above-mentioned plants (Table 1). As a result of adhesive cultivation, for different types of crops. It was distinctly obvious that *P. solenopsis* feed on certain parts of the plants causing damage to the crop. The transmission of crawlers between parts, occurring during growth phases. The following observations were made based on field experimentation. All these families share the defining characteristics of the villi of the cotton plant family (Malvaceae) at a certain age. In turn, this facilitated the transmission of the pest between host plants leading to its widespread. This clarifies that these families are not cultivated in the same or adjacent fields.

1. Vegetables crops:

Total of four vegetables field crops were surveyed *Helianthus*

tuberosus, *Lagenaria siceraria*, *Cucurbita pepo* and *Vigna unguiculata* with three different families.

1.1. Family : Cucurbitaceae

Although field pumpkin with edible fruit *Cucurbita pepo*, Wang *et al.* (2012), it was the alternative diet for all mealybug species in the laboratory, it was not recorded as a field host plant before for this pest, it infested leaves branches and stems at the field. This study recorded it as the first record for *P. solenopsis* in Egypt in the field. Alexandria as the locality of the current survey considers a typical Mediterranean coastal ecological zone. All above mentioned species was recorded infested with the mealybugs for the first time, especially for the new species of *L. siceraria* (Plate a).

1.2. Family: Fabaceae

Vigna unguiculata, common name cowpea. Edible part was the pods, *P. solenopsis* infested the leaves branches and stems, condensed in the terminal buds (Plate b).

1.3. Family: Astraceae

Helianthus tuberosus, common name Jerusalem artichoke. Edible part was the roots, *P. solenopsis* infested the leaves branches and stems. Condensed in the terminal buds (Plate c).

2. Ornamental plants:

The field survey carried out revealed the presence of two ornamental host plants, they were as follow: In case of the host plant *Sanchezia speciosa*, it's the first to record it as a host of *P. solenopsis* in Egypt (Plate d). When the weather conditions were suitable, crawlers move freely to fix themselves to the adjacent plants.

2.1. Family: Euphorbiaceae

Acalypha wilkesiana, the crawlers take a ride to this host plant (Plate f). Finally, this study was the first to record this Medication plant as new

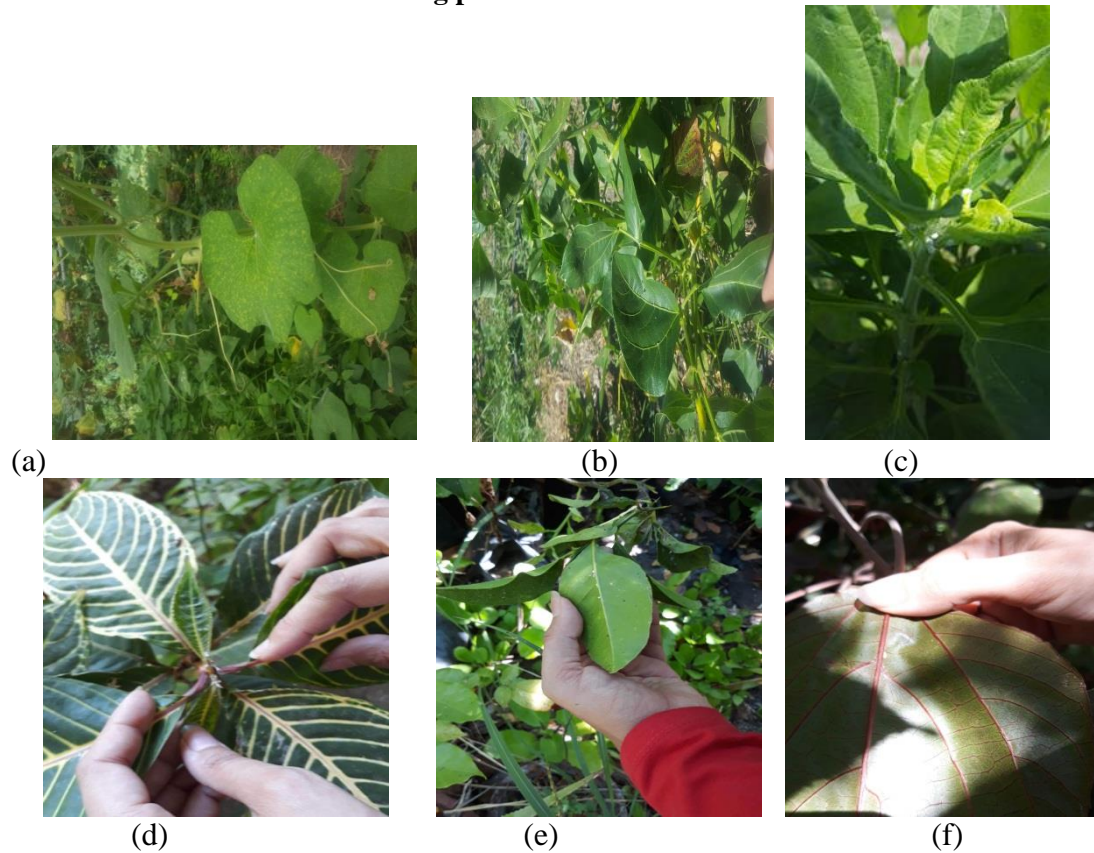
host plant of *P. Solenopsis* in Egypt especially at Alexandria Governorate.

3. Fruit crop:

3.1. Family: Rutaceae

Only one fruit crop was added *Citrus aurantifolia*, (Plate e), common name lime, with many different varieties of lemon cultivated in Egypt, but acid lemons also called Egyptian lime is the main variety depends on cultivated area. The present study was conducted in Nubaria district Alexandria Governorate, were the trend were similar in infestation with *P. solenopsis*

Plate (1): New host plants infested with *Phenacoccus solenopsis* at two farms locations, Alexandria. Declared the following plates.



a: *Lagenaria siceraria* b :*Vigna unguiculata* c: *Helianthus tuberosus* d: *Sanchezia speciosa* e: *Citrus aurantifolia* f: *Acalypha wilkesiana*

The current work elucidates that Alexandria locality as a typical coastal zone with highest humidity most of the year. This aspect accompanied with the shared characteristic of villi of families of vegetable plants, Astraceae, Cucurbitaceae and Fabaceae induced never to cultivate these plants in the same or adjacent areas. In addition, the study pushes the marketing of the economically vegetable crops bottle gourd *L. siceraria* Jerusalem artichoke, *H. tuberosus* and cowpea *V. unguiculata* for the international markets.

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