

## SHORT COMMUNICATION

**The pink hibiscus mealybug *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae) in Greece**

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**Summary** The invasive pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae), is reported for first time in Greece. Individuals of the mealybug were found infesting *Hibiscus rosa-sinensis* (Linnaeus) (Malvaceae) in private and public gardens in the urban environment in Rhodes, Dodecanese islands, East Greece. This is the first report of genus *Maconellicoccus* in Greece.

*Additional Keywords:* hibiscus, invasive species, mealybug

**Introduction**

The genus *Maconellicoccus* Ezzat (Hemiptera: Pseudococcidae) includes eight species that are distributed in Australian, Oriental and Ethiopian regions but only *Maconellicoccus hirsutus* has been reported in Palaearctic region (García Morales *et al.*, 2016). *Maconellicoccus hirsutus* Green, known as pink hibiscus mealybug, is a highly polyphagous species native to southern Asia, that feeds on 212 genera in 75 host plant families, including important crops such as bean (*Phaseolus vulgaris*), chrysanthemum (*Chrysanthemum* spp.), hibiscus (*Hibiscus* spp.), rose (*Rosa* spp.), pumpkin (*Cucurbita pepo*), avocado (*Persea americana*), citrus (*Citrus* spp.), coconut (*Cocos nucifera*), coffee (*Coffea* spp.), cotton (*Gossypium* spp.), corn (*Zea mays*), vegetables, grape (*Vitis vinifera*) and peanuts (*Arachis hypogaea*) (Chong *et al.*, 2015; García Morales *et al.*, 2016). For a complete list of *M. hirsutus* host plants see Chong *et al.* (2015).

Pink hibiscus mealybug is considered a highly invasive species. Although it is believed to originate from India, it has been accidentally introduced into other parts of

the world, i.e. North America, the Caribbean and Africa. Overall *M. hirsutus* distribution includes 75 countries in all over the world (EPPO, 2005). In Europe, it was reported for first time in Cyprus in 2011 (EPPO, 2011). Upon its introduction into several countries, it has caused substantial economic damages through the cost of control operations and impact on trade. In the US, it has been estimated that without control, it may cause a damage of 163 million dollars only in Florida (Chong *et al.*, 2015).

Adult females are 2.5–4 mm long, wingless, soft-bodied, elongate oval and flattened. Females can lay more than 500 eggs. Eggs are orange initially but turn into pink before hatching. Crawlers are 0.3 mm long, pink, oval in shape with well-defined legs and antennae, and lack the waxy body coating; young adult females turn greyish-pink, dusted with mealy white wax that covers their bodies; adult males are gnat-like 1 mm long, pink to orange, with a single pair of wings and two pairs of filaments. They are weak flyers, lack mouthparts and live only one day or two. Entire colony is covered by white, waxy ovisac material (Chong *et al.*, 2015; García Morales *et al.*, 2016). One generation is completed in approximately five weeks in warm conditions. In Jordan, nymphs have three peaks and adult females two peaks, in early February and mid-July, respectively (Al-Fwaeer *et al.*, 2014). Here

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we report the first presence of *M. hirsutus* in Greece.

Feeding by larvae and adults causes characteristic symptoms on the damaged plants. During feeding both larvae and adults inject toxic saliva that causes curling and contortion of leaves. Infested plants become stunted, swollen with leaf curl, shortened internodes or malformed stems. Damage varies according to the susceptibility of each host species; in highly susceptible plants feeding can ultimately cause the death of the plant (EPPO, 2005; Vitullo *et al.*, 2009; Hoy *et al.*, 2014; García Morales *et al.*, 2016).

## Materials and Methods

Infested hibiscus plants were found on the island of Rhodes (36°26'1.49"N and 28°13'28.54"E) in September 2014 and samples were sent to BPI. New samples were sent to BPI collected from the Municipality of Rhodes coming from *Hibiscus* sp. (Malvaceae), *Ceratonia siliqua* (Fabaceae), *Erythrina* sp. (Fabaceae) and *Bauhinia* sp. (Fabaceae) in autumn of 2016. All of them are known host plants of *M. hirsutus*. Microscopic slides were prepared following the procedure described by Kosztarab and Kozár (1988) and identified according to description and illustration by Williams and Watson (1988). Specimens are deposited at the Biological Control Laboratory of BPI.

**Material examined:** Rhodes (Dodecanese islands); 02.ix.2014, 2 ♀♀, *Hibiscus* sp. (Malvaceae); Rhodes, 02.ix.2014 1 ♀♀ *Hibiscus* sp. (Malvaceae); Rhodes; 13.xii.2016, 2 ♀♀, *Hibiscus* sp. (Malvaceae); Rhodes; 13.xii.2016, 1 ♀♀, *Hibiscus* sp. (Malvaceae).

## Results and Discussion

This is the first record of the pink hibiscus mealybug, *M. hirsutus* in Greece. Reports from local authorities from the island of Rhodes had pointed out that infestation has expanded within the island during the years 2014-2016. No other outbreaks or records of

*M. hirsutus* have been reported outside Rhodes. The specific pathway of introduction of the species into Rhodes is unknown. However, long distance dispersal of the pest is likely to occur through movement of infested plant material and to a lesser extent with infested fruits and cut flowers (EPPO 2005).

The introduction of the pink hibiscus mealybug in Rhodes without its natural enemies could pose a serious threat for several crops of high economic importance, such as vegetables, vineyards and ornamental plants in urban areas and in nurseries. Control efforts of the mealybug should principally focus on the identification and mapping of the actual infested area on the island of Rhodes in order to design an efficient management plan that would restrict further spread of the pest in the area. A sustainable solution should definitely include the careful introduction of its natural enemies following all the appropriate procedures for such an approach.

Because of the minimum tolerance level for *M. hirsutus* damage, intense management approaches are often required. Management tactics include monitoring, cultural, biological and chemical treatments. Observations for typical damage symptoms like bunchy top, honeydew and sooty-mold presence can help in the identification of infestation spots. The pheromone of *M. hirsutus* has been identified and can be used in pheromone traps for monitoring and detection especially in areas with low infestation density. Monitoring with pheromone traps is also useful for timing insecticide applications.

After its introduction into a new area *M. hirsutus* is usually difficult to eradicate due to its high reproductive ability and polyphagy. In areas where it has been established, long standing sustainable management has been provided by biological control. Especially, classical biological control attempts have been quite successful (Kairo *et al.*, 2000). Several natural enemies have been associated with *M. hirsutus*, including specialist and generalist parasitoids and predators. In classical biological control the

predatory species *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae) and the parasitoids *Anagyrus kamali* Moursi and *Gyranoidea indica* Shafee, Alam and Agarwal (Hymenoptera: Encyrtidae) are regarded as most commonly used biological control agents (Chong *et al.*, 2015). The releases of the above parasitoids and predators have resulted in very successful control of *M. hirsutus* in Central America (Chong *et al.*, 2015).

The use of contact insecticides may result in scarce control of the scale population due to the cryptic behaviour and the waxy covering of the mealybug bodies. Therefore, any applications should follow after careful monitoring for the presence of crawlers which are the most susceptible stage. Systemic insecticides might have a higher efficacy on reducing *M. hirsutus* populations. Nevertheless, application of insecticides should be avoided when biological control efforts are taking place. At present, no insecticide against *M. hirsutus* is registered in Greece.

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## ΣΥΝΤΟΜΗ ΑΝΑΚΟΙΝΩΣΗ

**Πρώτη καταγραφή του *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae) στην Ελλάδα**

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**Περίληψη** Το είδος *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae), καταγράφεται για πρώτη φορά στην Ελλάδα. Ενήλικα άτομα του ψευδόκοκκου συλλέχθηκαν σε φυτά ιβίσκου *Hibiscus rosa-sinensis* (Linnaeus) (Malvaceae) σε ιδιωτικούς και δημόσιους κήπους στο αστικό περιβάλλον, στη Ρόδο. Αυτή είναι η πρώτη καταγραφή του γένους *Maconellicoccus* στην Ελλάδα.

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