GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Maconellicoccus hirsutus***

Maconellicoccus hirsutus **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Hemiptera	Pseudococcidae

Common name guava mealybug (English), pink mealybug (English), pink hibiscus mealybug (English), hibiscus mealybug (English), hibiscus-schmierlaus (German), cochenille de l'hibiscus (French)

Synonym *Phenacoccus hirsutus* , (Green)

Similar species

Summary *Maconellicoccus hirsutus* or the pink hibiscus mealybug, is a polyphagous pest on a wide range of ornamental and agricultural plant species. Native to tropical and subtropical Asia and Africa, *M. hirsutus* forms colonies covered by a white waxy, elastic ovisac material. Feeding causes plant deformation and lowered aesthetics, which can result in heavy economic losses. The overall potential annual cost of control and damages to the US economy from *M. hirsutus* has been estimated to be around US$ 700 million, with the global estimate being around US$ 5 billion. While chemical and physical control methods are generally ineffective, effective biological control of *M. hirsutus* has been acheived in a number of countries.

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Species Description

The adult female *Maconellicoccus hirsutus* is 2.5 – 4 mm long, soft-bodied, elongate oval and slightly flattened while males have one pair of very simple wings, long antennae, white wax filaments projecting posteriorly and no mouthparts (EPPO, 2005). The taxonomy is almost entirely based on the adult female and a good slide preparation of a female is required for identification on species level (EPPO, 2006). Slide-mounted females show the combination of 9-segmented antennae, anal lobe bars, numerous dorsal oral rim ducts on all parts of the body except the limbs and long and flagellate dorsal setae (EPPO, 2005). Eggs are pink, and appearance in life is orange pink to reddish, with the entire colony covered in a white, sticky, elastic, woolly, waxy ovisac material (EPPO, 2005; 2006). Immature instars, commonly referred to as \"crawlers\" are about 0.3 mm long and pink with the imature and newly developed adult females being greyish pink (EPPO, 2005). A guide to the distinguishing features of the different instars of *M. hirsutus* and other mealybug speces can be found in Gullan (2000). Additionally, a detailed identification key can be found in EPPO (2006) adapted from Williams (1996) distinguishing *M. hirsutus* from other species in the same genus. Ezzat (1958; in Francis & Francis, 2001) separates the genus *Maconellicoccus* from *Paracoccus*, the closest known relatives, by the following features in the adult female: Pseudo articulation in the 9th (terminal) antennal joint, Anterior leg with unequal tarsal digitules and Small oral collar tubular ducts present on both the dorsal and ventral sides of the body.

Lifecycle Stages
The life cycle of *Maconellicoccus hirsutus* has been studied in India. Each adult female lays 150–600 eggs over a period of about one week, and these hatch in 6–9 days. A generation is completed in about five weeks in warm conditions. In countries with a cool winter, the species survives cold conditions as eggs (Bartlett, 1978; in EPPO, 2005). There may be as many as 15 generations per year (Pollard, 1995; in EPPO, 2005) with three immature instars in the female and four in the male (Chong *et al.*, 2008). Immature stages are often referred to as \"crawlers\" and are easily dispersed by water, wind or animal agents (EPPO, 2005).

Habitat Description
While the primary host of *Maconellicoccus hirsutus* is the ornamental *Hibiscus rosa-sinensis*, *M. hirsutus* will also feed on and inhabit a wide range of predominantly woody plants, including many ornamentals (EPPO, 2005). Host records extend to 76 families and over 200 genera, with some preference for *Fabaceae*, *Malvaceae* and *Moraceae* (Mani, 1989 & Garland, 1998; in EPPO, 2005).

Reproduction
The reproduction of *Maconellicoccus hirsutus* is noted as pathenogenic in some areas such as Egypt and Bihar but bi-parental in others, such as West Bengal and probably the Caribbean (EPPO, 2005), however in a laboratory setting, pathenogenesis could not be induced (Chong*et al.*, 2008). Life table analysis suggests that *M. hirsutus* has an enormous potential to increase its population level within a short period of time with each female capable of producing more than 150 female progeny in about 40 days under laboratory conditions (Chong *et al.*, 2005).

Nutrition
While the primary host of *Maconellicoccus hirsutus* is the ornamental *Hibiscus rosa-sinensis*, *M. hirsutus* will also feed on a wide range of predominantly woody plants, including many ornamentals (EPPO, 2005). Host records extend to 76 families and over 200 genera, with some preference for *Fabaceae*, *Malvaceae* and *Moraceae* (Mani, 1989 & Garland, 1998; in EPPO, 2005). Colonies of *M. hirsutus* will form on and feed on the new growth of the host plant, severely distorting and stunting their growth (EPPO, 2005). While the insect feeds, it excretes sugary honeydew on which sooty mold develops, deteriorating the quality of the agricultural or forest product (Gonzalez-Gaona *et al.*, 2010). As the plant dies back, *M. hirsutus* will migrate to healthy tissue, with the colonies migrating from shoot tips to twigs to branches and finally down the trunk (EPPO, 2005).

General Impacts
Maconellicoccus hirsutus feeds on a large number of plant species, including many important horticultural and agricultural crops such as coffee, guava, citrus, grape, peanuts, rose, beans, coconuts, maize, sugar cane, soursop, soybean, cotton, and other fiber crops (Ranjan, 2006; Ujjan & Shahzad, 2007; Reddy *et al.*, 2009). The feeding of *M. hirsutus* causes malformation of shoots and leaves believed to be caused by the injection of a toxic saliva (Kairo *et al.*, 2000). In addition to lowering the aesthetics of the plant, this deformation can also result in lowered crop yields and plant mortality in heavy infestations (Kairo *et al.*, 2000; Chong *et al.*, 2008). Like other sap sucking insects, *M. hirsutus* also excretes a sugary honeydew on which sooty mold develops, further deteriorating the quality of the agricultural or forest product (Gonzalez-Gaona *et al.*, 2010). The presence of large quantities of wax, characteristic of *M. hirsutus* infestations, also reduces the aesthetic and commercial value of ornamentals (Kairo *et al.*, 2000). The overall potential annual cost of control and damages to the US economy from *M. hirsutus* has been estimated to be around US$ 700 million, with the global estimate being around US$ 5 billion (Ranjan, 2006).

Management Info
Monitoring: Methods such as visual analysis and trapping of males using captive live virgin females have been utilised in the past with limited success (Gonzalez-Gaona *et al.*, 2010). On the other hand, the use of sex pheremones inside delta-style traps has been shown to be effective for specific monitoring and determining the geographic distribution of *M. hirsutus* (Gonzalez-Gaona *et al.*, 2010).
Preventative measures: Improvement of legislation and quarantine systems showed limited success in the Caribbean, with *M. hirsutus* still managing to spread to over 20 islands since 1994 (Kairo *et al.*, 2000). Various quarantine security methods have shown promising results, including methyl bromide, irradiation, heat vapour treatment and hot water immersion (Zettler *et al.*, 2002; Jacobsen & Hara, 2003; Follett, 2004; Hara & Jacobsen, 2005).
Chemical control: Use of pesticides in controlling *M. hirsutus* is generally ineffective partly because of its habit of hiding in crevices (EPPO, 2005) and because pesticides cannot penetrate the heavy layers of wax that shield the body (Kairo *et al.*, 2000). Furthermore, rapid recolonisation and an extremely large host range and large host size in some cases makes it almost impossible to have a spraying program capable of bearing the cost and coping with the practicalities of treating the whole range of infested plants in an affected area (Sagarra & Peterkin, 1999).
Physical control: Physical control methods such as pruning and burning of infested hosts have been ineffective in slowing the spread of *M. hirsutus* (Sagarra & Peterkin, 1999).
Biological control: Biological control is seen as the most effective method of control (Kairo *et al.*, 2000). A number of different parasitoids and predators have been trialled, the most effective of these being the parasitoid wasp *Anagyrus kamali* (Hymenoptera: Encyrtidae) from China, and the generalist predator *Cryptolaemus montrouzieri* (Coleoptera: Coccinellidae) from Australia (Kairo *et al.*, 2000).
Please follow this link for more details on the management and control of *Maconellicoccus hirsutus*.

Pathway
Long distance dispersal is likely achieved through transportation of host plants and possibly to a lesser extent, the transportation of fruit and flowers (EPPO, 2005)

Principal source:

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ALIEN RANGE

[1] ANGUILLA
[1] BELIZE
[1] CAYMAN ISLANDS
[1] GRENADA
[1] GUAM
[1] MONTSERRAT
[1] PAKISTAN
[1] SAINT KITTS AND NEVIS
[1] SAINT MARTIN (FRENCH PART)
[1] TAIWAN
[1] TURKS AND CAICOS ISLANDS
[1] BARBADOS
[1] BES ISLANDS (BONAIRE, SINT EUSTATIUS AND SABA)
[1] DOMINICA
[1] GUADELOUPE
[2] MEXICO
[3] NORTHERN MARIANA ISLANDS
[3] PUERTO RICO
[1] SAINT LUCIA
[1] SAINT VINCENT AND THE GRENADINES
[1] TRINIDAD AND TOBAGO
[3] UNITED STATES

[1] VENEZUELA
[1] VIRGIN ISLANDS, U.S.
[1] VIRGIN ISLANDS, BRITISH

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Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.
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