

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 achieved in a number of countries.



[view this species on IUCN Red List](#)

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 spesces 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 pheromones 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:

Compiler: IUCN SSC Invasive Species Specialist Group (ISSG) with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

Review: Under expert review

Publication date: 2010-06-02

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

BIBLIOGRAPHY

47 references found for *Maconellicoccus hirsutus*

Management information

Amalin, Divina M., Kenneth A. Bloem, Dale Meyerdirk, and Ru Nguyen, 2003. Biological Control of Pink Hibiscus Mealybug in South Florida: A One-year Assessment.

Baskaran, R. K. Murali; Mahendhiran, G.; Suresh, K., 2007. Field evaluation of *Scymnus coccivora* Ayyar for the management of guava mealybug, *Maconellicoccus hirsutus* Green. Journal of Entomological Research (New Delhi). 31(2). JUN 2007. 137-140.

[Connor, R.A. 2008. Anguilla Invasive Species Strategy \(Draft\) 2008. Department Of Environment: Anguilla.](#)

Summary: Available from: [http://www.gov.ai/documents/Anguilla%20Invasive%20Species%20Strategy%202008%20\(2\).pdf](http://www.gov.ai/documents/Anguilla%20Invasive%20Species%20Strategy%202008%20(2).pdf) [Accessed 7 May 2010]

Etienne, J., Matile-Ferrero, D., LeBlanc, F., Marival, D., 1998. First record of the mealybug *Maconellicoccus hirsutus* (Green) from Guadeloupe; present state of this pest of crops in the French Caribbean (Hem., Pseudococcidae). Bulletin de la Société Entomologique de France

[European and Mediterranean Plant Protection Organization \(EPPO\), 2005. Data sheets on quarantine pests *Maconellicoccus hirsutus*](#)

Summary: Available from: http://www.eppo.org/QUARANTINE/insects/Maconellicoccus_hirsutus/DS_Maconellicoccus_hirsutus.pdf [Accessed 19 April 2010]

European and Mediterranean Plant Protection Organization (EPPO), 2006. Diagnostic *Maconellicoccus hirsutus*

Follett, Peter A., 2004. Generic vapor heat treatments to control *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae). Journal of Economic Entomology. 97(4). August 2004. 1263-1268.

Francis, Antonio; Bloem, Kenneth A.; Roda, Amy L.; Lapointe, Stephen L.; Zhang, Aijun; Onokpise, Oghenekome., 2007. Development of trapping methods with a synthetic sex pheromone of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Hemiptera : Pseudococcidae). Florida Entomologist. 90(3). SEP 2007. 440-446.

[Garcia-Valente, Felix; Ortega-Arenas, Laura D.; Gonzalez-Hernandez, Hector; Villanueva-Jimenez, Juan A.; Lopez-Collado, Jose; Gonzalez-Hernandez, Alejandro; Arredondo-Bernal, Hugo C., 2009. Natural and Induced Parasitism of *Anagyrus kamali* Against Pink Hibiscus Mealybug on Teak Shoots in Bahía de Banderas, Nayarit. Agrociencia. 43\(7\). OCT-NOV 2009. 729-738.](#)

Summary: Available from: <http://www.colpos.mx/agrociencia/Bimestral/2009/oct-nov/art-7.pdf> [Accessed 19 April 2010]

Gautam, R. D., Pilgrim, R. N., Stewart, V. E., 2000. The pink mealybug. Protocols for the protection of agricultural production and trade: the systems approach (SA)

[Gibbs, Ian H. and Bret Taylor, A Review of the Biological Control Program for the Pink Hibiscus Mealybug *Maconellicoccus hirsutus* \(Green\)\(Homoptera: Pseudococcidae\) in Barbados: Problems and Progress](#)

Summary: Available from: <http://www.agriculture.gov.bb/files/mealybug.pdf> [Accessed 19 April 2010]

[Gonzalez-Gaona, Ernesto; Sanchez-Martinez, Guillermo; Zhang, Aijun; Lozano-Gutierrez, Julio; Carmona-Sosa, Felipe., 2010. Validation of Two Pheromonal Compounds for Monitoring Pink Hibiscus Mealybug in Mexico. Agrociencia. 44\(1\). JAN-FEB 2010. 65-73.](#)

Summary: Available from: <http://www.colpos.mx/agrociencia/Bimestral/2010/ene-feb/art-6.pdf> [Accessed 19 April 2010]

[Gullan, J. Penny, 2000. Identification of the immature instars of mealybugs \(Hemiptera: Pseudococcidae\) found on citrus in Australia. Australian Journal of Entomology. \(2000\) 39. 160-166](#)

Summary: Available from: <http://entomology.ucdavis.edu/gullanandcranstonlab/Gullanpdfs/citrus.pdf> [Accessed 19 April 2010]

Hall, David G.; Roda, Amy; Lapointe, Stephen L.; Hibbard, Ken, 2008. Phenology of *Maconellicoccus hirsutus* (Hemiptera : Pseudococcidae) in Florida based on attraction of adult males to pheromone traps. Florida Entomologist. 91(2). JUN 2008. 305-310

Hara, Arnold H.; Jacobsen, Christopher M., 2005. Hot water immersion for surface disinfestation of *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae). Journal of Economic Entomology. 98(2). APR 05. 284-288

[IUCN/SSC Invasive Species Specialist Group \(ISSG\), 2010. A Compilation of Information Sources for Conservation Managers.](#)

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.

Jacobsen, Christopher M.; Hara, Arnold H., 2003. Irradiation of *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae) for phytosanitation of agricultural commodities. Journal of Economic Entomology. 96(4). August 2003. 1334-1339.

Lai, Yi-Chun; Chang, Niann-Tai, 2007. The association of pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) with bigheaded ant, *Pheidole megacephala* (Fabricius) on hibiscus. Formosan Entomologist. 27(3). SEP 2007. 229-243

Mani, M.; Krishnamoorthy, A., 2008. Field efficacy of Australian ladybird beetle *Cryptolaemus montrouzieri* Mulsant in the suppression of *Maconellicoccus hirsutus* (Green) on Sapota. Journal of Biological Control. 22(2). 2008. 471-473

McComie, Lilory D. 1996b. Incidence and treatment of the hibiscus mealybug (*Maconellicoccus hirsutus* Green) one year after its discovery in Trinidad. Regional Symposium on the Pink Mealybug, (Grenada), 24-27 Jun 1996

[Meyerdirk, D. E., R. Warkentin., B. Attavian., E. Gersabeck., A. Francis, M.Adams, and G. Francis, 2001. Biological Control of Pink Hibiscus Mealybug Project Manual. United States Department of Agriculture](#)

Summary: Available from: http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/phm.pdf [Accessed 2 May 2010]

[Michaud, J. P., 2003. Three targets of classical biological control in the Caribbean. 1st International Symposium on Biological Control of Arthropods](#)

Summary: Available from: <http://www.bugwood.org/arthropod/day5/Michaud.pdf> [Accessed 19 April 2010]

Morais, Michael, 1997. Releases of the parasitic wasp *Anagyrus kamali* (Hymenoptera: Encyrtidae) in the field to control the pink mealybug, *Maconellicoccus hirsutus* Green (Hemiptera: Pseudococcidae) and preliminary results on efficacy. Proceedings of the 1st Seminar on the Hibiscus Mealybug, Ministry of Agriculture, Land and Marine Resources, Centeno (Trinidad and Tobago). Research Division.- Centeno (Trinidad and Tobago): MALMR, 1997. 1. Seminar on the Hibiscus Mealybug, 1. Seminar on the Hibiscus Mealybug, Farmers Training Centre, Centeno (Trinidad and Tobago), 12 Apr 1996

Moses T.K. Kairo, Gene V. Pollard, Dorothy D. Peterkin & Vyjayanthi F. Lopez, 2000. Biological control of the hibiscus mealybug, *Maconellicoccus hirsutus* Green (Hemiptera: Pseudococcidae) in the Caribbean. Integrated Pest Management Reviews 5: 241-254, 2000. [National Plant Diagnostic Network \(NPDN\), 2005. Standard Operating Procedure for Plant Diagnostic Laboratories. Pink Hibiscus Mealybug *Maconellicoccus hirsutus* \(Green\) DRAFT 1.1](#)

Summary: Available from: <http://www.sepdn.org/DesktopModules/ViewDocument.aspx?DocumentID=2330> [Accessed 19 April 2010]

Ram, P., Cooper, B., Lopez, V.F., Morais, M., Peterkin, D., 1998. A perspective on the release of *Anagyrus kamali* (Hymenoptera: Encyrtidae) for the biological control of the Hibiscus or Pink Mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae) by the Ministry of Agriculture, Land and Marine Resources. Management Strategies for the Control of the Hibiscus Mealybug, Centeno (Trinidad and Tobago), 12 Apr 1998

Reddy, G. V. P.; Muniappan, R.; Cruz, Z. T.; Naz, F.; Bamba, J. P.; Tenorio, J., 2009. Present Status of *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae) in the Mariana Islands and Its Control by Two Fortuitously Introduced Natural Enemies. Journal of Economic Entomology. 102(4). AUG 2009. 1431-1439.

Roelofs, William J.; Ertle, Lawrence R.; Meyerdirk, Dale E., 2007. No-choice host range tests for *Allotropa* sp near *mecrida*, a parasitoid of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Hemiptera : Pseudococcidae). Biocontrol Science & Technology. 17(9-10). 2007. 977-981.

Roelofs, William J.; Meyerdirk, Dale E.; Warkentin, Richard; Andress, Earl R.; Carrera, Karina., 2006. Classical biological control of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green), in southern California. Biological Control. 37(2). MAY 2006. 155-166.

Shen, Hsiu-Mei; Wu, Huai-hai; Chang, Niann-Tai, 2007. Population fluctuation of the pink mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae), and the ants associated with it in Pingtung, Taiwan. Formosan Entomologist. 27(3). SEP 2007. 245-260.

Srinivas, T.; Prasad, K. Sathya; Shekhar, M. A.; Manjunath, D., 2007. Evaluation on neem based formulations vis-a-vis Dichlorvos against *Maconellicoccus hirsutus*. Uttar Pradesh Journal of Zoology. 27(1). APR 2007. 13-20.

Ujjan, Aziz Ahmed; Shahzad, Saleem, 2007. Pathogenicity of *Metarhizium anisopliae* var *acidum* strains on pink hibiscus mealy bug (*Maconellicoccus hirsutus*) affecting cotton crop. Pakistan Journal of Botany. 39(3). JUN 2007. 967-973.

Vitullo, Justin; Wang, Shifa; Zhang, Aijun; Mannion, Catharine; Bergh, J. Christopher., 2007. Comparison of sex pheromone traps for monitoring pink hibiscus mealybug (Hemiptera : Pseudococcidae). Journal of Economic Entomology. 100(2). APR 2007. 405-410.

Williams, D. J., 1996. A brief account of the hibiscus mealybug *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae), a pest of agriculture and horticulture, with descriptions of two related species from southern Asia. Bulletin of Entomological Research (1996) 86, 617-628

Zettler, J.L., Follett, P.A., & Gill, R.F. (2002). Susceptibility of *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae) to methyl bromide. Journal of Economic Entomology, 95(6), 1169-1173.

General information

[Bogren, Carlos E. and Scott Ludwig, 2007. Pink Hibiscus Mealybug A New Pest in Texas. AgriLife Extension Texas A & M System](#)

Summary: Available from: http://repository.tamu.edu/bitstream/handle/1969.1/87496/pdf_2517.pdf?sequence=1 [Accessed 19 April 2010]

Chong, Juang-Horng; Roda, Amy L.; Mannion, Catharine M., 2008. Life history of the mealybug, *Maconellicoccus hirsutus* (Hemiptera : Pseudococcidae), at constant temperatures. Environmental Entomology. 37(2). APR 2008. 323-332.

Matile-Ferrero, D., Etienne, J., 1996. Presence of the hibiscus mealybug, *Maconellicoccus hirsutus* in Saint-Martin (Hemiptera, Pseudococcidae). Revue Française d'Entomologie

McComie, Lilory D., 1996. Status of the Hibiscus (pink) mealybug *Maconellicoccus hirsutus* (Green) programme in Trinidad. CAGRIS/TT (Trinidad and Tobago)

Summary: Reports on a programme for the management of the Hibiscus mealybug (HMB) - *Maconellicoccus hirsutus* (Green) in Trinidad. This programme includes surveillance of the pest, control strategies, training and publicity. HMB was proclaimed a notifiable pest in October 1995. Plant quarantine regulations have been amended to prevent the spread of HMB to Tobago. In Trinidad, 174 plant species in 64 families have been affected by HMB. The early short-term containment strategy involved an insecticide spray, cut and burn protocol. This was replaced by a biological control programme using 3 natural enemies: the Asian parasitic wasp - *Anagyrus kamali*, the Australian ladybird beetle - *Cryptolaemus montrouzieri*, and the Indian ladybird beetle - *Scymnus coccivora*. The biological control programme has had good results and is on-going.

Available from: http://www.eppo.org/QUARANTINE/insects/Maconellicoccus_hirsutus/DS_Maconellicoccus_hirsutus.pdf [Accessed 19 April 2010]

Michaud, J. P. and G. A. Evans, 2000. Current Status of Pink Hibiscus Mealybug in Puerto Rico including a Key to Parasitoid Species. The Florida Entomologist, Vol. 83, No. 1 (Mar., 2000), pp. 97-101

[National Center for Biotechnology Information \(NCBI\), 2010. *Maconellicoccus hirsutus*](#)

Summary: Available from: <http://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=177089> [Accessed 19 April 2010]

[North American Plant Protection Organization \(NAPPO\), Phytosanitary Alert System, 2006. *Maconellicoccus hirsutus* \(Green\). First report of pink hibiscus mealybug in George Town, Grand Cayman](#)

Summary: Available from: <http://www.pestalert.org/viewNewsAlert.cfm?naid=25> [Accessed 19 April 2010]

Ranjan, R. 2006. Economic impacts of the pink hibiscus mealybug in Florida and the United States. Stochastic Environmental Research and Risk Assessment, 20, 353-362.

Rosas-Garcia, Ninfa M.; Martinez-Montoya, Humberto., 2009. Isolation of Microsatellites in a Mexican Population of *Maconellicoccus hirsutus* and Amplification in Populations from Different Geographical Origins. Southwestern Entomologist. 34(3). SEP 2009. 295-304.

Sagarra, L.A. and D.D. Peterkin, 1999. Invasion of the Caribbean by the hibiscus mealybug, *Maconellicoccus hirsutus* Green [Homoptera : Pseudococcidae]. Phytoprotection, vol. 80, n° 2, 1999, p. 103-113.

Vitullo, Justin; Zhang, Aijun; Mannion, Catharine; Bergh, J. Christopher., 2009. Expression of Feeding Symptoms from Pink Hibiscus Mealybug (Hemiptera: Pseudococcidae) by Commercially Important Cultivars of Hibiscus. Florida Entomologist. 92(2)-JUN 2009. 248-254.



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Maconellicoccus hirsutus*

Williams, D. J., 1986. The identity and distribution of the genus *Maconellicoccus* Ezzat (Hemiptera: Pseudococcidae) in Africa. *Bulletin of Entomological Research* (1986), 76:351-357 Cambridge University Press