EPPO Datasheet: *Maconellicoccus hirsutus*

Last updated: 2021-10-01

IDENTITY

Preferred name: *Maconellicoccus hirsutus*
Authority: (Green)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Hemiptera: Sternorrhyncha: Pseudococcidae
Other scientific names: *Phenacoccus hirsutus* Green
Common names: hibiscus mealybug, pink hibiscus mealybug, pink mealybug
view more common names online...
EPPO Categorization: A2 list
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EPPO Code: PHENHI



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Notes on taxonomy and nomenclature

Maconellicoccus hirsutus was originally described from specimens collected in India as *Phenacoccus hirsutus* by Green (1908). It was subsequently designated as the type species of the genus *Maconellicoccus* by Ezzat (1958). Eight species are currently recognized in the genus *Maconellicoccus*.

HOSTS

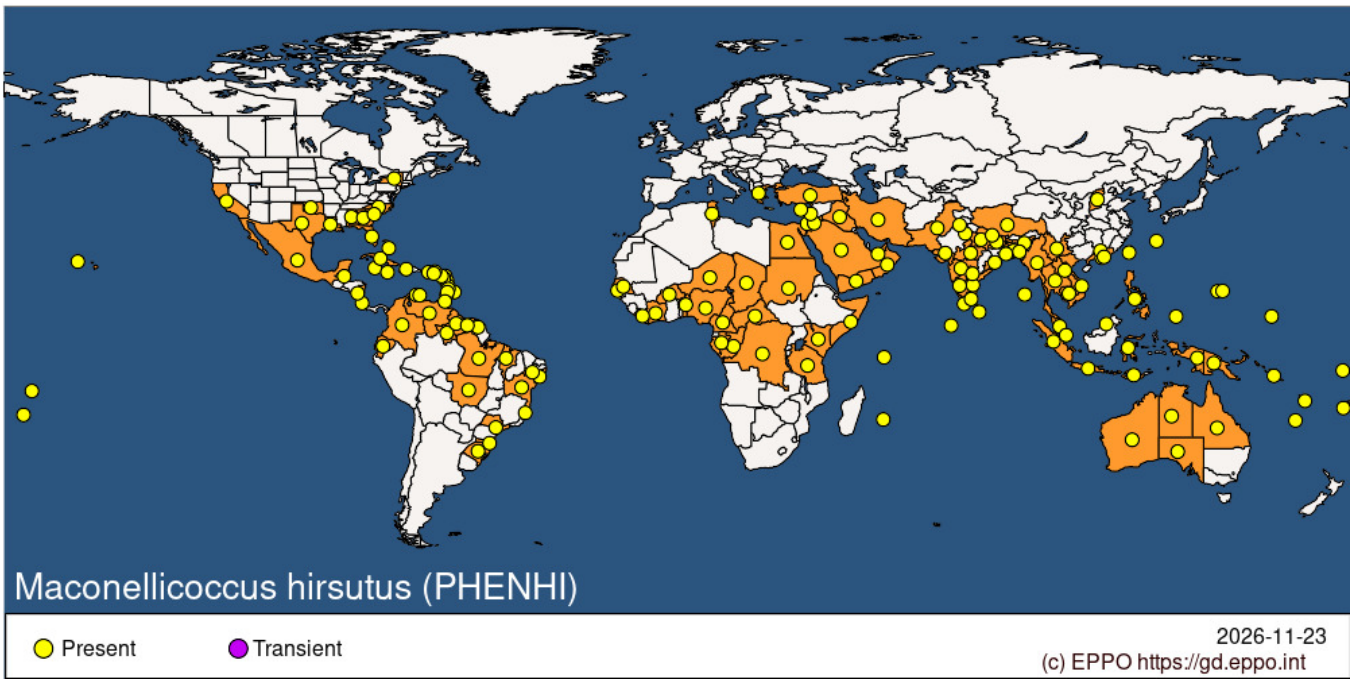
Maconellicoccus hirsutus is highly polyphagous, feeding on a wide range of predominantly woody plants assigned to 222 genera in 78 families, including many crops and ornamentals (García Morales *et al*., 2016). It shows some preference for plants in the families Fabaceae, Malvaceae and Moraceae (Mani, 1989; Chang & Miller, 1996; Garland, 1998). Many of the recorded hosts are tropical plants that are hardly or not cultivated in the EPPO region. Other recorded crop plants which could be of significance for the EPPO region are avocado, banana, cherimoya, citrus, cotton, fig, grapevine, guava, and mulberry. *M. hirsutus* has also been recorded on several rosaceous crops including apple, apricot, peach, pear and plum, but there appears to be no impact recorded on these hosts. The ornamental *Hibiscus rosa-sinensis* is a major host which is often severely affected. A comprehensive list of hosts is provided by García Morales *et al.* (2016).

Host list: *Abelmoschus esculentus, Acnistus arborescens, Albizia guachapele, Albizia julibrissin, Alpinia purpurata, Ananas comosus, Annona cherimola, Annona glabra, Annona muricata, Annona squamosa, Anthurium andraeanum, Arachis hypogaea, Artocarpus heterophyllus, Asparagus officinalis, Averrhoa carambola, Beta vulgaris, Boehmeria nivea, Bougainvillea spectabilis, Cajanus cajan, Capsicum annuum, Capsicum frutescens, Carica papaya, Cassia fistula, Centrolobium paraense, Ceratonia siliqua, Chenopodium album, Chrysalidocarpus lutescens, Citrus reticulata, Citrus x aurantium var. paradisi, Citrus x aurantium var. sinensis, Citrus x aurantium, Citrus, Coccoloba uvifera, Cocos nucifera, Coffea arabica, Coffea canephora, Colocasia esculenta, Conocarpus erectus, Cordia lutea, Cosmos, Couepia sp., Crescentia cujete, Cucumis sativus, Cucurbita maxima, Cucurbita pepo, Cyanthillium cinereum, Diospyros kaki, Duranta erecta, Eriobotrya japonica, Erythrina variegata, Euphorbia pulcherrima, Ficus benjamina, Ficus carica, Glycine max, Gossypium hirsutum, Grevillea robusta, Guazuma ulmifolia, Handroanthus chrysanthus, Helianthus annuus, Heliconia psittacorum, Heliconia, Heptapleurum actinophyllum, Hevea brasiliensis, Hibiscus cannabinus, Hibiscus mutabilis, Hibiscus rosa-sinensis, Hibiscus sabdariffa, Hibiscus schizopetalus, Hibiscus tiliaceus, Inga edulis, Ipomoea batatas, Ixora chinensis, Ixora coccinea, Ixora, Jacaranda mimosifolia, Jatropha curcas, Lactuca sativa, Lantana camara, Litchi chinensis, Magnolia grandiflora, Malpighia glabra, Malus domestica, Malus sylvestris, Mangifera indica, Manihot esculenta, Manilkara zapota, Melaleuca citrina, Mimosa caesalpiniifolia, Mimosa hostilis, Morus alba, Murraya koenigii, Musa x paradisiaca, Mussaenda erythrophylla, Myrtus communis, Nephelium lappaceum, Nerium oleander, Opuntia, Pachira sp., Pachystachys lutea, Passiflora edulis, Persea americana, Phaseolus vulgaris, Philodendron hederaceum, Phoenix dactylifera, Phoenix sylvestris, Piper aduncum, Plumeria rubra, Pouteria sapota, Prunus armeniaca, Prunus domestica*

, Prunus persica, Psidium guajava, Pteridium aquilinum, Punica granatum, Pyrus communis, Rhizophora mangle, Rhizophora sp., Ricinus communis, Samanea saman, Senna alexandrina, Solanum americanum, Solanum lycopersicum, Solanum melongena, Spondias mombin, Spondias purpurea, Spondias tuberosa, Syngonium podophyllum, Tabebuia rosea, Talinum paniculatum, Tectona grandis, Theobroma bicolor, Theobroma cacao, Theobroma grandiflorum, Theobroma speciosum, Turnera ulmifolia, Vitis vinifera, Ziziphus mauritiana, Zygia latifolia

GEOGRAPHICAL DISTRIBUTION

Maconellicoccus hirsutus is probably native to Southern Asia, and has spread worldwide in tropical and subtropical regions (Martins *et al.*, 2019).



EPPO Region: Cyprus, Greece (mainland), Israel, Jordan, Tunisia, Türkiye
Africa: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Congo, The Democratic Republic of the, Cote d'Ivoire, Egypt, Gabon, Gambia, Kenya, Liberia, Niger, Nigeria, Reunion, Senegal, Seychelles, Somalia, Sudan, Tanzania, United Republic of, Tunisia
Asia: Bangladesh, Brunei Darussalam, Cambodia, China (Aomen (Macau), Guangdong, Shanxi, Xianggang (Hong Kong), Xizhang, Yunnan), India (Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal), Indonesia (Irian Jaya, Java, Nusa Tenggara, Sulawesi, Sumatra), Iran, Islamic Republic of, Iraq, Israel, Japan (Ryukyu Archipelago), Jordan, Lao People's Democratic Republic, Lebanon, Malaysia (West), Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam, Yemen
North America: Mexico, United States of America (Alabama, California, Florida, Georgia, Hawaii, Louisiana, New York, North Carolina, Oklahoma, South Carolina, Texas)
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South America: Brazil (Alagoas, Bahia, Espirito Santo, Maranhao, Mato Grosso, Para, Pernambuco, Rio Grande do Sul, Roraima, Santa Catarina, Sao Paulo), Colombia, Ecuador, French Guiana, Guyana, Suriname, Venezuela
Oceania: Australia (Northern Territory, Queensland, South Australia, Western Australia), Fiji, Guam, Micronesia, Federated States of, New Caledonia, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

BIOLOGY

The life cycle of *M. hirsutus* has been studied in India (Mani, 1989). Each adult female lays 150–600 eggs over a period of about one week, and these hatch in 6–9 days. Females have three nymphal instars, and the males have four. The final two male nymph instars (called prepupa and pupa) are usually sessile and do not feed. Temperatures most favorable for the development and reproduction of *M. hirsutus* are 25 to 27 °C, and the thermal thresholds for female development are 14.5 °C (T min) and 29 °C (T max) (Chong *et al.*, 2008). 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) or other stages, both on the host plant and in the soil (Pollard, 1995). There may be as many as 15 generations per year (Pollard, 1995). First-instar nymphs, known as 'crawlers', disperse by walking to other parts of the same plant or are carried further on the wind or by other means (e.g., animals, humans, vehicles or water). Crawlers settle in cracks and crevices, usually on new growth which becomes severely stunted and distorted, and in which densely packed colonies develop. Reproduction is mostly parthenogenetic in Egypt (Hall, 1921) and Bihar, India (Singh & Ghosh, 1970), or bi-parental in West Bengal, India (Ghose, 1971b; 1972a) and probably in the Caribbean (Williams, 1996).

Infestations of *M. hirsutus* are often associated with attendant ants, which feed on the honeydew egested by the mealybugs (Ghose, 1970; Mani, 1989; Halaybeh & Katbeh-Bader, 2010).

DETECTION AND IDENTIFICATION

Symptoms

Infested growing points become distorted, stunted, and swollen. These symptoms vary according to the susceptibility of each host species. In highly susceptible plants, even brief probing of unexpanded leaves by the mealybug *stylets* causes severe crumpling of the leaves, and heavy infestation can cause defoliation, dieback and even death of the plant. As the plant dies back, the mealybugs migrate to healthy tissue, so the colonies migrate from shoot tips to twigs to branches and finally down the trunk. The mealybugs themselves are in general readily visible, though sometimes they are hidden in the distorted and swollen growth, or beneath the wax ovisacs. Infested plants may also be covered in sticky honeydew egested by the mealybugs, which serves as a medium for the growth of black sooty moulds. The honeydew may also attract attendant ants (Ghose, 1970; Mani, 1989).

Morphology

Eggs are oval and pink. The first instars or crawlers are 0.3 mm long, pink; immature females and newly matured females greyish-pink, dusted with mealy white wax; adult female 2.5–4 mm long, soft-bodied, elongate oval and slightly flattened. The entire colony tends to become covered by white, waxy ovisac material.

Maconellicoccus hirsutus can only be accurately identified by examination of slide-mounted adult females under a compound light microscope. A taxonomic key to all the species of *Maconellicoccus* is provided by Williams (1996) and there is an EPPO diagnostic protocol available for *M. hirsutus* (EPPO, 2006). *M. hirsutus* may be recognized by the presence of the following suite of characters: 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. This makes the species fairly easy to recognize in parts of the world where other *Maconellicoccus* species do not occur, such as Europe and the Americas. Adult males have a single pair of wings, long antennae, a pair of white wax ?laments projecting posteriorly from the abdomen and no mouthparts.

Detection and inspection methods

All developmental stages of *M. hirsutus* can be found by visual inspection of plant material, especially on the growing points, buds, flowers, and fruit. Large infestations may become covered by the white, sticky, elastic, woolly, waxy ovisacs. If the sticky wax is parted with a needle and examined with a x10 hand lens, clusters of eggs and females become visible.

One of the commonest, preferred hosts of *M. hirsutus* is *Hibiscus rosa-sinensis*, and this is a good plant to monitor for early detection of the arrival of the pest.

PATHWAYS FOR MOVEMENT

Natural spread of *M. hirsutus*, by the first instars crawling or being carried by wind, other animals, or machinery, occurs locally and relatively slowly. Faster and long-distance movement is likely to be due to adult females and immature stages being carried with plant material in trade, especially plants for planting. *M. hirsutus* may be transported with cut flowers and fresh fruit and vegetables, although the pest would have difficulty transferring to a suitable host due to their limited mobility.

PEST SIGNIFICANCE

Economic impact

Maconellicoccus hirsutus is an invasive, highly polyphagous pest that has had a major economic impact in many tropical and subtropical regions. In India, *M. hirsutus* has been recorded causing economic damage to a range of crops including: cotton (Dhawan *et al.*, 1980; Muralidharan & Badaya, 2000); the ?bre crops *Hibiscus sabdariffa*, *Hibiscus cannabinus* and *Boehmeria nivea* (Ghose, 1961; 1971a; Singh & Ghosh, 1970; Raju *et al*., 1988); grapevine (Manjunath, 1985); mulberry (Rao *et al*., 1993); pigeonpea (Patel *et al*., 1990); and *Ziziphus mauritiana* (Balikai & Bagali, 2000).

Maconellicoccus hirsutus has also had a major economic impact in the Americas. It was first detected in 1993 on the island of Grenada (Michaud & Evans, 2000), where the annual losses were estimated to be 3.5 million USD, before establishment of biological control (François, 1996). Similar losses have been estimated in several other Caribbean islands. Various crops including *Annona* spp., *Spondias* spp., okra, mango and sorrel, and ornamentals which are valued by the tourist industry have been attacked, and also important forest trees such as *Hibiscus elatus* and *Tectona grandis* (Pollard, 1995; Peters & Watson, 1999; Kairo *et al*., 2000). Affected countries suffered serious loss of trade because other countries would not accept shipments of agricultural produce from them (Peters & Watson, 1999). If the mealybug were to spread across the Southern USA, it is estimated that it could cause losses of 750 million USD per year (Mof?t, 1999).

Williams (1996) notes that almost all serious damage by *M. hirsutus* has been recorded between 7° and 30° North, where there are reports of seasonal differences in the incidence of the pest.

Control

Plant protection products are of limited effectiveness against *M. hirsutus* because of its habit of hiding in crevices, and the waxy covering of its body (Williams, 1996). In India, most granular insecticides are ineffective against *M. hirsutus* (Mani, 1989); and systemic insecticides are only used to control heavy infestations. Inorganic oil emulsion sprays gave good control of *M. hirsutus* on guava. Any insecticide used against *M. hirsutus* should be carefully selected to avoid injury to its natural enemies. IPM using both coccinellid beetle predators and insecticides (dichlorvos and chlorpyrifos) has been achieved on grapevine (Mani, 1989).

Biological control by release of natural enemies has proved highly effective in the management of *M. hirsutus*. The coccinellid predator *Cryptolaemus montrouzieri* has been used successfully to reduce large populations of *M. hirsutus* in India (Mani & Krishnamoorthy, 2001) and the Caribbean (Kairo *et al*., 2000). In Egypt, however, *C. montrouzieri* was unable to survive the cold winters in suf?cient numbers to be effective over the long term, and the main biological control agents used are the hymenopteran parasitoids *Anagyrus kamali* and *Achrysopophagus* sp. (Bartlett, 1978). The great success of the biological control programmes against *M. hirsutus* in the Caribbean, using *C. montrouzieri* and the endoparasitoids *A. kamali* and *Gyranusoidea indica*, is largely attributable to these insects reproducing at least twice as fast as the mealybug (Pollard, 1995; Garland, 1998; Michaud & Evans, 2000; Kairo *et al* ., 2000; Persad & Khan, 2002; Meyerdirk & DeChi, 2005); populations were reduced by 82-97%, and the parasitoids were found to be effective in tropical, subtropical and semi-desert conditions. It was also important to use public

awareness programmes to reduce the use of plant protection products that could adversely affect the biological control agents (Kairo *et al*., 2000).

Limited information is available on host-plant resistance or on methods of cultural control.

Phytosanitary risk

M. hirsutus was added in 2012 to the EPPO A2 list of pests recommended for regulation as a quarantine pest (A2 pests are locally present in the EPPO region), and EPPO member countries at risk are recommended to regulate it as a quarantine pest. It is a quarantine pest in several countries and is also of regulatory interest to other Regional Plant Protection Organizations (e.g. COSAVE, EAEU and NAPPO).

In the EPPO region, *M. hirsutus* presents a potential risk to a range of crops, ornamentals and amenity plants including avocado, banana, cherimoya, citrus, cotton, fig, grapevine, guava, hibiscus, and mulberry. There is also a possibility that it could affect glasshouse crops in more northern countries. In addition, its presence in a country may create difficulties for the export of planting material.

PHYTOSANITARY MEASURES

There are a range of phytosanitary measures that may be taken to reduce the risk of introduction and spread of *M. hirsutus* including: pre-export inspections to ensure that consignments of plants for planting are pest free; sourcing imports from pest free areas or in a pest-free place of production; phytosanitary certificates and plant passports; chemical treatments on crops including reproductive material; physical treatments on consignments or during processing; heat and cold treatments; and post-entry quarantine (PEQ).

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CABI resources used when preparing this datasheet

CABI Datasheet on *Maconellicoccus hirsutus.* https://www.cabi.org/isc/datasheet/40171

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Datasheet history

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EPPO (2005) *Maconellicoccus hirsutus*. Datasheets on quarantine pests. *EPPO Bulletin* **35**(3), 413-415. https://doi.org/10.1111/j.1365-2338.2005.00903.x

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