

Maconellicoccus hirsutus (Hibiscus Mealybug)

Order: Hemiptera (True Bugs)

Class: Insecta (Insects)

Phylum: Arthropoda (Arthropods)



Fig. 1. Hibiscus mealybug, *Maconellicoccus hirsutus*.

[http://www.texasinvasives.org/pest_database/detail, downloaded 20 March 2015]

TRAITS. First described in India as *Phenacoccus hirsutus* in 1908 (Mani, 1989), its common names include hibiscus mealybug, pink mealybug, and cochenille de l'hibiscus (French). Adult females are 2.5-4mm in length with a soft, flattened body that is oval shaped and are wingless (Fig. 1). Have 9 segmented antennae, short caudal filaments and long dorsal setae (hairs) which allows for recognition from other mealybugs. Body colour is reddish pink, and covered by a waterproof mass of white wax (Miller, 1999). Males are reddish brown, 3mm long, with two long tails, lack waxy coating, have a pair of wings and are capable of flight, and have non-functional mouthparts.

DISTRIBUTION. Now widespread in more than 25 territories (Fig. 2), but has a major pest status in Egypt and India and still extending its invasive range (Mani, 1989). In the Caribbean it was first reported in 1993 in Grenada, in 1995 in Trinidad and Tobago, and by 1997 it had spread to most Caribbean countries (IUCN, 2010).

HABITAT AND ACTIVITY. The habitat is on moist plants. Its primary host is the ornamental *Hibiscus rosa-sinensis*. However, it also inhabits a variety of woody plants and extend to 76 families of plant host with preference of Fabaceae, Malvaceae and Moraceae. In the subtropics this species may become dormant and can survive in the soil or on the host plant, but in the tropics they complete their life cycle rapidly. They occur in disturbed areas such as agricultural fields or in planted forests. Climate change projections indicate a larger range will be suitable for this species.

FOOD AND FEEDING. A polyphagous insect pest with a host range of more than 125 species of plants feeding on fruits, vegetables and fibre crops such as coffee, maize, sugar cane, soybean, okra and cotton. It is a primary consumer that also attacks ornamental plants such as the rose and hibiscus (Reddy et al., 2009). It is restricted to hibiscus in many countries due its natural enemies such as parasites *Anagyrus kamali* and predatory beetles *Cryptolaemus montrouzieri*. Females feed in colonies on soft healthy tissues (Hoy et al., 2003). Similar to other mealybugs, *M. hirsutus* feeds on the phloem tissues by injecting salivary toxins into the growing points (Aristizabal et al., 2012). Like other sap sucking insects when it attacks it causes curling of shoots and deformations of the terminal growth (Fig. 3) resulting in the formation of a permanent injury known as bunchy top or rosetting (Pena, 2013). The affected plants show signs of a mouldy substance and a presence of large quantities of wax.

POPULATION ECOLOGY. The social organization of this species is in related groups of females and males. In a study conducted in the U.S. Virgin Islands virgin females were able to attract males at a distance of 50m by the production of sex pheromones containing two compounds (Serrano et al., 2001). This indicated that there is a strong relationship between females and flying males in the population. Their abundance is reflected by their ability to colonize a wide range of hosts and their widespread distribution. They live in colonies and are found aggregated on host plants sealed away from predators (Juniora et al., 2013). More males than females are present per square centimeter of an infected host in a ratio of 5:1 (Zhang and Amalin, 2005). Females live till their first reproduction while males are unable to feed so die after maturation and fertilization of females which occur within a few days.

REPRODUCTION. In India the life cycle (Fig. 4) of *M. hirsutus* was studied and it is reported that both sexual and parthenogenetic (asexual) reproduction occur. The males are attracted to females over a wide distance due to the production of sex pheromones by virgin females (Zhang et al., 2004). Freshly laid eggs of 0.3-0.4mm in length and 0.15-0.21mm in width are found in sacs of white wax that are created by the female. The eggs are orange when laid but become pink before they hatch. An adult female lays about 150-600 eggs in one week. Females die after depositing the eggs so only mate once in its life time. Development of the eggs into the first instar nymphs or crawlers occur in 3-9 days which are able to disperse themselves on the host plants. Both males and females of *M. hirsutus* have active nymphal (juvenile) stages but males have a last inactive instar where wing buds form. Females have three while males have four instar nymphal stages. Juvenile stages last for 10-25 days. Adult males are smaller than the females and live only a few days to mate (Juniora et al., 2013). Development from egg to adult occurs in 23-35 days at 37°C (Pluke et al., 1999). *Maconellicoccus hirsutus* has a high reproductive rate as it produces up to 15 generations in a year thus the populations on an infected host is large. The population increases drastically as females produce more than 150 female progeny in 40 days. Seasonal climatic

patterns influence populations as they are higher during the summer months and low during the rainy and winter months. They remain inactive in the egg stage in cooler climates.

BEHAVIOUR. The juveniles have been identified as the main agents of dispersal. The nymphs have little wax which allows for easy dispersal by wind and can survive without food for two days. They have long legs and antennae that allow movement to other parts of the host by crawling. Females protect their eggs by creating waxy sacs. The behaviour of mealybugs is cryptic as it has the ability to conceal itself (Juniora et al., 2013). The adult females are covered in a waxy white material that allows for escape from predators.

APPLIED ECOLOGY. There is an ecological threat of this pest to agriculture and horticulture systems as feeding leads to death of the host. It was reported that it is the second most important pest in Egypt that attacks the citrus industry. It has also affected the grape vineyards of India (Mani et al., 2014). The lady beetle, *Cryptolaemus montrouzieri* was an effective control used at the vineyards in southern India in the 1970s. Arrival to Trinidad and Tobago in 1995 resulted in 125 million dollars loss a year. As a result of such infestations biological programmes were implemented using *Anagyrus kamali* and *Gyranusoidea indica* which are two parasitic wasps. *Maconellicoccus hirsutus* is attacked worldwide by 21 parasites and 41 predators (Sagarra and Peterkin, 1999).

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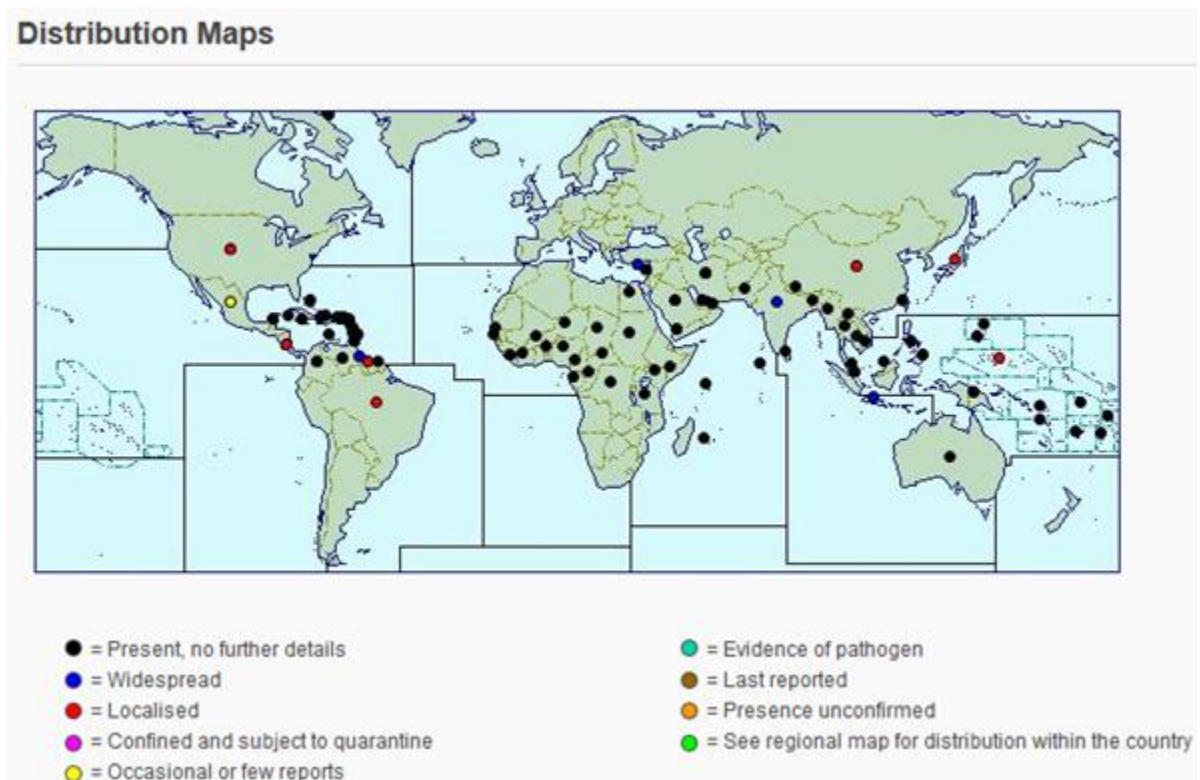


Fig. 2. Geographical range of *Maconellicoccus hirsutus*.

[<http://www.cabi.org/isc/datasheet/40171>, downloaded 21 March 2015]



Fig. 3. Infestation of *Maconellicoccus hirsutus* on *Hibiscus rosa-sinensis*.

[<https://edis.ifas.ufl.edu/pdf/IN/IN15600.pdf>, downloaded 22 March 2015]

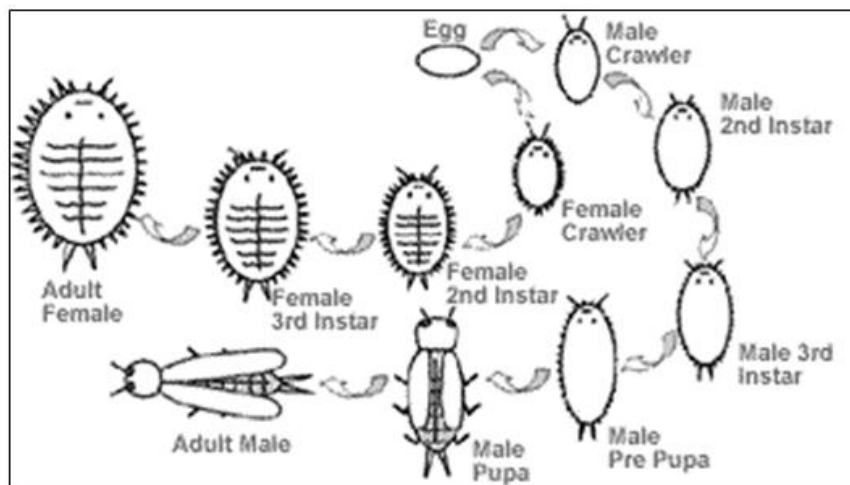


Fig. 4. The life cycle of *Maconellicoccus hirsutus*.

[<http://www.duroibugs.co.za/pests/mealybug.htm>, downloaded 22 March 2015]