



Papaya mealybug, *Paracoccus marginatus* (Pseudococcidae: Hemiptera): A serious constraint in papaya cultivation

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Abstract

Papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Pseudococcidae), has emerged as a serious constraint to papaya cultivation in many tropical and subtropical regions. The pest is highly invasive and polyphagous, infesting papaya and several other important crops. Both nymphs and adult females cause damage by sucking sap from leaves, stems, and fruits, resulting in leaf curling, chlorosis, stunted growth, fruit deformation, and premature leaf drop. The rapid spread, high reproductive potential, and protective waxy covering of the papaya mealybug make its management difficult under field conditions. Yield losses can be severe, particularly under favourable climatic conditions, posing a threat to farmers' livelihoods and sustainable papaya production. This article provides an overview of the distribution, host range, biology, damage symptoms, and economic importance of *P. marginatus*, along with an emphasis on integrated management strategies.

Keywords: Damage, IPM, mealybug, papaya

Introduction

Papaya (*Carica papaya* L.) is an important tropical and subtropical fruit crop valued for its high nutritional content, medicinal properties, and year-round production potential. It contributes significantly to farmers' income and nutritional security in many papaya-growing regions. However, papaya cultivation is increasingly challenged by several biotic stresses, among which insect pests play a major role in reducing productivity and fruit quality. From the last few years, the papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Pseudococcidae), has emerged as one of the most destructive pests of papaya.

The papaya mealybug is an invasive, polyphagous pest capable of infesting a wide range of host plants, including economically important fruits, vegetables, and ornamentals (Tanwar *et al.*, 2010; Seni and chongtham, 2013). Both nymphs and adult females feed by sucking plant sap from leaves, stems, and fruits, leading to chlorosis, leaf curling, stunted growth, premature leaf drop, and deformation of fruits. Severe infestations result in copious

honeydew secretion, which helps the development of sooty mould, further reducing photosynthesis and market value of crops.

The rapid multiplication rate, wide host range, and waxy protective covering of *P. marginatus* make its management difficult under field conditions (Tanwar *et al.*, 2010). Uncontrolled infestations can cause heavy yield losses and, in extreme cases, complete crop failure. The pest has spread rapidly across major papaya-growing areas, posing a serious threat to sustainable papaya production. Therefore, understanding the biology, damage symptoms, and management strategies of papaya mealybug is essential for developing effective and eco-friendly management measures and ensuring the long-term viability of papaya cultivation.

Distribution: The papaya mealybug, *Paracoccus marginatus* is a native of Mexico and/or Central America (Miller *et al.*, 1999). It assumed the status of a major pest in India in 2009 when it caused severe damage to economically important crops and huge

losses to farmers in Coimbatore, Erode, Tirupur and Salem districts of Tamil Nadu (Tanwar *et al.*, 2010; Seni and chongtham, 2013). Besides Tamil Nadu, presently it has extended its presence in other states of India like Karnataka, Kerala, Andhra Pradesh, Assam, Rajasthan and Tripura, West Bengal, Gujarat and Odisha. In Odisha, they become serious in the March-April and again in the October month in Sambalpur and Bargarh districts.

Host range: It has a wide host range of over 60 species of plants including economically important plants such as *Carica papaya*, *Annona squamosa*, *Hibiscus rosa-sinensis*, *Ipomoea spp.*, and *Solanum melongena*.

Identification and Life cycle: It can be distinguished by its greenish yellow body colour with large amounts of white waxy secretion. It has sexual dimorphism characters; females are greenish yellow in colour, wingless and takes three instars to complete their development whereas males are reddish in colour with transparent wing and takes four instars to complete their development. Females usually lay 100 to 600 eggs in an ovisac, covered with wax are greenish yellow. They are oviposited on the shoot, midribs of young leaves and fruits. Egg-laying usually occurs over the period of 7 to 12 days. Egg hatch occurs in about 6-10 days, and newly emerged crawlers, begin to actively search for feeding sites. Female nymph takes around 19 to 30 days to mature and depends on the prevailing temperature as well as host plants (Seni and Sahoo, 2014). It is reported that a significant positive correlation was present between papaya mealybug population and maximum temperature whereas, the maximum relative humidity and rainfall had negative correlation with the population (Seni, 2015).

Damage symptoms: It infested along the veins and the midribs of the older leaves and all areas of the tender leaves and fruits. Severely affected older leaves turn yellow and dry up. Tender leaves become crinkled. Terminal shoots become bunched and distorted. Heavy mealybug populations produce a large volume of honey dew, which causes black sooty mould to cover the infected fruits and vegetation. It reduces the fruit quality as well as market value of the crop. Later, in severe infestation plant dies.

Integrated management

Effective management of papaya mealybug requires an integrated pest management

(IPM) approach that combines cultural, mechanical, biological, botanical, and chemical methods. Reliance on a single control strategy is often ineffective due to the pest's high reproductive potential, waxy body covering, and wide host range.

Cultural control

- Use healthy, pest-free seedlings for planting.
- Avoid planting papaya near alternate host plants such as hibiscus, cotton, brinjal, and weeds that harbour mealybugs.
- Maintain field sanitation by removing and destroying infested plant parts.
- Practice balanced fertilization; excessive nitrogen favours mealybug multiplication.
- Ensure proper spacing and aeration to reduce humidity, which favours pest buildup.
- Regularly monitor the crop, especially during dry and warm periods.

Mechanical and physical control

- Pruning and destroying heavily infested leaves, shoots, and fruits at the early stage of infestation.
- Use high-pressure water spray to dislodge mealybugs from plant parts.
- Apply grease bands or sticky bands around the trunk to prevent ant movement, as ants protect and helps spreading mealybugs.

Biological control

Biological control is the most effective and sustainable method for managing papaya mealybug. Biological control involves the use of natural enemies i.e. parasitoids and predators. Release of parasitoid like *Acerophagus papayae*, *Anagyrus loeckii*, *Pseudleptomastix maxicana* helps suppress the mealybug population built up.

Conserve the Predators like *Cryptolaemus montrouzieri*, indigenous *Scymnus spp.*, the Cecidomyiidae *Diadiplosis coccidarum*, chrysopid (lace wing), Syrphid (hover fly) and *Spalgis epius* by avoiding indiscriminate use of insecticide.

Botanical and bio-rational control

- Spraying neem oil (2-3%) or NSKE 5% at early stages of infestation.

- Use fish oil rosin soap (FORS) @ 25 g/l or potassium soap to break the waxy coating of the insect.
- Entomopathogenic fungi like *Beauveria bassiana*, *Lecanicillium lecanii* and *Paecilomyces pictus* be used under favourable conditions.

Chemical Control

Chemical control should be used only when infestation exceeds economic threshold levels and preferably in combination with other methods. Spraying of systemic insecticides such as dimethoate 30 EC (2 ml/l), thiamethoxam 25 WG (0.6 g/l), imidacloprid 17.8 SL (0.6 ml/l) is effective. Adding of a sticker or soap solution improve the penetration of insecticides through the waxy covering. Insecticides should be rotated with different modes of action to delay resistance development. Avoid spraying during peak activity of natural enemies.

Conclusion

Papaya mealybug, *P. marginatus*, has emerged as a serious and persistent constraint in papaya cultivation in India as well as in Odisha, significantly affecting crop growth, yield, and fruit quality. Severe infestations lead to heavy economic losses through direct feeding damage, reduced marketability of fruits, and increased cost of pest management, thereby threatening the profitability of papaya farming. The management of papaya mealybug is challenging due to its high reproductive potential, protective waxy covering, and ability to survive on multiple host plants. Indiscriminate use of chemical insecticides has often resulted in limited success and poses risks to natural enemies and the environment. Therefore, emphasis must be placed on integrated pest management approaches that combine cultural practices, conservation and augmentation of biological control agents, need-based chemical interventions, and farmer awareness programs.



Fig.1. Papaya mealybug infested plant parts

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