

REVIEW ARTICLE

REVIEW ARTICLE ON THE MANAGEMENT OF MOST PREVALENT INSECT PEST OF PAPAYA

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ABSTRACT

The papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink, is a tiny hemipteran that feeds on a wide range of plants, including economically important tropical fruits and ornamentals. Among the different pests in papaya, Papaya mealy bug is one of the chief pest attacking papaya. The papaya mealy bug was first discovered in Manatee and Palm Beach counties in Florida in 1998, and it soon spread throughout the state. This paper delves into the detail review of information about the papaya mealy bug and it's nature of damage, biological cycle and management strategies.

KEYWORDS

insect pest, papaya, pests

1. INTRODUCTION

Papaya is a commercial fruit crop in many tropical areas throughout the world. This fruit is highly rich in vitamins, minerals, and dietary antioxidants. The papaya fruit fly, *Toxotrypana curvicauda* Gerstaecker, is the most frequent pest of papaya (*Carica papaya* L.) in tropical and subtropical areas of the New World. In 1905, the insects were imported to Florida on papaya shipments from the West Indies. It began in the Florida Keys and Miami, and has since spread to many places where papayas are produced. Papaya is a commercial fruit crop in many tropical regions of the world. The fruit is a rich source of vitamins, minerals and dietary antioxidants. *Toxotrypana curvicauda* Gerstaecker, the papaya fruit fly, is the most common pest of papaya (*Carica papaya* L.) in tropical and subtropical portions of the New World. The insects were brought to Florida in 1905, most likely on papaya shipments from the West Indies. It first became established in the Florida Keys and Miami, then spread onto many states wherever papayas are grown (Walker et al., 2005)

1.1 Scenario in case of Nepal and Asian countries

The papaya mealybug (Hemiptera: Pseudococcidae) is a sucking polyphagous insect that feeds on a variety of different plant species, including economically valuable tropical fruits, vegetables, and ornamentals. Since its first report in Coimbatore in 2007 A.D., the papaya mealy bug has caused significant harm in agriculture and horticultural crops. The papaya mealy bug has been observed attacking a wide range of excellent cultivated crops and severe weed hosts belonging to many plant kingdom families (Tanwar et al., 2010).

1.2 Insect habit and Nature of Damage

Papaya mealy bug:

The papaya mealy bug, also known as the *Paracoccus marginatus*, is a tiny sap-sucking insect belonging to the Pseudococcidae family of mealybugs. Mealy bug covers the adult female's yellowish segmented, flattened oval body, which is about two millimeters long. Between one and two weeks, the mature female deposits up to 600 eggs into her ovisac. The crawlers, which resemble smaller copies of the adult female, scatter 10 days after the eggs hatch. The ladies have four instars, while the males have five. The

papaya mealy-bug feeds on the plant sap by inserting its stylet into the epidermis of the leaf, the skin of the fruit, or the stem. Simultaneously, it injects a harmful material into the plant, causing chlorosis, stunting, early leaf and fruit fall, honeydew production, sooty mould, and possibly plant death.



Figure 1: Mealy bug on Papaya

1.3 Management Strategy

Different types of management strategy was effectively followed for the control of most prevalent insect pest of papaya.

- a. Physical Method:
 - i. Mostly use of cleaning material. Source planting material from certified nurseries and inspect seedlings during purchase before we take into the farm.
 - ii. Strictly restrict the movement of planting material.

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- iii. Mostly practiced crop rotation with the category of non-host plants for the possible to break the pest cycle.
 - iv. To improve and maintain high soil fertility, apply manures or fertilizer.
- b. Cultural Method:
- i. Sticky bands, also known as alkaline sheets or pesticide bands, should be applied around the trunks of papaya plants and other host plants to prevent different sorts of insects such as crawlers and attendant ants from moving around.
 - ii. Sanitization of the field farm equipment before moving it to the uninfested crop or field. Use 1% bleach solution to clean the tools or use if available of chlorine solution.
 - iii. Clipping off the infested twigs and leaves and burning during early stage of infestation is one of the best method of eradication of the pest. All crop remains in the mealy bug-infested garden should be clipped off and burned.
 - iv. To prevent infested plants or plant material from being transported from one area to another and outside of the infested region, a localized quarantine should be utilized.
 - v. Physically dislodge mealy bugs by hosing down plants on a regular basis.
- c. Biological Method:
- i. In biological pest control, natural enemies such as parasites and predators are used to manage pests. The use of traditional biological control for mealybugs is emphasized in most mealybug control programs since it is sustainable.
 - ii. It is not harmful to the environment.
 - iii. Insects do not develop resistance over time.
 - iv. Parasitoids are frequently extremely effective and host-specific.

Many predators attack *Paracoccus marginatus*, making predators an efficient biological control tool for the papaya mealybug. *Cryptolaemus montrouzieri*, an invasive Australian ladybird beetle, native *Scymnus* spp., the Cecidomyiidae *Diadiplosis coccidarum* (Cockerel), chrysopid (lace wing) larvae and adults, and Syrphid (hover fly) larvae are among them. Mealybug populations can be quickly reduced by predators such as ladybird beetles and lace wing flies. The lepidopteran predator *Spalgis epius* (Lycaenidae) is a well-known carnivorous butterfly that feeds on a variety of pseudococcids and coccids, as well as papaya mealybug ovisacs, nymphs, and adults (Tanwar et al., 2010).

- d. Innovative methods/Use of sex pheromones:

The location of sex pheromone generation and release in female mealybugs has yet to be discovered, though it has been proposed that it could be the translucent pores on the rear legs (Gullan and Kosztarab 1997). So far, ten sex pheromones have been discovered. Mealy bug species have been discovered, all of which are agricultural pests such as Citrus mealy bug, Vine mealy bug, Comstock mealy bug, Pink hibiscus mealy bug, Obscure mealy bug etc. All known mealybug pheromones are monoterpenoid esters, which are mostly simple acids. The majority of them, on the other hand, are non-head-to-tail monoterpenoids with distinct isoprene unit connections (Millar and Midland 2007).

- e. Resistant varieties:

Scientists created two virus-resistant papaya varieties, SunUp and Rainbow. SunUp possessed two copies of the coat protein (cp) gene and reddish-flesh fruit. Rainbow was created by crossing SunUp with a popular non-transgenic cultivar with yellow flesh and just one copy of the coat protein (cp) gene.

- f. Chemical method:

Mealy bugs can be controlled with a variety of chemical controls, although none are currently approved for this purpose. Papaya mealy bug is a type of papaya mealy bug. Ingredients that are active in registered Acephate, carbaryl, and other pesticides are used in pesticide formulations include diazinon, dimethoate, malathion, and chlorpyrifos. Mineral oils that are white. In most cases, double the usual dose is used. When treatment for mealy bugs, this method is used because Mealy bugs have thick waxy, cottony sacs that protect them. They are frequently hidden inside broken leaves and buds. As a result, chemical restrictions are only partially effective. Multiple applications are required to be effective natural enemies, as well as non-target consequences. Using chemicals as a control

method is a less desired alternative fend off the papaya mealy bug (Walker et al., 2005).

- g. Integrated Pest Management Technique:

- With four replications and eight treatments, (Netherlands et al. 2013) found that Imidacloprid 17.8% SL and Thiamethoxame 25% WG in an experiment with four replications and eight treatments. and Trizophos 40% SL were found to be the most effective in the management of mango stem borers, while Bordo mixture, second to third place went to lantana camera, sweet flag stolen extract, and nimex.

- The Indian Institute of Horticulture Research in Bengaluru developed a product called 'sealer cum healer,' which protects the trunk against egg laying by adults when sprayed to the stem with an insecticide (dichlorovos) and a fungicide (copper oxychloride) (Bajracharya, n.d.).

1.4 Way Forward

- a. Bio-control methods like natural enemies are not even effective for the control of mealy bugs. Even the chemical attracts and light traps are also found ineffective in reduction of the damage
- b. Though papaya orchard is encountered by many pest especially papaya mealy bug, dry shoots and unwanted branches should be pruned for orchard sanitation and training should be given to papaya growers and concerned stakeholders is required.
- c. As the behavior, biology and ecology of the papaya mealy bug is known so we can prevent egg laying or stop the entry of grubs into the stem by physical, cultural, chemical, or integrated method.
- d. Introduction of new pests or the rise of new biotypes that render previously resistant varieties useless, new agronomic methods, and the deployment of new kinds with concealed sensitivity to formerly unimportant pests. Thus, understanding the origins of crops and their pests is critical for developing pest control measures, and having adaptable breeding programs that allow for the addition of new objectives when new pests emerge is critical. Breeding for cultivars with long-lasting resistance is also necessary.

2. CONCLUSION

Thus Papaya mealy bug is a severe problem in papaya orchards, according to the study. Despite the fact that this evaluation covers a variety of topics such as symptoms, life cycle, and control measures, the best complete control measures are insufficient to combat the pest. As a result, a number of management and control strategies have been offered.

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