

MEALYBUGS: A POLYPHAGOUS PEST OF FIELD AND HORTICULTURE CROPS

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ABSTRACT



Mealybugs (Hemiptera: Coccoidea) are destructive, polyphagous pests affecting diverse field, horticultural, and plantation crops worldwide. Their sap-sucking activity causes plant deformation, honeydew secretion, sooty mold development, and substantial yield losses. Some species also transmit economically important plant viruses. Their waxy covering, cryptic behaviour, rapid reproduction, and microbial associations complicate management. Sustainable control requires integrated pest management combining cultural, biological, botanical, and chemical approaches. Eco-friendly biological control agents and microbial-based interventions offer promising alternatives for long-term suppression of mealybug populations and reduced dependence on synthetic pesticides.

KEYWORDS: IPM, Phloem feeders, Polyphagous pests

INTRODUCTION

Mealybugs (Hemiptera: Coccoidea) are slow-moving insects that have obvious segmentation, elongate-oval in shape and are soft in their female form with the worldwide distribution of about 2000 species and 290 genera. A mealy or cottony wax secretion, which frequently spreads along the sides in a succession of tiny filaments and typically has two longer ones at the posterior end of the body, covers them either thinly or thickly. They are among the most dangerous pests of plant life because their mouthparts, which resemble threads and are frequently longer than the body itself, are inserted through the tough tissue or bark to suck juices from the host. They range in size from extremely small young (0.50 mm) to fully grown adult females (up to 8.00 mm or possibly 9.00 mm) (Mckenzie, 2023).

Mealybugs are serious insect pests of diverse cropping systems the world over with over 160 species of mealybugs being labelled as polyphagous pests. Mealybugs are phloem feeders and the characteristic

leaf-curling damage by them might be the result of calcium extraction linked to pectin degradation by salivary pectin esterases. Many of the mealybug pests also act as vectors for various virus diseases. They are hard to be controlled by insecticides due to its morphological, structural and behavioural adaptability with the tendency to aggregate and settle themselves in cracks or crevices in tree barks, under the leaf sheath, under fruit sepals, etc. The female individuals of various mealybug species are found to release pheromone through abdominal scent glands to attract the males for mating and this phenomenon has been exploited to develop sex pheromones for monitoring and control. Herbivore-induced plant volatiles (HIPVs) play a significant role in attracting natural enemies of mealybug and the same could be exploited for conservative biological control. The presence of symbiotic microbes in the saliva of phloem-sucking hemipterans, including mealybugs, enables these insect pests to defeat host plant defences and detoxify insecticides. Gut endosymbionts, wax-degrading bacteria and entomopathogenic fungi are other promising eco-friendly agents that can channel to suppress populations of this polyphagous insect pest. Mealybugs are also successfully used as biocontrol agents for controlling weeds (Subramanian *et. al.*, 2021; Namadara *et. al.*, 2025).

LIFE CYCLE OF MEALYBUG

Majority of mealybugs reproduce by parthenogenetically, some (like *M. hirsutus*) reproduce sexually. They were typically found in groups, primarily in the plant canopy, albeit they might sometimes be found elsewhere. There can be up to 600 eggs in each egg sac. Males had four nymphal phases, while females had three. If the climate is warm, they can breed all year long.



Eggs: 3-9 days



Adult: 30-60 days

**General
life cycle of
mealybug**



Nymph: 22-25 days

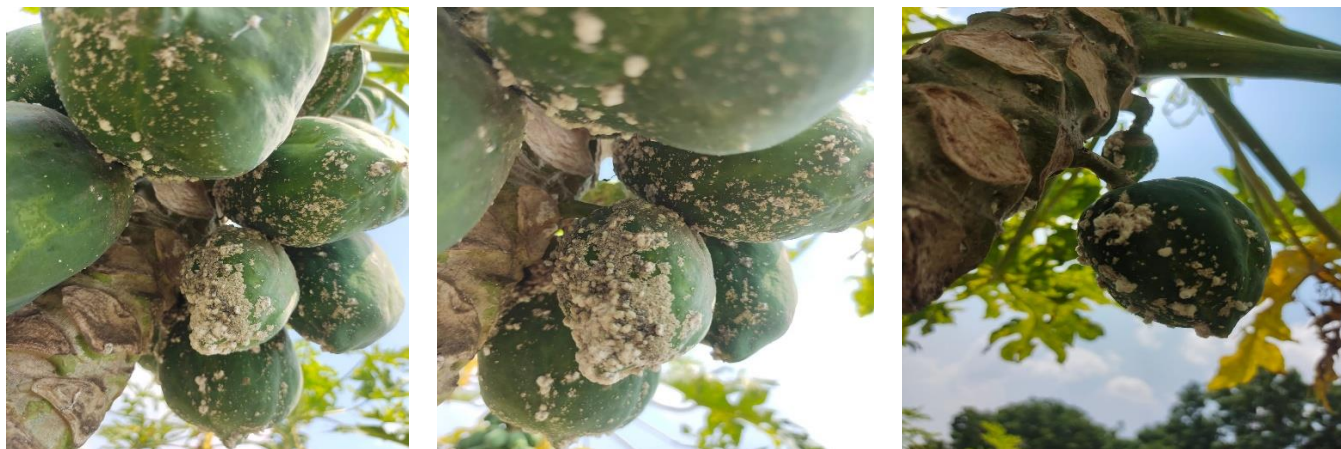


Fig 1. Infestation of papaya mealybug on fruits

HOSTS PLANTS

Mealybugs can be found on plants in nurseries, greenhouses and landscapes. Nearly 5000 different species of mealybugs live on about 246 different plant families worldwide. With 585 species, Poaceae are the most common host plants for mealybugs, whereas Cyperaceae has the fewest host plants (75 species). Weeds such as *Amaranthus vividus*, *Bidens Pilosa*, *Sonchus oleraceus*, *Chenopodus ambrosoides*, *Commelina sp.*, *Cucumis anguria*, *Momordica charantia*, *Cyperus rotundus*, *Chamaesyce hirta*, *Croton sonderianus*, *Jatropha urens*, *Mimosa pudica*, *Piptadenia moniliformis*, *Serra macranthera*, *Herissanthia crispa*, *Sida cordifolia*, *Malva sylvestris* L., Redroot pigweed, *Amaranthus retriflexus* L., Crimson clover, *Trifolium incarnatum* L., *Linaria sp.* and *Chorizococcus rostellum* also serve as host plants for mealybugs.

TRANSMISSION OF PLANT VIRUSES:

Mealybugs transmit few genera of plant viruses, in contrast to aphids and whiteflies. They are less efficient than aphids, leafhoppers and other insect vectors at spreading plant viruses because they are less mobile. Virus transmission rates are also influenced by the age and sex of mealybugs. For instance, older female mealybugs are less effective at spreading plant viruses. Additionally, the nymph life phases influence how quickly viruses spread (adults are more effective than nymphs). Mealybugs transmit viruses of the genus *Ampelovirus* and some *Closteroviruses*, of the *Closteroviridae* family. Mealybugs also transmit badnavirus of the *Caulimoviridae* family. *Closteroviridae* generally consists of four genera- *Closterovirus*, *Ampelovirus* and *Crinivirus*, *Velarivirus*. Some studies have also confirmed the transmission of vitiviruses

Table 1: Common mealybugs and their associated hosts plants

S.N.	Comon name	Scientific name	Host plants/crops
1	Solanum mealybug	<i>Phenacoccus solani</i>	Solanaceous crops, cotton, brinjal, okra, tomato, sesame, sunflower and china rose etc.
2	Pink sugarcane mealybug	<i>Saccharicoccus sacchari</i>	Sugarcane, reeds, some grasses etc.
3	Long-tailed mealybug	<i>Pseudococcus longispinus</i>	Citrus, grapes, pear, pineapple, avocado, ornamentals, orchids and common in greenhouse plants etc.
4	Striped mealybug	<i>Ferrisia virgata</i>	Guava, sapota, cotton, tomato, brinjal, pepper, hibiscus, sugar apple, cocoa, cassava, amaranth and plumeria etc.
5	Citrus mealybug	<i>Planococcus citri</i>	Ornamentals, vegetables, grapes, annona, lily, citrus, coconut, coleus, cactus, croton, muskmelon, primrose, yam, mango, banana, date palm, guava, soya bean, tulip and cacao etc.
6	Pineapple mealybug	<i>Dysmicoccus brevipes</i>	Pineapple, citrus, capsicum, coffee, ficus, hibiscus, banana, potato, clove, cocoa, maize, ginger, grapes etc.
7	Hibiscus mealybug	<i>Maconellicoccus hirsutus</i> (<i>Phenacoccus hirsutus</i>)	Hibiscus, acalypha, acacia, asparagus, cabbage, cauliflower, banyan, Fig, rubber plant, cotton, sunflower, jasmine, sapota, guava etc.
8	Mango Mealybug	<i>Drosicha mangiferae</i>	Mango, neem tree, navel orange, sweet potato, bottle guard, lantana, tobacco, black night shade etc.
9	Cotton mealybug	<i>Phenacoccus Solenopsis</i>	Cotton, apple of sodom, Indian laburnum, watermelon, bermuda grass, carrot, pepper mint, date palm etc.
10	Papaya mealybug	<i>Paracoccus marginatus</i>	Papaya, cashew nut, pine apple, jatropha, banana, beans, cowpea etc.
11	Rice mealybug	<i>Brevennia rehi</i>	Rice and other grasses

by some mealybug species. These viruses trigger leaf discoloration, deformation, mottling and leaf yellowing. Pathogen transmission by mealybugs have been reported on guava, citrus, pomegranate, grapes, sugarcane, banana, black pepper, pineapple plantation, stone fruit, berries, yam, cassava, cashew, papaya, pawpaw and cocoa.

INTEGRATED PEST MANAGEMENT

Cultural Control

In the early stages of infestation, a strong jet of water can be used to wash away mealybugs from the infested plant parts. Ant populations should be controlled by using an ant barrier or fence around the field to reduce the spread of mealybugs. Heavily infested plant parts should be removed and destroyed. Weeds around the field should be removed regularly to prevent the spread of mealybugs. Farm machinery, tools, and equipment should be cleaned and sanitized regularly to prevent secondary infestation. In perennial crops, mealybugs hiding under the bark should be removed. The stem can also be treated with dichlorvos 76 EC @ 2 ml + fish oil resin soap @ 2 g per litre of water.

Biological Control

Biological control agents such as *Cryptolaemus montrouzieri*, *Anagyrus pseudococchi*, *Hypoaspis* spp., *Leptomastix dactylopii*, *Verticillium lecanii* and *Beauveria bassiana* can be used to control mealybugs. The predatory mite *Hypoaspis* feeds on young mealybugs (crawlers) and helps reduce their population. Other beneficial insects, such as *Cheilomenes sexmaculata*, *Nephus regularis*, *Scymnus coccivora* and *Rodolia fumida*, feed on mealybugs and can be encouraged and conserved in the field. Predatory beetles can be released at about 5,000 beetles per hectare, one to three times depending on the crop and level of mealybug infestation. In tree crops, about 10 predatory beetles per tree can be released. Release parasitoid, *Coccidoxenoides perminutus* (Hymenoptera: Encyrtidae) on all instars. During periods of high humidity, spray *Verticillium lecanii* or *Beauveria bassiana* at 2×10^8 CFU/ml to help reduce the mealybug population.

Chemical Control

Use pesticides that are relatively safer for beneficial insects and natural enemies. To control ants, Chlorpyrifos 20 EC @ 2.5 ml/litre of water or 5% Malathion dust @ 25 kg/ha can be applied. Mealybugs are difficult to control with contact insecticides because they hide in cracks and crevices and are protected by a waxy covering. Therefore, systemic insecticides may be more effective. Depending on the crop and local recommendations, the following insecticides or botanical pesticide can be used: Neem

oil @ 30 ml/litre of water, Imidacloprid 200 SL @ 1 ml/litre of water, Malathion 50 EC @ 2 ml/litre of water, Dimethoate 30 EC @ 2 ml/litre of water, Methyl demeton 25 EC @ 2 ml/litre of water, Phosphamidon 40 SL @ 1.25 ml/litre of water and Monocrotophos 36 WSC @ 2 ml/litre of water

Nanotechnology

Silver nanoparticles of ginger extract recorded to cause mortality of 2nd and 3rd instars.

CONCLUSION

Mealybugs are serious, polyphagous pests that damage many crops by sucking plant sap and transmitting plant viruses. Their waxy covering and hiding behaviour make them difficult to control. Therefore, an integrated pest management approach involving cultural, biological, botanical and botanicals based chemical methods is essential for effective and sustainable management. Emerging approaches may also provide promising eco-friendly control.

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