



Sustainable control and management of Mealy bugs infestation

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ABSTRACT

Mealybugs are insects in the family *Pseudococcidae*, unarmored scale insects found in moist, warm climates. Many species are considered as pests, they feed on plant juices of greenhouse plants, house plants and subtropical trees and also act as a vector for several plant diseases. Mealy bugs found on both tops and bottom of leaves, on the flower buds, on the stem or anywhere else on the plant. These are bugs that spread from plant to plant. To eliminate a mealy bug invasion, a systemic pesticides and physical cleaning of the plant should be used. Like most pests, the best control for mealy bugs is defensive. Healthy; vigorous plants are less susceptible to infestation than weak, underpotted, and stressed plants. Plant protection products are of limited effectiveness against mealy bugs because of their habit of hiding in crevices and the presence of waxy covering of its body. On outdoor plants, cultural practices and biological control should be adequate for suppressing mealy bugs in most situations.

IndexTerms: *Pseudococcidae*, Mealybugs, Pesticides, Cultural and Biological control.

I INTRODUCTION

The mealy bug diversity in India accounts to 31 genera spread over three tribes in *Phenacoccinini*, *Rhizoecini* and *Sphaerococcini* within family *Pseudococcidae* [9] including many economically important species which are considered as pests of many vegetable, horticultural, ornamental and agricultural crops. These species include *Solenopsis* mealybug *Phenacoccus solenopsis* Tinsley, spherical mealybug

Nipaecoccus viridis (Newstead), striped mealybug *Ferrisia virgata* (Cockerell), papaya mealybug *Paracoccus marginatus* Williams and Granara de Willink, pink hibiscus mealybug *Maconellicoccus hirsutus* (Green), citrus mealybug *Planococcus citri* (Risso), pink sugarcane mealybug *Saccharicoccus sacchari* (Cockerell) and mango mealybug *Drosicha mangiferae* Stebbins [18] [2] and [3]. They are small phloem-sucking insects, the nymphs and adult females of which cause damage by sucking cell sap.

The mealybug species are widespread throughout the world. It has been found on a relatively wide variety of host plants like mango, grapevines, citrus, custard apple, sapota, cashew, pineapple and ornamentals like hibiscus, croton, ferns, cacti, gardenias and orchids etc. Besides these, mealybug infestation has also been reported in storage of tuber crops like aerial yam, elephant foot yam, *Colocasia*, *cassava* etc. [5]. They have a wide variety of predators, including: Coccinellids, Coleopterans, lacewings of the families Chrysopidae, Coniopterygidae and Hemerobiidae, flies of the families Cecidomyiidae and Chamaemyiidae, *Anthocorids* bugs, *Lycaenids*, lepidopterans, and *Phytoseiid* mites [4].

Sahu *et.al.*, [15] observed the mealybugs infestation on crops including cereals, legumes, oilseeds, vegetables, fruits, ornamentals, medicinal and weeds. Among the Mealybugs species, *P. solenopsis* Tinsley was noticed as the most dominant species which observed on 14 species of different host plants infested with maximum 46.66 percent.

Choi *et.al.*, [1] recorded two new species of mealybugs on succulent plants from Korea. Both species have not been documented from South Korea except for quarantine inspection reports.

Nagrare *et.al.*, [3] reported five new species of mealybugs on cotton plants from India. Among these species, *N. viridis* was found to be next most widely distributed mealybug species after *P. solenopsis* and deserves close monitoring.

Rondelli *et.al.*, [6] records Mealybugs (Hemiptera: Pseudococcidae) Infesting Rosettes of Conilon Coffee Plants in the State of Rondônia, South-Western Amazon, Brazil. These insects infest mainly the inflorescence and rosette, and are grouped into the category known as “mealybugs of the rosette complex.” These pseudococcids feed on phloem, which can weaken the plant, often causing die back and fall of flower buds as well as fruits, and resulting in a reduction in production.

This study aimed to survey species of host plants for mealybugs (Hemiptera: Pseudococcidae) in different agroecosystems, in the eastern UP of Bahraich district.

II. MATERIALS AND METHODS

The present study was conducted in Tarai regions of eastern UP and nearby villages of Bahraich region during the period of 2017 and 2018. Survey of different host range of mealy bugs attacking on commonly grown cereals, pulses, oilseeds, vegetables, flower, fruits, ornamental and forest trees conducted at five

villages of Bahraich regions viz. Kursanda, Payagpur, Dahaura, Guthiya and Fakharpur were selected for observation of the various host plants of mealy bugs. Nature of damage, location of occurrence and plant part infected with mealy bugs were also recorded. For identification of mealy bugs, insects were collected from different parts of the plants like leaves, stems, flower and seeds. The samples consisted mostly of adult females and immature instars of mealy bug. The collected samples were preserved in 70% ethanol for transporting to the laboratory. In case of natural enemies i.e., parasites, parasitoids and predators, plant parts with infested mealy bugs were kept separately at room temperature to facilitate emergence of natural enemies. Emerged natural enemies were also preserved in 70% ethanol solution. All the collected specimens were identified with the help of standard keys prescribed by National Bureau of Agricultural Insect Resources and Indian Council of Agriculture Research.

III. RESULTS AND DISCUSSION

In the present study 25 plant species were observed for the survey of host range of mealybugs. The observed plant species were categorized into cereals, pulses, oilseed, vegetable, fruit, fibre, sugarcane, ornamental, medicinal, forest trees and weeds on the basis of economical value. Guava, hibiscus, mango, okra and papaya, Jack fruit, Citrus, Pumpkin Brinjal and tomato were identified as common hosts of mealy bugs. In the present studies a total of 25 plant species belonging to 7 families were recorded as hosts for mealy bugs. Most common families are Malvaceae, Solonaceae and Leguminaceae (Plate 3). Tomato, brinjal, papaya, aonla, hibiscus, Jack fruit etc were observed to be highly infested by mealybugs. The highest number of host plants of mealybugs were recorded in the family Malvaceae (07plant species), Asteraceae (3plant species) followed by Solonaceae (5plant species), Cucurbitaceae (03 plant species), Anacardiaceae (02 plant species), Rutaceae (02 plant species) and Poaceae (03 plant species) (Plate 2).

Mealybugs are soft, oval, wax-covered insects that feed on many plants in garden, landscape, and indoor settings. Usually found in colonies, they are piercing-sucking insects closely related to soft scales but lack the scale covers. Like soft scales, they can produce abundant honeydew and are often associated with black sooty mold. Mealybugs are favored by warm weather and thrive in areas without cold winters or on indoor plants. Mealybugs are in the insect family Pseudococcidae, part of the superfamily Coccoidea, which also includes armored scales, soft scales, and cottony cushion scale (Plate 1, Fig 1).

Mealy bug bodies are distinctly segmented and usually covered with wax. Older individuals may have wax filaments around their body margins. In some species the filaments are longer in the rear and can be used to help distinguish between different species.

Mealy bugs are usually found feeding in colonies in somewhat protected areas such as between two touching fruits, in the crown of a plant, in branch crotches, on stems near soil, or between the stem and touching leaves. A few mealy bug species feed on roots.

While adult females are wingless and similar in shape to nymphs, adult male mealybugs, which are rarely seen, are tiny two-winged insects with two long tail filaments. Many mealybug species can reproduce asexually without mating. Many woody ornamental plants and some herbaceous perennials can be infested including cactus, coral bells (*Heuchera*), figs (*Ficus*), flax grasses (*Phormium*), fuchsia, gardenia, hibiscus, jasmine, mimosa, *Miscanthus* grasses, and oleander. The cypress bark mealy bug can be a serious pest on Monterey cypress in urban areas and also attacks other species of cypress, cedar, and juniper.

Muthulingam and Vinobaba [16] identified eight different species of mealybugs and among them six were identified up to species level. Identified species were *P. solenopsis*, *Planococcus citri*, *F. virgata*, *P. marginatus*, *M. hirsutus* and *Dysmicoccus neobrevipes*. Nebie *et.al.*, [17] also identified two mealybug species in mango trees infested by *Icerya aegyptiaca* Douglas (Hemiptera: Monophlebidae) and *F. virgata* Cockerell (Hemiptera: Pseudococcidae).

Neetan and Aggarwal [8] recorded different natural enemies from mealy bug colonies which included four coccinellid predators, one parasitoid and one *Chrysoperla* species.

Ahmed and Abd-Rabou [13] studied the Host plants, geographical distribution, natural enemies of the citrus mealybug, *Planococcus citri*. The results indicated that the citrus mealy bug infested 65 plant species belonging to 56 genera in 36 families and distributed in 20 governorates. The results also observed the host plants and temperatures greatly influenced on the development of *P. citri*. The lowering of the temperature increased the dimension of the mealy bug and lengthened the developmental period.

The geographic distribution, abundance, severity and attack of an invading insect are directly related to its ability to feed and reproduce on several hosts, as well as to its ability to adapt to the environment [14]. In its native range, *M. hirsutus* has been recorded causing economic damage to many crops. In India, losses have been reported for cotton; the fibre crops *Hibiscus sabdariffa*, *Hibiscus cannabinus* and *Boehmeria nivea*; grapevine; mulberry; pigeonpea; *Zizyphus mauritiana*. Presumably, many ornamental woody plants are also affected, but populations and damage may be limited by natural enemies [7].

Pesticides have been a large part of control for mealybug and include sodium cyanide, sulfur fumigation, chlorinated hydrocarbons like DDT and organophosphates like parathion, neonicotinoids, botanical insecticides, biosynthesis inhibitors, and insect growth regulators (Danne, *et.al.*, [10] and Oliver *et.al.*, [11]. Mealybug control often involves the control of caretaking ants that are important for the proper development of mealybugs. Without the ants, mealybug populations are small and slow to invade new areas and the field would be free of a serious mealybug infestation. Therefore, management of mealybugs often includes the control of ant species. For management of mealybugs, it is important to know the species present as management programs for the various mealybugs may differ. Plant protection products are of limited

effectiveness against mealybugs because of their habit of hiding in crevices and the presence of waxy covering of its body [12].

The results of this study will make important contributions for the background on the diversity of host plants for mealy bugs in different agroecosystems, in the eastern UP of Bahraich district.

VI. CONCLUSIONS

This study shows the need to explore opportunities for sustainable control of this insect pest. But it is important to consider the indigenous species of mealybugs in the control strategy. The management of these mealybugs' species needs additional research on their host plants and their natural enemies.

In addition, the identification of plant species that are potential reservoirs of these mealy bugs provides subsidies for the correspondent implementation of integrated pest management programs.

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Plate-1

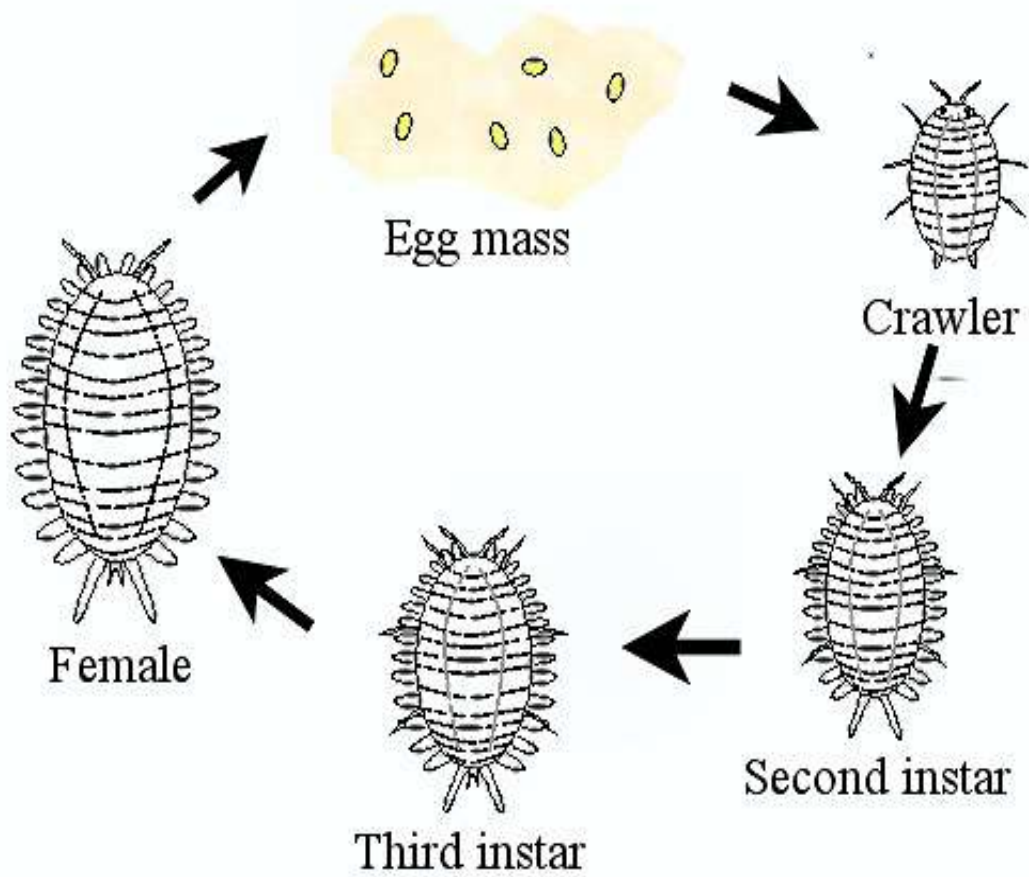


Fig 1: Life cycle of Common Mealy Bugs

Plate-2

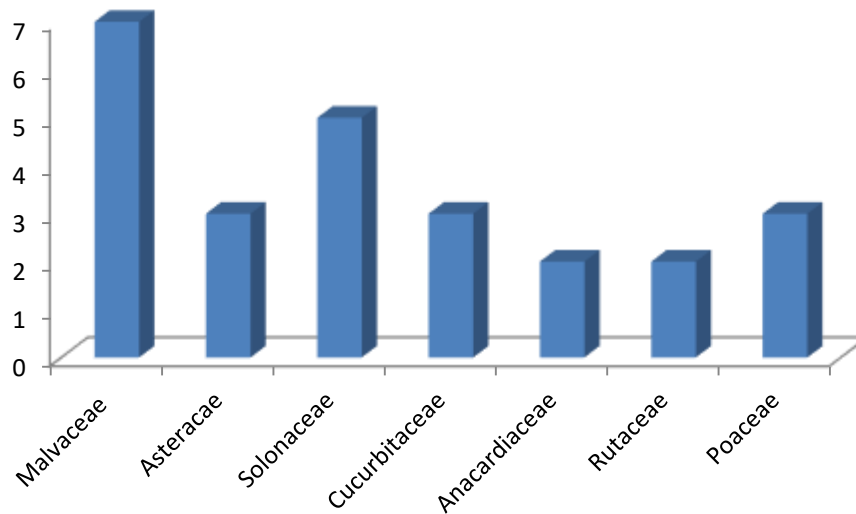


Fig.- No. of Host plants infected by Mealy bug

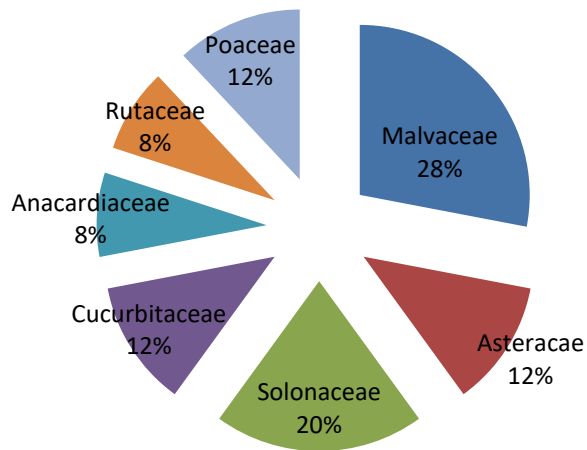


Fig.-Prevalence percentage of Mealy bug infestation on different host plants

Plate-3



Fig: Mealy bugs infestation on different host plants