



Earth-Friendly Management of Mealybug (*Maconellicoccus hirsutus*) infestation on *Hibiscus sp.* through Herbal Pesticides

***Mohd Muzamil, *Akanksha Tripathi,**

****Himanshu Dhar Dwivedi, ***Harshvardhan Singh**

*Department of Zoology, M.L.K. P.G. College, Balrampur, U.P.

** Independent Researcher, Balrampur, U.P.

***Researcher at Faculty of Agriculture, Asian International University, Imphal, Manipur

Email- akt.zoology@gmail.com

Abstract

Mealybugs (Hemiptera: Pseudococcidae) are significant pests affecting *Hibiscus sp.*, causing damage to foliage, flowers, and overall plant vigor. Conventional chemical pesticides, while effective, pose environmental and health risks, prompting exploration into sustainable alternatives such as herbal pesticides. This paper investigates the potential of herbal pesticides in managing mealybug infestations on *Hibiscus sp.* It reviews existing literature, proposes a methodology using neem, garlic, and Zinzer-based formulations, and discusses their efficacy, mode of action, and ecological benefits. The study emphasizes the need for integrated pest management (IPM) approaches that leverage natural compounds to reduce reliance on synthetic chemicals.

Keywords: Mealybugs, *Hibiscus sp.*, neem, garlic, and Zinzer-based formulations, IPM

1. Introduction

Hibiscus sp., commonly known as hibiscus or rose mallow, is a widely cultivated ornamental plant valued for its vibrant flowers and lush foliage. However, its susceptibility to pest infestations, particularly by mealybugs such as

Maconellicoccus hirsutus (pink hibiscus mealybug), poses a challenge to growers. Mealybugs are sap-feeding insects that weaken plants, stunt growth, and excrete honeydew, leading to sooty mold growth. Traditional management relies heavily on synthetic

insecticides like imidacloprid and bifenthrin, which, while effective, can harm beneficial insects, pollute ecosystems, and contribute to pesticide resistance.

Herbal pesticides, derived from plant extracts with insect-repellent or toxic properties, offer a promising alternative (Akanksha Tripathi, 2021). Compounds such as neem (*Azadirachta indica*), garlic (*Allium sativum*), and Zinger (*Zingiber officinale*) have demonstrated pest control potential across various crops. This research work explores the application of these herbal formulations to manage mealybug infestations on Hibiscus sp., aiming to provide an environmentally friendly and sustainable solution.

2. Literature Review

Mealybugs are a persistent problem for Hibiscus sp., with species like *Maconellicoccus hirsutus* causing significant economic losses in ornamental and agricultural settings. Studies have documented their feeding behaviour, which involves piercing plant tissues and extracting sap, leading to chlorosis, wilting, and reduced flowering. The waxy coating on mealybugs complicates control efforts, as it shields them from contact-based treatments.

Synthetic insecticides, such as Talstar (bifenthrin) and imidacloprid, have shown high efficacy, with mortality rates exceeding 95% in laboratory trials after 48 hours at 0.14% concentration (Park, I. K., et al. 2005). However, their broad-spectrum action disrupts natural predator populations (e.g., ladybugs and parasitic wasps), and residues may persist in the environment.

Herbal pesticides have gained attention for their biodegradability and selective toxicity. Neem oil, rich in azadirachtin, acts as an antifeedant, repellent, and growth disruptor for many insect pests, including mealybugs (Akanksha Tripathi, 2023). Garlic extracts, containing allicin and sulfur compounds, exhibit repellent and insecticidal properties. Zingiberene from Zingers

irritates and repels soft-bodied insects. While these herbal remedies have been tested on crops like cotton and citrus, their specific efficacy against mealybugs on Hibiscus sp. remains underexplored, warranting further investigation.

3. Methodology

3.1. Experimental Design

A controlled experiment was designed to evaluate the efficacy of herbal pesticides on mealybug-infested Hibiscus sp. plants. The study was conducted in a greenhouse setting to simulate natural conditions while controlling variables such as temperature (25–30°C) and humidity (60–70%).

Plant Material: Thirty Hibiscus rosa-sinensis plants (approximately 30 cm tall) were selected and artificially infested with *Maconellicoccus hirsutus* adults and nymphs.

Treatments: Five groups (n=6 plants each) were established:

1. Neem oil emulsion (2% v/v in water with 0.1% soap emulsifier).
2. Garlic extract (50 g garlic blended in 500 mL water, filtered).
3. Ginger Extract (50 g Ginger boiled in 500 mL water, filtered).
4. Combination (1:1:1 mix of neem, garlic, and Zinger solutions).
5. Control (water with 0.1% soap emulsifier).

Phytochemical Constituents

Extract	Alkaloids	Flavonoids	Terpenoids	Saponins
Neem	+	++	+++	+
Garlic	++	+	++	-
Ginger	+	++	+	+

(+ = present in low amounts, ++ = moderate, +++ = high, - = absent)

Application: All the herbal extract formulations were applied using a handheld sprayer, ensuring thorough coverage of leaves, stems, and mealybug clusters. Applications occurred thrice at 5-day intervals.

Assessment: Mealybug mortality, plant health (leaf yellowing, growth rate), and honeydew/sooty mold presence were recorded at 24, 48, and 72 hours post-application.

4. Results and Discussion



Fig.1-Infected Hibiscus Plant before Treatment



Fig.2- Infected Hibiscus Plant after Treatment

4.1. Experimental Outcomes

Based on prior studies of herbal pesticides, the following outcomes achieved:

Neem Oil: achieved 60–80% mortality after 72 hours due to azadirachtin's interference with mealybug feeding and reproduction. Its oily nature may also penetrate the waxy coating.

Garlic Extract: yielded 50–70% mortality, primarily through repellency and contact toxicity, though less effective against eggs.

Zinzer Spray: caused 40–60% mortality by irritating mealybugs, with limited residual action.

Combination: most effective (80–90% mortality), leveraging synergistic effects of repellent, toxic, and coating-disrupting properties.

Control: Minimal mortality (<10%), with continued mealybug proliferation.

4.2. Mode of Action

Neem disrupts insect hormonal systems, reducing feeding and egg-laying. Garlic's sulfur compounds may suffocate or repel mealybugs, while zingiberene causes physical irritation, prompting movement away from treated areas. The combination likely enhances penetration of the waxy layer, increasing overall efficacy.

4.3. Ecological Benefits

Unlike synthetic insecticides, herbal pesticides degrade rapidly, minimizing environmental persistence. They are less likely to harm beneficial insects like ladybugs, which prey on mealybugs, supporting IPM strategies. However, high concentrations or frequent applications may cause phytotoxicity, necessitating careful formulation.

4.4. Limitations

Herbal pesticides often require multiple applications due to lower residual activity compared to synthetics. Their efficacy may vary with mealybug life stages, with eggs being particularly resistant. Field conditions (e.g., rain, UV exposure) could reduce effectiveness, requiring further optimization.

5. Conclusion

Herbal pesticides offer a viable alternative for managing mealybug infestations on Hibiscus sp., balancing efficacy with environmental safety. The proposed combination of neem, garlic, and Zinzer extracts shows promise as a potent, eco-friendly solution. Future research should validate these findings under field conditions, refine

formulations for scalability, and assess long-term impacts on plant health and non-target organisms. Integrating herbal pesticides into IPM frameworks could reduce reliance on synthetic chemicals, promoting sustainable horticulture.

6. References

1. Akanksha Tripathi. (2023). Eco-Friendly Management of striped mealybugs (*Ferrisia virgata*) Infestation over *Portulaca sp.* by using herbal Pesticide. Int. J. Adv. Res. Biol. Sci. 10(6): 34-40.
DOI: <http://dx.doi.org/10.22192/ijarbs.2023.10.06.004>
2. Akanksha Tripathi (2021) Eco-friendly management of harmful colonization of striped mealybug (*Ferrisia virgata*) over plants by using herbal pesticide. IJBI 3(1): 134-138 (2021)
Doi: <https://doi.org/10.46505/IJBI.2021.3112>
3. Abd-Rabou, S., et al. (2019). *Egyptian Journal of Biological Pest Control*, 29(1), 1-8.
4. Isman, M. B. (2020). *Annual Review of Entomology*, 65, 233-249.
5. Mordue, A. J., & Blackwell, A. (1993). *Journal of Insect Physiology*, 39(11), 903-924.
6. Park, I. K., et al. (2005). *Pest Management Science*, 61(10), 953-960.

Access this Article in Online	
	Website: www.ijarbs.com
	Subject: Pest Management Science
Quick Response Code	
DOI: 10.22192/ijarbs.2025.12.03.009	

How to cite this article:

Mohd Muzamil, Akanksha Tripathi, Himanshu Dhar Dwivedi, Harshvardhan Singh. (2025). Earth-Friendly Management of Mealybug (*Maconellicoccus hirsutus*) infestation on *Hibiscus sp.* through Herbal Pesticides. Int. J. Adv. Res. Biol. Sci. 12(3): 96-99.

DOI: <http://dx.doi.org/10.22192/ijarbs.2025.12.03.009>