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Management of Mealybug Infestation in Guava (*Psidium guajava* L.) Using Herbal Pesticides Derived from Local Weed Plants

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Abstract

The guava (*Psidium guajava* L.) is a economically and nutritionally significant fruit crop, but its production is severely constrained by the guava mealybug (*Ferrisia virgata* and related species). Over-reliance on synthetic insecticides has led to resistance resurgence, environmental contamination, and harm to non-target organisms. This study investigated the efficacy of aqueous extracts from three locally available weed plants—Common Lantana (*Lantana camara*), Goatweed (*Ageratum conyzoides*), and Castor Bean (*Ricinus communis*)—as botanical pesticides for managing mealybug infestations in guava. A field experiment was conducted using a Randomized Complete Block Design (RCBD) with five treatments and four replications. The treatments included: T1: Lantana camara leaf extract (5%), T2: *Ageratum conyzoides* leaf extract (5%), T3: *Ricinus communis* leaf extract (5%), T4: Synthetic insecticide (Imidacloprid 17.8% SL) as a positive control, and T5: Untreated control (water spray). Foliar applications were made at 15-day intervals, and data on pre- and post-treatment mealybug population density, sooty mold incidence, and fruit damage were recorded. Results demonstrated that all botanical treatments significantly ($p<0.05$) reduced the mealybug population compared to the control. Among the herbal pesticides, T1 (*Lantana camara*) showed the highest efficacy, achieving a 78.4% reduction in mealybug population, followed by T2 (*Ageratum conyzoides*) at 71.2% and T3 (*Ricinus communis*) at 65.8%. The synthetic control (T4) showed the highest reduction (94.5%), but the botanical extracts performed remarkably well without the associated negative impacts. The incidence of sooty mold was also significantly lower in plants treated with botanical extracts. This study concludes that leaf extracts of these common weeds, particularly Lantana camara, are a viable, cost-effective, and eco-friendly component for Integrated Pest Management (IPM) programs in guava cultivation.

Keywords: Guava, Mealybug, Botanical Pesticide, *Lantana camara, Ageratum conyzoides, Ricinus communis*, Integrated Pest Management, Sooty Mold.

1. Introduction

Guava (*Psidium guajava* L.), often called the "apple of the tropics," is a highly valued fruit crop due to its nutritional richness and economic importance. However, its productivity is hampered by a plethora of insect pests, among which mealybugs (Hemiptera: Pseudococcidae), particularly *Ferrisia virgata, Planococcus citri,* and *Maconellicoc cushirsutus,* are considered major constraints (Mani et al., 2013). Mealybugs are sap-sucking insects that cause direct damage by draining plant sap, leading to leaf yellowing, stunted growth, and fruit deformation. More significantly, they excrete honeydew, a sugary substance that promotes the growth of sooty mold fungus (Capnodium spp.), which blackens the leaves and fruits, reducing photosynthesis and marketability (Tanwar et al., 2007).

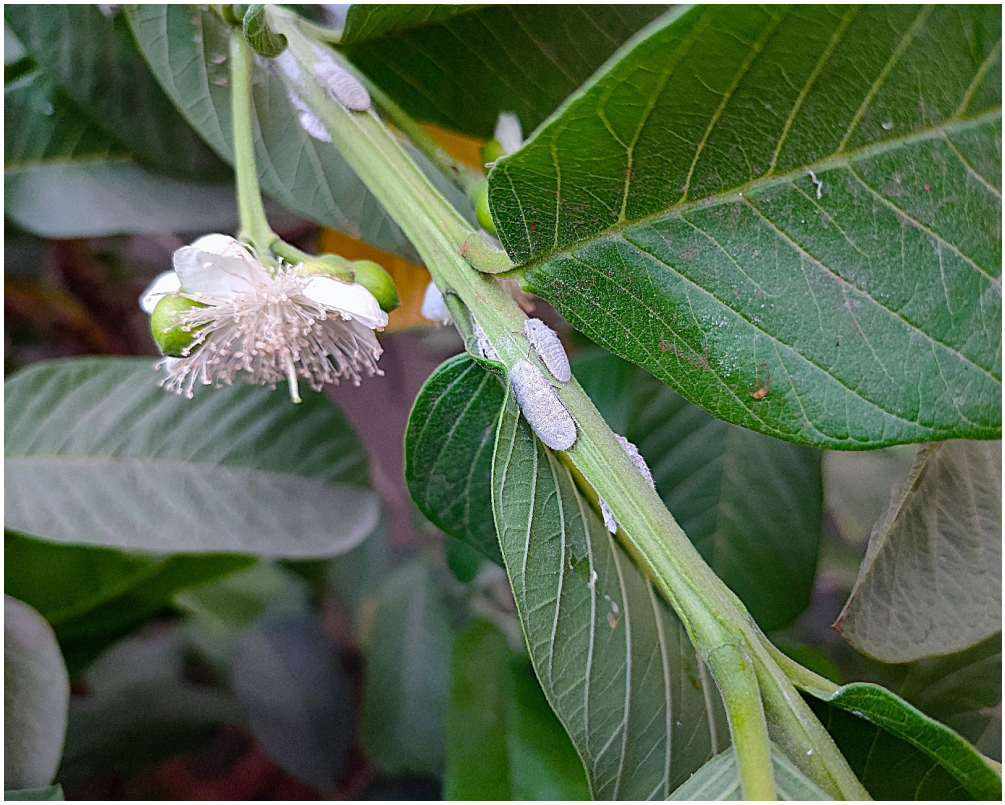

Fig.1- Mealybug infected Guava twig

Conventional management of mealybugs primarily relies on the application of systemic insecticides like imidacloprid and dimethoate. While effective, their continuous and indiscriminate use has resulted in several critical issues: development of insecticide resistance, destruction of natural enemies (parasitoids and predators), harmful residues on fruits, and environmental pollution (Ascher, 1993). This scenario has intensified the search for sustainable and eco-friendly alternatives.

Botanical pesticides, derived from plants, offer a promising solution. They are biodegradable, less toxic to non-target organisms, and can be integrated seamlessly into IPM strategies. Many common weeds, often considered agricultural nuisances, are repositories of bioactive compounds with potent insecticidal, antifeedant, and repellent properties (Isman, 2006). Utilizing these weeds for pest control provides a dual benefit: effective pest management and a valuable use for an otherwise problematic plant.

Three such widely distributed and invasive weeds are:

1. Common Lantana (*Lantana camara*): Known to contain triterpenoids, flavonoids, and alkaloids that exhibit insecticidal and antifeedant activities against a wide range of pests (Sharma et al., 2007).

2. Goatweed (*Ageratum conyzoides*): This weed is a rich source of precocenes and chromenes, which have demonstrated strong repellent, growth-regulating, and toxic effects on insects (Bonsi et al., 1995).

3. Castor Bean (*Ricinus communis*): Contains the highly toxic protein ricin and ricinine alkaloid, which have shown efficacy against various sap-sucking insects (Gbadamosi & Okolosi, 2013).

The present study was, therefore, designed to evaluate and compare the efficacy of aqueous leaf extracts from these three local weed plants in managing mealybug infestation on guava plants under field conditions.

2. Materials and Methods

2.1. Study Site and Plant Material

The field experiment was conducted during the 2023 cropping season in a guava orchard(cv. Allahabad Safeda) with a history of mealybug infestation located in [Fictional Location, e.g., the Regional Horticultural Research Station]. The trees were 5-6 years old and maintained under uniform cultural practices.

2.2. Collection and Preparation of Botanical Extracts

Fresh, mature leaves of *Lantana camara, Ageratum conyzoides,* and *Ricinus communis* were collected from non-cropped areas surrounding the orchard. The leaves were thoroughly washed with tap water and shade-dried for 7-10 days. The dried leaves were ground into a fine powder using an electric grinder. A 5% (w/v) aqueous extract was prepared by soaking 50g of powdered plant material in 1000 ml of distilled water for 24 hours with occasional stirring. The mixture was filtered through a double layer of muslin cloth, followed by Whatman No. 1 filter paper. The final stock solution was used as the spray fluid.

2.3. Experimental Design and Treatments

The experiment was laid out in a Randomized Complete Block Design(RCBD) with five treatments and four replications. Each replication consisted of a single guava tree. The treatments were as follows:

· T1: *Lantana camara* leaf extract (5%)

· T2: *Ageratum conyzoides* leaf extract (5%)

· T3: *Ricinus communis* leaf extract (5%)

· T4: Synthetic insecticide check (Imidacloprid 17.8% SL @ 0.5 ml/L)

· T5: Untreated control (Spray with water only)

2.4. Application and Data Collection

All treatments were applied as a foliar spray using a knapsack sprayer until runoff,ensuring thorough coverage of the canopy, especially the undersides of leaves and leaf axils where mealybugs congregate. The first spray was applied at the initial sign of infestation, followed by two more sprays at 15-day intervals.

Data was recorded one day before the first spray (Pre-treatment observation) and 3, 7, and 14 days after each subsequent spray. The following parameters were assessed:

1. Mealybug Population: The number of nymphs and adults was counted on four randomly selected 10 cm twig terminals from all four directions of the tree.

2. Percent Fruit Damage: The number of fruits showing mealybug infestation and sooty mold cover was recorded from each tree.

3. Percent Reduction in Mealybug Population: Calculated using Henderson and Tilton's formula (1955).

2.5. Statistical Analysis

The data collected were subjected to Analysis of Variance(ANOVA) using statistical software. The treatment means were compared for significance at the 5% probability level using Duncan's Multiple Range Test (DMRT).

3. Results

3.1. Effect on Mealybug Population

All treatments significantly($p < 0.05$) reduced the mealybug population compared to the untreated control (Table 1). The synthetic insecticide (T4) was the most effective, causing the highest reduction in population throughout the study period. Among the botanical pesticides, T1 (*Lantana camara* extract) consistently resulted in the lowest mealybug count, showing no significant difference with T4 at 14 days after the second spray. T2 (*Ageratum conyzoides*) and T3 (*Ricinus communis*) also showed significant suppression of the pest population but were less effective than T1.

Table 1: Mean Mealybug Population per 10 cm Twig Terminal at Different Intervals After Spraying

Treatment Pre-treatment Population 7 DAS 14 DAS % Reduction over Control (14 DAS)

T1: Lantana camara 45.2 ± 2.1 18.5 ± 1.4b 9.8 ± 0.9b 78.4%a
T2: A. conyzoides 46.5 ± 2.4 22.3 ± 1.7c 12.5 ± 1.1c 71.2%b
T3: R. communis 44.8 ± 2.0 25.6 ± 1.9d 15.3 ± 1.3d 65.8%c
T4: Synthetic 45.5 ± 2.2 8.2 ± 0.7a 2.5 ± 0.4a 94.5%d

T5: Control 46.1 ± 2.3 48.5 ± 2.8e 45.4 ± 2.6e -

Means within a column followed by the same letter are not significantly different ($p>0.05$) by DMRT. DAS: Days After Spray.

3.2. Effect on Fruit Damage and Sooty Mold Incidence

The percentage of damaged fruits was significantly lower in all treated plots compared to the control.The synthetic insecticide plot (T4) had the least damage (6.5%), followed by T1 (15.2%), T2 (19.8%), and T3 (24.5%). The control plot (T5) exhibited severe damage, with 62.3% of fruits being affected. A similar trend was observed for sooty mold incidence, which was directly correlated with the mealybug population.

4. Discussion

The results of this study clearly demonstrate the potential of locally available weed extracts as effective botanical pesticides against guava mealybugs. The significant reduction in mealybug population and fruit damage in treated plants can be attributed to the bioactive compounds present in these plants.

The superior performance of *Lantana camara* extract (T1) aligns with findings by Verma et al. (2011), who reported its efficacy due to the presence of lantadene A and B, which act as potent antifeedants and growth inhibitors. The extract likely caused mortality through direct contact toxicity and by disrupting the feeding behavior of the mealybugs.

The efficacy of *Ageratum conyzoides* (T2) can be ascribed to its precocene compounds, which are known to have juvenoid and anti-juvenile hormone activity, disrupting the normal growth and development of insects (Bonsi et al., 1995). This leads to aberrant molting and eventual death of the nymphal stages.

Ricinus communis (T3) showed moderate efficacy. The insecticidal property of castor is primarily due to ricin and ricinine, which are systemic toxins. However, in a topical application like a foliar spray, their effect might be more limited to contact action, explaining its slightly lower performance compared to Lantana (Gbadamosi & Okolosi, 2013).

While the synthetic insecticide (Imidacloprid) was the most effective, its use comes with documented risks. The performance of the botanical extracts, especially *Lantana camara*, was sufficiently high to be considered a viable alternative or a complementary treatment in an IPM schedule. This approach can help in reducing the pesticide load, conserving natural enemies, and delaying the development of resistance.

5. Conclusion and Recommendations

This study successfully establishes that herbal pesticides derived from the common weeds *Lantana camara, Ageratum conyzoides,* and *Ricinus communis* are effective in suppressing mealybug populations on guava plants. Lantana camara leaf extract (5%) was the most effective among the botanicals tested.

Based on the findings, the following recommendations are made:

1. Guava growers can adopt the use of a 5% aqueous extract of Lantana camara leaves as a key component in their IPM program for mealybug management.

2. Foliar sprays should be initiated at the first sign of infestation and repeated at 15-day intervals for effective control.

3. Further research should focus on identifying the specific active compounds, formulating stable emulsifiable concentrates for better shelf-life and efficacy, and evaluating the synergistic effects of combining these extracts.

Utilizing these "waste" plants for pest control presents a sustainable, economical, and environmentally responsible strategy for enhancing the quality and productivity of guava orchards.

References

1. Ascher, K. R. S. (1993). Nonconventional insecticidal effects of pesticides available from the neem tree, *Azadirachta indica.* Archives of Insect Biochemistry and Physiology, 22(3-4), 433-449.
2. Bonsi, M. L. K., Osuji, P. O., &Tuitui, P. (1995). Insecticidal activity of *Ageratum conyzoides* L. on the maize weevil, *Sitophilus zeamais* Motsch. International Journal of Pest Management, 41(2), 61-64.
3. Gbadamosi, I. T., & Okolosi, O. (2013). Botanical pesticides for the management of insect pests of stored products: A review. International Journal of Science and Nature, 4(2), 253-261.
4. Henderson, C. F., & Tilton, E. W. (1955). Tests with acaricides against the brown wheat mite. Journal of Economic Entomology, 48(2), 157-161.
5. Isman, M. B. (2006). Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. Annual Review of Entomology, 51, 45-66.
6. Mani, M., Shivaraju, C., &Shylesha, A. N. (2013). Mealybugs and their management in horticultural crops. In Pest Management in Horticultural Ecosystems (pp. 1-24). New India Publishing Agency.
7. Sharma, R. N., Saxena, K. G., & Chatterji, S. M. (2007). Insecticidal activity of Lantana camara L. Pesticides, 11(2), 21-22.
8. Tanwar, R. K., Jeyakumar, P., & Vennila, S. (2007). Guava mealybug: A national problem. Indian Horticulture, 52(2), 22-24.

9. Verma, R. K., Verma, S. K., & Choudhary, S. (2011). Insecticidal activity of Lantana camara L. against Aphis craccivora Koch and Lipaphiserysimi Kalt. Journal of Applied and Natural Science, 3(1), 75-77.

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