

Assessing the Effectiveness of *Phauda flammans* Walker (Lepidoptera: Zygaenidae) Pest Control Methods in Different Banyan Tree Management Organizations

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Abstract

This study investigates the effectiveness of *Phauda flammans* pest control methods for managing Banyan Trees. It evaluates physical control measures, monitors environmental factors, examines historical situations and preventive/control methods, considers local environmental ecology, and utilizes data to comprehend pest conditions. The findings reveal the efficacy of adhesive tape physical control techniques, while the effectiveness of hemp mats remains uncertain. Moreover, adverse weather conditions are found to decrease pest densities and minimize tree damage, underscoring the significance of integrating environmental factors into pest control strategies.



Figure 1. The whole banyan tree crowns were eaten away by *Phauda flammans* larvae

Objectives

Pest management research aims to develop effective solutions by addressing knowledge gaps through various methodologies. This includes understanding the biology and ecology of *Phauda flammans* to identify vulnerabilities and target specific life cycle stages for control measures. Research also focuses on studying the interactions between pests and their environment to exploit vulnerabilities related to environmental factors, increasing the efficiency and sustainability of pest management. Evaluating the effectiveness of different control methods and their impact on pest populations helps determine appropriate and sustainable strategies. Comprehensive analysis of pest dynamics through gathering information from diverse sources enables the development of context-specific pest control strategies. Ultimately, the goal is to advance environmentally friendly, economically viable, and socially acceptable practices for sustainable and effective pest management.

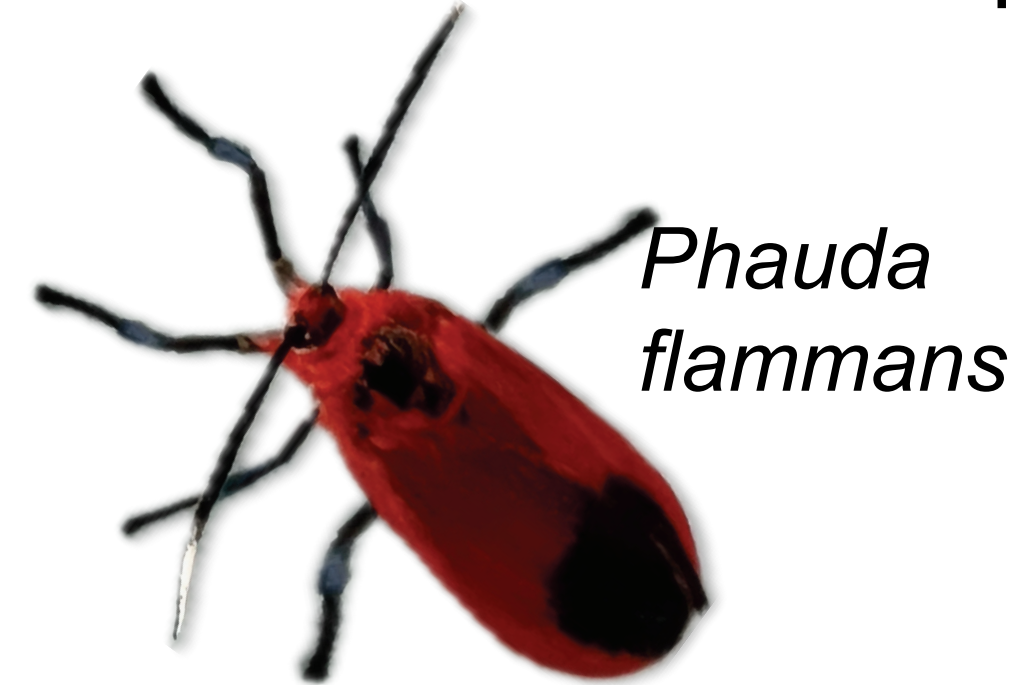


Figure 2. hemp mats control method on banyan tree trunk



Figure 3. adhesive tape control method on banyan tree trunk

Literature Review

Rising global temperatures have intensified the feeding behaviour of insects, particularly *Phauda flammans*, on banyan tree leaves. This has resulted in extensive leaf consumption, leading to an abundance of larvae on the ground. While banyan trees can usually regenerate leaves, the presence of withered branches raises safety concerns due to an increased risk of accidents or injuries from falling. The combined effects of larvae infestation, foliage loss, and the strain of leaf regeneration pose significant challenges to the overall health and vitality of banyan trees. Additionally, the presence of brown root rot disease further compromises the tree's ability to fully recover, increasing the risk of tree mortality or collapse. The outbreak of the *Phauda flammans* pest in Hong Kong in 2020 can be attributed to the complex interplay between weather patterns and temperatures. The absence of cold weather in 2019 disrupted the natural hibernation patterns of moths, while the banyan tree's leaf regrowth was insufficient to sustain the feeding demands of the *Phauda flammans* population. As a result, the pest spread

extensively, causing severe ecological and environmental repercussions throughout Hong Kong.

Methodology

A total of 70 banyan trees were carefully selected from various tree management organizations. Two distinct physical control methods were employed: 1. hemp/straw mats and 2. adhesive tape, based on their potential to impede the movement and pupation of *Phauda flammans*. These control methods were meticulously implemented on the chosen trees to assess their effectiveness in managing the pest population. The primary objective of this research is to create an unfavourable environment for pests by utilizing a combination of hemp/straw mats and adhesive tape, thereby impeding their reproductive capabilities and leading to a reduction in their numbers. Besides the treated trees, 20 banyan trees were designated as control subjects, remaining untreated throughout the study to establish a baseline for comparison. By analyzing the variations in pest infestation levels between the treated trees and the control group, researchers can evaluate the impact and efficacy of the selected control methods.

Results

During the nine-month study, conducted from August 28, 2023, to April 27, 2024, the impact of different control methods on *Ficus* tree crown density was thoroughly examined. Monthly measurements of crown density were recorded and analysed, revealing distinct patterns. The Hemp mats control method consistently maintained a crown density below 80, while the Adhesive tape control method resulted in densities consistently above 80. Notably, the Tin Yiu (2) Estate exhibited a significant increase in crown density, indicating the positive impact of the adhesive tape control method. In contrast, the control group showed minimal changes in crown density.

Discussions

Insufficient replacement of hessian mat coverings promotes larvae's establishment of pupation sites, facilitating their life cycle and increasing the risk of future infestations. However, the use of adhesive tape to capture *Phauda flammans* larvae and adults raises concerns about unintentionally trapping beneficial insects and other creatures. In the vicinity of Tin Shui Wai's area, which neighbours a wetland conservation area, migratory birds regularly pass through, seeking abundant insect populations. These insects not only provide nourishment for the birds' flight preparations but also contribute to ecological balance by controlling insect populations. The proximity of Tin Shui Path to a river frequently visited by migratory birds creates favourable conditions where pesticide-free *Phauda flammans* become a desirable food source for these avian visitors.

Conclusion

- Adhesive tape as a physical control technique for banyan trees demonstrated favourable outcomes in managing *Phauda flammans* pests.
- The effectiveness of Hessian mats for physical control remains uncertain.
- Adverse weather conditions were observed to decrease pest density and mitigate damage to banyan trees.
- The research highlights the importance of considering environmental aspects, such as temperature and weather conditions, in pest control strategies.