



**Effect of Varietal Difference of Coconut Palms on the Population Dynamics of
Goniozus Nephantidis Muesebeck (Hymenoptera: Bethyridae) Parasitizing Opisina
Arenosella Walker (Lepidoptera: Oecophoridae), the Black Headead Caterpillar
Pest of Coconut**

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DOI : <https://doi.org/10.5281/zenodo.19876916>

ARTICLE DETAILS

Research Paper

Accepted: 16-04-2026

Published: 10-05-2026

Keywords:

biological control,
parasitoid, coconut pest,
Goniozus nephantidis,
Opisina arenosella

ABSTRACT

This study investigates the biology of *Goniozus nephantidis*, a key parasitoid of the coconut pest *Opisina arenosella*, reared on two coconut varieties: West Coast Tall (WCT) and Malayan Green Dwarf (MGD). The research evaluates developmental parameters such as fecundity, incubation period, larval and pupal duration, and adult longevity. Biochemical analyses of coconut leaves, including nitrogen, phosphorus, potassium, chlorophyll, moisture, and protein content, were also conducted. The findings reveal that most biological parameters did not differ significantly between the two varieties, except for larval duration and adult longevity variations. The results suggest that slight biochemical differences in host plants indirectly influence parasitoid development. This study contributes to improving biological control strategies for coconut pests.

Introduction

The coconut palm is one of the most useful of all the tropical plants. More than one part of the tree is used commercially from top to bottom and hence coconut palm is also known as 'Kalpavriksha'. It needs optimum climate, bright sunshine, fairly high humidity and well distributed rainfall, averaging 100cm. The major coconut growing state in India is Kerala. Karnataka, Tamilnadu and Andhra Pradesh are the other major contributors.



Coconut (*Cocos nucifera*) is a vital tropical crop widely cultivated in India, particularly in Kerala. It is often referred to as 'Kalpavriksha' due to its multiple uses. However, coconut cultivation is severely affected by pests such as *Opisina arenosella*, commonly known as the black-headed caterpillar. This pest causes significant damage to coconut leaves, reducing yield and plant health.

Biological control using parasitoids has proven to be an effective strategy in managing pest populations. *Goniozus nephantidis*, a larval ectoparasitoid, plays a crucial role in controlling *O. arenosella* populations. The development and efficiency of parasitoids are often influenced by the host plant's biochemical composition. This study aims to evaluate the biology of *G. nephantidis* on *O. arenosella* reared on two coconut varieties and to assess the influence of plant biochemical factors on parasitoid development.

Review of literature

Coconut and Palmyra palm (*Borassus flabellifer*) are the major host plants of *Opisina arenosella* (Antony, 1962). *Opisina arenosella*, the black headed caterpillar pest of coconut, is a voraciously feeding, defoliating pest and accounts for more than 90% of leaf damage, during the periods of severe infestation (Nirula, 1965). *Opisina arenosella* Walker (Lepidoptera: Oecophoridae) stands out as a predominant leaf feeder in peninsular India. The larvae attack palms of any age from nursery to grown up plants causing severe yield loss ranging from 25 to 75 per cent (Lal, 1968).

Opisina arenosella causes severe damages to coconut leaflets and it results in the reduction in number of flower spikes, immature nut fall and retardation of growth (Dharmaraju; 1963).

Opisina arenosella Walker is subjected to attack by many entomophagous insects during its developmental stages. Ever since the pest infestation became a threat to coconut cultivation, many have reported and studied the biology and behaviour of many parasitoids and have utilized them in biological control practices (Rao, 1924 and 1926).

A checklist of all parasitoids, parasites, predators and hyperparasites of *O.arenosella* in Ceylon and India were studied, recorded and published. The important larval parasitoids listed were *Apanteles taragmae*, *Diocetes* sp., *Microbracon brevicornis*, *Goniozus nephantidis* and *Elasmus nephantidis*. The pupal parasitoids include *Brachymeria nephantidis*, *Xanthopimpla punctata*, *Goryphus nursei*, *Winthemia* sp., *Eurytoma albotibialis* and *Thelairosoma gracilis* and the predators recorded were *Parena latecincta* and *Triphleps* sp (Dharmaraju, 1962).



Methodology

Coconut seedlings of WCT and MGD varieties were obtained and maintained under controlled conditions. *O. arenosella* larvae were collected and reared on leaves of respective coconut varieties. *G. nephantidis* adults were introduced to late instar larvae for parasitization.

Biochemical analyses of coconut leaves included estimation of nitrogen, phosphorus, potassium, chlorophyll, protein, and moisture content using standard laboratory techniques. Developmental parameters such as fecundity, incubation period, larval and pupal duration, and adult longevity were recorded. Statistical analysis was performed using ANOVA.

Results

The biochemical analysis indicated minor variations between WCT and MGD varieties. Most biological parameters of *G. nephantidis*, including fecundity and incubation period, did not show significant differences. However, larval duration and adult longevity showed statistically significant variation.

Parasitoids reared on MGD exhibited shorter larval periods, indicating faster development. Adult longevity also varied significantly between treatments, suggesting host plant influence.

Discussion

In the present study it is observed that *Goniozus nephantidis* prefer the late stage larvae of *Opisina arenosella* for parasitisation and oviposition. These observations are in agreement with the suitable host stage preference by *G. nephantidis* for parasitism and oviposition noted by Dharmaraju and Pradhan (1976). In some cases it stings the early instars even if its development cannot be a successful one (Pillai, and Bhat, 1986). This behavior indicates that *G. nephantidis* does help in eliminating host larval stages even though its progeny may not successfully complete their development.

The findings suggest that host plant biochemical composition indirectly affects parasitoid development. Although major nutrients showed minimal variation, differences in potassium and moisture may contribute to developmental changes.

The study aligns with previous research indicating that plant quality influences herbivore and parasitoid interactions. Faster development on MGD may enhance biological control efficiency, making it a preferable system for parasitoid multiplication.



Conclusion

This study demonstrates that coconut variety influences the developmental biology of *G. nephantidis* through indirect biochemical effects. The results highlight the importance of host plant selection in biological control programs. Further research is recommended to explore additional ecological and environmental factors influencing parasitoid efficiency.

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