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The effectiveness of biocontrol of *Opisina arenosella* (Lepidoptera: Oecophoridae) using *Bracon brevicornis* (Hymenoptera: Braconidae)

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Abstract

The Coconut black-headed caterpillar, *Opisina arenosella* Walker is a notorious pest of coconut in Kerala. Most damage is recorded from India and Srilanka. Caterpillars of this oecophorid prefer to live in a gallery of frassy material and they feed on leaf chlorophyll matter. *O. arenosella* causes significant yield losses in coconut crops, but there is a lack of scientific information whether this pest can be controlled effectively using biocontrol agents. This paper describes the effects of the parasitoid, *Bracon brevicornis* (Hymenoptera: Braconidae) on larvae of *O. arenosella*. The adult *B. brevicornis* gave excellent control of larvae of *O. arenosella*. These findings suggest that, repeated release of *B. brevicornis* was very effective. By controlling *O. arenosella*, using *B. brevicornis* is 78% of recovery was finally attained.

Keywords: *Opisina arenosella*, biological control, parasitoid, *Bracon brevicornis*

1. Introduction

The coconut black headed caterpillar, *Opisina arenosella* (Lepidoptera: Oecophoridae: Xyloryctinae) is a serious pest of coconut palm and palmyra palm. It is an endemic, frequently outbreaking pest of coconut in India, Sri-Lanka, Bangladesh and Myanmar. *O. arenosella* is a small and grayish white moth, commonly in coastal areas of Kerala ^[1]. Taxonomically *O. arenosella* comes under the family Oecophoridae and the genus *Opisina*. The population of *O. arenosella* is found to be present throughout the year and attain peak density during March to May. The major factors regulating the pest population were maximum temperature, sunshine and rainfall ^[2]. Duration of different life stages of *O. arenosella* as follows, 4-6 days for egg, 30-60 days for larval instars, 10-14 days for pupa and completed its life cycle within 50-75 days (Figure 2). Infestation of this pest is first noticed in Kerala is in Travacore in 1917 ^[3]. *O. arenosella* is one of the most serious pests of coconut palm in Andhra pradesh, Bihar, Goa, Karnataka, Kerala, Maharashtra, Orissa, Tamilnadu and Westbengal in India.

Species of the hymenopterans are main parasitoids of *O. arenosella*. *Bracon brevicornis* attack the larvae of *O. arenosella* and it is used for the control of the pest. With increase in larval parasitisation, reduce the pest population. Adult female laid the egg on larva of *O. arenosella*. Egg was hatch out in 1 or 2 days and larval period was 2-3 days. Larvae became pupa and early pupa is light cream colored and late pupa was brown in colour. Pupal period lasts for 3-4 days.

Insect pest such as *O. arenosella* can cause extensive damage to coconut across India. Among the coconut affected pests, *O. arenosella* is very serious one. This pest are difficult to manage with conventional methods. This pest population have been shown to progressively diminish through natural parasitoid interactions. Thus providing an effective and sustainable approach for controlling this pest. The main objective of this work was to test the effect of *B. brevicornis* use against pest *O. arenosella* for the management of this challenging pest *O. arenosella* in order to reduce its attack.

2. Materials and Methods

The work was conducted during the dry months of March to May. The *O. arenosella* infested plot of Tirurangadi Grama panchayath was selected for my study and fifty palms were marked in plot as sample trees. Tirurangadi is located at 11.05°N 75.93°E. It has an average elevation of 10 m (33 ft). From each tree, total number of leaves, pest infested leaves and then total number of leaflets and pest infested leaflets were counted.

2.1 Rearing of *Bracon brevicornis*

B. brevicornis is cultured in alternate host *Corcyra cephalonica* in laboratory and its breeding room is maintained at 26-30 °C during winter and in summer. Cocoons were collected and placed in glass chimneys for adult emergence. Emerging adults were collected at the rate of a minimum number of ten in 15×2.5 cm glass vials and plugged with cloth covered cotton wool.

For feeding the adults 50% honey was provided inside on cotton swabs. After giving sufficient time for the adults to mate and put with mature *C. cephalonica* larvae. They laid eggs on the *C. cephalonica* larvae. After parasitisation, the paralysed larvae containing eggs which then develop to mature *B. brevicornis*.to get bb

2.2 Release of *B. brevicornis* in affected area

A glass tube containing 20 insects were released on the crown of the palm. The glass tube was kept in the crown for 24 hours and thereby *B. brevicornis* were fully released. This procedure was applied to 50 coconut trees of the locality and from them they spread to other palms also. The releasing was done twice in a month and total releasing events were done 6 times in 3 months. The number and mode of attacked leaves on 50 coconut palms were noted before parasitoid releasing.

3. Result and Discussion

Biological control of insect pests is characterized by a persistent, strong reduction in the pest population following the introduction of a natural enemy. Successful biological control of the pest is possible only if large scale field release of the parasitoids is made in a wider area. Here the control over the *O. arenosella* is exercised in a wide area. Biological control of *O. arenosella* has been proven to be a very valuable asset to coconut palm producers in many areas in Kerala.

Analysis of mathematical models suggests that differential exploitation of patches of the pest in a spatially heterogeneous environment provides the most likely mechanism to account for known successes. After completing each releasing events of *B. brevicornis*, the progress is found on the coconut tree. 78% of recovery was finally attained. The percentage of recovery in each releasing was shown in table 1.

Table 1: Effect of releases of *B. brevicornis* on *O. arenosella* affected coconut palm

Releasing events	Mode of attack			Total number of palms	Percentage of recovery
	mild	moderate	severe		
1 st release	32	2	16	50	0%
2 nd release	24	3	14	41	18%
3 rd release	22	5	9	36	28%
4 th release	19	4	5	28	44%
5 th release	15	4	1	20	60%
6 th release	10	1	0	11	78%

The parasitoid *B. brevicornis* will survive as long as the pest is prevalent and therefore the control effect may last over a long period of time.

4. Conclusion

The controlling of *O. arenosella* using *B. brevicornis* is very effective. This biological control reveals the success of the controlling pest than any other methods.

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