

Research Articles

FIELD EVALUATION OF THE PROMISING SPECIES OF  
INDIGENOUS PARASITOIDS IN THE BIOLOGICAL SUPPRESSION  
OF *OPISINA ARENOSELLA* WALKER, THE COCONUT LEAF  
EATING CATERPILLAR

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ABSTRACT

Biological suppression of the coconut leaf eating caterpillar *Opisina arenosella* is achieved by nearly 40 species of parasitoids and 20 species of predators. Among these, the bethylid, elasmid and chalcidid parasitoids are the most promising ones. Release of these stage-specific parasitoids at the fixed norms and intervals resulted in significant reduction (94%) in pest population after two years.

INTRODUCTION

*Opisina arenosella* Walker (Lepidoptera : Oecophoridae) is one of the key pests of the coconut palm in the coastal and backwater tracts and sometimes in the river belts and bunds of paddy fields. It infests the coconut palm almost throughout the year with peak infestation during the months of February to May, but this may even prolong to June, in cases of delayed South West monsoon.

Parasitoids, predators and pathogens play an effective role in the natural biological suppression of *O. arenosella*. List of natural enemies associated with the pest in Sri Lanka was prepared by Perera (1993), Cock and Perera (1987) and in India by Pillai and Nair (1993). Among the 40 parasitoids recorded from India, the larval parasitoid *Goniozus nephantidis* (Mues.) (Bethylidae), the pre-pupal parasitoid *Elasmus nephantidis* Rohw. (Elasmidae) and the pupal parasitoid *Brachymeria nosatoi* Habu (Chalcididae) are the most promising ones. Sathiamma *et al.* (1987) fixed the norms for the release of these effective parasitoids based on the

occurrence of target stages of pest in the field. The present paper summarises the results on the field evaluation of the bethylid, elasmid and chalcidid parasitoids at fixed norms for the biosuppression of *O. arenosella*.

MATERIALS AND METHODS

Five hundred palms were selected in the backwater area at Thodiyur (Kollam Dt., Kerala). Twenty per cent palms were marked at random as sample palms for observations. Pre - and post - release observations were recorded. The data recorded were total number of leaves, infested leaves, 20% leaves from the lower/middle whorl marked as sample leaves and population of the different stages of the pest, parasitoids and predators from 41 - 60% leaflets of the 20% sample leaves. From the data thus obtained, population was estimated based on the sampling formula evolved by George *et al.* (1984):

1. November - January  $Y = 6.36 + 8.99X$
2. February - March  $Y = 22.59 + 5.75X$
3. April - June  $Y = 38.40 + 9.70X$
4. July - October  $Y = 20.57 + 6.20X$

'X' = pest count in the sample leaflets;  
'Y' = estimated population

The parasitoids were released after assessing the population of the target stage/s of the pest at fortnightly intervals, at fixed norms viz. bethylid 20.5%, elasmid 49.4% and chalcidid 31.9% in relation to the target stages of the pest. The number of parasitoids released during the different periods is given in Table 1. Studies were initiated during November, 1990 and continued till October, 1993. The data and figures for the different periods were worked out and results are presented in figures 1,2,3 and 4.

The percentage of parasitism at each time of observation was assessed by collecting and examining 50 infested leaflet samples from the experimental palms. The parasitised larvae, pre-pupae and pupae were taken to the laboratory and observed for the emergence of the parasitoids. Count of the parasitised larvae (*G. nephantidis*), pre-pupae (*E. nephantidis*) and pupa (*B. nosatoi*) was recorded and percentage of parasitism worked out.

#### RESULTS AND DISCUSSION

The estimated total population of *O. arenosella* comprising the larvae, prepupae and pupae is presented in Fig. 1. During 1990-91, from an initial population of 3153 the population increased steadily and reached

the peak during April-June (5664) and then it declined to a low population (2215) during July - October. Further reduction in population was obtained during 1991-92 and 1992-93. The population levels followed almost the same trend during all the years. The reduction in population was quite significant. From an initial pre-release population of 3153 the population was reduced to 2215 after one year, 176 after two years and 1136 after three years, the percentage reduction being 30, 94 and 64, respectively, during the period ending July - October, 1991, 1992 and 1993. It was observed that during the second year (1991-92) there was drastic decline in pest population and the population reached very negligible level during July - October. During the subsequent year a build up in population was noted, but it remained at a low level.

Considering the larval population alone (Fig. 2), the trend remained the same as for the total population. Peak population was observed in April - June and low population during July - October. The reduction obtained was significant, 28% after one year, 94% after two years and 63% after three years.

The studies revealed the significant decline in populations of pre-pupae (Fig. 3) and pupae (Fig. 4). Release of the elasmid parasitoid effected 55% reduction in

Table 1. Number of parasitoids released during the different periods at Thodiyur.

Parasitoid	Year	Nov-Jan	Feb-Mar	Apr-June	Jul-Oct
<i>Goniozus nephantidis</i>	90-91	624	720	1092	456
	91-92	486	156	312	36
	92-93	180	60	366	228
<i>Elasmus nephantidis</i>	90-91	30	84	62	16
	91-92	21	20	38	14
	92-93	7	14	28	14
<i>Brachymeria nosatoi</i>	90-91	25	64	96	12
	91-92	8	9	22	9
	92-93	5	9	15	9

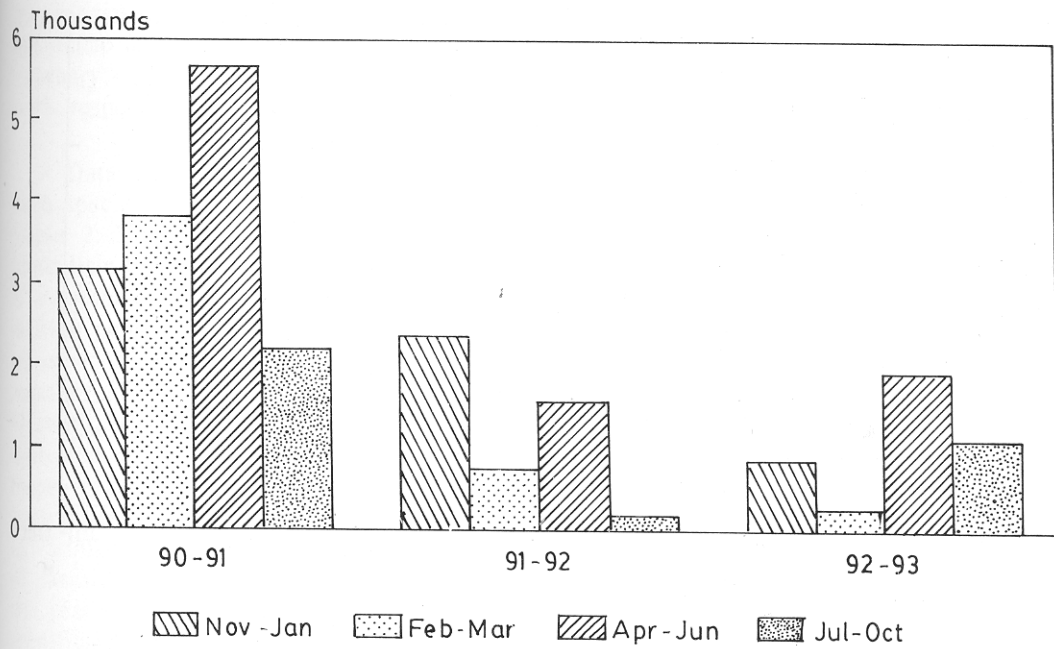


Fig. 1. Estimated total population of *Opisina arenosella* at Thodiyur

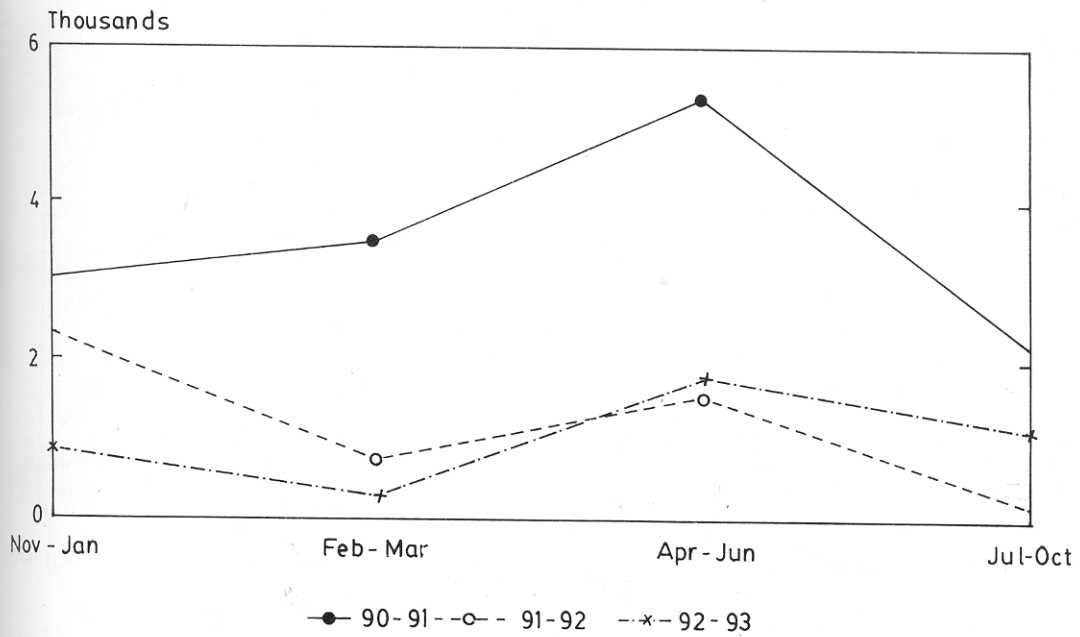


Fig. 2. Estimated larval population of *Opisina arenosella* at Thodiyur

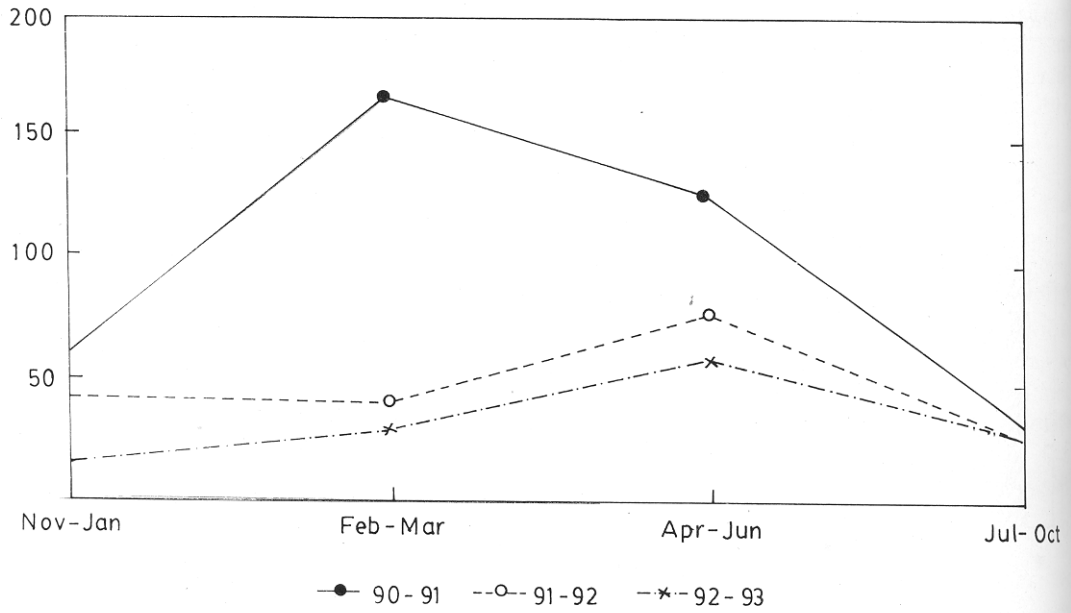


Fig. 3. Estimated pre-pupal population of *Opisina arenosella* at Thodiyur

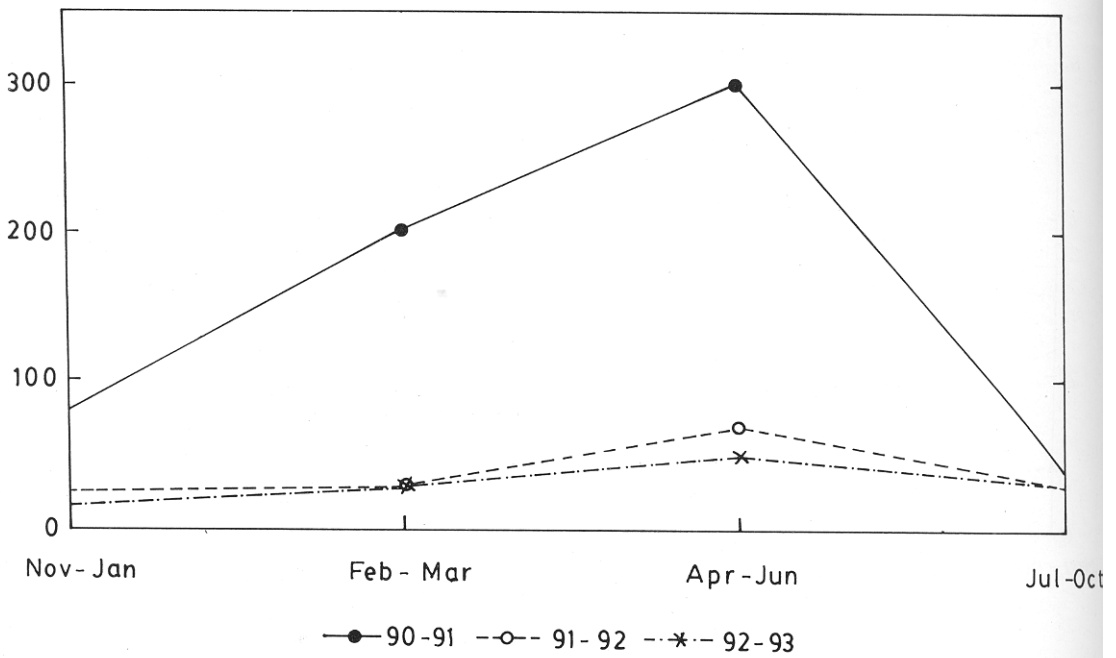


Fig. 4. Estimated pupal population of *Opisina arenosella* at Thodiyur

pre-pupal population of *O. arenosella*. Similarly, the chalcidid parasitoid *B. nosatoi* could bring about 65% reduction in pupal population. Maximum population of pre-pupae and pupae were observed during February - March and April - June of 1990 - 91, respectively.

Data on percentage of parasitism by each species of parasitoids are presented in Table 2. The data revealed 3.7 to 47.6% parasitism by *G. nephantidis*, 0 to 55.6% by *E. nephantidis* and 0 to 71.4% by *B. nosatoi*. A high percentage of larval parasitism was observed in the field during November - January, February - March, and July - October. Parasitised pre-pupae were not collected during February - March period. Pupal parasitism was also observed to be high during all the four periods except July to October of 1992-93. The high percentage of parasitism existing in the field throughout the year suppressed the pest population to a significant level.

The results clearly highlighted that the releases of the bethylid, elasmid and chalcidid parasitoids at the fixed norms, at fixed intervals, effected significant biological suppression of *O. arenosella*. The reduction obtained was quite evident as 94% of the pest population got suppressed during the second year. A high percentage of parasitism by all the three species of parasitoids was observed during this year, which in fact enabled the reduction in population of the pest. Releases of the parasitoids can be regulated based on the stage of the pest present on the palms. Continued releases are needed when resurgence of the pest occurred and the pest remained in a multistage condition. During the second year of study, the population reached a very low level and the number of parasitoids released was also meagre. Subsequently, the pest population increased and the parasitoids present were unable to maintain the pest under check resulting in an increase in pest population, during April - June.

Table 2. Percentage of parasitism recorded from 50 sample leaflets collected from Thodiyur.

Parasitoid	Percentage parasitism				
	Year	Nov-Jan	Feb-Mar	Apr-June	Jul-Oct
Larval <i>Goniozus nephantidis</i>	90-91	20.0 (10/50)	7.5 (3/40)	8.3 (2/24)	35.1 (20/57)
	91-92	8.9 (4/45)	28.0 (7/25)	3.7 (1/27)	34.4 (11/32)
	92-93	18.4 (7/38)	47.6 (10/21)	11.8 (6/51)	7.4 (2/27)
Pre-pupal <i>Elasmus nephantidis</i>	90-91	16.7 (1/6)	0.0 (0/7)	25.0 (1/4)	15.4 (2/13)
	91-92	100.0 (1/1)	0.0 (0/5)	0.0 (0/5)	50.0 (1/2)
	92-93	33.3 (1/3)	0.0 (0/3)	55.6 (5/9)	14.3 (1/7)
Pupal <i>Brachymeria nosatoi</i>	90-91	18.2 (4/22)	18.2 (2/11)	45.5 (5/11)	9.1 (1/11)
	91-92	11.1 (1/9)	25.0 (2/8)	25.0 (3/12)	100.0 (4/4)
	92-93	71.4 (5/6)	42.9 (3/7)	38.1 (8/21)	0.0 (0/0)

Data in the parentheses indicate the actual figures.

Studies conducted earlier also revealed that 83% reduction in pest population could be obtained by the release of the bethylid parasitoid *G. nephantidis* @ 20.5% and 81% reduction by the release of elasmid parasitoid *E. nephantidis* @ 49.4%, in relation to the target stages of the pest (Sathiamma *et al.* 1987). The present study further confirmed that release of the promising species of indigenous parasitoids at fixed norms and at fixed intervals could bring about significant reduction in population of *O. arenosella*.

Another important feature observed during the study was that 18 - 83% of the larvae belonged to the early larval instars, and the larval parasitoids released were unable to suppress the early instar caterpillars. Bethylids and elasmids are, late-larval and pre-pupal parasitoids respectively. The early stage caterpillars co-exist with the late larval stages with maximum population during the first year (1990-91) and minimum during the third year (1992-93) (Fig. 5). Hence, It is suggested

that in order to achieve successful biological suppression of *O. arenosella*, parasitoids suppressing the early instar caterpillars are also to be released at fixed norms based on the pest population estimates. No egg parasitoids of the pest had hitherto been recorded, but for the record of *Trichogramma chilonis* Ishii by Dharmaraju (1952) in East Godavari District of the erstwhile Madras State. As such, it is quite essential to look for the egg parasitoids in all the *O. arenosella* infested tracts in Bangladesh, India and Myanmar or to introduce some exotic species of egg parasitoids for trials against this pest.

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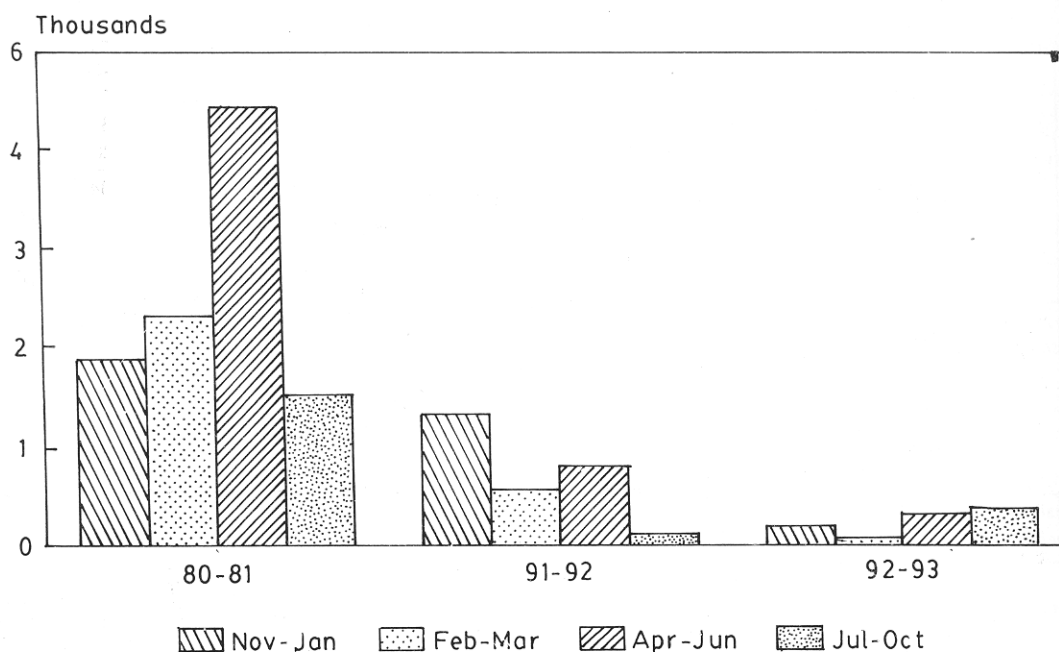


Fig. 5. Estimated population of early instar caterpillars of *Opisina arenosella* at Thodiyur

ashri G. Karunakaran Pillai and N. lharan and Smt. P. Saraswathy Amma, or Technical Assistants and the orting staff (climbers) of the Institute the help rendered in recording the rvations of the palms.

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