

A METHOD TO ESTIMATE THE INTENSITY OF NATURAL PUPAL PARASITISM OF *OPISINA* *ARENOSELLA* WLK. (= *NEPHANTIS SERINOPA* MEYRICK)*

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ABSTRACT

The nature, size and position of the emergence holes made in the host pupal cases by different species of pupal parasitoids of the coconut caterpillar *Opisina arenosella* Wlk. (= *Nephantis serinopa* Meyr.) were studied. These criteria were used in developing a method to estimate the intensity of natural parasitism of the pest and the relative contribution of individual species of parasitoids in the natural suppression of the pest. The advantages of the method of examination of empty pupal cases are that it is less time-consuming, less cumbersome and more accurate than the currently adopted method of collecting sample pupae at periodic intervals and observing the emergence of parasitoids and evaluating the intensity of parasitism.

INTRODUCTION

A complex of parasitoids is associated with *Opisina arenosella* Wlk. (= *Nephantis serinopa* Meyrick) (Lepidoptera: Cryptophasidae), the Asiatic, leaf eating, multivoltine pest of the coconut palm in the coastal and backwater tracts of India. The larval parasitoids are fewer in number and the extent of natural pest suppression exerted by them is comparatively low. Many pupal parasitoids such as the chalcidids *Brachymeria nosatoi* Habu, *B. nephantidis* Gahan, *B. lasus* (Walker), *B. hime attevae* Joseph et al., *B. euploae* (Westw.), *B. excarinata* Gahn and *Antrocephalus hakoniensis* (Ashmead), the eulophid *Trichospilus pupivora* Ferriere, the ichneumonids *Xanthopimpla punctata* F.,

X. nana nana Schulz. (recently recorded by the authors) and *Goryphus nursei* (Cameron) and the tachinid *Thelairodrino gracilis* Mesnil were recorded in association with *O. arenosella* in Kerala. Of these, *B. nosatoi* and *B. nephantidis* were the most important ones (Joy and Joseph, 1977, 1978; Pillai and Nair, 1981). In northern tracts of Kerala, parasitism by *Brachymeria* spp. was comparatively low and the eulophid parasite *T. pupivora* dominated over the species (Joy and Joseph, 1977). On an average, 51.7 per cent of the pupae were suppressed by parasitoids in southern Kerala and of the total parasitism nearly 90 per cent was effected by *Brachymeria* spp. *B. nosatoi* alone accounted for 57.2 per cent, *B. nephantidis* 26.9 per cent, *B. hime attevae* and *B. lasus* 2.7

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per cent, *Xanthopimpla* spp. 7.0 per cent and *T. pupivora* 3.1 per cent. The hyperparasite *Eurytoma albotibialis* Ashmead suppressed 3 per cent of *Brachymeria* population (Pillai and Nair, 1981).

The commonly adopted method for assessment of the intensity of natural parasitism is to collect pupae from pest infested palms at random and keep them under observation in the laboratory till the parasitoid adults or moths have emerged. The limitation of this method was that some of the pupae collected from the field would be freshly formed ones which were not exposed to parasites for any reasonable period of time to get sufficient opportunity for their natural parasitisation.

While studying the biology of indigenous pupal parasitoids in the laboratory it was observed that emergence holes made in the host pupae by different species of parasitoids differed in their shape, size and position. These criteria have been used in this study as a tool to evaluate the extent of pupal parasitism by the different species of parasitoids.

MATERIALS AND METHODS

Four hundred and sixty five live pupae of *O. arenosella* were collected from pest infested coconut gardens at Thottappally, Alleppey District, Kerala, in May, June, July and September 1980 and kept under observation in the laboratory for emergence of moths and parasitoids and the percentage of effective natural parasitism was recorded. The emerged pupae were opened and exami-

ned towards the close of observations and the number of moths/parasites present recorded.

One hundred and fifty three empty pupal cases of *O. arenosella*, from which the moths as well as parasitoids had emerged, were collected at random, from pest infested palms in the same locality during September, 1980, brought to the laboratory and examined. The emergence holes made by *B. nephantidis*, *B. lasus*, *B. hime attevae*, *T. pupivora*, *X. punctata* and *X. nana nana* were examined under a stereoscopic binocular microscope. Based on the details of the position, size and nature of emergence holes the pupal cases were categorised. From this the extent of parasitism by individual species of parasitoids was calculated.

Observations recorded from both the lots, viz., live pupae and empty pupal cases, were compared for confirmation of the extent of effective natural parasitism.

RESULTS

The pupal cases from which the moths emerged were light, soft and brown. The cephalic ends of such pupae were burst open due to the pressure exerted by the emerging moths (Fig. 1 H & I). All the cephalic segments of the pupal cases were retained as such even after the emergence of moths.

The pupae from which the parasitoids emerged were tough, heavier and blackish particularly in their abdominal regions. *B. nosatoi*, the dominant species of the pupal parasitoids of *O. arenosella*,

was observed to make an opening as wide as the cephalic region of the host pupa (Fig. 1 A). The margins of the emergence hole bore a serrated appearance.

B. nephantidis, *B. lasus* and *B. hime attevae* made emergence holes of 0.5 mm–3.0 mm in the dorsal, ventral or lateral regions below the cephalic end of the host pupae. Among the three species, *B. lasus* made the biggest hole, mostly round and rarely oval, 2.25–3.00 mm in diameter (Fig. 1 D). A few chewed up pieces of sclerites could also be observed sticking to the margins of the hole. *B. hime attevae* on the other hand made an oval hole (Fig. 1 B), one end of which was broader in all cases. The broader end might be about 2 mm wide and the margins of the hole serrated. In some cases the hole was nearly round. The emergence hole made by *B. nephantidis* (Fig. 1 C) was more or less oval or irregularly round with zigzag and slight wavy margins. The hole measured 1.5 mm × 2.5 mm. The exit hole made by *Antrocephalus hakonensis* was somewhat similar to that of *B. nosatoi*, though the size of the hole made by *A. hakonensis* (Fig. 1 E) was comparatively smaller and their margins were not quite prominently serrated as that of *B. nosatoi*.

T. pupivora made 2–8 minute emergence holes in the host pupal case and emerged through them. The colour of the pupal case was distinctly black. *X. punctata* and the newly recorded *X. nana nana* made a characteristic operculum-like opening in the cephalic end of the pupa. This operculum was

retained as such in the pupal case even after emergence of the parasitoid. (Fig. 1 G).

The hyperparasitoid of *Brachymeria* spp. viz., *Eurytoma albotibialis* Ashmead made a round emergence hole generally towards the middle of the host pupa. This hole was, however, comparatively bigger than the emergence holes made by *T. pupivora*.

Intensity of natural parasitism of live *O. arenosella* pupae collected from Thottappally and reared in the laboratory during May–September, 1980 is presented in Table I.

The overall parasitism as revealed from the examination of empty pupal cases of *O. arenosella* collected from Thottappally area during September, 1980 is presented in Table II.

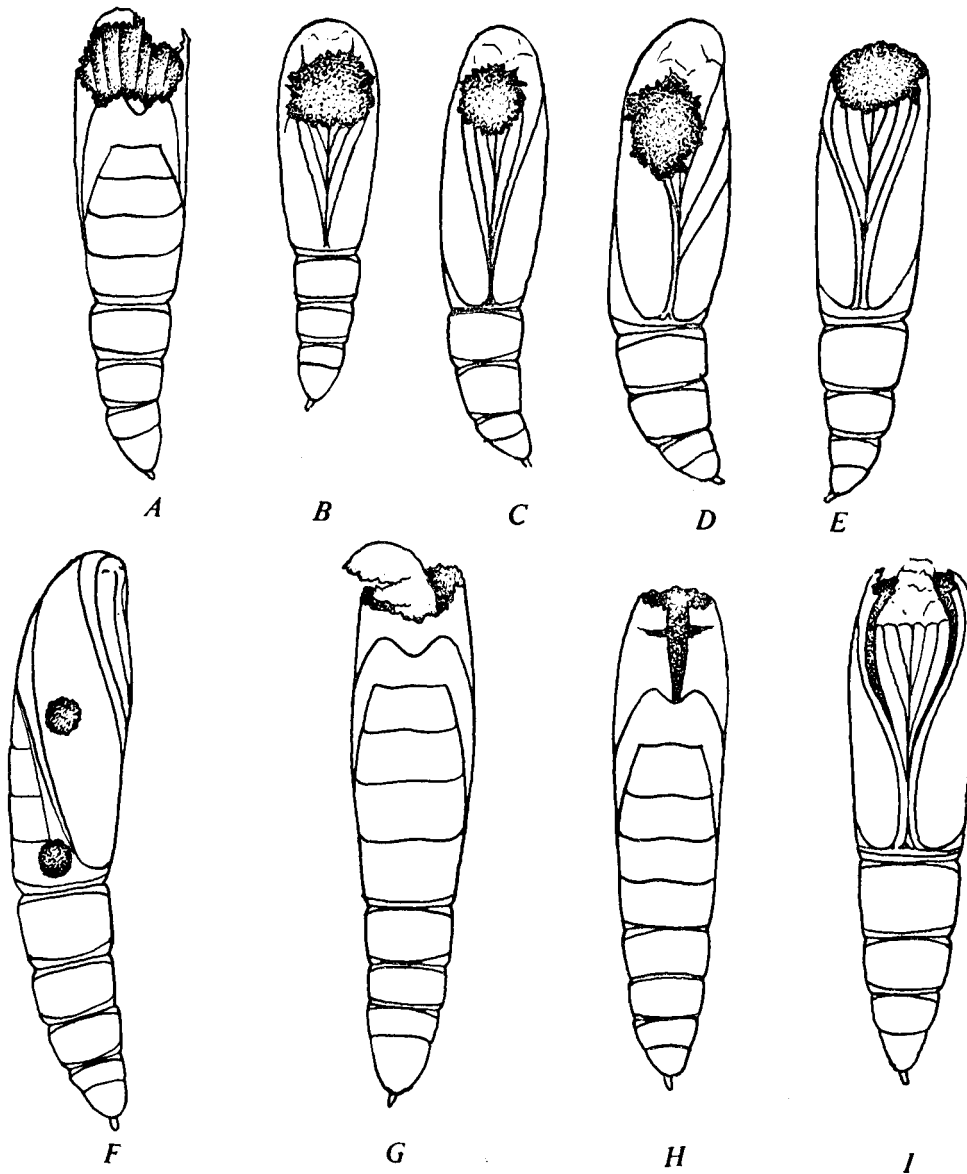
DISCUSSION

By adopting the method of examination of empty pupal cases, the overall percentage of natural parasitism of *O. arenosella* pupae and the relative contribution of individual species of parasitoids in the natural suppression of the pest population could be accurately assessed.

The data collected from live pupae indicated 44.1 per cent natural parasitism, whereas the examination of pupal cases revealed 52.3 per cent parasitism during the entire pest generation.

The present study also confirmed the earlier observations that *B. nosatoi*

FIG. 1. EMERGENCE HOLES MADE BY DIFFERENT SPECIES OF PARASITIDS AND *O. ARENOSELLA* MOTHS



A. *Brachymeria nosatoi*, B. *B. hime attevae*, C. *B. nephantidis*,
D. *B. lasus*, E. *Antrocephalus hakonensis*, F. *Trichospilus pupivora*,
G. *Xanthopimpla punctata*, H., I. *Opisina arenosella* moths.

Table I. *Intensity of natural parasitism of Opisina arenosella pupae as revealed from the observations made on live pupae*

Total No. of sample pupae observed	% of pupae from which moths emerged	% of pupae from which parasitoids emerged	% parasitism by different species of parasitoids					
			<i>B. nosatoi</i>	<i>B. nephantidis</i>	<i>B. himeattevae</i>	<i>B. lasus</i>	<i>T. pupivora</i>	<i>E. albotibialis</i> (Hyperparasite)
456	55.9	44.1	24.3	13.3	3.2	0.2	2.2	0.9

Table II. *Intensity of natural parasitism of Opisina arenosella pupae as revealed from the observations of empty pupal cases*

Total No. of pupal cases examined	% pupae from which moths emerged	% pupae from which parasitoids emerged	% parasitism by different species of parasitoids					
			<i>B. nosatoi</i>	<i>B. nephantidis</i>	<i>B. himeattevae</i>	<i>T. pupivora</i>	<i>X. punctata</i>	<i>E. albotibialis</i> (Hyperparasite)
153	47.7	52.3	30.1	15.7	1.3	1.3	2.6	0.7

was the dominant species of parasitoid and effected upto 30 per cent parasitism of *O. arenosella* pupae, followed by *B. nephantidis* with 15.7 per cent parasitism. All the other species of pupal parasitoids played insignificant role in the natural suppression of *O. arenosella* (Pillai and Nair, 1981).

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