

## OPTIMUM WEIGHT OF HOST LARVA FOR THE MASS MULTIPLICATION OF *GONIOZUS NEPHANTIDIS* MUES., THE LARVAL PARASITOID OF *OPISINA ARENOSELLA* WALKER.

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### ABSTRACT

The leaf eating caterpillar, *Opisina arenosella* Walker, is a major pest of coconut palm (*Cocos nucifera* L.). *Goniozus nephantidis* Mues. is the most important larval parasitoid used for the control of this pest. Mass multiplication of *G. nephantidis* is done in the laboratory on *O. arenosella* and the alternate host, *Corcyra cephalonica* S. Studies were carried out to find out the influence of the host larval weight on the various biological parameters of *G. nephantidis* like the number of eggs laid/host larva, adult emergence, sex ratio of the progeny and egg to adult period. *G. nephantidis* was reared on five different weight categories, viz., 31-40 mg, 41-50 mg, 51-60 mg, 61-70 mg and above 70 mg of both the host larvae under laboratory conditions. All the above parameters except the number of male progeny were positively correlated with the weight of the host larva. Maximum number of eggs/larva (12.17), adult emergence (11.75) and number of female progeny (10.42) were recorded on *Opisina* larvae having weight above 70 mg. Similarly, on *Corcyra* also the maximum number of eggs/larva (11.82), adult emergence (11.18) and number of female progeny (10.18) were recorded in the same weight category. Between the same weight categories of *Opisina* and *Corcyra*, more number of eggs were laid on *Opisina* larvae. These observations suggest that host larvae, either *Opisina* or *Corcyra*, having an optimum weight of more than 70 mg are more suitable for mass multiplication of *G. nephantidis*.

**Key words:** *Opisina arenosella*, *Goniozus nephantidis*, *Corcyra cephalonica*, Weight dependent parasitism

### INTRODUCTION

*Goniozus* (= *Perisierola*) *nephantidis* Mues. (Bethyridae: Hymenoptera) is the most important larval parasitoid used in the biological suppression of coconut leaf caterpillar, *Opisina arenosella* (Xylorictidae: Lepidoptera). Details of the life history and habits of this parasitoid have been studied by Ramachandra Rao & Cherian (1928), Nirula (1956) and Antony & Kurien (1960). Dharmaraju (1952) reported *Corcyra cephalonica* Staint. as the alternate host for the laboratory rearing of this parasitoid. Dharmaraju & Pradhan (1976) investigated the

effect of physical factors like temperature, humidity and light and biological factors like food host density, parasite density and age of host larvae on the biotic potential of *G. nephantidis*. Mass multiplication of *G. nephantidis* is always required in the augmentative release of this parasitoid for an effective biosuppression of *O. arenosella*. For the successful mass multiplication, knowledge about the most suitable host stage is necessary. Therefore, studies were undertaken to investigate the influence of the weight of host larvae on the important biological parameters of *G. nephantidis*. Two host larvae viz., *O. arenosella* and *C. cephalonica* separately were used in the present study.

**MATERIALS AND METHODS**

Sufficient cultures of the host larvae viz., *O. arenosella* and *C. cephalonica* and the parasitoid, *G. nephantidis* were maintained in the laboratory. Experiments were conducted in the laboratory at 23-31° C temperature and 75-90% RH. The larvae of *O. arenosella* (primary host) were reared on coconut leaflets in glass bottles (19 X 8 cm) and that of *C. cephalonica* (alternate host) were reared on semolina (sooji) in glass troughs (10 X 15 cm). The host larvae were grouped on the basis of their weight into five different categories viz., 31-40 mg, 41-50 mg, 51-60 mg, 61-70 mg and above 70 mg. Larvae from each weight category were introduced individually in separate glass tubes (10 X 2.5 cm) with a 3-day old mated female of *G. nephantidis*. Replications in each category varied between 11 to 22 and each replicate contained one host larva and one parasitoid. Observations were recorded on the number of eggs laid/host larva, number of adults emerged, sex ratio of the progeny and the egg to adult period. The data were subjected to statistical analysis and correlation coefficients were worked out for the above parameters with weight of the host larva. Comparison between the different treatments was done using Completely Randomized Design (CRD). The results are presented in Tables 1,2 and 3.

**RESULTS AND DISCUSSION**

It is evident from Table 1 and 2 that the number of eggs laid, number of adults emerged and the number of female progeny per host larva was highest on host larvae of above 70 weight category in both the hosts. On *O. arenosella* the values are 12.17, 11.75 and 10.42 respectively and on *C. cephalonica* they are 11.82, 11.18 and 10.18 respectively. It is evident that in this weight category, the above parameters showed a slight increase on *O. arenosella*. The difference in the above parameters of the parasitoids expressed in the case of lowest and highest weight categories of both hosts was significant.

Pillai and Nair (1985) observed that 5<sup>th</sup> or early 6<sup>th</sup> instar caterpillars of *O. arenosella* are the ideal host stages for successful parasitism by *G. nephantidis*. Remadevi *et al.* (1978) reported that the parasitoid preferred 4<sup>th</sup> or 5<sup>th</sup> instar caterpillars of *O. arenosella*. Dharmaraju and Pradhan (1976) observed maximum biotic potential of *G. nephantidis* on 6-week old larvae of *C. cephalonica*. It has been observed in the laboratory cultures of the hosts that the individual larvae of a particular instar vary widely in their size and weight. Hence it will be more appropriate if the host larval weight is considered for mass rearing of the parasitoid rather than their instar. Moreover, there can be

**Table 1. Effect of larval weight of *O. arenosella* on various biological parameters of *G. nephantidis*.**

Weight of <i>O. arenosella</i> larvae (mg)	No. of eggs laid/ larva	No. of adults emerged	No. of female progeny	No. of male progeny	Egg to adult period (days)
31-40	8	6.55	5.1	1.45	11.1
41-50	8.65	8.35	7	1.35	11.18
51-60	8.1	6.9	5.3	1.62	11.33
61-70	9.64	9.1	7	2.18	11.36
> 70	12.17	11.75	10.42	1.33	11.17
S.E. / Plot	3.24	3.64	3.61	1.53	0.65
Av.CD at 5%	2.48	2.79	2.77	NS	NS

**Table 2. Effect of larval weight of *C. cephalonica* on various biological parameters of *G. nephantidis***

Weight of <i>O. arenosella</i> larvae (mg)	No. of eggs laid/ larva	No. of adults emerged	No. of female progeny	No. of male progeny	Egg to adult period (days)
31-40	7.9	6.9	6.3	0.6	11.9
41-50	8.3	7.1	6.2	0.8	11.65
51-60	8.77	6.95	6.14	0.82	11.1
61-70	9.83	8.58	7.5	1.08	11.25
> 70	11.82	11.18	10.18	0.91	11.73
S.E. / Plot	3.07	3.14	3.08	0.95	0.67
Av.CD at 5%	2.34	2.4	2.35	NS	0.51

**Table 3. Correlation coefficient between weight of host larvae and various biological parameters of *G. nephantidis***

Weight of host larvae	No. of eggs laid/ larva	No. of eggs laid/ larva	No. of female progeny	No. of male progeny	Egg to adult period
<i>O. arenosella</i>	0.4963 <sup>^</sup>	0.3818 <sup>^</sup>	0.3810 <sup>^</sup>	0.0735 <sup>*</sup>	0.5711 <sup>^</sup>
<i>C. cephalonica</i>	0.2279 <sup>\$</sup>	0.2940 <sup>\$</sup>	0.2958 <sup>\$</sup>	-0.0605 <sup>*</sup>	0.5039 <sup>^</sup>

<sup>^</sup> Significant at 1%<sup>\$</sup> Significant at 5%<sup>\*</sup> Not Significant

supernumerary larval instars due to environmental and other factors such as cooling (Cymborowsky & Bogus, 1976), chilling (Pipa, 1976), starvation (Bhaskaran & Jones, 1980) and injury (Krishnakumaran, 1972). This makes it more difficult to assess the host larval instars by its age, especially when larger numbers were handled in the laboratory for mass rearing of the parasitoids. So it will be more practical in such an attempt to categorise the host larvae based on their body weight. The rate of multiplication and the progeny emergence of a parasite in a particular host are important factors in the successful biological control of a pest (Taylor, 1937). The present study revealed that the number of eggs laid/host larva, adults emerged and female progeny of the parasitoid increased with increase in the weight of the host larva. This is in agreement with the observations of Waage (1985), who reported that laboratory parasitoid populations often yield individuals with

reduced fitness and undesirable sex ratio in response to several biological and ecological factors, among which the food resource of the host plays a major role in improving the fitness of the natural enemies.

Correlation coefficients (Table 3) revealed that the number of eggs/larva, adults emerged, number of female progeny and egg to adult period were positively correlated with the weight of the host larva in both the hosts, although the values showed a slight decrease in the case of *C. cephalonica*. The positive correlation of egg to adult period of the parasitoids with weight of the host larvae may be attributed to the fact that the parasitoid larvae could complete its full larval period when host larvae supported it with sufficient nutrients. In the case of lowest weight categories of the host, the parasitoid larvae pupated earlier because of the relatively lesser nutritional source. In a mass multiplication

Mass multiplication of *G. Nephantidis*

method, a high preponderance of female progeny is a valid attribute for the parasitoid as well as for the success of the biocontrol programme. In the present study it was observed that the sex ratio of the progeny showed a healthy trend. Hence, it is suggested that host larvae, either *O. arenosella* or *C. cephalonica*, having an optimum weight of >70 mg shall be used for the mass multiplication of *G. nephantidis*.

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