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NORMS FOR RELEASE OF LARVAL, PREPUPAL AND PUPAL PARASITOIDS OF *OPISINA* ARENOSELLA WLK., THE LEAF EATING CATERPILLAR OF THE COCONUT PALM'

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ABSTRACT

An experiment was conducted to work out the dosages for release of the larval, prepupal and pupal parasitoids of *Opisina arenosella* under field conditions. Parasite releases were made at three doses *Viz.* Zero, 25 and SOX of the target stages of the pest population at fortnightly intervals. Observations revealed that the releases of the parasites effected varying levels of reduction in population density of *O. arenosella.* The reduction obtained was significant in plots in which the larval parasitoid *Goniozus nephantidis* and the prepupal parasitoid *Elasmus nephantidis* were released. The doses worked out were 20.5% for G. *nephantidis,* 49.4% for *E. nephantidis* and 31.9% for B. *nosatoi,* when the parasitoids were released individually, and 40.4% when a combined release was made.

INTRODUCTION

Opisina arenosella is one of the important pests of the coconut palm in the coastal, backwater and certain interior tracts of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Gujarat and Orissa. The biological method of pest suppression by employing the indigenous parasitoids of the pest was known from very early times and more than twenty species of parasitoids were identified (Rao, Cherian and Ananthanarayanan, 1948; Nirula. 1956; Dharmaraju, 1962; Joseph, Narendran and Joy, 1973.) Of these, the pupal parasitoids *Trichospilus pupivora* Ferr. (Eulophidae), the larval parasitoids *Goniozus nephantidis (=Parasierola nephantidis)* (Mues.) (Bethylidae) and *Bracon brevicornis* Wesm. (Braconidae) and the pre-pupal parasitoid *Elasmus nephantidis* Rohw. (Elasmidae) were mass multiplied in the laboratory and released on palm crowns as and when *Opisina* infestation occurred in the field. Recently, Joy and Joseph (1977 and 1978) and Pillai and Nair (1981)

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recognised the importance of the chalcidid pupal parasitoids in exerting effective natural suppression of O. *arenosella*. Techniques were standardised for the laboratory multiplication of the chalcidid parasitoids, particularly ***Brachymeria nosatoi*** Habu with a view to employing it for field releases (Pillai and Nair, 1982). Evaluation of the role of these parasitoids in the suppression of the pest population revealed that the performance of *G. nephantidis*, E. *nephantidis* and ***B. nosatoi*** was better. These parasitoids are effective particularly during summer as well, which is eventually the peak period of pest abundance. Even though evidences of successful utilisation of these parasitoids for pest suppression were known no effort was so far made to work out the optimal dose for release of the parasitoids in coconut gardens infested, with leaf eating caterpillar. The current practice is to release parasitoids fixing the dose arbitrarily on per palm or unit area basis. But, this method cannot give an idea on the pest-parasitoid ratio available at a given time. Hence, the present set of experiments was laid out at two centres *viz*., at Eravipuram (1981 and 1982) and at Kannetty (1982-1984), in Quilon District, Kerala, with a view to working out the dosages for the field release of three species of parasitoids *viz*., the bethylid ***G. nephantidis***, the elasmid ***E. nephantidis*** and the chalcidid ***B. nosatoi,*** individually and in combination, for the effective suppression of O. *arenosella*. The results of the observations are summarised in this paper.

MATERIALS AND METHODS

At Eravipuram

A coconut garden comprising a total of 500 palms of the age group 5-7 years was selected for the experiment. The treatments included:

Plot I Control – no parasite release; Plot II *G. nephantidis* 25%; Plot III G. *nephantidis* 50%; Plot IV *E. nephantidis* 25%; Plot V E. *nephantidis* 50%; Plot VI ***B. nosatoi*** 25% and Plot VII B. ***nosatoi*** 50%. Each plot comprised fifty palms and ten palms (20% sample) were marked, at random, in each plot as sample palms for recording the observations. Three to four rows of palms were left in between each plot as border rows. Control plot was maintained at a distance of about 300m away from the release plots. Observations were recorded at fortnightly intervals on the population of the pest and its natural enemies present on 20% sample leaves of 20% sample palms (George, Sathiamma and Vijayakumar, 1985).

At Kannetty

A garden comprising nearly 300 coconut palms of the age group 5–7 years, was divided into three plots. Ten palms were marked, at random, in each plot consisting of 50 palms each for recording the observations. Release plots were separated by three rows of border palms and the control plot separated from the release plot by a distance of nearly 200m. The treatment included:

Plot I Control – no release; Plot II *G.* ***nephantidis*** 25%, ***E. nephantidis*** 25%,

and B. *nosatoi* 25%, Plot III G. *nephantidis* 50%; *E nephantidis* 50% and *B. nosatoi* 50%. Observations of sample palms were recorded every fortnight. After recording the observations, the target stages of the pest were estimated using the formulae evolved by George et al, (1985) and the respective parasitoids released in each plot at 25% and 50% of the target stages of the pest. The three parasitoids were released at Eravipuram centre individually and at Kannetty centre in combination.

At both the centres, the parasitoids were released by the 'spot release' technique on the adaxial surface of the infested leaves of the coconut palms. Parasitoids were not released in the plots where the target stages of the pest were absent at the time of observations.

RESULTS AND DISCUSSION

Releases of G. *nephantidis*, E. *nephantidis* and *B. nosatoi* at zero, 25 and 50% doses, individual and in combination, effect varying levels of reduction in population of *O. arenosella* (Table *I).* Significant reduction was obtained in the plots where *G. nephantidis* and *E. nephantidis* were released, while the reduction was non-significant in the plots where *B. nosatoi* was liberated. However, in the plot, where G. *nephantidis* was released at 50% dose the mean pest population remained at a higher level. This is because of a very high population of *Opisina* present in the plot initially (517.3 per palm). Till four months the parasitoids released could not bring about appreciable reduction in pest population in this plot. Since then, there was a marked decline and it reached almost zero levels after seven months of release. Considering the effect of parasitoid releases, individually at the above doses, significant reduction was obtained in the mean number of infested leaves. However, the release of the parasitoids, in combination, could not effect satisfactory reduction in leaf damage.

In order to work out the doses for

Table I. *Efficacy of release of different doses of bethylid, elasmid and chalcidid parasitoids for the control* of opisina arenosella

Dose of parasitoids (%)	Parasitoids released							
	G. nephantidis		E. *nephantidis*		*B.* nosatoi		combination *of parasitoids*	
	Mean infested leaves	Mean pest population	Mean infested leaves	Mean pest population	Mean infested leaves	Mean pest population	Mean ideated leaves	Mean pest population
0	32.1	29.0	32.7	29.0	32.1	29.0	40.3	10.5
25	1.8	6.1	4.2	5.1	10.2	11.5	36.0	49.2
50	15.0	54.5	5.2	5.2	8.2	16.5	37.5	46.5
CD at 5%	8.1	30.6	5.3	10.1	7.4	NS	NS	16.6

NS—Not significant

release of these three parasitoids *viz*., G. ***nepantidis***, ***E. nephantidis*** and ***B. nosaroi*** in leaf eating caterpillar infested gardens 'quadratic response curves' were fitted for the host-parasitoid relationship and the optimum doses of parasitoids worked out (Table II). The reduction in *Opisina* population was maximum in the plots where *G. nephantidis* was released. Reduction in pest population to the extent of 82.9% was obtained by releasing this parasitoid at a dose of 20.5% of the larval population. E. *nephantidis* required a dose as high as 49.4% of the pre-pupal population to gain a reduction of 81% and ***B. nosatoi*** at a dose of 31.9% could effect only 29% reduction in pest population, whereas, release of a combination of C. ***nephonridis,*** E. *nephantidis* and ***B. nosaroi,*** each required a dose of 40.4%, which effected only 35.5% reduction in population of ***0 . arenosella.***

The observations clearly indicated that inundative release of indigenous parasitoids at the doses determined is the best method for suppression of *O. **arenosella*** under field conditions. In order to achieve maximum efficiency of parasitoid releases, as most of the parasitoids are stage-specific, the different stages of the pest including different larval instars were separately counted, every time, and parasitoids released accordingly. It is always better to release the larval parasitoids when the host larvae are around the third instar stage. the pre-pupal parasitoids in the late larval instar and the pupal parasitoids in the early pupal phase.

Table II. ***Optimum doses for parasitoid release and reduction in population of*** Opisina arenosella

Parasitoid	Optimum dose (%)	Reduction in pest population (%)
Goniozus nephantidis	20.5	82.9
Elasmus nephantidis	49.4	81.0
Brachymeria nosatoi	31.9	29.0
Combination of the three parasitoids	40.4	35.5

As compared to the larval population in the field, the pupal population is comparatively low in all the plots examined. Hence, the chances of parasitism and the resultant reduction in ***Opisina*** population was also relatively minimum. For example, at Eravipuram centre the larval population was 1123 and 138 in the two plots where *G. nephantidis* was released. as compared to the pupal population of 53 and 55, respectively, in the *B. **nosaroi*** released plots. At Kannetty centre, the larval population was 1460 and 1459. as compared to the pupal population of 135 and 159, respectively in the plots where *G. **nephantidis, E.** nephantidis* and ***B.** nosatoi* were released in combination. As such, the impact of the pupal parasitoids in the suppression of pest population was minimal in view of the inadequacy of specific host stage at the time of parasite releases.

This experiment. also revealed that release of the parasitoids at the early stages of pest build up is absolutely necessary, so that pest suppression could be effected even before the caterpillars cause appreciable damage to the palms, attain adult stage and build up a new generation.

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