

Natural enemy complex of coconut leaf eating caterpillar, *Opisina arenosella* Walker (Lepidoptera: Xylorictidae) in Karnataka

A. SUJATHA* and S. P. SINGH

Project Directorate of Biological Control

P. B. No. 2491, H. A. Farm Post, Bellary Road

Bangalore 560 024, Karnataka, India

ABSTRACT: Surveys in coastal and interior Karnataka during 1996 and 1997 revealed the occurrence of four larval, one larval-pupal and thirteen pupal parasitoids and eleven predators of *Opisina arenosella* Walker. Eight hyperparasitoids were also recorded.

KEY WORDS: Hyperparasitoids, *Opisina arenosella*, parasitoid, predator

The coconut leaf eating caterpillar, *Opisina arenosella* Walker is a serious defoliator of coconut, palmyra and wild date palm in India. It often assumes severe proportions in certain tracts. Coconut palms of all ages are infested by *O. arenosella*. Nirula *et al.* (1951) observed that massive damage to crown of leaves affected the thatching quality, in addition to decline in yield in the years following the outbreak of the pest. Perera (1993) estimated the economic injury level at 15.5 per cent defoliation per palm and reported that the pest causing over 40 per cent visually assessed leaf damage can be considered as an outbreak.

Adverse effects of chemical pesticides administered by stem injection, root feeding and spraying have prompted the research workers to select biological control as a long term strategy to manage the insect pests in this perennial crop. Earlier reports revealed that *O. arenosella* supports 40 parasitoids and 22 predators (Pillai and Nair, 1993; Veeresh *et al.*, 1995), and 26 species of spiders (Sathiamma *et al.*, 1987). Among these natural enemies, occurrence and field efficacy of larval parasitoids, *Apanteles taragamae* Viereck, *Goniozus nephantidis* (Muesebeck); pupal parasitoid, *Brachymeria* spp. (Nadarajan and Channabasavanna,

1980; Pushpalatha and Veeresh, 1995); larval predator, *Parena nigrolineata* (Chaudoir) (Gulagannavar, 1987) and egg predator *Cardiastethus affinis* Poppies (Srinivasa, 1996) have been studied in Karnataka. In order to strengthen the profile of natural enemies of *O. arenosella* in Karnataka, a survey was conducted during 1996 and 1997 in coastal and interior areas, where the pest infestation ranged from 50-90 per cent.

MATERIALS AND METHODS

Observations on the occurrence of *O. arenosella* and its natural enemies at monthly interval were made at Kalmady and Malpe (coastal) and Maddur (interior). In coastal area the coconut gardens selected as monocrop were located on riverbanks. Interior areas covered irrigated mixed cropping system involving coffee, guava, sapota, banana, shoeflower, rose, jasmine, etc. At both locations, observations were made on seedlings (< 5 year - old), young palms (5 to 15 years) and tall palms (above 15 years) of coconut.

Observations on *O. arenosella* (egg, larva, pupa) and its natural enemies were recorded in the middle 40-60 per cent leaflets of 20 per cent leaves (80 leaflets per palm) (George *et al.*, 1982). Larvae and pupae of the pest were kept in separate glass jars covered with muslin cloth for the emergence of parasitoids and hyperparasitoids. Predators were separated by brushing out of larval galleries and tested in the laboratory for predatory efficiency. Natural enemies collected were preserved

in 70 per cent alcohol for determining the taxonomic status.

RESULTS AND DISCUSSION

In coastal and interior Karnataka, four larval, one larvo-pupal, thirteen pupal parasitoids and eleven predators were recorded from *O. arenosella*. The natural enemies recorded are listed in Tables 1 and 2.

In coastal Karnataka, three larval parasitoids *viz.*, *Apanteles taragamae*, *Goniozus nephantidis* and *Bracon brevicornis* and ten pupal parasitoids *viz.*, *Antrocephalus hakonensis*, *A. maculipennis*, *Brachymeria nephantidis*, *B. nosatoi*, *B. atteviae*, *B. lasus*, *Trichospilus pupivora*, *Xanthopimpla punctata*, *Eupelmus* sp. and *Anastatoidea brachartoniae* were recorded.

Apanteles taragamae was recorded throughout the year. Among the pupal parasitoids, *A. hakonensis* and *A. maculipennis* were the first to appear in February and continued their parasitising activity up to May. Similarly, *T. pupivora* was recorded from February to November. *Eupelmus* sp. was available in March-April, *A. brachartoniae* in April-May and *B. brevicornis* in April, November and December. *Goniozus nephantidis* was available from May to November and *B. nephantidis*, *B. nosatoi*, *B. atteviae* and *B. lasus* from June to September.

In interior Karnataka, three larval parasitoids, one larvo-pupal and 10 pupal

parasitoids were recorded. *Apanteles taragamae*, *M. hutsoni*, *B. nephantidis*, *B. nosatoi*, *B. atteviae* and *B. lasus* were recorded throughout the year. *Tetrastichus howardi* and *T. pupivora* were available from February to November, *A. hakonensis*, *A. maculipennis* and *A. phaeospilus* in April-May, *Bracon* sp. in April, June and August, *G. nephantidis* in April, August and December and *G. gibbosus* in October - December.

Xanthopimpla punctata, *Eupelmus* sp. and *A. brachartona* were recorded only in coastal Karnataka, and *A. phaeospilus*, *M. hutsoni*, *T. howardi* and *G. gibbosus* only in interior Karnataka. Out of the eleven predators recorded, 9 were available in coastal Karnataka and 7 in interior Karnataka. *Cardiastethus exiguus* and *Phytoseiulus* sp. were recorded throughout the year in coastal Karnataka and the former in interior Karnataka. *Parena nigrolineata*, and *Cardiocondyla wroughtoni* were recorded only in coastal

Karnataka. Similarly, *Mallada astur* was recorded only in interior Karnataka.

Eight hyperparasitoids were recorded from the primary parasitoids in the coconut ecosystem. *Apanteles taragamae* was hyperparasitised by maximum seven species while *Goniozus nephantidis* by six. *Aphanogmus manilae*, *Eupelmus albotibialis*, *E. braconidis*, *Pediobius imbreus* and *Tetrastichus howardi* were the hyperparasitoids recorded on both *A. taragamae* and *G. nephantidis* in coastal Karnataka. In interior Karnataka, *A. manilae*, *E. albotibialis* and *E. braconidis* were common on *A. taragamae*, and *G. nephantidis*. *Meteoridea hutsoni* was recorded from *A. taragamae* and *P. imbreus* from *G. nephantidis*. *Bracon* sp. was hyperparasitised by *A. manilae* and *P. imbreus* in interior and *Brachymeria* spp. by *E. albotibialis* in coastal Karnataka, respectively. The only tachinid recorded was hyperparasitised by *Nesolynx dipterae* in interior Karnataka.

Table 1. Hymenopteran parasitoids of *O. arenosella*

Name	Family	Stage	Period	Region
<i>Apanteles taragamae</i> Viereck	Braconidae	Larva	Throughout the year	Coastal and Interior
<i>Bracon brevicornis</i> Wesmael	Braconidae	Larva	April, November, December	Coastal
<i>Bracon</i> sp.	Braconidae	Larva	April, June August	Interior
<i>Goniozus</i> (= <i>Parasierola</i>) <i>nephantidis</i> (Muesebeck)	Bethylidae	Larva	November – May April, August, December	Coastal Interior

Name	Family	Stage	Period	Region
<i>Antrocephalus hakonensis</i> (Ashmead) <i>A. maculipennis</i> (Cameron) <i>A. hakonensis</i> (Ashmead) <i>A. maculipennis</i> (Cameron) <i>A. phaeospilus</i> Waterston	Chalcididae	Pupa	February – May April - May	Coastal Interior
<i>Brachymeria nephantidis</i> Gahan <i>B. nosatoi</i> Habu <i>B. atteviae</i> Joseph, Narendran & Joy <i>B. lasus</i> (Walker)	Chalcididae	Pupa	September – June Throughout the year	Coastal Interior
<i>Trichospilus pupivora</i> Ferriere	Eulophidae	Pupa	November – February	Coastal Interior
<i>Xanthopimpla punctata</i> (Fabricius)	Ichneumonidae	Pupa	June - March	Coastal
<i>Eupelmus</i> sp.	Eupelmidae	Pupa	March - April	Coastal
<i>Anastatoidea brachartoniae</i> Gahan	Eupelmidae	Pupa	April - May	Coastal
<i>Meteoridea hutsoni</i> (Nixon)	Braconidae	Larval-pupal	Throughout the year	Interior
<i>Tetrastichus howardi</i> (Olliff)	Eulophidae	Pupa	November – February	Interior
<i>Goryphus gibbosus</i> Jonathan and Gupta	Ichneumonidae	Pupa	October - December	Interior

Table 2. Predators of *O. arenosella*

Name	Taxonomic status	Stage attacked	Period	Region
<i>Cardiastethus exiguus</i> Poppius	Heteroptera : Anthocoridae	Egg and first instar larva	Throughout the year	Coastal and Interior
<i>Buchananiella sodalis</i> Buchanan-White	Heteroptera : Anthocoridae	Egg and first instar larva	August- September October- November	Coastal Interior
<i>Parana nigrolineata</i> (Chaudoir)	Coleoptera : Carabidae	Larva	January – August July-January	Coastal Interior
<i>Jauravia</i> sp.	Coleoptera : Coccinellidae	Egg	March – June July- December	Coastal Interior
<i>Phytoseiulus</i> sp.	Acarina : Phytoseiidae	Egg	Throughout the year	Coastal
<i>Monomorium floralica</i> (Jerdon)	Hymenoptera : Formicidae	Egg, larva and pupa	March-May September- November	Interior
<i>Monomorium</i> spp.	Hymenoptera : Formicidae	Egg, larva & pupa	June- September	Coastal
<i>Cardiocondyla wroughtoni</i> Forel	Hymenoptera : Formicidae	Egg, larva & pupa	June- September	Coastal
<i>Crematogaster</i> sp.	Hymenoptera: Formicidae	Egg, larva & and pupa	June – September November- December	Coastal Interior
<i>Tapinoma</i> sp.	Hymenoptera : Dolichoderinae, Formicidae	Egg, larva, pupa	June – September July – September	Coastal Interior
<i>Mallada astur</i> (Banks)	Neuroptera: Chrysopidae	Egg and first instar larva	July – December	Interior

Table 3. Hyperparasitoids recorded on different parasitoids of *O. arenosella*

Name	Family	Name of primary parasitoid (host)
Coastal region		
<i>Aphanogmus manilae</i> (Ashmead)	Ceraphronidae	<i>Apanteles taragamae</i> Viereck <i>Goniozus nephantidis</i> (Muesebeck)
<i>Eupelmus</i> sp.	Eupelmidae	<i>A. taragamae</i> <i>G. nephantidis</i>
<i>Eurytoma albotibialis</i> Ashmead	Eurytomidae	<i>A. taragamae</i> <i>G. nephantidis</i> <i>Brachymeria</i> spp.
<i>E. braconidis</i> Ferriere	Eurytomidae	<i>A. taragamae</i> <i>G. nephantidis</i>
<i>Pediobius imbreus</i> (Walker)	Eulophidae	<i>A. taragamae</i> <i>G. nephantidis</i>
<i>Tetrastichus howardi</i> (Olliff)	Eulophidae	<i>A. taragamae</i> <i>G. nephantidis</i>
Interior region		
<i>A. manilae</i> (Ashmead)	Ceraphronidae	<i>A. taragamae</i> <i>G. nephantidis</i> <i>Bracon</i> sp.
<i>E. albotibialis</i> Ashmead	Eurytomidae	<i>A. taragamae</i> <i>G. nephantidis</i>
<i>E. braconidis</i> Ferriere	Eurytomidae	<i>A. taragamae</i> <i>G. nephantidis</i>
<i>Meteoridea hutsoni</i> (Nixon)	Braconidae	<i>A. taragamae</i>
<i>P. imbreus</i> (Walker)	Eulophidae	<i>Bracon</i> sp. <i>G. nephantidis</i>
<i>Nesolynx dipterae</i> Risbec	Eulophidae	Indet. Tachinid

ACKNOWLEDGEMENTS

The authors are grateful to Dr. T. C. Narendran, Calicut University for identifying all the parasitoids of *O. arenosella*. Sincere thanks are due to Dr. Mushtaq Ali, UAS, Bangalore, Dr. J. Poorani, Project Directorate of Biological Control, Bangalore and M. Nasser, Calicut University, for identifying the predators. Useful suggestions made by Dr. Subaharan, CPCRI, Kasaragod are acknowledged.

REFERENCES

- George, M. V., Sathiamma, B. and Vijayakumar, K. 1982. A technique to estimate the population of coconut leaf eating caterpillar, pp. 638-643. In: Bavappa, K.V. A. (Ed.). *Proceedings PLACROSYM V*, Central Plantation Crops Research Institute, Kasaragod, Kerala, India.
- Gulagannavar, U. 1987. Studies on the predators of coconut black headed caterpillar, *Opisina arenosella* Walker (Lepidoptera: Xylorictidae) with special reference to *Parena nigrolineata* (Chaudoir) (Coleoptera: Carabidae). *Mysore Journal of Agricultural Sciences*, **21**: 5-6.
- Nadarajan, L. and Channabasavanna, G. P. 1980. Population dynamics of black headed caterpillar, *Nephantis serinopa* Meyrick and its parasites. *Mysore Journal of Agricultural Sciences*, **14** (4): 217-223.
- Nirula, K. K., Antony, J. and Menon, K. P. V. 1951. Investigations on the pests of coconut palm. The coconut caterpillar, *Nephantis serinopa* Meyrick - Life history and habits. *Indian Coconut Journal*, **4**(4): 217-223.
- Perera, P. A. C. R. 1993. Integrated control of *Opisina arenosella* Walker, pp. 443-454. In : Nair, M. K., Khan, H. H., Gopalasundaram, P. and Bhaskara Rao, E. V. V. (Eds). *Advances in Coconut Research and Development*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Pillai, G. B. and Nair, K. R. 1993. A checklist of parasitoids and predators of *Opisina arenosella* Walker on coconut. *Indian Coconut Journal*, **23** (9): 2-9.
- Pushpalatha, N. A. and Veeresh, G. K. 1995. Population fluctuation of coconut black-headed caterpillar *Opisina arenosella* Walker (Lepidoptera: Xylorictidae). *Journal of Plantation Crops*, **23** (1): 44-47.
- Sathiamma, B., Jayapal, S. P. and Pillai, G. B. 1987. Spider fauna on the coconut palm and their role in the biological suppression of *Opisina arenosella* Walker, pp.53-55. In: Joseph, K. J. and Abdurahiman U. C., (Eds). *Advances in Biological Control Research in India – Proceedings National Seminar on Entomophagous Insects*, Calicut, 1985, 258 pp.
- Srinivasa, Y. B. 1996. Predatory potential of *Cardiastethus affinis* Poppius (Hemiptera: Anthocoridae) on the

coconut black-headed caterpillar,
Opisina arenosella Walker
(Lepidoptera: Xylorictidae). M. Sc.
thesis, UAS, Bangalore, 144 pp.

Veeresh, G. K., Mushthak Ali, T. M. and

Kumar, A. R. V. 1995. Ants as balancers
in nature for pest problems, pp. 121-
136. In: Ananthkrishnan, T. N. (Ed.)
*Biological Control of Social Forest and
Plantation Crops Insects*. Oxford &
IBH Publishing Co., New Delhi.