Proceedings of the Symposium on
Biological Control of Lepidopteran Pests
July 17-18, 2002, Bangalore

Seasonal incidence of braconid parasitoids of *Opisina arenosella* Walker (Lepidoptera: Oecophoridae) in south interior Karnataka

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ABSTRACT: **Surveillance on braconid parasitoids of *Opisina arenosella* Walker in South interior Karnataka during 1996-1997 revealed the efficiency of *Apanteles taragamae* Viereck (early larval), *Bracon brevicornis* Wesmael (late larval) and *Meteoridea hutsoni* (Nixon) (larval-pupal) during rainy, summer and winter seasons, respectively. *A. taragamae* and *M. hutsoni* were equally active on young and adult palms, whereas *B. brevicornis* was active on adult palms. *M. hutsoni* showed significant positive correlation with larval and pupal populatiou of the pest and exhibited density dependent relationship with pest population.**

KEY WORDS: *Apanteles taragamae, Bracon brevicornis,* coconut, interior Karnataka, *Meteoridea hutsoni, Opisina arenosella*

Introduction

Braconid parasitoids are potential biocontrol agents against a number of insect pests of agriculture and forest plants. Among the braconid parasitoids of *Opisina arenosella* Walker, *Apanteles taragamae* is a highly adaptable solitary endoparasitoid with wide distribution (Rao *et al.*, 1948; Ghosh and Abdurahiman, 1985a). In south interior Karnataka around Bangalore, the activity of *A. taragamae* was high during September (Nadarajan and ChannaBasavanna, 1980) and May-June (Pushpalatha, 1992). Polyphagous species, *Bracon brevicornis* is a widely distributed gregarious larval parasitoid of *O. arenosella*. Remadevi *et al.* (1980) gave an account of life history and biology of *B. brevicornis*. *Meteoridea hutsoni*, a solitary larval pupal endoparasitoid was first recorded from the pupae of *O. arenosella* (Sudheendrakumar *et al.*, 1979). In coastal Kerala, *M. hutsoni* has a limited distribution, being confined to Calicut and Malappuram districts (Mohammed *et al.*, 1982).

Nirula (1956) and Mohammed *et al.* (1982) have recorded the hyperparasitism of *O. arenosella*. Ghosh and Abdurahiman (1985b) and Kapadia (1983) discussed the role of hyperparasitoids in dampening the effect of primary parasitoids. Information is lacking with reference to the status of parasitoids of *O. arenosella* in Karnataka and hence this study on their status, seasonal occurrence, effect of abiotic and biotic factors and hyperparasitoids were conducted.

Materials and Methods

Observations on the population of *O. arenosella* and its natural enemies were recorded every month during September 1996-August 1997 in pest infested coconut plantations at Somanahalli near Maddur of Mandya district (12° 18' N and 76° 42' E) located at a height of 933.9 meters above mean sea level in the south interior area of Karnataka. Data were recorded from pest infested young palms (5-15 years) of 10 meters height and adult palms (above 15 years) of 30 meters height. The mixed cropping system in this plot involved coffee, guava, mulberry, banana and flowering shrubs as intercrops. The sampling plan for surveillance was adopted as per George *et al.* (1982). Pest larvae collected from 20 percent sample leaflets/palm during every month were observed for parasitism. Meteorological data were obtained from Regional

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Research Station, Vishweshwarayya Canal Farm, Mandya. Seasonal variation in the parasitism levels of braconids was recorded during 1996-1997. Correlation between population of the pest, braconids and abiotic factors was worked out. Hyperparasitism was observed by checking the parasitoid cocoons.

Results and Discussion

Apanteles taragamae

Parasitism recorded on both young and adult palms showed significant differences between different months during 1996-1997. The highest parasitism recorded was 4.27 and 5.74 percent, respectively, on young and adult palms (Table 1). Seasonal analysis revealed significantly high parasitism during rainy season on young palms, whereas on adult palms the difference was not significant (Table 3). Nadarajan and Channa Basavanna, (1980) also reported the highest parasitism (15.0 percent) by *A. taragamae* during September around Bangalore. Contrary to these findings, Pushpalatha (1992) reported its efficiency during summer in South interior Karnataka. Among the abiotic factors mean maximum temperature, and sunshine showed significant negative correlation with parasitism of *A. taragamae* on adult palms (Table 3). Significant positive correlation was observed between its parasitism and pest population only on adult palms (Table 5). Present field studies indicated that both abiotic and biotic factors influenced the parasitoid activity on adult palms at greater heights.

Bracon brevicornis

Parasitism by ***B. brevicornis*** was high during March-May, when temperature was 17° to 34°C, humidity (AN) 30 to 80 percent and rainfall 15 to 58mm. In young and adult palms, the percent parasitism ranged between 1.33-5.00 and 4.44-30.0, respectively (Table 1). Significantly high parasitism was recorded on adult palms during summer (Table 2). Contrary to the results

Table 1. Parasitism by braconids on young and adult palms in interior Karnataka

Month	Young palm			Adult palm		
	A	B	M	A	B	M
September, 1996	0.00	0.00	0.00	1.00 (4.060)	0.00	0.00
October	2.5 (6.46)	0.00	3.8 (11.18)	3.57, (7.75)	0.00	6.67 (14.80)
November	1.28 (5.58)	0.00	20.0 (26.10)	0.00	0.00	13.2 (21.30)
December	0.00	0.00	2.5 (6.46)	5.7 (11.90)	0.00	22.1 (27.80)
January , 1997	4.1 (11.40)	0.00	21.9 (27.40)	3.7 (9.40)	0.00	22.9(28.30)
February	0.00	0.00	20.2 (26.20)	0.6 (3.10)	0.00	17.6 (24.70)
March	0.00	2.0 (6.55)	0.00	0.00	16.0 (23.30)	0.00
April	0.00	0.00	5.3 (11.40)	0.00	30.0 (32.80)	3.96 (9.80)
May	0.00	5.0 (10.50)	0.00	0.00	12.3 (19.90)	0.00
June	1.3 (4.60)	1.3 (3.84)	9.5 (17.60)	1.5 (4.90)	4.4 (12.10)	5.3 (11.50)
July	4.3 (11.74)	3.0 (8.15)	0.00	4.8 (10.70)	5.2 (13.10)	0.00
August	3.2 (8.80)	0.00	8.9 (16.90)	4.0 (8.20)	0.00	7.9 (14.00)
Mean	4.05	4.83	11.93	5.01	16.87	12.67
CD (P=0.05)	1.96**	NS	7.40**	8.82*	9.05**	7.27**

A- *Apanteles taragamae* B- *Bracon brevicornis* M- *Meteoridea hutsoni*
*Significant at 5% ** Significant at 1%
Figures in parentheses are angular transformed values.

of *A. taragamae*, mean maximum temperature and sunshine showed significant positive correlation with parasitism of *B. brevicornis* on adult palms (Table 3). Studies on the bioecology of *B. hebetor* in south Kerala also revealed that population was maximum in hot season during February-March and reached its peak during April-May (Sathiamma *et al.*, 1986). But Ghosh and Abdurahiman (1987) recorded parasitism ranging from 2.50 to 6.45 percent in north Kerala, where activity was uniform in all the four seasons.

Meteoridea hutsoni

During the present survey, *M. hutsoni* was recorded in coffee mixed coconut cropping system in interior Karnataka for the first time throughout the study period on both young and adult palms. Mean temperature of 16-31°C, moderate relative humidity of 34-58 percent and low rainfall of 6-52mm favoured its activity during November-February. Parasitism ranged 3.96-22.95 percent and showed significant differences between the months (Table 1). Mohammed *et al.* (1982) and Ghosh and Abdurahiman (1984) recorded 0.26-35.64 and 5.71 percent parasitism, respectively by *M. hutsoni* in coastal north Kerala and reported that though it has limited distribution it caused high percentage of parasitism in localized pockets. Due to continued larval and pupal suppression during winter the pest density was significantly low during the summer (Table 4). Data on seasonal variation indicated that parasitism by *M. hutsoni* was significantly high during winter and low during summer, whereas during both post-monsoon and rainy seasons, it was statistically on par. No significant difference was observed in parasitism between young and adult palms (Table 2), which indicated its equal activity at different heights. Among the abiotic factors, minimum temperature and rainfall showed significant negative correlation with parasitism by *M. hutsoni*. Significant positive relationship of *M. hutsoni* and *B. brevicornis* with sunshine on adult palms, revealed the favourable influence of light in the population build up at greater height (Table 3).

Table 2. Seasonal variation in the parasitism by braconids

Seasons	Percent parsitism					
	A. taragamae		*B. brevicornis*		*M. hustoni*	
	Young palm	Adult palm	Young palm	Adult palm	Young palm	Adult palm
Post- monsoon	1.02 (5.61)	1.68 (6.95)	0.00	0.00	11.16 (19.31)	10.63 (19.00)
Winter	0.89 (5.28)	2.95 (9.47)	0.00	0.00	18.74 (25.52)	19.24 (25.99)
Summer	0.00	0.00	3.70 (10.83)	19.10 (25.59)	5.25 (11.38)	3.96 (9.83)
Rainy	2.63 (9.20)	3.27 (8.93)	1.93 (7.97)	4.78 (12.58)	9.13 (17.48)	6.42 (14.39)
Mean	1.13 (5.02)	1.97 (6.34)	2.81 (9.40)	11.94 (19.08)	11.07 (18.42)	10.06 (17.31)
CD (P=0.05) For A means	2.11**	NS	NS	9.79**	7.45**	5.51**
For B means	NS		3.84**		NS	

*Significant at 5% ** Significant at 1%

A= CD between seasons B= CD between young and adult palms

Figures in parentheses are angular transformed values.

Table 3. Correlation matrix between abiotic factors and activity of braconids

Natural enemies	Palm age	Maxi. temp.	Min. temp.	Relative humidity (FN)	Relative humidity (AN)	Sunshine (h)	Rainfall (mm)
Apanteles taragamae	Young palm	-0.116	0.047	0.012	0.135	-0.1422	0.104
	Adult palm	-0.321*	-0.094	0.174	0.314*	-0.383**	0.032
Meteoridea hutsoni	Young palm	-0.302*	-0.500**	0.110	-0.069	0.197	-0.351*
	Adult palm	-0.264	-0.733*	-0.106	-0.232	0.295*	-0.352*
Bracon Brevicornis	Young palm	0.085	0.021	0.284	0.149	0.099	0.193
	Adult palm	0.535*	-0.277	-0.685**	-0.640**	0.543*	-0.372

* Significant at 5%

** Significant at 1%

Significant positive correlation between parasitism by *M. hutsoni* and pupal and larval population of *O. arenosella*, revealed density dependent relationship with pest population (Table 5). Present studies as well as the field studies conducted by Ghosh and Abdurahiman (1987) indicate the need to undertake the mass production and release of *M. hutsoni* during the peak period of pest infestation during November-March in the areas of its absence.

Hyperparasitoids

In interior area, hyperparasitism of *O. arenosella* was observed on both young and adult palms during July-August and January-March. *A. taragamae* was parasitised by *Aphanogmus manilae, Eurytoma* spp. and *M. hutsoni*. Ghosh (1988) also reported that among the three important primary larval parasitoids of *O. arenosella*, *A. taragamae* recorded maximum hyperparasitoids in Kerala, which reduced its efficiency by 50 percent. Secondary parasitism of *B. brevicornis* by *Pediobius imbreus* during June-August, coincided with the drop in its percent parasitism to 4.78 from 19.10 in summer (Table 2). Present studies revealed that hyperparasitism during the peak period of activity of primary larval parasitoids affected their population buildup.

Table 4. Seasonal variation in the population of *O. arenosella*

Seasons	Pest population per 80 leaflets per palm (Mean)			
	Larva		Pupa	
	Young palm	Adult palm	Young palm	Adult palm
Post- monsoon	1495.0(38.49)	1657.5 (40.62)	250.0 (15.65)	322.5 (17. 80)
Winter	1605.0(39.98)	2222.5 (46.99)	250.0 (15.65)	710.00 (26.54)
Summer	767.5(27.47)	1187.5 (34.36)	90.0 (9.41)	100.00 (9.98)
Rainy	1692.5(40.85)	1320.0 (36.23)	200.0 (14.08)	207.50 (14.34)
Mean	1390.0 (36.70)	1596.9 (39.55)	197.5 (13.69)	335.00 (17.16)
CD (P=0.05)	7.81*	5.65**	3.31**	3.31**

*Significant at 5% ** Significant at 1%

Figures in parentheses are square root transformed values.

Table 5. Correlation matrix for *Opisina arenosella* and activity of braconids

Palm age	Species	Stage of *Opisina arenosella*	Relation with pest population
Young palm	*Apanteles taragamae*	Second instar larva	0.057
	Bracon brevicornis	Late instar larva	0.3654
	Meteoridea hutsoni	Pupa	0.9039**
		Late instar larva	0.0622
Adult palm	*A. taragamae*	Second instar larva	0.3152*
	B. brevicornis	Late instar larva	0.3011
	M. hutsoni	Pupa	0.7849 **
		Late instar larva	0.4520**

* Significant at 5%

** Significant at 1%

Acknowledgements

The authors are grateful to Dr. M. K. Nair, former Director, and Dr. V. Rajagopal, Director, CPCRI for providing facilities and to Dr. P. L. Tandon, Principal Scientist; Dr. Chandish Ballal, Sr. Scientist and Dr. Poorani, J, Scientist (SS), PDBC, Bangalore for critically going through the manuscript. We are indebted to Dr. T. C. Narendran, Professor, Calicut University, for the identification of braconids and to Shri. C. H. Amarnath, Technical Officer, CPCRI, Kasaragod for statistical analysis.

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