J. Biol. Control, 13: 115-120, 1999

Research Note

Natural parasitism in teak defoliator, *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae) in intensively managed plantation

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ABSTRACT: Parasitism in teak defoliator, *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae) was studied in an intensively managed teak plantation at Veeravanallur, South Tamil Nadu. Among the recorded parasitoids namely, *Sympiesis* sp. (Hymenoptera: Eulophidae), *Sarcophaga* sp. (Diptera: Sarcophagidae) and *Palexorista solennis* Walker (Diptera: Tachinidae), the latter was most predominant. Parasitism by *P. solennis* ranged from 8.0 per cent in October when defoliator was in the first generation to a peak of 54.54 per cent in December, suppressing the defoliator larval population in the fourth generation.

KEY WORDS: *Hyblaea puera*, intensively managed teak plantation, natural parasitism

Of late, teak monoculture has become a commercial proposition in the plains with intensive silvicultural practices that include drip irrigation, manuring, weeding and plant protection. Despite these intensive management measures, flushing occurs only on receipt of showers, especially of monsoon, leading to defoliator outbreaks. Devoid of biodiversity, the ecosystem of these intensively managed plantations differs from that of natural forests that is long lasting and stable with a long evolutionary history coupled with great diversity of flora and fauna (Walcher, 1977). Attempts have been made to understand the role of biocontrol agents in teak forests, especially on *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae) and *Eutectona machaeralis* (Walker) (Lepidoptera: Pyralidae) (Patil and

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Thontadarya, 1983; Sudheendrakumar, 1986; Ahmad, 1990; Sudheendrakumar *et al.*, 1995). Since the role of parasitoids in the intensively managed plantations has been rarely studied, investigations were made on the occurrence of parasitoids in an intensively managed 2 hectare teak plantation at Veeravanallur, Tamil Nadu, between January' 96 and January'97 and the results are presented in this note.

Since defoliator occurs as a seasonal pest, its larval population assessment and sampling was made during October, 96 to January, 97 at weekly interval from 25 randomly selected 3-year - old trees. Larval population was assessed by counting the total number of larvae present on a sapling. To assess parasitism, minimum 100 larvae in each of the five instars were collected at random from the plantation and reared in cages on fresh teak leaves in the laboratory at Agricultural College and Research Institute, Killikulam at 30.32±2.28°C and 81.06±2.78 per cent relative humidity. Parasitized moribund larvae were transferred to Petri-dishes to facilitate the parasitoids to pupate. The parasitoids emerging from the puparia were collected periodically. To assess the variation in leaf area consumption between tachinid-parasitized and healthy larvae, defoliator larvae laden with tachinid eggs on the thoracic region (usually second and third instars) were carefully collected from the plantation and reared in the laboratory on fresh teak leaves cut into circular discs (4.5cm diam)and placed over moist filter paper in Petri-dishes. Leaf discs were changed daily after measuring the leaf area consumed by a portable leaf area meter (CI-202 CID, Incorporated, USA).

Defoliator larvae were found prone to large-scale parasitism under plantation conditions, especially during the Northeast monsoon season when the pest occurred in a 4-generation epidemic. The parasitoids recovered from defoliator larvae were identified as *Sympiesis* sp. (Hymenoptera: Eulophidae), *Palexorista solennis* Walker (Diptera: Tachinidae) and *Sarchophaga* sp. (Diptera: Sarcophagidae). *Sympiesis* sp. exclusively parasitised the first instar larvae with peak parasitism (12.5%) in November. Reviewing the biological control of defoliator by parasitoids, Nair *et al.* (1995) suggested that *Sympiesis* sp. could be reared on *Corcyra cephalonica* and released inundatively as it lacked in numerical response. The role of *Sarcophaga* sp. could not be quantified. The most predominant parasitoid was *P. solennis* that occurred not only on defoliator but also on skeletonizer. Nair and Sudheendrakumar (1986) also observed that *P. solennis* was the most predominant parasitoid in natural forests, being regular and consistent on several occasions (Sudheendrakumar, 1986). Though it is a parasitoid of late instar, behavioural studies on the tachinid revealed that they could lay eggs on the thoracic region of late second instars as well as of third instars.

Parasitised defoliator larvae became sluggish responding much less to the external stimuli. However, they continued to feed on the leaf. Consequently, the rate

of food ingestion lessened in comparison with that of healthy larvae (Table 1). While the healthy larvae consumed 28.58 cm^2 of leaf area on an average, the parasitised larvae ingested only 22.57cm^2 leaf area, which was 21.03 per cent less.

Table 1. Mean leaf area consumed by tachinid-parasitised and healthy larvae of *H.puera*

Instar	Leaf area consumed in cm^2			
	Parasitised larva		Healthy larva	
	Mean	Range	Mean	Range
Third	42.02±5.25	22.70- 58.16	52.11± 4.76	29.46- 67.68
Fourth	20.84±3.82	1.74-3 8.12	36.97± 3.82*	5.36- 52.66
Fifth	4.85±4.34	0.00- 33.00	16.66± 4.46*	0.00- 34.43

*Significantly different from the value in the other column(t-test; P=0.05).

The decrease in feeding rate with increase in instar number of the parasitised larvae was due to parasitism. While the decrease in food consumption of the field collected healthy larvae (between third and fifth instars) was due to the fact that they often avoided feeding and tended to pupate much earlier than normal when reared under laboratory conditions.

Tachinids parasitised only 8.0 per cent of defoliator larvae in October when the latter was in its first generation (Fig.1). Sudheendrakumar (1986) recorded 3-6 per cent parasitism due to *P. solennis* in the first epidemic in two seasons. Later parasitism increased manifolds through successive generations, exhibiting a two-way response i.e., functional response of the defoliator and numerical response of the tachinid. Parasitization steadily increased in November (37.71%) when the host population was 16.35 larvae/tree. Parasitism averaged 54.54 per cent during December, peaking in early December (80.76%). Only a fewer defoliator larvae (16.66%) were parasitised in January as the host population was on the decline (2.1 larvae/tree). Earlier a 4-6 fold increase in parasitism has been reported by Sudheendrakumar (1986). The low rate of parasitism during the initiation of defoliator outbreak may be related to the scarcity of defoliator larvae during the off-season. Sudheendrakumar (1986) also reported that the number of parasitoids available to compete with the first epidemic population of the pest would be very small.

Parasitism during the fourth generation (early January) declined rapidly in response to the reduction in defoliator population density. However, in forest plantations parasitoid populations were unable to respond numerically to host density increase because of the rapid mobility of *H. puera* populations (Nair *et al.*, 1955).

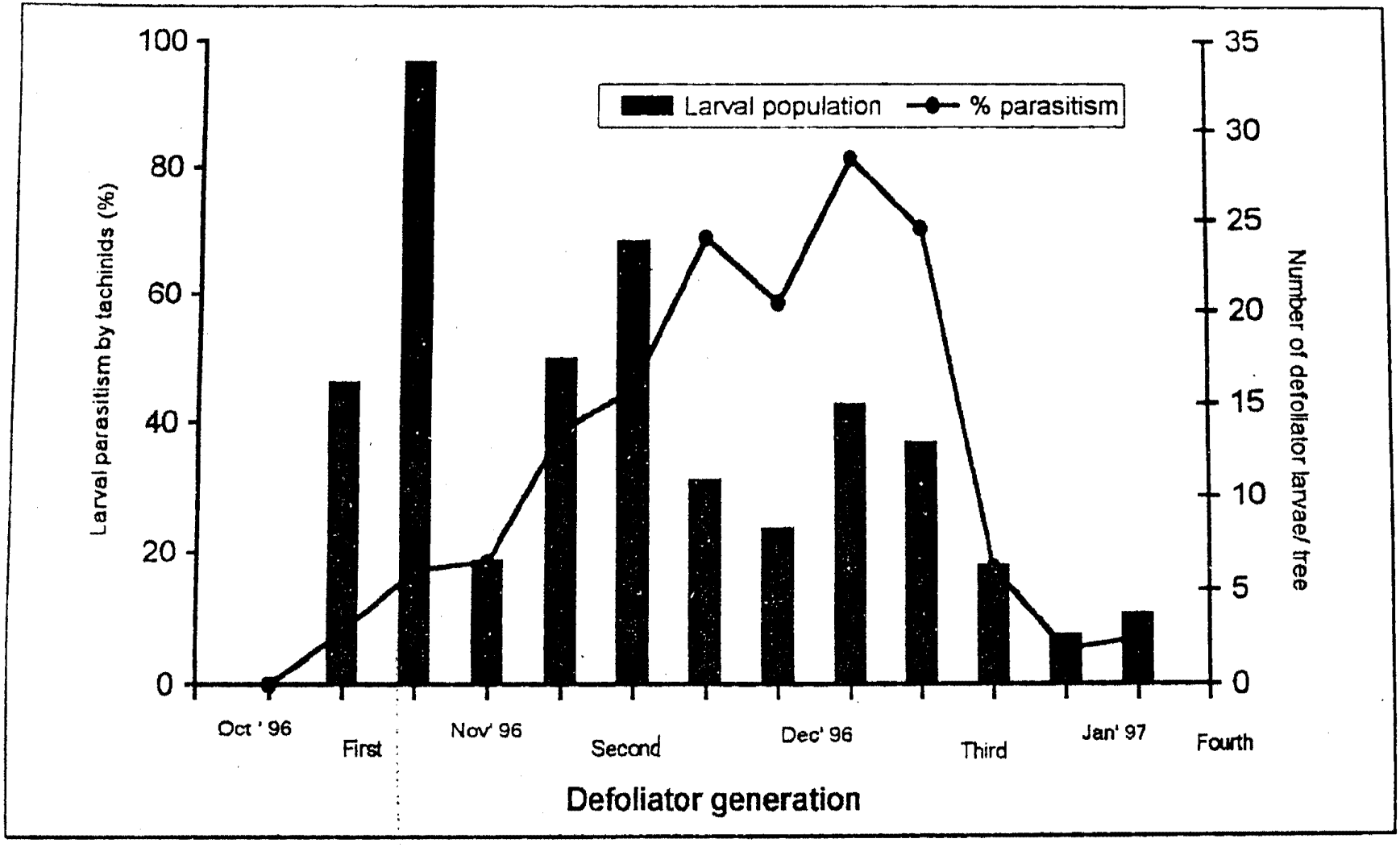

Fig. 1. Dynamics of defoliator larval population and parasitism by tachinid in monsoon epidemics

Therefore, when a new generation of adult parasitoids emerge in a locality, the host could move away to another area, as the moths are migratory. Similarly, when a high density population of the susceptible stage of host larvae occurred from an incoming population of moths, there was rarely a resident population of parasitoids resulting in spatial isolation of the host and its parasitoids (Nair, 1987). Thus host migration could help in evading the parasitoids.

Being a parasitoid of both defoliator and skeletonizer, no special efforts are necessary to conserve this tachinid in plantations because skeletonizer occurs on teak all round the year. Defoliator also occurs sporadically at a negligible residual level. The tachinid, therefore, can sustain itself on these populations during non-outbreak periods of defoliator.

ACKNOWLEDGEMENTS

The authors thank Dr. V. V. Sudheendrakumar, Faculty of Entomology, Kerala Forest Research Institute, Peechi for identifying the parasitoids. The financial assistance rendered by M/s. Sterling Tree Magnum (India) Ltd., Chennai is gratefully acknowledged.

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