

## Survey and tritrophic interactions between host plants, *Helopeltis antonii* Signoret (Heteroptera: Miridae) and its egg parasitoids

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**ABSTRACT:** The egg parasitoids of *Helopeltis antonii* Signoret existing in neem endemic area (coastal and hinterland of Tamil Nadu) and in non-neem endemic area (western ghats of Tamil Nadu and coastal Karnataka) are *Telenomus* sp. laricis group (Scelionidae), *Erythmelus helopeltidis* Gahan (Mymaridae), *Chaetostricha* sp. and *Ufens* sp. (Trichogrammatidae). *Telenomus* sp. is very much dominant in non-neem endemic areas, whereas *Ufens* sp. is quite prominent in neem endemic areas. When the eggs of *H. antonii* laid on neem were exposed for natural parasitism, neem has not exerted any adverse interaction on *Telenomus* sp.

**KEY WORDS:** Egg parasitoids, *Helopeltis antonii*

*Helopeltis antonii* Signoret (Heteroptera: Miridae) is the serious pest on cashew and neem. Even though, the egg parasitoids of *H. antonii* on cashew viz., *Telenomus* sp. laricis group, *Erythmelus helopeltidis* Gahan, *Chaetostricha* sp. and *Gonatocerus* sp. have been documented from coastal Karnataka on cashew (Sundararaju, 1996), the species composition of egg parasitoids of *H. antonii* on neem has not been studied so far. Hence, present studies were

undertaken to identify the species of egg parasitoids of *H. antonii* existing in the neem endemic and non-neem endemic areas of Tamil Nadu and to document their tritrophic interactions.

### MATERIALS AND METHODS

#### Survey of egg parasitoids of *H. antonii* in Tamil Nadu

Plant samples of neem (*Azadirachta indica* A. Juss), cashew (*Anacardium*

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*occidentale* L.), guava (*Psidium guajava* L.) and drumstick (*Moringa oleifera* Lamark.) containing eggs of *H. antonii* at different locations in neem endemic area (coastal and hinterland) and non-neem endemic area (eastern slopes and western ghats) of Tamil Nadu during 1993-96. At each location, at least 75 eggs were examined mainly to find out whether egg parasitism exists or not. Sampling of eggs was repeated twice on same host plant, wherever, egg parasitism was absent in the first instance. For this purpose, the plant parts containing the eggs were either dissected immediately or on or before sixtieth day after maintaining them in adult parasitoid emergence cage (Sundararaju, 1993) for collection of adult parasitoids and finally percentage of parasitism was worked out. The total parasitism was classified into two main groups based on the characteristics of different species of parasitoids. The two groups were categorized as *Telenomus* group (TG) of Scelionidae and non-*Telenomus* group (NTG) belonging to Trichogrammatidae and Mymaridae (Sundararaju, 1996).

### **Tritrophic interactions between host plants, *H. antonii* and its egg parasitoids**

The tritrophic interactions were studied to find out whether host plants influence the extent of parasitism of egg parasitoids and which type of egg parasitoid is more prevalent on a particular host plant. For this purpose, the gravid females of *H. antonii* were caged for oviposition on tender shoots of respective host plants. After 24h, the cages were removed and those shoots having eggs of *H. antonii* were

exposed for natural egg parasitism as a host enrichment technique (Luck *et al.*, 1988) during 1994-97. In each occasion, minimum of one hundred eggs were exposed for natural parasitism and the shoots containing eggs were severed from respective host plant and the extent of parasitism was estimated on or before sixtieth day by dissection method as explained earlier. In the neem endemic areas, the eggs were exposed on neem, cashew, drumstick, guava, cotton (*Gossypium hirsutum* L.) and silk cotton [*Ceiba pentandra* (L.) Gaetrn.] in hinterland (Coimbatore) and cashew and neem in Vridhachalam and Villupuram (east coast region of Tamil Nadu), respectively. In non-neem endemic area at Puttur (coastal Karnataka), the eggs were exposed on neem, cashew and guava. Neem trees were specially raised for this study in this region. Similarly, at Coimbatore, as cashew never existed due to antagonistic soil condition, cashew grafts/seedlings were raised for this purpose with adequate amelioration.

## **RESULTS AND DISCUSSION**

### **Survey of egg parasitoids of *H. antonii* in Tamil Nadu**

In this study, both groups (TG and NTG) were encountered. In total three species of solitary egg parasitoids viz., *Telenomus* sp. *laricis* group (Hymenoptera: Scelionidae), *Ufens* sp. (Hymenoptera: Trichogrammatidae) and *Erythmelus helopeltidis* Gahan (Hymenoptera: Mymaridae) were reported for the first time in Tamil Nadu. The *Chaetostricha* sp.

reported from coastal Karnataka was found to be absent whereas the occurrence of *Telenomus* sp. and *E. helopeltidis* (Sundararaju, 1993) has also been confirmed in this study in Tamil Nadu. The egg parasitism was observed in all host plants surveyed except guava and the highest extent of parasitism on different host plants ranged from 19.1 to 61.9 per cent (Table 1). Occurrence of three species (*Ufens* sp., *E. helopeltidis* and *Telenomus* sp.) and one species (*Ufens* sp.) were observed on neem at hinterland (Coimbatore) and coastal region (Chennai), respectively. On cashew, the dominant egg parasitoid (*Telenomus* sp.) recorded from coastal Karnataka (Sundararaju, 1993) was detected in western ghat region (Pechiparai) of Tamil Nadu, whereas in the east coast, it was absent and only *Ufens* sp. was recorded. On drumstick, only *Telenomus* sp. was detected at Coimbatore.

### Tritrophic interactions between host plants, *H. antonii* and its egg parasitoids

From the eggs of *H. antonii* laid in different host plants at Coimbatore (neem endemic area), occurrence of *Telenomus* sp. was more prominent on other host plants (cashew, drumstick, silk cotton and cotton) than on neem and it ranged from 11.0 to 48.7 per cent, whereas on neem its occurrence was noticed to a maximum extent of 6.3 per cent. But on neem, occurrence of NTG parasitoids was quite prominent and ranged from 7.5 to 91.8 per cent (Table 2). The low occurrence of *Telenomus* sp. on neem may be due to interspecific competition between NTG parasitoids rather than any adverse influence of host plant (tritrophic interaction), since its occurrence was highest (22.7%) on neem and was quite dominant than NTG parasitoids at Puttur (neem non-endemic area).

Table 1. Survey on natural egg parasitism of *H. antonii* in Tamil Nadu

Host plant	Location	Period of sampling	Range of egg parasitism (%)		
			Total	Species composition	
				NTG	TG
<i>Azadirachta indica</i>	Coimbatore	Nov. -Dec., 93	50.0-61.9	50.0-61.9	0.0-4.8
<i>Azadirachta indica</i>	Chennai	April, 95	18.9	18.9	0.0
<i>Anacardium occidentale</i>	Vridhachalam	April-May, 95	15.4-47.4	15.4-47.4*	0.0
<i>Anacardium occidentale</i>	Pechiparai	July, 96	70.8	0.0	70.8
<i>Moringa oleifera</i>	Coimbatore	Aug., 95	19.1	0.0	19.1
<i>Psidium guajava</i>	Periyakulam	Dec., 94 & Jan., 96	0.0	0.0	0.0
<i>Psidium guajava</i>	Coimbatore	Oct., 95 & Nov., 95	0.0	0.0	0.0

NTG (*Ufens* sp. and *Erythmelus helopeltidis*); TG (*Telenomus* sp. laricis group); \* only *Ufens* sp.

Table 2. Extent of parasitism of exposed eggs of *H. antonii* in neem endemic and non-endemic areas

Host plant	Location	Period of sampling	Range of egg parasitism (%)		
			Total	Species composition	
				NTG	TG
<b>Neem endemic area</b>					
<i>Azadirachta indica</i>	Coimbatore	Nov., 94 to Oct., 95	7.5 — 91.9	7.5—91.9	0.0 — 6.3
<i>Azadirachta indica</i>	Villupuram	Dec., 95	56.7	56.7*	0.0
<i>Anacardium occidentale</i>	Coimbatore	Dec., 94 & Jan., 95	1.8 — 11.0	0.0— 1.8	0.0—11.0
<i>Anacardium occidentale</i>	Vridhachalam	Jan., 95	45.2	45.2*	0.0
<i>Moringa oleifera</i>	Coimbatore	Nov., 94- Jan., 95	23.7 — 50.0	0.0— 2.9	23.7 —48.7
<i>Gossypium hirsutum</i>	-do-	Aug. 94 & 95 & Nov., 94	5.8 — 22.2	5.8—16.3	0.0 —22.2
<i>Ceiba pentandra</i>	-do-	Dec., 95	25.2	0.0	25.2
<i>Psidium guajava</i>	-do-	Oct. & Nov., 95	0.0	0.0	0.0
<b>Neem non-endemic area</b>					
<i>A. indica</i>	Puttur	Mar., 97	37.7	15.1**	22.7
<i>A. occidentale</i>	-do-	-do-	60.1	23.7**	36.5
<i>P. guajava</i>	-do-	-do-	50.0	19.2**	30.8

NTG (*Ufens* sp. and *Erythmelus helopeltidis*); \*\* *Chaetostricha* sp. and *E. helopeltidis*  
 + only *Ufens* sp.; TG (*Telenomus* sp. *laricis* group)

Even though in the neem endemic area, occurrence of any egg parasitoids was totally absent on guava, their occurrence on neem in the non-endemic area (Puttur) was recorded to a maximum extent of 50 per cent on the same host plant (Table 2) and it needs further study in Tamil Nadu. This study again confirms that *Telenomus* sp. is absent in the cashew belt of east coast

(Vridhachalam). Since, *Telenomus* sp. was recorded on a number of host plants in host enrichment technique, it may very well establish especially on cashew in the east coast and it is worth while to introduce it in the cashew belt of east coast of Tamil Nadu. In fact, the influence of host plants has affected the parasitism by *Trichogramma* and *Encarsia* sp. on other

host insects (Yadav, 1980; Yadav and Patel, 1981; Srinivasa *et al.*, 1999) and no such adverse effect of host plant has been recorded in the present study.

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