

## Studies on Predatory Potential of *Nesidiocoris tenuis* (Reuter) on *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae)

Lakshmi Sireesha, E.T. \*, Ramesh Babu, T., Koteswara Rao, S.R. and Panduranga, G.S.

Department of Entomology, S.V. Agricultural College, ANGRAU, Tirupati -517 502, A.P.

\*Corresponding Author E-mail: [sireeshaetlakshmi@gmail.com](mailto:sireeshaetlakshmi@gmail.com)

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### ABSTRACT

South American tomato leaf miner, *Tuta absoluta* (Meyrick) is a recently introduced invasive insect pest on solanaceous crops. *Nesidiocoris tenuis* (Reuter) is a predator of major insect pests of solanaceous crops and it has been used in biological control programmes. The predatory potential of nymphs and adults of *N. tenuis* was evaluated on various life stages of *T. absoluta* under laboratory conditions. The results showed that both nymphs and adults of *N. tenuis* preferentially fed on egg stage of *T. absoluta*. In addition, third nymphal instars of *N. tenuis* fed voraciously on first and second instars of *T. absoluta* with feeding potential of 2 and 1.75 prey for predator, respectively. Whereas first instar nymph of *N. tenuis* showed least preference towards first (0.75 prey/ predator) and second larval instars (0.25 prey/ predator) of *T. absoluta*. Hence, *N. tenuis* should be released during third nymphal stage to allow them to feed on first and second larval instars of *T. absoluta* to maximize the effectiveness of predator in reducing the population of *T. absoluta*. It is also concluded that these predatory bug can be utilized as an effective biocontrol agent along with other management tactics for ecofriendly management of invasive insect pest like *T. absoluta*.

**Key words:** Predator, *N. tenuis*, *T. absoluta*, tomato.

### INTRODUCTION

South American tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is a major pest of tomato (*Solanum lycopersicum*) as well as other solanaceous crops such as egg plant (*Solanum melongena*), potato (*Solanum tuberosum*), belpapper (*Capsicum annum*), tobacco (*Nicotiana tabacum*), solanaceous weeds and garden

bean, (*Phaseolus vulgaris*)<sup>5</sup>. It is a native pest of South America<sup>4</sup>. In India, the pest was first time reported in Pune, Maharashtra in 2014. It attacks the crop since from seedling stage till harvesting of fruits. It feeds on leaves, stems, buds, young fruits and reduces the quality of fruits by invading secondary pathogens. In severe cases, it inflicts 50-100% yield loss in both greenhouse and field conditions<sup>6</sup>.

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Biological control refers to the action of parasitoids, predators or pathogens in maintaining the insect population density at a lower average level than would occur in their absence<sup>1</sup>. The predatory bug, *Nesidiocoris tenuis* (Reuter) (Hemiptera: Miridae) is common in tomato and other vegetable crops and it is a polyphagous predatory bug on whiteflies, moth eggs and small grubs<sup>3</sup>. It preferentially feeds on *T. absoluta* eggs and larvae. Therefore the studies on predatory potential of *N. tenuis* on different of *T. absoluta* was planned and executed for the effective management of *T. absoluta*.

### MATERIAL AND METHODS

#### *Mass rearing of the N. tenuis*

The tomato pinworm was used as a prey throughout the study period. Mass multiplication of predator, *N. tenuis* was done on tomato plants infested with *T. absoluta* under laboratory conditions at  $25 \pm 2^\circ\text{C}$  and  $75 \pm 2\%$  RH.

For oviposition substrate like tomato seedlings was used for egg laying by the bug. As per the food source is concerned, eggs and newly emerged larvae of *T. absoluta* and tomato seedlings were used. *N. tenuis* though feed on the tomato seedlings but failed to complete the life cycle on tomato seedling in the absence of *T. absoluta*. Therefore finally, *T. absoluta* as food source and tomato seedlings as oviposition substrate were found to be the best combination for mass multiplication of *N. tenuis*.

#### *Determination of predatory potential of N. tenuis on T. absoluta*

In order to determine the predatory potential of *N. tenuis*, each petriplate was confined with five individuals of each stage of *T. absoluta* (i.e. five number of eggs, 1<sup>st</sup> instar larvae, 2<sup>nd</sup> instar larvae, 3<sup>rd</sup> instar larvae, 4<sup>th</sup> instar larvae and pupae). Nymphal and adult stages of *N. tenuis* was introduced by using aspirator separately into each petriplate containing different stages of *T. absoluta* to estimate the feeding preference and feeding potential of predator after 48 hours of release. This experiment is replicated in four times.

### RESULT AND DISCUSSION

The results on feeding preference and feeding potential of *N. tenuis* on *T. absoluta* is presented in Table 1.

The feeding potential of *N. tenuis* was observed only on eggs, first, second and third instar larvae of *T. absoluta*. The predatory potential of I instar nymph of *N. tenuis* on eggs, first, second and third instar nymphs of *T. absoluta* was found to be 1.25 eggs, 0.75, 0.25 and 0.25 larvae, respectively. The consumption capacity of II instar nymph of *N. tenuis* on eggs, first, second and third instar larvae of *T. absoluta* was 1.50 eggs, 1.25, 1.25 and 0.75 larvae, respectively. The mean number of eggs, I, II and III instar larvae of *T. absoluta* consumed by III instar nymph of *N. tenuis* was 1.50 eggs, 2.00, 1.75 and 1.00 larvae, respectively. The mean number of eggs, I, II and III instar larvae of *T. absoluta* consumed by IV instar nymphs of *N. tenuis* was 1.25 eggs, 1.50, 1.50 and 0.75 larvae, respectively. The consumption capacity of V instar nymph of *N. tenuis* on eggs, first, second and third instar larvae of *T. absoluta* was 2.75 eggs, 1.25, 1.25 and 0.50 larvae, respectively. The consumption capacity of adult of *N. tenuis* on eggs, first, second and third instar larvae of *T. absoluta* was 2.25 eggs, 1.00, 1.00 and 0.50 larvae, respectively.

The results indicated that the adult and nymphs of *N. tenuis* feed on all developmental stages of *T. absoluta*. However, adults and V instar nymph exhibited great preference to the eggs ( $2.25 \pm 0.25$ ) of *T. absoluta*. The third instar nymph of the predator showed the greatest effect on both first instar and second instar larvae of *T. absoluta*, ( $2.00 \pm 0.25$  and  $1.75 \pm 0.40$  predated individuals, respectively) when compared to other nymphs and adults of *N. tenuis* (Table 1).

These results were on par with the findings of Ettaib et al.<sup>2</sup>, who reported that both adult and nymphs of *N. tenuis* feed on all developmental stages of *T. absoluta*, with great preference to eggs ( $17.75 \pm 0.95$ ) and third instar nymph of the predator showed the greatest effect on both I instar and II instar

larvae of *T. absoluta*, ( $1.5 \pm 0.57$  and  $1.25 \pm 0.50$  predated individuals, respectively) when

compared to other nymphs and adults of *N. tenuis*.

**Table 1: Predatory potential of *N. tenuis* against *T. absoluta***

Nymphal stages of <i>N. tenuis</i>	Life stages of <i>T. absoluta</i> (Mean $\pm$ S.E)					
	Egg	I instar	II instar	III instar	IV instar	Pupa
I instar nymph	$1.25 \pm 0.25$	$0.75 \pm 0.25$	$0.25 \pm 0.25$	$0.25 \pm 0.28$	$0.00 \pm 0.00$	$0.00 \pm 0.00$
II instar nymph	$1.50 \pm 0.28$	$1.25 \pm 0.25$	$1.25 \pm 0.25$	$0.75 \pm 0.25$	$0.00 \pm 0.00$	$0.00 \pm 0.00$
III instar nymph	$1.50 \pm 0.25$	$2.00 \pm 0.25$	$1.75 \pm 0.40$	$1.00 \pm 0.40$	$0.00 \pm 0.00$	$0.00 \pm 0.00$
IV instar nymph	$1.25 \pm 0.47$	$1.50 \pm 0.25$	$1.50 \pm 0.25$	$0.75 \pm 0.25$	$0.00 \pm 0.00$	$0.00 \pm 0.00$
V instar nymph	$2.25 \pm 0.25$	$1.25 \pm 0.25$	$1.25 \pm 0.28$	$0.50 \pm 0.28$	$0.00 \pm 0.00$	$0.00 \pm 0.00$
Adult	$2.25 \pm 0.25$	$1.00 \pm 0.28$	$1.00 \pm 0.28$	$0.50 \pm 0.28$	$0.00 \pm 0.00$	$0.00 \pm 0.00$

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