

## Original Research Article

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## Studies on Biology of Predatory Bug, *Nesidiocoris tenuis* (Reuter) on *Tuta absoluta* (Meyrick)

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

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

\*Corresponding author

### ABSTRACT

#### Keywords

*N. tenuis*, Total life period, biology, *T. absoluta*

#### Article Info

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*Nesidiocoris tenuis* (Reuter) (Hemiptera: Miridae) is an effective predator of pests of tomato crops and a promising biocontrol agent of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae). The aim of this study was to know the biology of the predator, *N. tenuis* on *T. absoluta*. This study was revealed that egg period as 6.97 days and number of nymphal instars was five. The duration of I, II, III, IV and V instar nymphs was 2.71, 3.09, 2.83, 3.06 and 2.76 days, respectively and total nymphal period was 14.48 days. The longevity of adult was 7.43 days. The total life period was observed 28.89 days when fed on *T. absoluta*.

### Introduction

*Nesidiocoris tenuis* (Reuter, 1895), belonging to the plant bug family Miridae (Hemiptera), is widely distributed in the Palaearctic and Mediterranean regions (Kerzhner and Josifov, 1999; Sanchez *et al.*, 2008). This polyphagous mirid is commonly found on various plants in a variety of natural ecosystems (Alomar and Albajes, 1996; Perdakis and Lykouressis, 2004; Sanchez *et al.*, 2004), and has a wide range of host plants, including some greenhouse crops (Sanchez *et al.*, 2008). Some reports have classified this species as an insect pest, as it can damage crops by directly feeding on host plants such as tomato and

pepper (Schuh and Slater, 1995; Yasunaga, 2000; Wheeler, 2001; Arno *et al.*, 2009; Wheeler, 2000a). Conversely, in many countries, this species has recently been used as a biological control agent in agro-ecosystems, in order to control major greenhouses insect pests such as *Bemisia tabaci* (Gennadius), *Trialeurodes vaporariorum* (Westwood), *Macrosiphum euphorbiae* (Thomas), *Frankliniella occidentalis* (Pergande), moths like *Spodoptera exigua* (Hubner) and *Tuta absoluta* (Meyrick) as this species is zoophytophagous, with predatory-preference feeding habits (Wheeler, 2001; Sanchez *et al.*, 2008; Wheeler, 2000b; Bueno and van

Lenteren, 2012; Urbaneja *et al.*, 2012; Lins Jr *et al.*, 2014). In recent years, it is sought as important biological agent of *T. absoluta* in vegetable crops (Ettaib *et al.*, 2016). Therefore, in this study duration of egg, all nymphal stages, total nymphal and life period was observed on *T. absoluta*.

## **Materials and Methods**

### **Mass multiplication of predatory bug, *N. tenuis***

The tomato pinworm was used as a prey for *N. tenuis* 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  $75 \pm 2$  per cent RH.

A laboratory population was established with field collected population of *N. tenuis*. This culture was maintained in plastic jars provided with *T. absoluta* infested tomato leaves as a source of food until the nymphs of *N. tenuis* becomes adults. These adults were transferred to oviposition cages for mating. Fresh tomato seedlings were provided daily for egg laying. Seedlings were inspected continuously for the emergence of nymphs. Later, nymphs were collected and reared in plastic jars provided with different stages of *T. absoluta*. The food was provided daily for developing nymphs of *N. tenuis* till they moult into adult. The adults were collected and released into oviposition cages for further culturing of *N. tenuis*. Rearing was continued and the culture was used to study the biology of *N. tenuis*.

### **Biology of *N. tenuis***

The initial population of *N. tenuis* was collected from the infested fields of tomato. The mass culturing of *N. tenuis* in rearing cages was done on tomato plants infested with tomato pinworm, *T. absoluta* under laboratory

conditions. Developmental biology of *N. tenuis* was studied on the tomato leaves infested with *T. absoluta* at temperature  $25 \pm 2^{\circ}\text{C}$  and  $75 \pm 2$  per cent RH. Tomato seedlings infested with *T. absoluta* raised in plastic pots were exposed to *N. tenuis* in rearing cages for oviposition inside the oviposition cage. After 24 hours, the seedlings were removed and kept for further development. Since the eggs of the bug were deeply embedded in the leaves or stems and could not be located, no observation was carried out during the egg stage. Seedlings were inspected daily and the nymphs emerged were collected and reared individually in petri plates by providing the different stages of *T. absoluta* as prey. Tomato leaves infested with tomato pinworm was provided as prey to each nymph in the individual rearing petri plates. The leaf petiole was wrapped with moist cotton to keep it turgid. The food was changed daily and the petri plates under observation were examined at 24 hours interval for moulting of the nymph till all nymphs developed into adults. The duration of egg, each nymphal instar, total nymphal duration and duration from egg to adult emergence were recorded (Gavkare and Sharma, 2014). Mean and SD were calculated for the obtained data to know the biology of the predatory bug.

## **Results and Discussion**

Developmental biology of *N. tenuis* was studied on *T. absoluta* at constant temperature of  $25 \pm 2^{\circ}\text{C}$  and RH of  $75 \pm 2$  per cent and the results are presented in Table 1 and Fig. 1.

### **Biology of predatory bug, *N. tenuis***

A brief description of individual developmental stage is illustrated here under. Because of its zoophytophagus, the tomato leaves were provided as an alternative food source for *N. tenuis*. The predatory bug, *N. tenuis* was reared on the *T. absoluta* and

maintained the culture of predator during the experimental period.

**Egg period**

Eggs are laid into the plant mesophyll tissue and cannot be seen with the naked eye. Egg period ranged from 6-8 days with an average of  $6.97 \pm 0.37$  days (Table 1 and Fig. 1).

**Nymphal period (instarwise)**

The newly hatched nymphs were yellowish green turned to bright emerald green as they develop. Nymphs have dark eyes and cannot fly. They were found on the underside of leaves in the growing plants and moved quickly when disturbed. They blended very well with plant material and like to hide so can be difficult to see. The nymphs moulted four times during their development before undergoing adult stage. The first instar nymphal period lasts for 2 to 4 days with an

average of  $2.71 \pm 0.53$  days (Table 1 and Fig.1). The second instar nymphal period lasts for 2 to 4 days with an average of  $3.09 \pm 0.36$  days (Table 1 and Fig. 1). The third instar nymphal period lasts for 2 to 4 days with an average of  $2.83 \pm 0.29$  days (Table 1 and Fig. 1). The fourth instar nymphal period lasts for 3 to 4 days with an average of  $3.06 \pm 0.43$  days (Table 1 and Fig. 1). The fifth instar nymphal period lasts for 2 to 4 days with an average of  $2.76 \pm 0.27$  days (Table 1 and Fig. 1).

**Total nymphal period**

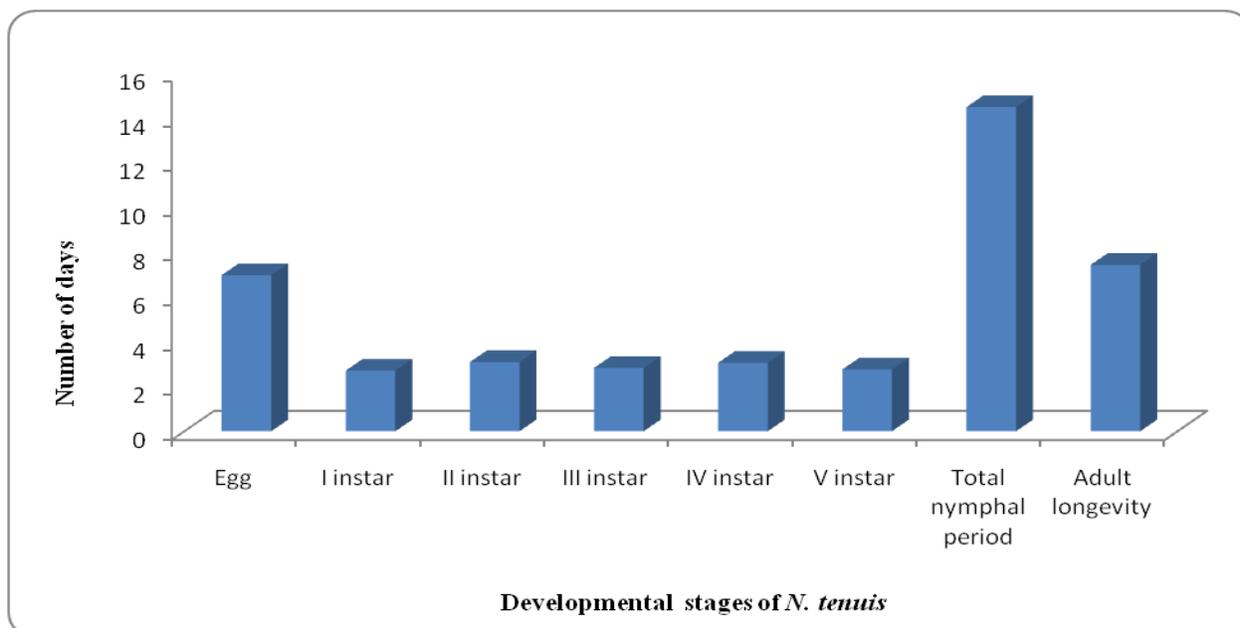
The total nymphal development period lasts for 12-17 days with an average of  $14.48 \pm 0.94$  days (Table 1 and Fig. 1). The results of present study are comparable with the findings of Dessouki *et al.*, (1976) who reported that the nymphal period ranged from 16.50 to 22.79 days.

**Table.1** Duration (in days) of developmental stages of predatory bug, *N. tenuis* on tomato pinworm, *T. absoluta*

Stages of <i>N. tenuis</i>	Range of duration (days)	Mean $\pm$ (S.D)(days)
<b>Egg period</b>	6-8	$6.97 \pm 0.37$
<b>I instar</b>	2-4	$2.71 \pm 0.53$
<b>II instar</b>	2-4	$3.09 \pm 0.36$
<b>III instar</b>	2-4	$2.83 \pm 0.29$
<b>IV instar</b>	3-4	$3.06 \pm 0.43$
<b>V instar</b>	2-4	$2.76 \pm 0.27$
<b>Total nymphal period</b>	12-17	$14.48 \pm 0.94$
<b>Adult longevity</b>	6-10	$7.43 \pm 1.11$
<b>Total life period</b>	26-31	$28.89 \pm 1.03$

Mean values presented in the table are average of four replications

**Fig.1** Duration (in days) of developmental period of *N. tenuis* on tomato pinworm, *T. absoluta*



### Adult longevity

Adults were bright green with black specks on their clear hind wings and large bulging dark eye. Adults have striped antenna and can fly. Longevity of adult was found to be 6 to 10 days with an average of  $7.43 \pm 1.11$  (Table 1 and Fig. 1).

### Total life period

The total life period (egg to adult longevity) was 26-31 days with an average of  $28.89 \pm 1.03$  days (Table 1 and Fig. 1).

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