

SCIENTIFIC NOTE

First Record of *Nesidiocoris tenuis* (Reuter) (Heteroptera: Miridae), as a Predator of the Tomato Leaf Miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), in Senegal

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ABSTRACT

The recent detection in Senegal of the tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) and its rapid geographic spread, is a real concern for tomato production in Africa south of the Sahara. Deployment of effective biological control in the newly invaded area is urgently needed. The predatory species, *Nesidiocoris tenuis* (Reuter, 1895) (Heteroptera: Miridae), was collected, for the first time in Senegal, from tomato fields infested with *T. absoluta*. Laboratory feeding bioassay confirmed a potential of *N. tenuis* as a biocontrol agent of *T. absoluta*.

Key words: *Nesidiocoris tenuis*, predator, *Tuta absoluta*, Fauna, Senegal.

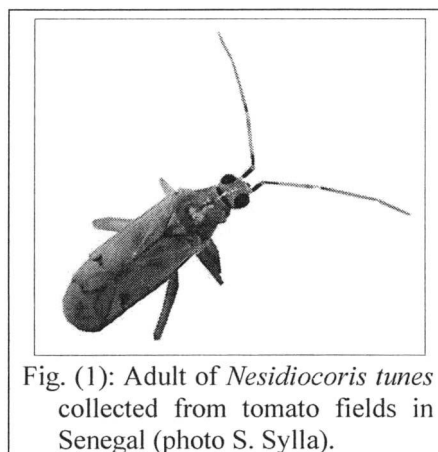
Nesidiocoris tenuis (Reuter, 1895) (Heteroptera: Miridae) is a common mirid predatory bug found on tomato plants, *Solanum lycopersicum* L. (Solanaceae), and a number of vegetable crops (Urbaneja *et al.*, 2005) and tobacco (Perdikis *et al.*, 2011) in South and North America, West Indies, Africa including Senegal, Mediterranean basin to Europe, Asia, Australia and Pacific Islands (Alomar *et al.*, 2002; Arno *et al.*, 2006; Sanchez *et al.*, 2009; Guenaoui *et al.*, 2011 and Mollá *et al.*, 2011). As many Dicyphini plant bugs, *N. tenuis* is omnivorous and referred sometimes as a plant pest or as a beneficial natural enemy on the same crop plants including tomato (Wheeler, 2000). In southern France, it is considered as a tomato pest of greenhouse tomatoes (Trottin-Caudal, 2011). Perdikis *et al.* (2009) reported that this predator has low potential to cause damage on tomato stems and flowers even at high densities. However, exclusive feeding on plant sap negatively affects female fertility (Urbaneja *et al.*, 2005).

The adult is a small (6-8 mm long) green bug (Goula and Kurz, 1994). Head is oval and conspicuous with a black transversal stripe on the vertex and black rings on the antennae. Clypeus is dark. Femora and tibiae are often yellowish with a conspicuous black spot at the base of the tibiae and the apex of the tarsi is dark. The 1st and 2nd nymphal instars have no wings, whereas 3rd, 4th, and 5th nymphal instars have wing pads. Each nymphal instar is fully green with black eyes (Fig. 1).

Duration of whole cycle of *N. tenuis* ranges from 14.9 days at 35°C and 21.8 days at 25°C, to 86.7 days at 15°C (Sanchez *et al.*, 2009). At 25°C, eggs require 7 days before hatching and nymphs need 12.9 days to reach the adult stage, when fed on eggs of *Ephestia kuehniella* Zeller, as a substitute prey (Sanchez *et al.*, 2009). The developmental cycle was shorter when nymphs of *N. tenuis* feed exclusively on whiteflies than when they feed on thrips or mites (Calvo *et al.*, 2012). Its fertility reached 60-80 nymphs per female when temperature ranged between 20 and 35°C and was greatly reduced at 15 and 40°C (Sanchez, 2009).

Nesidiocoris tenuis is commercially produced as a biological control agent worldwide (van Lenteren, 2012). It is known as an effective natural enemy for controlling whiteflies of both *Trialeurodes vaporariorum* (Westwood) and *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodiade) (Sanchez, 2009) and to a lesser extent thrips, leafminers, aphids, mites and eggs of lepidopteran pests (Perdikis and Lykouressis, 2002; Calvo and Urbaneja, 2003 and Urbaneja *et al.*, 2005).

The invasive tomato leaf miner, *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae), has been recorded as a prey for *N. tenuis* in Europe and North Africa (Mollá *et al.*, 2011; Al-Jboory *et al.*, 2012; El Arnaouty and



Kortam, 2012 and Mollá *et al.*, 2014). Under laboratory conditions, *N. tenuis* adults can prey on more than 100 eggs per day (Mollá *et al.*, 2014) and less than 2 first-instar larvae (Urbaneja *et al.*, 2009). *T. absoluta* was recently detected in Senegal (Pfeiffer *et al.*, 2013), where it causes significant damage to field-grown tomatoes (Brévault *et al.*, 2014). To date, no effective predator has been identified. *N. tenuis* was found for the first time in November 2014 in four tomato fields in the main vegetable-producing area (Niayes): Lac rose (14°50'0.34"N, 17°13'9.59"W), Keur Mbir Ndao (14°57'6.48" N, 17°4'24.60" W), Tieudem (14°54'0.03" N, 17°5'24.70" W), and Dieguène (14°50'60.01" N, 17°30'0.10" W). Specimens were sent to INRA-CBGP (Montpellier-sur-Lez, France) for further identification. Subsequent monitoring (plant shaking) of a set of 25 tomato fields in the Niayes area in April 2015, all infested by *T. absoluta*, showed that *N. tenuis* was present in 80% of sampled fields.

To address the capability of *N. tenuis* to prey on *T. absoluta*, a preliminary feeding bioassay was conducted in the laboratory. Five starved adults of *N. tenuis* were placed individually for 24 h in Petri dishes (6 cm diameter) with a small tomato leaflet inside. They were offered *T. absoluta* in the form of (a) 20 eggs, (b) 10 first-instar larvae, or (c) 10 eggs and 5 first-instar larvae. Mean predation was 51% of eggs in (a) with all *N. tenuis* adults feeding at least one egg, 14% of first-instar larvae in (b) with four *N. tenuis* adults feeding at least one first-instar larva, and 48% of eggs and 8% of first-instar larvae in (c) with all *N. tenuis* adults feeding at least one egg or one first-instar larva. This result indicates that *N. tenuis* can consume various stages of *T. absoluta*, with significant preference for eggs over larvae ($\chi^2 = 8.47$, $P < 0.01$).

Biological control programs in greenhouses based on the use of polyphagous predators like *N. tenuis* have made the management of key tomato pests possible such as whiteflies, and also the invasive leaf miner *T. absoluta* (Urbaneja *et al.*, 2009 and Mollá *et al.*, 2014). Provided *N. tenuis* does not cause damage to tomato crops, its occurrence in Senegal is a great opportunity for developing conservation biological control programs against *T. absoluta* through habitat management and use of selective insecticides.

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