Integrated Control in Protected Crops, Mediterranean Climate
IOBC/wprs Bulletin Vol. 29 (4) 2006
pp. 233 - 238

Zoophytophagy of the plantbug *Nesidiocoris tenuis* in tomato crops in southeast Spain.

Juan Antonio Sanchez, Modesto del Pino-Pérez, Mª del Mar Davó, José Isidro Martinez-Cascales, Alfredo Lacasa
Department of Biotechnology and Crop Protection, Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario (IMIDA), c/ Mayor, s/n, 30150 La Alberca, Murcia, Spain.
E-mail: juana.sanchez23@carm.es

Abstract: *Nesidiocoris tenuis* (Heteroptera: Miridae) is one of the most abundant zoophytophagous plantbugs in tomato crops in southeast Spain. It preys on whiteflies and other small pests such as spider mites, leafminers and early instars of Lepidoptera. It also feeds on plants producing necrotic rings in stems and leaves, flower abortion and fruit blemishing. However, the intensity of the damage seems to vary from one geographical region to another. The aim of this assay was to determine the role of *N. tenuis* as a whitefly predator and to quantify damage in tomato crops in southeast Spain. Assays were carried out in four mesh-houses from July to October. Two of the greenhouses had screened vents while in the other two, the vents were unscreened. *Trialeurodes vaporariorum* was much more abundant than *Bemisia tabaci*. There were no differences in whitefly and *N. tenuis* population dynamics between greenhouses with screened and unscreened vents. Damage to flowers and stems followed *N. tenuis* population dynamics. *N. tenuis* caused the abortion of around 50% of the flowers during the four weeks following the population outbreak. We advise caution when using this plantbug as a biological control agent until management strategies have been better defined.

Key words: *Nesidiocoris tenuis,* Miridae, plantbugs, whitefly, *Bemisia tabaci, Trialeurodes vaporariorum,* tomato, damage, flower abortion.

Introduction

Nesidiocoris tenuis (Reuter) (Heteroptera: Miridae) is the one of the most abundant dicyphines in tomato crops in southeast Spain. This zoophytophagous insect is commonly found in tomato crops along the southern Mediterranean coast when the use of pesticides is reduced (Sanchez *et al.,* 2003a, 2003b). It is a very effective whitefly predator able to reduce the pest population in a short time. Calvo and Urbaneja (2003) considered *N. tenuis* a key predator for the control of *Bemisia tabaci* Gennadius and *Trialeurodes vaporariorum* (Westwood) in southern Spain and the Canary Islands. It also preys on other tomato pests such as spider mites, leafminers and early instars of Lepidoptera (Torreno 1994; Urbaneja *et al.*, 2005). Augmentative release and conservation of *N. tenuis* have been encouraged for pest control in tomato crops in the Mediterranean area and the Canary Islands (Calvo & Urbaneja, 2003; Calvo & Urbaneja, 2004).

N. tenuis also feeds on plants, producing necrotic rings in stems and leaves, flower abortion and fruit blemishing. However, the intensity of the damage varies from one geographical region to another; for instance, whilst in the Canary Islands *N. tenuis* damage has not been reported and the bug is a welcome pest control agent (Carnero *et al*., 2000), in southeast Spain it causes damage to tomato plants and its role is controversial. Calvo and Urbaneja (2004) suggested an approximate intervention threshold for tomato crops, but neither the factors involved nor the quantity of damage produced have ever been determined.

The aim of this assay was to determine the role of *N. tenuis* as a whitefly predator and to quantify damage in tomato crops in southeast Spain. In this area, meshes have been widely used to cover vents and prevent *B. tabaci* and *T. vaporariorum* immigration because of the high incidence of virus (e.g. Tomato yellow leaf curl –TYLCV- and Tomato chlorosis virus –ToCV-) in the last few years. Insect-excluding screens are also considered to negatively influence crop colonization by natural enemies. In this work we also compared whitefly and *N. tenuis* population dynamics in greenhouses both with and without screened vents.

Material and methods

Crop history

Assays were carried out in four mesh-greenhouses (10 x 20 threads/cm^2) located in Mazarrón (Murcia, Spain), from the beginning of July until the end of October of 2004. In two of the greenhouses, 480 plants were arranged in eight double rows of 30 plants. In the other two, 360 plants were arranged in six double rows of 30 plants: in these last two greenhouses, the lateral vents had no screens.

Tomato seedlings were transplanted on July 10th, 2004. Distance between plants was 0.5 m, and 1 m both within lines and between double rows. Tomato yellow leaf curl Sardinian virus (TYLCSV) tolerant varieties Boludo® (Petoseed) and Tyrade® (S&G) were used. No chemicals were applied to control pests or diseases.

Insect and plant sampling

N. tenuis and whitefly population dynamics were monitored by weekly sampling 30 randomly selected plants in each greenhouse. *N. tenuis*, adults and nymphs, were counted *in situ* on one leaf from the apex, one from the middle, and one from the lower part of the plant. Middle leaves were bagged, brought to the laboratory and observed under a stereo microscope for scale counting. Whitefly immatures were only counted on alternate leaflets. *B. tabaci* and *T. vaporariorum* pupae were recorded separately, while nymphs were all counted together and not differentiated.

Damage produced by *N. tenuis* in shoots and flowers was quantified for each of the 30 randomly selected plants. The number of necrotic rings was counted in the upper 20 cm of each plant. Both the total and the number of aborted flowers were also counted in one bunch of flowers from each plant.

Data analysis

Abundance of *N. tenuis* was expressed as the average number of individuals per leaf (the average of the three sampled leaves per plant). Whitefly abundance was expressed as the average number of immatures per leaf (nymphs + pupae), without differentiating between *B. tabaci* and *T. vaporariorum*.

Damage was expressed as the average number of necrotic rings and the proportion of aborted flowers.

Results and discussion

Insect population dynamics

The whitefly population reached a very high density soon after the transplant, due to the high rate of whitefly immigration. In greenhouses with unscreened lateral vents, a maximum of 194 scales per leaf was reached at the end of July (Figure 1a). In the following six weeks the whitefly population progressively decreased to 3.3 scales per leaf (Figure 1a). The most abundant whitefly species was *T. vaporariorum,* while only 5% of all pupae were *B. tabaci*. In greenhouses with screened vents whitefly reached a maximum of 292 scales per leaf in about the second week of August (Figure 2a). In the following five weeks, the number of scales descended to 2.8 per leaf. *T. vaporariorum* was the most abundant whitefly species during the sampling period, representing 90% of all pupae.

N. tenuis spontaneously colonized the crops about three weeks after the transplant. In houses with unscreened vents, the *N. tenuis* population started to increase and reached a peak of 5.4 individuals per leaf in about the fourth week of August (Figure 1a). Thereafter, the number of *N. tenuis* decreased following the same trend as for whitefly. In greenhouses with screened vents *N. tenuis* population dynamic was very similar to that of unscreened greenhouses; *N. tenuis* reached a maximum of 4.4 individuals per leaf at the beginning of September and numbers decreased thereafter. In all greenhouses, *N. tenuis* density stabilized at around 1 individual per leaf after the fall in population (Figure 1a and 2a).

There were almost no differences between greenhouses with respect to the establishment and population dynamics of *N. tenuis* either with screened or unscreened vents. This was also the case for whitefly, whose initial population and evolution were very similar for both types of greenhouses. Contrary to what we had expected, screens did not represent an obstacle to the immigration of insects to crops. However, the absence of significant differences may have been due to poor mesh setting at junctions, leaving holes that facilitated the entry of insects.

Crop damage

The number of necrotic rings in the apex of tomato plants and the number of aborted flowers evolved parallel to *N. tenuis* population dynamics (Figure 1 and 2). In both types of greenhouse, the greatest damage was observed at *N. tenuis* population peaks. The highest numbers of necrotic rings were around 6 and 4 for greenhouses with unscreened and screened vents, respectively (Figure 1b and 2b). In greenhouses with unscreened laterals, the percentage of aborted flowers remained around 50% during the four weeks following *N. tenuis* outbreaks (Figure 1b). In screened vent greenhouses, the percentage of aborted flowers ranged between 43 and 52% in the weeks following *N. tenuis* outbreaks.

The damage inflicted by *N. tenuis* is of great concern when using this zoophytophagous plantbug for pest control in tomato crops in southeast Spain. The number of necrotic rings produced by *N. tenuis*, even at high population densities, did not seem to limit plant growth and loss from feeding on stems and leaves is expected to be of very little economic significance. However, necrotic rings sometimes weaken the apex, leading to the decapitation of the plant. The biggest problem with *N. tenuis* was that it caused the abortion of a high number of flowers. Although yield losses were not been quantified in this work, the high rate of flower abortion produced by *N. tenuis* was quite likely to have a significant economic impact on the produce. The abortion of flowers is especially troublesome in cluster tomato varieties. Damage to fruits has also to be quantified because it may downgrade yield. On the basis of these results we advise growers to be very cautious in the use of *N. tenuis* in tomato crops in southern Spain. The phytophagous behaviour of *N. tenuis* has to be characterized and intervention thresholds established before we can be confident about the use of this plantbug as a pest control agent in tomato crops.

Acknowledgements

We would like to thank Celestino Méndez from the COARA growers association and also José Francisco Pastor and Fernando Cánovas, who helped with sampling. This work was funded by research project AGL2003-07532-C03-03. J.I. Martinez-Cascales had a pre-doctoral fellowship granted by the Fundación Séneca (Agencia Regional de Ciencia y Tecnología. Región de Murcia, Ref. 02206/EE2/05).

References

Calvo, J & Urbaneja, A. 2003: *Nesidiocoris tenuis* Reu. (Het.: Miridae) en tomate: ¿Amigo o Enemigo? AlmeríaVerde 4: 21- 23.

Calvo, J & Urbaneja, A. 2004. *Nesidiocoris tenuis* un aliado para el control biológico de mosca blanca. Horticultura Internacional 44: 20-25.

Carnero, A., Díaz, S., Amador, S., Hernández, M. & Hernández E. 2000: Impact of *Nesidiocoris tenuis* (Heteroptera, Miridae) on whitefly populations in protected tomato crops. IOBC/WPRS Bull. 23: 259.

Sanchez, J.A., Martinez-Cascales, J.I. & Lacasa, A. 2003a: Abundance and wild host plants of predator mirids (Heteroptera: Miridae) in horticultural crops in the Southeast of Spain. IOBC/WPRS Bull. 26(10): 147-152.

Sanchez, J.A., Martinez-Cascales, J.I. & Lacasa, A. 2003b: Distribución geográfica, abundancia y plantas hospedantes de míridos depredadores (Heteroptera: Miridae) de interés para el control biológico de plagas en cultivos hortícolas de la región de Murcia. Phytoma España 154: 55.

Torreno H. 1994: Predation behavior and efficiency of the bug *Cyrtopeltis tenuis* (Hemiptera: Miridae), against the cutworm, *Spodoptera litura* (F.). Philippine Entomol. 9: 426-434.

Urbaneja, A., Tapia, G. & Stansley, P. 2005: Influence of host plant and prey availability on developmental time and survivorship of *Nesidiocoris tenuis* (Het.: Miridae). Biocontrol Sci. Technol. 15: 513-518

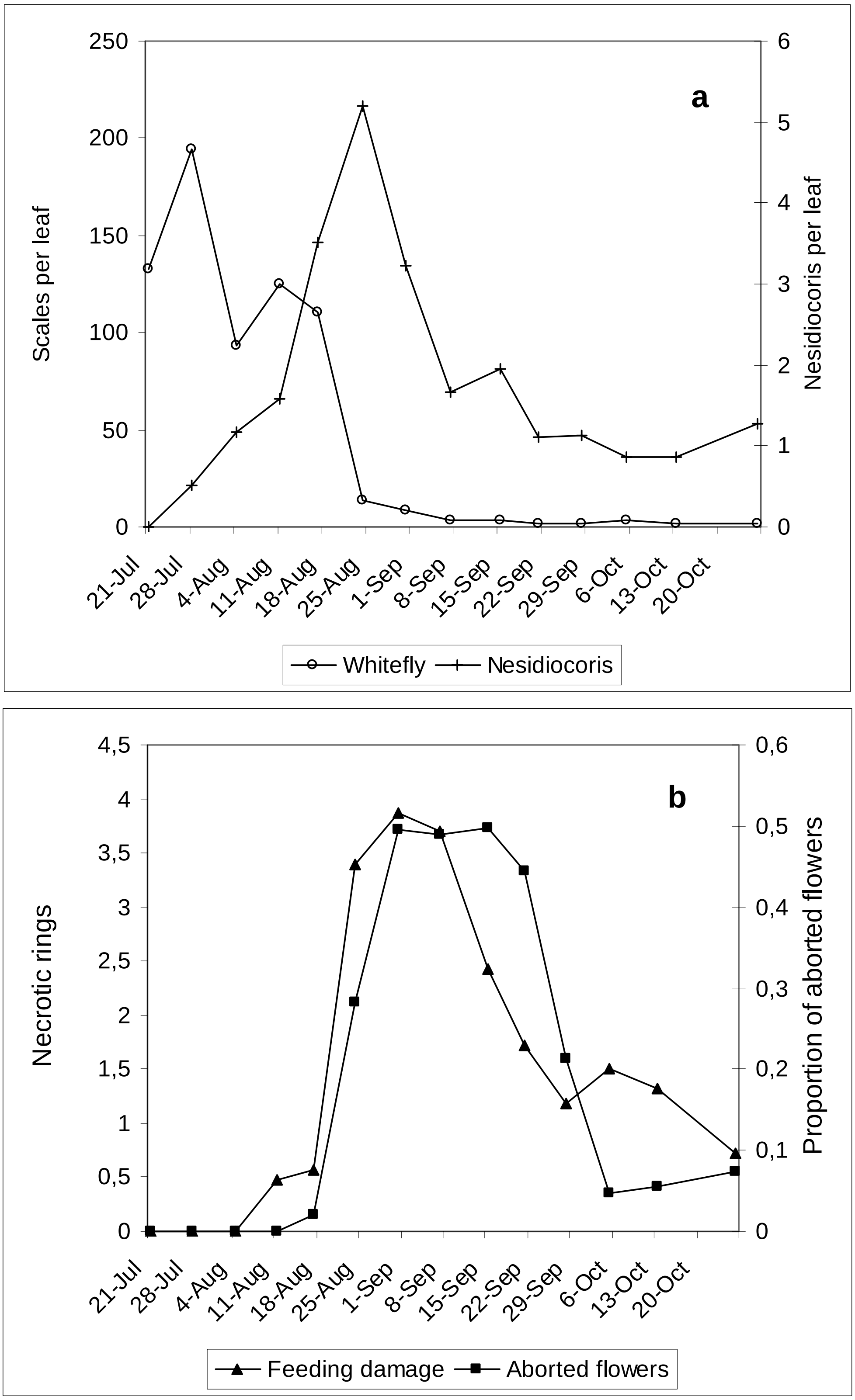

Figure 1. Mesh greenhouse with unscreened lateral vents. (a) Population dynamics of *Nesidiocoris tenuis* and whiteflies (*T. vaporariorum* and *B. tabaci*). (b) Damage to tomato plants.

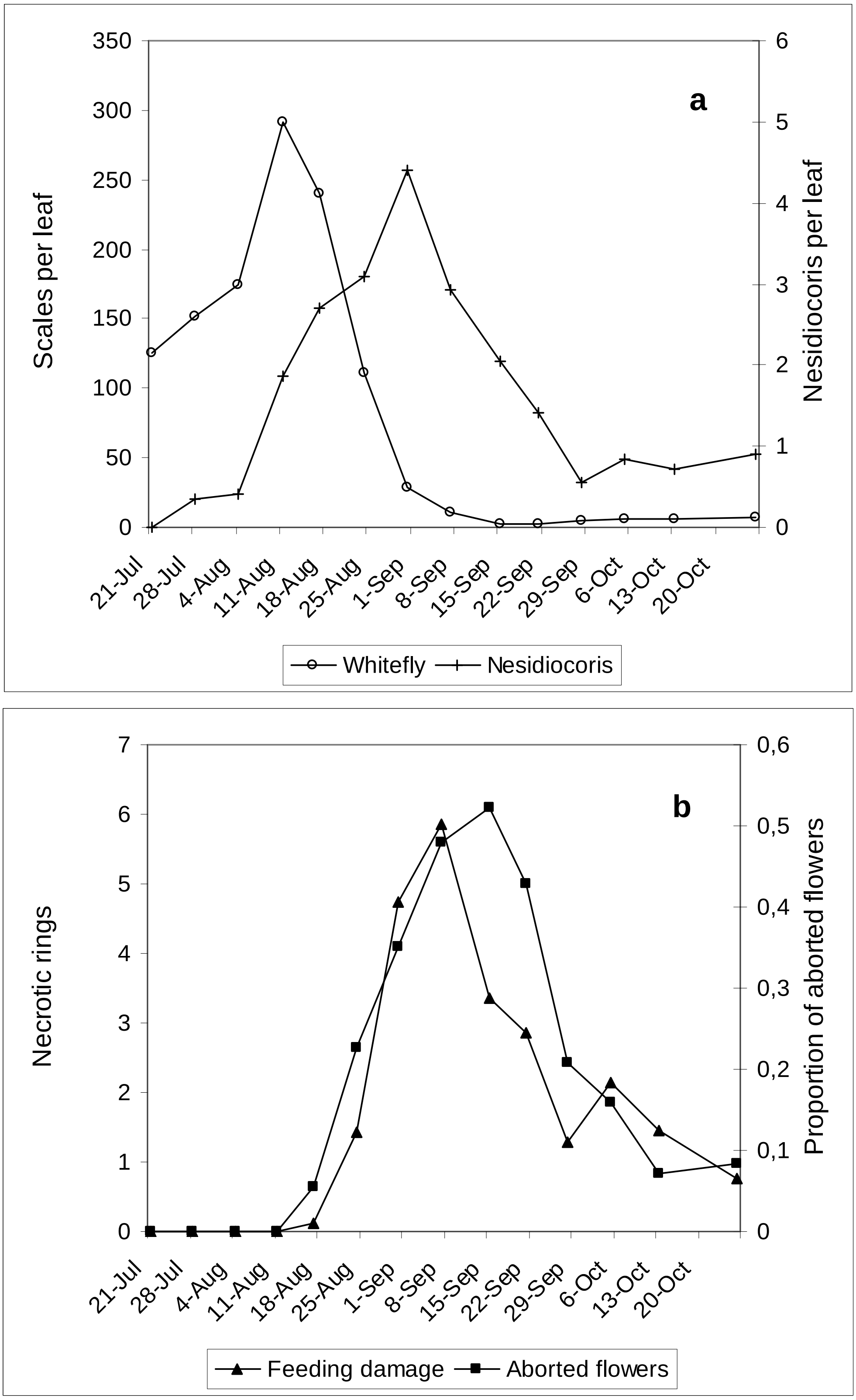

Figure 2. Mesh greenhouse with screened lateral vents. (a) Population dynamics of *Nesidiocoris tenuis* and whiteflies (*T. vaporariorum* and *B. tabaci*). (b) Damage to tomato plants.