

Occurrence of *Scaphoideus titanus* Ball and some other Auchenorrhyncha in the Vineyards of Western Slovakia

JÁN TANCÍK¹ and GABRIEL SELJAK²

¹Department of Plant Protection, Faculty of Agrobiological and Food Resources, Slovak University of Agriculture in Nitra, Nitra, Slovak Republic; ²Agriculture and Forestry Institute Nova Gorica, Nova Gorica, Slovenia

*Corresponding author: jan.tancik@uniag.sk

Abstract

Tancik J., Seljak G. (2017): Occurrence of *Scaphoideus titanus* Ball and some other Auchenorrhyncha in the vineyards of western Slovakia. Plant Protect. Sci., 53: 95–100.

A study of Auchenorrhyncha was carried out in 2014 and 2015 in 7 vineyard plots with different varieties and pest management strategies in the Nitra wine region and Lesser Carpathian wine region in western Slovakia. The aim of this study was to obtain information related to the presence of potential vector insects associated with grapevine yellows phytoplasmas from the Flavescence dorée and Bois noir groups. Insects were collected by sweeping with an entomological net. Thirty species of Auchenorrhyncha were identified as belonging to 6 families. Cicadellidae were the most abundant, comprising 20 species. *Scaphoideus titanus* was collected at 4 localities. Identification of the phytoplasma vector is critical to the national strategy for assessment and control of vectors spreading the phytoplasma disease in Slovakian vineyards. The first finding of *Metcalfa pruinosa* was noticed in vineyards in Slovakia.

Keywords: Leafhoppers; planthoppers; *Scaphoideus titanus* Ball; phytoplasma vector; incidence

Leafhoppers and planthoppers (Auchenorrhyncha) are important pests in grape vineyards. They cause damage by direct feeding as well as by transmitting pathogens such as phytoplasmas (WEINTRAUB & BEANLAND 2006). The American Grapevine Leafhopper, *Scaphoideus titanus* Ball, 1932 (Hemiptera, Cicadellidae), is the most important vector of Flavescence dorée phytoplasma (SCHVESTER *et al.* 1962, 1969). *S. titanus* is of North-American origin and was accidentally introduced into Europe in the 1950s (CAUDWELL 1957). It was reported for the first time in 1958 in southern France (BONFILS & SCHVESTER 1960). Since then it has spread mainly eastwards, secondarily northwards, and thirdly southwards. VIDANO (1964) reported the occurrence of *S. titanus* in the vineyards of the Italian Riviera (Liguria) in 1964 close to the French border. *S. titanus* was recorded in Switzerland in 1968 (BAGGIOLINI *et al.*

1968; CLERC *et al.* 1997), in northern Portugal in 1998 (QUARTAU *et al.* 2001), and in Spain in Catalonia (LAVINA *et al.* 1995). In the central and eastern parts of Europe it is widespread in Slovenia (SELJAK 1985, 2008), Serbia (MAGUD & TOŠEVSKI 2004; KRŃAJIĆ *et al.* 2007), in Croatia (BUDINŠČAK *et al.* 2005), in Austria (ZEISNER 2005), in Hungary (DER *et al.* 2007), in Bosnia and Herzegovina (DELIĆ *et al.* 2007), in northern Bulgaria in 2006 (AVRAMOV *et al.* 2011), and Romania in 2009 (CHIRECEANU *et al.* 2011). Until 2015 no information had been available about *S. titanus* in Slovakia, but its occurrence was expected. It was identified for the first time in Slovakia in 2014 (TÓTHOVÁ *et al.* 2015).

The aim of this study was to evaluate the community of Auchenorrhyncha in vineyards in western Slovakia. Particular attention was paid to *S. titanus*, the most important insect vector of Flavescence dorée phytoplasma.

Supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences – VEGA, Grant No. 1/0539/15.

Table 1. Details of the vineyard plots investigated in this study, wine grape varieties and pest control strategies

Location	Grape variety	Pest control strategy
Nitra winery region		
Šintava	Blauer Limberger, Saint Laurent	biological
Báb	Blauer Limberger	chemical
Radošina	Riesling	chemical
Sikenica	Riesling	chemical
Lesser Carpathian wine region		
Pezinok	Chardonnay, Traminer, Cabernet Sauvignon	biological
Vištuk	Zwaiglet, Blauer Limberger	biological
Svätý Júr	Muscat blanc	chemical

MATERIAL AND METHODS

The study was carried out in 7 commercial vineyard plots with different varieties and pest management strategies (chemical and biological), located in two important Slovakian viticultural regions: the Nitra wine region and Lesser Carpathian wine region (Table 1). Insects were collected by sweeping with an entomological net in order to detect the possible presence and abundance of *S. titanus* and other Auchenorrhyncha. *In situ* sampling of vineyards started at the end of June at localities near Šintava in the Nitra wine region. Later, occasional sweepings were carried out from the end of July to the beginning of September on 4 × 25 vine plants and on ground vegetation under vine canopies (producing a single sample). Identifications of collected leaf- and planthoppers were made by the second author using different identification keys (RIBAUT 1936, 1952; GIUSTINA 1989; HOLZINGER *et al.* 2003; BIEDERMANN & NIEDRINGHAUS 2004).

RESULTS

In our investigations, during the grape growing season in 2014, 132 specimens of the Auchenorrhyncha group were captured on selected grapevines. Twenty-four species of Auchenorrhyncha were identified in 2014 as belonging to 4 families; the species composition and collected specimens at each collection point are shown in Table 2. Within the Auchenorrhyncha assemblage, Cicadellidae (leafhoppers) were the most abundant, comprising 97 specimens, belonging to 18 species. Among the Aphrophoridae 21 specimens belonging to 4 species were identified. In 2015, 130 specimens of Auchenorrhyncha were captured, belonging to 5 families (Table 3). Representatives of the

family Cicadellidae with 99 specimens and belonging to 8 species were the most abundant.

In our investigation, the sampling was mainly aimed at detecting the presence of the vector *S. titanus*. In the major wine-growing region of western Slovakia, *S. titanus* was found to occur at 4 locations (Tables 2 and 3). Higher occurrences of *S. titanus* were detected in the northwestern part of Slovakia and in vineyards with a biological control strategy. Adults of *S. titanus* were collected from different vine varieties (Table 2). If the species was present at a given location, specimens were usually collected from all vine varieties.

DISCUSSION

S. titanus was detected for the first time in Slovakia in 2014 (TÓTHOVÁ *et al.* 2015), as well as in this study. The occurrence of *S. titanus* was more abundant in the north-western part of Slovakia than in the southern parts (Sikenica). Similar observations were reported by TÓTHOVÁ *et al.* (2015). The highest catches of *S. titanus* occurred in 2014 at Pezinok and Vištuk localities in the Lesser Carpathian wine region and in Šintava in the Nitra wine region. In 2015 the population density increased significantly at these localities.

The planthopper species *Hyalesthes obsoletus* Signoret, known to be the main vector of the grapevine Bois noir phytoplasma (MAIXNER 1994), was not detected in our investigation. However, two other species belonging to the family Cixiidae – *Reptalus panzeri* (Löw) and *Cixius wagneri* China – were found in this survey. In recent years these species have attracted increasing scientific interest in many European wine-growing areas because of their potential as phytoplasma transmitters (PALERMO *et al.* 2004; RIEDLE-BAUER *et al.* 2006; CHIRECEANU *et al.* 2011).

doi: 10.17221/40/2016-PPS

Table 2. Leaf- and plant-hopper diversity in selected vineyards in Slovakia in 2014

	Nitra vinery region				Lesser Carpathian vinery region		
	Šintava		03.09. SL	Báb 03.09. R	Pezinok 27.08. Ch, T, CS	Sv. Júr 27.08. M	Vištuk 05.08. Z
	25.06. BL	31.07. SL					
Cicadellidae							
<i>Scaphoideus titanus</i> Ball, 1932	3 nymphs	2 ♀	1 ♀		Ch 1 ♂ T 1 ♂, 1 ♀ CS 1 ♂, 2 ♀		6 ♀, 8 ♂
<i>Acericerus ribauti</i> Nickel & Remane, 2002			1 ♂	1 ♂	Ch 1 ♂		
<i>Agallia consobrina</i> Curtis, 1833		1 ♀					1 ♀
<i>Anaceratagallia laevis</i> (Ribaut, 1935)					Ch 1 ♀, 1 ♂		
<i>Arthaldeus striifrons</i> (Kirschbaum, 1868)			1 ♀, 1 ♂			2 ♀, 2 ♂	
<i>Cicadella viridis</i> (Linnaeus, 1758)					Ch 1 ♂ CS 3 ♂, 2 ♀		
<i>Doratura homophyla</i> (Flor, 1861)			2 ♀, 4 ♂	1 ♀, 1 ♂		4 ♀	
<i>Empoasca decipiens</i> Paoli, 1930				1 ♂			
<i>Empoasca vitis</i> (Goethe, 1875)			3 ♂				
<i>Euscelis incisus</i> (Kirschbaum, 1858)				1 ♀	Ch 1 ♀ CS 1 ♀ Ch 1 ♂		
<i>Fieberiella florii</i> (Stål, 1864)							
<i>Hardya tenuis</i> (Germar, 1821)		3 ♂					1 ♀
<i>Nealiturus fenestratus</i> (Herrich-Schäffer, 1834)				2 ♂			
<i>Ophiola decumana</i> (Kontkanen, 1949)					CS 1 ♀		
<i>Platymetopius rostratus</i> (Herrich-Schäffer, 1834)		1 ♀					
<i>Psammotettix alienus</i> (Dahlbom, 1850)			2 ♂				
<i>Psammotettix confinis</i> (Dahlbom, 1850)			4 ♂	9 ♀, 5 ♂		1 ♀, 1 ♂	
<i>Zyginidia pullula</i> (Boheman, 1845)				2 ♀, 1 ♂			
Membracidae							
<i>Stictocephala bisonia</i> Kopp & Yonke, 1977					T 1 ♂		
Aphrophoridae							
<i>Neophilaenus campestris</i> (Fallén, 1805)						2 ♀	
<i>Neophilaenus infumatus</i> (Haupt, 1917)						1 ♀, 1 ♂	
<i>Neophilaenus modestus</i> (Haupt, 1922)						1 ♀	
<i>Philaenus spumarius</i> (Linnaeus, 1758)			1 ♀		Ch-2 ♀, T-2 ♀, CS-1 ♂	9 ♀, 1 ♂	
Delphacidae							
<i>Laodelphax striatellus</i> (Fallén, 1826)			3 ♀, 4 ♂	1 ♂		2 ♀, 3 ♂	

BL – Blauer Limberger; SL – Saint Laurent; R – Riesling; Ch – Chardonnay; T – Traminer; CS – Cabernet Sauvignon; Z – Zweigelt; M – Muscat blanc

Other detected leafhoppers that are known vectors of phytoplasmas include *Fieberiella florii* (Stål), *Nealiturus fenestratus* (Stål), and *Philaenus spumarius* (Linnaeus) (WEINTRAUB & BEANLAND 2006; CHIRECEANU *et al.* 2011). Two species of the leafhopper genus *Psammotettix* (*P. alienus* Dahlbom and *P. confinis* Dahlbom) were also identified. These are known to transmit phytoplasmas between the herbaceous plants (PROTA *et al.* 2006; SABTÉ *et al.* 2007). The

species *Empoasca vitis* (Goethe) was also identified. It occurs commonly in Slovakian vineyards. This species is not a phytoplasma vector. However, it is recorded as being a serious pest in many European viticultural areas (STAN *et al.* 2007).

A high population density of the citrus flatid plant-hopper, *Metcalfa pruinosa* (Say), was noticed in the Šintava locality. This is the first record of this planthopper in vineyards in Slovakia. On the vine,

Table 3. Leaf- and plant-hopper diversity in selected vineyards in Slovakia in 2015

	Nitra vinery region					LCwr	
	Šintava		24.09. BL	Radošina		Vištuk	
	21.07. SL	21.07. BL		21.07. R	9.09. R	21.07. Z	21.07. BL
Cicadellidae							
<i>Scaphoideus titanus</i> Ball, 1932		5 ♂ 6 ♀ 7 nymphs		1 ♂ 6 ♀		18 ♂ 7 ♀ 4 nymphs	9 ♂ 5 ♀ 2 nymphs
<i>Empoasca vitis</i> (Goethe, 1875)			1*	2 ♀	2 ♀		
<i>Hardya tenuis</i> (Germar, 1821)						1 ♂	
<i>Neoliturus fenestratus</i> (Herrich-Schäffer, 1834)			1*				
<i>Platymetopius rostratus</i> (Herrich-Schäffer, 1834)			1*				
<i>Psammotettix alienus</i> (Dahlbom, 1850)			14*				
<i>Emelyanoviana mollicula</i> (Boheman, 1845)		1 ♂	6*				
<i>Austroagallia sinuata</i> (Mulsant & Rey, 1855)			1*				
Membracidae							
<i>Stictocephala bisonia</i> Kopp & Yonke, 1977					1*		
Delphacidae							
<i>Dicranotropis hamata</i> (Boheman, 1847)		1 ♂					
Flatidae							
<i>Metcalfa pruinosa</i> (Say, 1830)		20*	2*	1*			
Cixiidae							
<i>Reptalus panzeri</i> (Löw, 1883)				1 ♀		1 ♀	
<i>Cixius wagneri</i> China, 1942			1*		1 ♂ 2 ♀		

LCwr – Lesser Carpathian vinery region; BL – Blauer Limberger; SL – Saint Laurent; R – Riesling; Z – Zwaiglet; M – Muscat blanc; *specimen gender has not been differentiated

the insect can cause damage by spoiling the plant organs with abundant waxy secretions produced by its juveniles, the extraction of sap and the release of honeydew, on which a sooty mould develops (BAGNOLI & LUCCHI 2000).

These preliminary data contribute to better knowledge of the species composition and population density of Auchenorrhyncha in Slovakian vineyard ecosystems. However, further and more detailed investigations need to continue. Such knowledge will be essential for the reasonable and integrated management of known and potential vectors for preventing the spread of the most harmful grapevine yellows diseases. This study is also in line with the national strategy for monitoring phytoplasma vectors. It also contributes to an assessment of the risk of the spread of grape yellow disease caused by phytoplasmas in Slovakia.

Acknowledgement. The authors thank Ing. RÓBERT KYSLER from the Organix s.r.o. at Nitra, Slovakia, for the co-operation during this study. The authors would like to thank EOGHAN O'REILLY for the revision of the manuscript.

References

- Avramov Z., Ivanova I., Laginova M. (2011): Screening for phytoplasma presence in leafhoppers and planthoppers collected in Bulgarian vineyards. *Bulletin of Insectology*, 64: 115–116.
- Baggiolini M., Canevascini V., Caccia R., Tencall Y., Sobrio G. (1968): Présence dans le vignoble du Tessin d'une cicadelle néarctique nouvelle pour la Suisse, *Scaphoideus littoralis* Ball. (Hom., Jassidae), vector possible de la flavescence doée. *Bulletin de la société entomologique Suisse*, 40: 270–275.
- Bagnoli B., Lucchi A. (2000): Dannosità e misure di controllo integrato. In: Lucchi A. (ed.): *La Metcalfa negli Ecosistemi Italiani*. ARSIA, Regione Toscana: 65–88.
- Biedermann R., Niedringhaus R. (2004): *Die Zikaden Deutschlands – Bestimmungstabellen für alle Arten*. Scheeßel. WABV.
- Bonfils J., Schvester D. (1960): Les cicadelles (Homoptera Auchenorrhyncha) dans leurs rapports avec la vigne dans le sud-ouest de la France. *Annual Epiphyte*, 11: 325–336.
- Budinščak Ž., Križanac I., Mikec I., Seljak G., Škorić D. (2005): Vektori fitoplazmi vinove loze u Hrvatskoj. *Glasilo biljne zaštite*, 4: 240–244.

doi: 10.17221/40/2016-PPS

- Caudwell A. (1957): Deux années d'études sur la Flavescence dorée, nouvelle maladie grave de la vigne. *Annales de l'amélioration des plantes*, 4: 359–393.
- Chireceanu C., Ploaie P. G., Gutue M., Nicola E. I., Stan C., Comsa M. (2011): Detection of the Auchenorrhyncha fauna associated with grapevine displaying yellows symptoms in Romania. *Acta Phytopathologica et Entomologica Hungarica*, 46: 253–260.
- Clerc L., Linder C., Gunthart H. (1997): Première observation en Suisse romande de la cicadelle *Scaphoideus titanus* Ball (Homoptera: Jassidae) vecteur de la Flavescence dorée de la vigne. *Revue Suisse de Viticulture, Arboriculture, Horticulture*, 29: 245–247.
- Delić D., Seljak G., Martini M., Emacora P., Carravo L., Myrta A., Durić G. (2007): Surveys for grapevine yellows phytoplasmas in Bosnia and Herzegovina. *Bulletin of Insectology*, 60: 369–370.
- Der Z., Konzor S., Zsolnai B., Ember I., Kolber M., Bertaccini A., Alma A. (2007): *Scaphoideus titanus* identified in Hungary. *Bulletin of Insectology*, 60: 199–200.
- Giustina W. (1989): Homoptères Cicadellidae. Vol. 3. Compléments aux ouvrages d'Henri Ribaut. *Faune de France* 73.
- Holzinger W.E., Kammerlander I., Nickel H. (2003): The Auchenorrhyncha of Central Europe – Die Zikaden Mitteleuropas. Vol. 1. Fulgoromorpha, Cicadomorpha (excl. Cicadellidae). Leiden-Boston, Brill Academic Publishers.
- Krnjajić S., Mitrović M., Cvrković T., Jović J., Petrović A., Forte V., Angelini E., Toševski I. (2007): Occurrence and distribution of *Scaphoideus titanus* in multiple outbreaks of “flavescence dorée” in Serbia. *Bulletin of Insectology*, 60: 197–198.
- Lavina A., Battle A., Larrue J., Daire X., Clair D., Boudon-Padieu E. (1995): First report of grapevine Bois noir phytoplasma in Spain. *Pest Disease*, 79: 1075.
- Magud B., Toševski I. (2004): *Scaphoideus titanus* Ball. (Homoptera, Cicadellidae) nova štetočina u Srbiji. *Biljni lekar/Plant Doctor*, 32: 348–352.
- Maixner M. (1994): Transmission of German grapevine yellows (Vergilbungskrankheit) by the planthopper *Hyalesthes obsoletus* (Auchenorrhyncha: Cixiidae). *Vitis*, 33: 103–104.
- Quartau J.A., Guimarães J.M., André G. (2001): On the occurrence in Portugal of the Nearctic *Scaphoideus titanus* Ball (Homoptera, Cicadellidae) the natural vector of the grapevine Flavescence dorée. *Bulletin OILB SROP*, 24: 273–276.
- Palermo S., Elekes M., Botti S., Ember I., Alma A., Orosz A., Bertaccini A., Kölber M. (2004): Presence of stolbur phytoplasma in Cixiidae in Hungarian vineyards. *Vitis*, 43: 201–203.
- Prota V., Sechi A., Tolu G., Botti S., Bertaccini A., Garau R. (2006): New findings on phytoplasmas-affected Auchenorrhyncha population in Sardinian vineyards. In: *Environment Identities and Mediterranean Area: ISEIMA 06: 1st International Symposium*, July 9–12, 2006, Corte-Ajaccio, France, Piscataway, IEEE, Conference Item: 622–624.
- Ribaut H. (1936). Homoptères Auchenorrhynques I (Typhlocybidae). *Faune de France* 31.
- Ribaut H. (1952): Homoptères Auchenorrhynques II (Jassidae). *Faune de France* 57.
- Riedle-Bauer M., Tiefenbrunner W., Otreba J., Hanak K., Schildberger B., Regner F. (2006): Epidemiological observations on Bois Noir in Austria vineyards. *Mitteilungen Klosterneuburg*, 56: 166–170.
- Sabté J., Amparo L., Legorburu J., Fortanete J., Perez De Obanos J.J., Perez Marin J.L., Reyes J., Battle A. (2007): Incidence of “bois noir” phytoplasma in different wine-growing regions of Spain and its relation to *Hyalesthes obsoletus*. *Bulletin of Insectology*, 60: 367–368.
- Schvester D., Moutous G., Carle P. (1962): *Scaphoideus littoralis* Ball (Homoptera: Jassidae), cicadelle vectrice de la Flavescence dorée de la vigne. *Revue de zoologie agricole et appliquée*, 91: 118–131.
- Schvester D., Carle P., Moutous G. (1969): Nouvelles données sur la transmission de la flavescence dorée de la vigne par *Scaphoideus littoralis* Ball. *Annales de Zoologie Ecologie Animale*, 1969: 445–465.
- Seljak G. (1985). *Scaphoideus titanus* Ball (*S. littoralis* Ball.) u primorskem vinogradarskom rajonu zapadne Slovenije. *Glasnik zaštite bilja*, 8 (2): 33–37.
- Seljak G. (2008): Distribution of *Scaphoideus titanus* Ball in Slovenia: its new significance after the first occurrence of grapevine “flavescence dorée”. *Bulletin of Insectology*, 61: 201–202.
- Stan C., Tuca O., Mitrea I. (2007): The vineyard entomofauna of the S.D. Banu Maracine during 2002–2004. *Annals of the University of Craiova*, 12: 77–82.
- Tóthová M., Bokor P., Cagaň L. (2015): The first detection of leafhopper *Scaphoideus titanus* Ball (Hemiptera, Cicadellidae) in Slovakia. *Plant Protection Science*, 51: 88–93.
- Vidano C. (1964): Scoperta in Italia dello *Scaphoideus littoralis* Ball cicalina Americana collegata alla Flavescence dorée della vite. *L'Italia Agricola*, 101: 1031–1049.
- Weintraub P.G., Beanland L. (2006): Insect vectors of phytoplasmas. *Annual Review of Entomology*, 51: 91–111.
- Zeisner N. (2005): Amerikanische Zikaden in Anflug. *Der Winzer*, 61 (5): 20–21.

Received: 2016–03–10

Accepted after corrections: 2016–10–05

Published online: 2016–11–14