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

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Abstract

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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; Krnjajić 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.

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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; GIU-STINA 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).

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

	Nitra vinery region				Lesser Carpathian vinery region			
	Šintava Báb			Báb	Pezinok	Sv. Júr	Višťuk	
	25.06. BL	31.07. SL	03.09. SL	03.09. R	27.08. Ch, T, CS	27.08. M	05.08. Z	
Cicadellidae								
Scaphoideus titanus Ball, 1932	3 nymphs	2 ♀	1 🖁		Ch 1 ♂ T 1 ♂, 1 ♀ CS 1 ♂, 2 ♀		6 ♀, 8 ♂	
Acericerus ribauti Nickel & Remane, 2002			$1 \circlearrowleft$	$1 \circlearrowleft$	Ch 1 ♂			
Agallia consobrina Curtis, 1833		1 ♀					1 ♀	
Anaceratagallia laevis (Ribaut, 1935)					Ch 1 ♀, 1 ♂			
Arthaldeus striifrons (Kirschbaum, 1868)			1 ♀, 1 ♂			2 \circlearrowleft , 2 \circlearrowleft		
Cicadella viridis (Linnaeus, 1758)					Ch 1 ♂			
Doratura homophyla (Flor, 1861)			2 ♀, 4 ♂	1 9.1 6	CS 3 ♂, 2 ♀	4 ♀		
Empoasca decipiens Paoli, 1930			- +, - 0	18	,	* +		
Empoasca vitis (Goethe, 1875)			3 ♂	Ü				
Euscelis incisus (Kirschbaum, 1858)				1 ♀	Ch 1 ♀			
Fieberiella florii (Stål, 1864)				'	CS 1 ♀ Ch 1 ♂			
Hardya tenuis (Germar, 1821)		3 ♂					1 ♀	
Neoaliturus fenestratus (Herrich-Schäffer, 1834)				2 ♂				
Ophiola decumana (Kontkanen, 1949)					CS 1♀			
Platymetopius rostratus (Herrich-Schäffer, 1834)		1 ♀						
Psammotettix alienus (Dahlbom, 1850)			2 👌					
Psammotettix confinis (Dahlbom, 1850)			4 3	9 ♀, 5 ∂	^	1♀,1♂		
Zyginidia pullula (Boheman, 1845)				2 ♀, 1 ∂	^			
Membracidae								
Stictocephala bisonia Kopp & Yonke, 1977					T 1 👌			
Aphrophoridae								
Neophilaenus campestris (Fallén, 1805)						2 ♀		
Neophilaenus infumatus (Haupt, 1917)						1♀,1♂		
Neophilaenus modestus (Haupt, 1922)						1 ♀		
Philaenus spumarius (Linnaeus, 1758)			1♀		Ch-2♀, T-2♀, CS-1♂	9♀,1♂		
Delphacidae								
Laodelphax striatellus (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), *Neo-aliturus 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. con-finis* 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 planthopper, *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			Radošina	Sikenica	Višťuk	
	21.07. SL	21.07. BL	24.09. BL	21.07. R	9.09. R	21.07. Z	21.07. BL
Cicadellidae							
Scaphoideus titanus Ball, 1932		5 ♂ 6 ♀ 7 nymphs		1 ♂ 6 ♀		18 ♂ 7 ♀ 4 nymphs	9 ♂ 5 ♀ 2 nymphs
Empoasca vitis (Goethe, 1875)			1*	2 ♀	2 ♀		
Hardya tenuis (Germar, 1821)						$1 \circlearrowleft$	
Neoaliturus fenestratus (Herrich-Schäffer, 1834)			1*				
Platymetopius rostratus (Herrich-Schäffer, 1834)			1*				
Psammotettix alienus (Dahlbom, 1850)			14*				
Emelyanoviana mollicula (Boheman, 1845)		1 ♂	6*				
Austroagallia sinuata (Mulsant & Rey, 1855)			1*				
Membracidae							
Stictocephala bisonia Kopp & Yonke, 1977					1*		
Delphacidae							
Dicranotropis hamata (Boheman, 1847)	18						
Flatidae							
Metcalfa pruinosa (Say, 1830)	20*	2*	1*				
Cixiidae							
Reptalus panzeri (Löw, 1883)				1♀		1♀	
Cixius wagneri 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.

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