

# Overwintering of psyllids in South Moravia (Czech Republic) with respect to the vectors of the apple proliferation cluster phytoplasmas

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## Abstract

We studied the overwintering of psyllids on conifers in two hilly sites in the Czech Republic, South Moravia: the Dražanská vrchovina Highlands and the Pavlovské vrchy Hills. Using a sweeping net on a long stick we collected altogether 3304 specimens of Psylloidea. In the Dražanská vrchovina, 27 species were found; 80 % of specimens belonged to the potential phytoplasma vectors *Cacopsylla pruni* (Scopoli), *Cacopsylla picta* (Förster), *Cacopsylla melanoneura* (Förster), and *Cacopsylla pyrisuga* (Förster). In the Pavlovské vrchy, 10 species were ascertained and *C. melanoneura* as the only phytoplasma vector was represented in 2.9 % of specimens. A high representation of phytoplasma vectors on conifers in the Moravian highlands can be explained by a long-distance migration of freshly mature psyllid specimens which would be carried from lowlands by ascending thermic currents, drifted by winds and deposited on hills by turbulence.

**Key words:** *Cacopsylla*, phytoplasma vectors, overwintering, migration.

## Introduction

A few species from the psyllid genus *Cacopsylla* (Homiptera Psyllidae) have recently proved to be vectors of phytoplasmas, which belong to the apple proliferation cluster and seriously damage fruit trees (Tedeschi *et al.*, 2002; Frisinghelli *et al.*, 2000; Carraro *et al.*, 1998; Grbic, 1974). Of these, *Cacopsylla melanoneura* (Förster), *Cacopsylla picta* (Förster), *Cacopsylla pruni* (Scopoli) and *Cacopsylla pyrisuga* (Förster) can be important vectors in the Czech Republic. These species overwinter in the adult stage and like most psyllids with a similar life cycle, they may be found on conifers during the winter. However, they have been so far collected by most authors on conifers only rarely and in low numbers (Tedeschi *et al.* 2002). The four above mentioned species occur frequently on their host plants in the lowlands of South Moravia (south-eastern part of the Czech Republic) (Lauterer, 1999) but are mostly absent in few artificially planted lowland conifer stands in their vicinity. Recently, we have focused on locating overwintering sites and monitoring migration of psyllids in South Moravia. We have supposed that lowland psyllids might migrate to overwintering sites situated on more distant hills.

## Materials and methods

We collected overwintering psyllids on conifers at two hilly sites in South Moravia in 2005-2007: (A) the Červený vrch and the Kalečník Hills in the Dražanská vrchovina Highland (49° 15' N, 16° 50' E, 479-535 m a.s.l.) on spruce; (B) the top of the Pálava Hill in the Pavlovské vrchy Hills (48° 52' N, 16° 39' E, 462 m a.s.l.) on pine trees. The site A was visited on 5 and 18 March 2006 and then regularly each month from August

2006 till June 2007, the site B was visited twice on 4 December 2005 and 19 March 2006. On each date psyllids were collected with the same time-limited sampling effort (5 hours) using a sweep net on a 5 m long stick. In total, the samples included 3304 specimens of Psylloidea (Site A: 3029 specimens, Site B: 275 specimens).

## Results and discussion

Altogether, we found 27 species of Psylloidea (i.e. 22% of the Czech fauna), including all the four vectors, overwintering on spruce at site A, while only 10 psyllid species (8%) were collected on pine trees at site B where only *C. melanoneura* was recorded from the vector species. The following species were found at site A: *C. melanoneura* (65.4%), *C. pruni* (11.1%), *Trioza remota* Förster (7.8%), *C. picta* (2.2%), *Trioza urticae* (L.) (2.2%), *Aphalara maculipennis* Löw (1.4%), *Cacopsylla brunneipennis* (Edwards) (1.7%), *C. pyrisuga* (1.3%), *Cacopsylla pulchra* (Zetterstedt) (1.1%), *Cacopsylla saliceti* (Förster) (1.1%), *Aphalara avicularis* Ossiannilsson, *Aphalara crispicola* Ossiannilsson, *Aphalara freyi* Burckardt et Lauterer, *Aphalara polygoni* Förster, *Bactericera albiventris* (Förster), *Bactericera nigricornis* (Förster), *Cacopsylla affinis* (Löw), *Cacopsylla crataegi* (Schrank), *Cacopsylla elegantula* (Zetterstedt), *Cacopsylla moscovita* (Andrianova), *C. pulchra*, *Cacopsylla rhamnicola* (Scott), *Trioza apicalis* Förster, *Trioza flavipennis* Förster, *Trioza rhamni* (Schrank) and *Trioza rotundata* Flor (all less than 1%). At site B, the samples included *T. remota* (49.8%), *B. albiventris* (12.0%), *B. nigricornis* (10.2%), *T. urticae* (11.6%), *C. pulchra* (5.8%), *C. saliceti* (5.8%), *C. melanoneura* (2.9%), *Bactericera curvatinervis* (Förster), *C. crataegi* and *C. rhamnicola* (all less than 1%). Despite a lower number of samples from pines we sug-

gest that spruce trees can be preferred over pines as shelter plants by the overwintering psyllids in South Moravia. However, e.g. *C. picta* was frequently found to overwinter on pines in Bulgaria (Harisanov, 1966).

The spring migration of psyllids from conifers onto host plants starts at the beginning of March. The migration of a new psyllid generation from host plants back onto conifers takes place one week after adult emergence, ca. at the end of May for *C. brunneipennis*, *C. melanoneura* and *C. pulchra*, and in June for *C. picta*, *C. pruni*, *C. pyrisuga* and *C. rhamnicola*.

We suggest that the migration of psyllids onto conifers would follow the "hilltopping" principle. Accordingly, the vector *Cacopsylla* spp. would be passively carried by ascending aerial currents rising from unevenly heated land surface in warm summer days up to tens of kilometres away from the host plants in lowlands and deposited on tree tops when the currents reach mountains or hills and lose their carrying capacity in turbulences. Psyllid individuals might consequently actively search for appropriate conifer trees to overwinter. Such aerial currents, which would be suitable for passive psyllid migration rise only in the long day period (June–August) between 11 a.m. and 4–5 p.m. At that period south and south-east winds prevail in the studied region and predetermined psyllid migration ways. The ascending currents don't rise in the short day period, hence those psyllid species in which adults of a new generation appear too early (April–May) or too late (September–November) can migrate only to short distances.

In order to investigate psyllids which overwinter on conifers we recommend sampling the trees at a height of at least 5 m above ground. The use of a long stick brought samples richer in species and individuals than beating the lowest tree branches.

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