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Data on the Hawthorn Psyllid Cacopsylla melanoneura (Förster) Populations in Southeast Romania

Constantina Chireceanu*, Viorel Fătu

Research and Development Institute for Plant Protection Bucharest, Laboratory of Harmful Organisms, Ion Ionescu de la Brad 8, Bucharest 013813, Romania
* Corresponding author: cchireceanu@yahoo.com

Abstract. In 2009, the hawthorn psyllid, *Cacopsylla melanoneura* (Förster) (Hemiptera: Psyllidae) was investigated in Băneasa area within the framework of a pests monitoring program initiated at the Research Development Institute for Plant Protection Bucharest. This psyllid is an important pest for apple orchards in Europe, as it is a vector of the apple proliferation phytoplasma. The overwintered adults colonized the hawthorn and apple as well as the sweet cherry plants in the neighboring of the apple orchards starting with the beginning of March. Egg laying period began in late March (on hawthorn) and early April (on apple). The larvae completed their development on hawthorn and on apple between middle April and June. No eggs or larvae were found on sweet cherry. The adults of the new generation were observed since the beginning of May until June, after that they left the hawthorn and apple plants. Our data indicated that the hawthorn, compared with apple, is mostly preferred as host plant for *C. melanoneura*, thus the most abundant populations of this insect have been observed on this.

Key words: *Cacopsylla melanoneura*, population dynamics, biology, hawthorn, apple

Introduction

The hawthorn psyllid *Cacopsylla melanoneura* (Förster) (Sternorryncha: Psyllidae) is an important pest in apple orchards in Europe, being involved in the spread of the phytoplasma pathogen which causes the apple proliferation disease (TEDESCHI *et al.*, 2002; TEDESCHI & ALMA, 2004; DELIC *et al.*, 2007; PEDRAZZOLI *et al.*, 2007; FIALOVA *et al.*, 2008; MALAGNINI *et al.*, 2010). The psyllid *Cacopsylla picta* (Förster) (CARRARO *et al.*, 2001b; FRISINGHELLI *et al.*, 2000; JARAUSCH *et al.*, 2003) and the leafhopper *Fieberiela florii* (Stal) (KRCZAL *et al.*, 1989; TEDESCHI & ALMA, 2006) are also reported as vectors of this pathogen.

C. melanoneura psyllid is described in the European literature as a species that develops one generation per year and overwinters as adult on coniferous plants (TEDESCHI *et al.*, 2002; ČERMÁK & LAUTERER, 2008). The studies on psyllid in different regions and under different climatic conditions revealed that, the overwintered adults named remigrants (MAYER *et al.*, 2009) migrate earlier in spring to plant species of the genus *Crataegus*, *Malus* and *Pyrus* where the copulation, oviposition and larval development take place. The adults of the new generation named emigrants (MAYER *et al.*, 2009) leave these host plants and come back to their coniferous overwintering hosts.

In Romania, the researches with respect to *C. melanoneura* psyllid refer only to descriptions and illustrations of morphological characters and genital apparatus for the adults collected from species of *Crataegus* (hawthorn), *Pinus montana mughus* (mountain pine) and *Abies alba* (European silver fir) in different locations in the South and South-West of the

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country (DOBREANU & MANOLACHE, 1962). The data are included in Psylloidea volume in *Fauna of Romania* helping in identifying the psyllid species. The winter adults of psyllid were also reported in pear orchards (CHIRECEANU & HONDRU, 1993). Studies concerning the role of *C. melanoneura* as vector in the epidemiology of apple proliferation disease in Romania are not available.

In the present work, we report the results of the investigations on the presence and abundance of the hawthorn psyllid *Cacopsylla melanoneura* in Băneasa area (South-East Romania) to obtain information on the biology and the population dynamics, as well as its preferences for different plant hosts. Based on data provided by the psyllid collections, we could outline the life cycle, structure and size of populations in relation to host plants.

Materials and Methods

The study on the population dynamics of *C. melanoneura* psyllid was carried out during spring 2009 (March-June) on apple, spontaneous hawthorn (*Crataegus monogyna* Jacquin) and sweet cherry trees located in the fruit trees research platform of Băneasa. Six collection points were used: an abandoned old apple orchard (1,2ha), an apple plot without pesticide (20 trees disposed in two rows), two times insecticide treated apple plot (11 trees disposed in two rows), two hawthorn trees inside of small brushwood, two hawthorn and one sweet cherry trees in the vicinity of abandoned apple orchard. The brushwood included species of woody plants such as pine and oak. Before beginning these investigations, a preliminary visual inspection had been made around the area to detect the presence of first *C. melanoneura* overwintered adults and to select the collection points. The adult population densities of psyllid were monitored weekly using the yellow sticky traps and the shoots beating methods from March until June. Two yellow sticky traps (15x30 cm, atraCERAS-type of Romanian origin) per hawthorn collecting points (one trap per tree), four traps per apple and one trap on sweet cherry were set in trees canopy on 1st March. Five shoots per tree at each collection point of hawthorn and sweet cherry trees and twenty-five shoots per apple were beaten upon an entomological net of 47 cm diameter in opening. The eggs and larvae density was estimated only on the hawthorn inside the brushwood and on abandoned apple orchard by examination of six floral formations and counting them under a stereomicroscope. The sampling was weekly. To precise the moment of eggs and nymphs emergence, the leaves and shoots of the plants were carefully examined daily. The psyllid adults were examined under a stereomicroscope and identified to species level according to adult's description in *Fauna of Romania* (DOBREANU & MANOLACHE, 1962) and the identification key for the Central European *Cacopsylla* species (BURCKHARDT, 2010). Taking into account the striking morphological resemblance between the adults of *C. melanoneura* and *C. affinis* species which live permanently together in mixed population on *Crataegus* spp. (DOBREANU & MANOLACHE, 1962; TEDESCHI *et al.*, 2009), and that this fact made difficult their separation, we appreciated this species complex as being *C. melanoneura* ones.

Daily air temperatures (average, minimum and maximum) and precipitations recorded throughout the collecting period were acquired using the Metrilog's system placed on Research Development Institute for Plant Protection Bucharest area. The averages of three days temperatures were calculated and used on graphic.

Results

Throughout the monitoring period a total of 6718 adult psyllids have been collected using the yellow sticky traps combined with shoots beating method on spontaneous hawthorn, apple and sweet cherry plants. Out of these, *C. melanoneura* was the predominant species, 6700 adults were separated, representing 99.73% of all psyllids. Data on the simultaneous weekly collections made possible to outline the population dynamics of *C. melanoneura* adults in the investigated area, as they are presented in Fig. 1 (A-F). The results

indicated that the overwintered adults populated the hawthorn and apple and also the sweet cherry trees since the beginning of March to the end of May. They were collected beginning with 2nd of March on hawthorn as well as apple trees, and one week later (10th of March) on sweet cherry tree using the shoots beating. In this time, the average daily temperatures were above 4°C (Fig. 2). In figure 2 we illustrated the minimum, average and maximum values of three days temperatures and precipitation fallen in Băneasa area during the monitoring period. The cumulative number of overwintered adults that colonized the hawthorn trees reached values 3.6 times higher than those on apple and 9.9 times higher than those on cherry tree. The dynamic curves of overwintered adults, designed by yellow sticky traps captures, marked two peaks in their migratory movement to spring host plants, except for the insecticidal treated apple which showed only one peak. The two peaks of captures were registered in the first and second week of May, when the average temperatures reached 15°C and 20°C, respectively. Measured by the beating method, the overwintered adults dynamic showed only one peak, one week later than the first peak of yellow sticky traps captures.

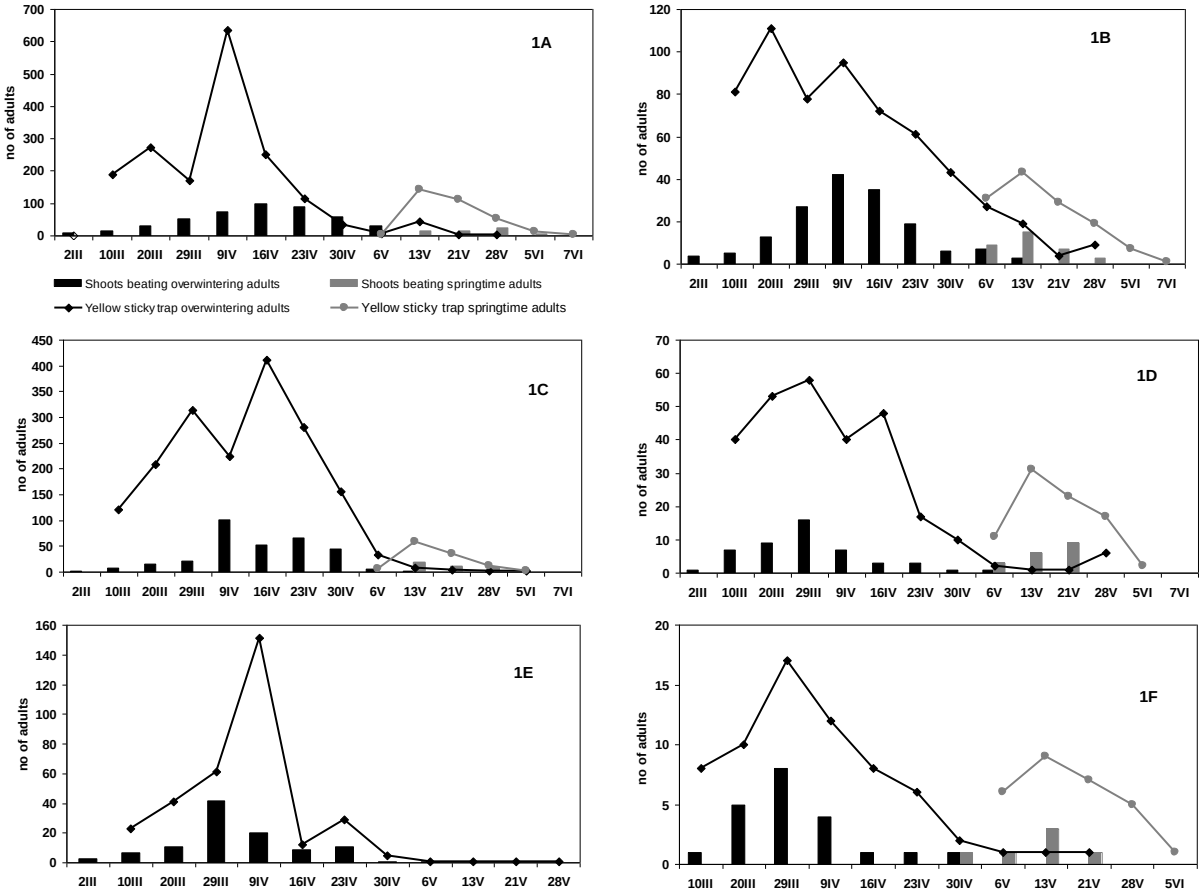

Fig. 1. Population dynamics of *Cacopsylla melanoneura* psyllid (overwintering and spring adults) on hawthorn plants inside of the brushwood (1A), on hawthorn plants in the neighborhood of abandoned apple orchard (1C), on abandoned apple orchard (1B), on apple without pesticide (1D), on two times insecticide treated apple (1F) and sweet cherry trees (1E) in the year 2009.

The new adults of spring generation, noted and registered on hawthorn and apple but not on cherry trees, emerged in first week of May, when the average temperatures were over 14°C. They were collected to the first week of June; they spent approximately a period time of five weeks on both hosts. The population of spring

adults on hawthorn was about two times higher than on apple.

Following the comparative results related to the number of adults recorded on each plant species by using the two collecting methods, we could observe that the yellow sticky traps indicated a longer time of adults' activity, with 2-3 weeks for the overwintered and with 1-2 weeks for the spring adults, than the beating sampling method.

Taking into account the three apple points that were investigated, a greater number of adults were recorded in abandoned apple, twice higher than in pesticide untreated and seven times higher than in pesticide treated apple. The adults density also varied in relation to the place where the hawthorn trees were located, namely it was 1.2 times higher on hawthorn placed inside the bushes than on the individual trees near the apple. Fluctuations of the psyllid adults dynamic generally followed a similar pattern on all surveyed plants.

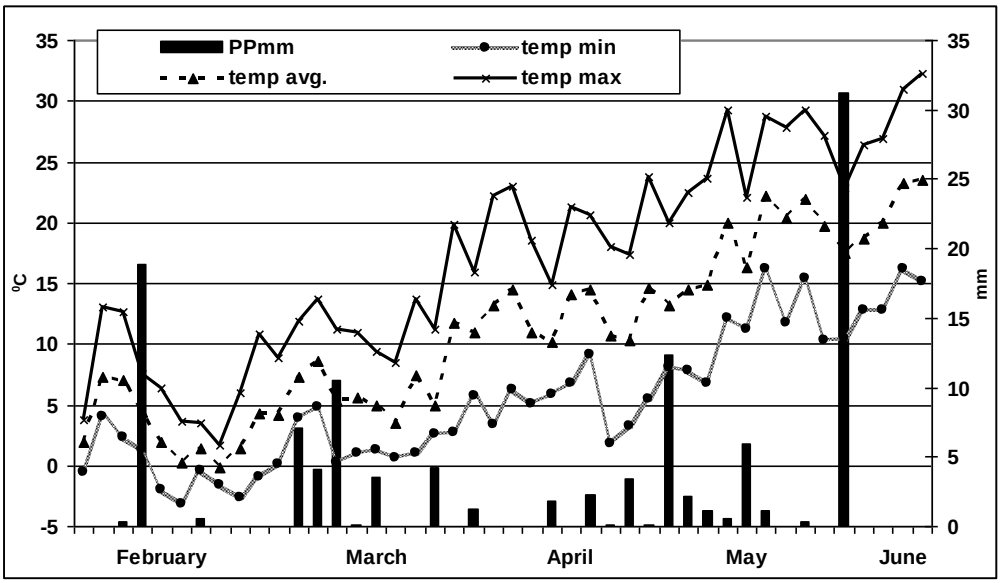

Fig. 2. The average, minimum and maximum air temperatures and precipitations recorded throughout the collecting period in Băneasa area

In figure 3, we illustrated the dynamics of the eggs and succeeding larvae populations, sampled in two collecting points, the abandoned apple and the hawthorn inside of brushwood.

With the end of March (on hawthorn) and the beginning of April (on apple), the overwintered females started to lay their eggs on leaves and floriferous organs by the end of May. Therefore the first eggs were observed on 29th March on hawthorn, and about one week later on apple (9th April). The first psyllid larvae began to emerge on hawthorn on 16th April, one week earlier than on apple (23rd April). The abundance levels of *C. melanoneura* eggs and larvae on hawthorn were of three and four times higher to those on the abandoned apple. During the spring period, when both eggs and larvae populations were increasing, the climatic conditions in collecting zone were favorable, characterized by the average and maximum daytime temperatures more than 12°C, and 15°C, respectively, and by very low precipitation. Our results indicated the psyllid eggs and larvae populations marked one peak. The maximum number of laying eggs was recorded in middle of April on hawthorn trees, and two weeks later on apple trees. For the populations of larvae, the maximum number in their dynamics was marked at the end of May on reproductive host plants, hawthorn and apple trees.

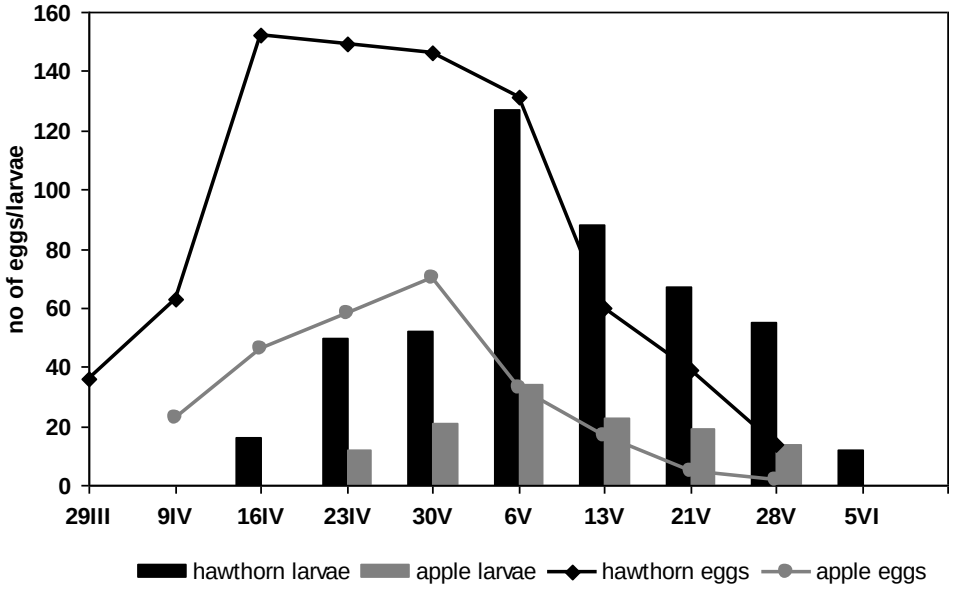

Fig. 3. Population dynamics of eggs and larvae of *Cacopsylla melanoneura* on hawthorn and on apple in the year 2009

Discussion

This entomological study is the first contribution to the knowledge of the presence, abundance and the biology of *C. melanoneura* and their comparatively population dynamics in relation to the host plants in Romania. By monitoring and capturing a large number of *C. melanoneura* specimens, this study allows us to establish the population dynamics course and the life cycle of the psyllid, from the overwintered adults to the new adults of spring generation, on hawthorn and apple plants under climatic conditions of Băneasa area, which could be valid for the climate conditions in South East of the county. The results in this work paper are in accordance with the literature findings (TEDESCHI *et al.*, 2002; ČERMÁK & LAUTERER, 2008; MAYER *et al.*, 2009) which indicate that the *C. melanoneura* species completes one generation per year on hawthorn and apple plants from the end of winter to the early summer. According to our data, *C. melanoneura* spent a little more than three months time on their spring reproductive host, hawthorn and apple plants. The overwintered adults arrived on spring hosts starting with the beginning of March, and the adults of new generation left them in the first seven days of June. This information could provide a good indication to forecast the adults' migration to apple orchards and also to warn over the optimal moment of the insecticide treatments against them. The eggs and larvae dynamics showed a maximum population between the end of April to beginning of May. For this period time the warning over the second chemical treatment date, corresponding to a prior-blossoming time, could be possible.

As our data specify, beside the hawthorn and apple plants, a high number of *C. melanoneura* overwintered adults populated the sweet cherry plants located near the apple orchards. This result may indicate that this species could play the role of an intermediate host plant where insects may cut off their migration from conifers to their spring reproductive host plants. No eggs, larvae or new adults were observed on sweet cherry, suggesting that it seems to be not an adequate host plant for the psyllid development. The overwintered adults from the sweet cherry needed to migrate to the hawthorn or apple plants to develop the new generation. Comparative observations under laboratory conditions showed that the psyllid is attracted by the odors of hawthorn and apple to the cherry detriment (GROSS & MEKONEN, 2004).

The substantially more abundant adult's population captured by us on

hawthorn, representing their main host plants, strongly confirmed the greater preference for this one than for apple. A similar situation was found in case of the psyllid eggs and larvae. Results are in compliance with those found in ovipositions bioassays conducted in Germany (MAYER *et al.* 2009) where the *C. melanoneura* preferred the hawthorn as host plant for reproduction and development, rather than the apple plants.

The presence of the high populations of the psyllid on hawthorns placed in the neighborhood of the apple and also on the abandoned apple orchard, could represent a great threat for the productive apple orchards in Romania, both being important components in the epidemiology and risk of apple phytoplasma spreading by psyllid (TEDESCHI *et al.* 2009).

Based on our results a permanent survey of the hawthorn psyllid in apple orchards shall be carried on in order to detect its possible role as vector in apple proliferation phytoplasma spreading in Romania.

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