A NEW HOST SPECIES FOR THE ARTHROPOD *CORYTHUCHA ARCUATA* IN PERI-URBAN AREAS OF WESTERN ROMANIA

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Abstract. *One of the most recently reported arthropod species in Europe is the oak lace bug, Corythucha arcuata (Insect Class: Order Hemiptera: Tingidae Family). Through this paper we aimed to highlight the adaptation of the insect on new plant species and the implications it has on it. Our study focused on a species very present in the decorative arrangements of gardens and green spaces, namely the Japanese quince (Chaenomeles spp.). The observations were made between April and October during 2020, in three green spaces and two private gardens in the peripheral areas of Timisoara or in the surrounding localities. Accidentally, the insect was reported on this plant, the previous observations being focused primarily on the species mentioned in the literature, in generally on Quercus sp. That is why we turned our attention to Japanese quince and watched the evolution of populations and damage to these plant species. From the observations of bushes from each space analysed, we found that the species is present in all these, in various population levels. Out of a total of 3230 individuals, most specimens found were adult forms associated with eggs, but also immature forms (larvae and nymphs) were found on plants. The first specimens were reported at the end of May, the maximums were recorded at the beginning of June and the last specimens were found at middle of October. Among the areas under study, shrubs in private gardens were by far the most attacked because the population level was also high. And the distance from the Green Forest, due to the presence of oak (which are favourite plants) was taken into account and, as a conclusion, we can say that in the spaces located less than 1 km from it the number of specimens was higher and farther (over 3 km) the fewer specimens.*

Keywords*: Oak lace bugs, Corythucha arcuata, level of population, Japanese quince, damage.*

INTRODUCTION

Corythucha arcuata Say (Tingidae, Hemiptera) is native to North America. The Tingidae family includes many species known as lace bugs (CHO, 2020). In Europe, oak lace bug was reported in 2000 in Italy (BERNARDINELLI AND ZANDIGIACOMO, 2000). The evolution in Europe until 2010 was quite slow (CABI, EPPO, 2007), only after 2010 it experienced an expansion especially to the east and southeast. In Romania it was reported in 2015 in the west of the country (DON ET AL., 2016), later it was reported in the south (CHIRECEANU ET AL., 2017). Studies conducted in the following year, 2017, highlighted the invasion on oak species from the south and west of the country (TOMESCU ET AL., 2018).

The potential range of host plants of this species in Europe and its development time was studied by BERARDINELLI (2006) who showed that the species is attracted to oak leaves of several varieties (*Q. robur*, *Quercus pubescens*, *Quercus petraea*, *Quercus cerris*), but to a lesser extent those of blackberry. Other potential host plants have also been mentioned, such as *Rubus ideaus, Castanea sativa, Rosa canina, Ulmus minor* and *Malus sylvestris* (DOBREVA, 2013, KUCUKBASMACI, 2014).

As with all species of Corythucha, wintering occurs as an adult in sheltered places, most often under the leaves on the ground. The adult is easily recognizable, resembles lace, has a double brown transverse pattern on the front wings (GOLUB AND SOBOLEVA, 2018). Females can be seen laying eggs in groups on the underside of the leaf (JOHNSON AND LYON 1994). A complete cycle, from egg to adult, can be completed in 30-45 days, until the end of summer, but the number of generations can vary from one to several generations, depending on climatic conditions (RABITSCH AND KENIS, 2010).

The massive presence on oak trees and the effect on them through the damage caused to the leaves was recently demonstrated in a country neighbouring Romania, where they were affected to a large degree, up to 90-100% (DERJANSCHI ET AL., 2018).

In general, the attack can lead to a reduction of photosynthesis levels, premature defoliation and a cones-quent discoloration of the leaves, like yellow or whitish spots on the upper part of the leaves (SHETLAR, 2000; BARBER, 2010; DOBREVA, 2013).

MATERIAL AND METHODS

In order to achieve the proposed goal, we chosed 5 study locations, of which 3 green spaces and 2 private gardens located in the peripheral areas of Timisoara and from a nearby locality (table 1). In these locations, we targeted a plant species very present in the decorative arrangements of gardens and green spaces, namely Japanese quince (*Chaenomeles spp*.), because on it, the arthropod *Corhythuca arcuata* was accidentally observed in one of the locations included in the plan research.

Table 1

Identification data and geographical coordinates of geographical locations in Timisoara and neighboring areas

Code	Name of the analyzed space	Identification coordinates	Distance from the Green Forest
P1	USAMVBT Park, Timisoara	N 45.782605, E 21.217025	5,3 km
P2	Iulius Mall Park, Timisoara	N 45.765362, E 21.2286208	4,2 km
SV1	Calea Lipovei, Sever Bocu Street, Timisoara	N 45.771657, E 21.231826	3,9 km
G1	Private garden-Dumbravita	N45.781176, E 21.244433	700 m
G2	Private garden- Dumbravita	N 45.782976, E 21.242014	400 m

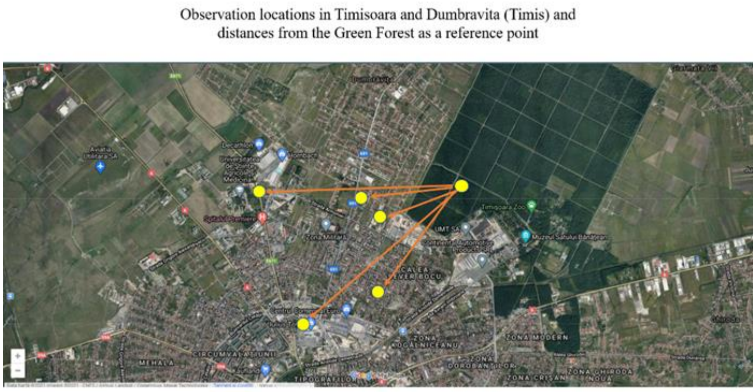

Figure 1. marking the observation points in relation to the Green Forest collected from the 2 private gardens

The 5 locations were chosen, by reporting to a randomly chosen point in the Green Forest (figure 1), on the grounds that there is a species preferred by this insect, more precisely oak.

Each chosen location had a distance from the reference point in the Green Forest, starting from 400 m to 5.3 km (table 1).

The observations on the 3 bushes/each location were made between April and October during 2020. The Japanese quince varieties analyzed were Crimson and Gold but also Simonii, the first being predominant. Leaf samples with various stages of the insect or attack were taken and analyzed in detail in the laboratory.

RESULTS AND DISCUSSION

Results about population level. From what has been observed, analyzing Japanese quince bushes as a potential host plant for *Corhythuca arcuata*, we can say that the number of individuals varied from reading to reading and from one plant to another. In table 2 it can see the present stages and their number found on each bush analyzed in the 5 spaces.

Table 2

Number of mature and immature individuals of *Corythucha arcuata* on leaves of Japanese quince, on bushes analysed, in all readings

*Bushes/ analysed space	Number of specimens of *Corythucha arcuata* on leaves of Japanese quince (all stages)**					
	***R 1	R 2	R 3	R 4	R 5	R 6	R 7
B1/P1	3 (A)	18 (A)+eggs	8 (L)	9 (N)	0 (A)	7(A)	0
B2/P1	5 (A)	48 (A)+eggs	15+10 (A+L)	10 (N)	1 (A)	7(A)	0
B3/P1	5 (A)	35(A)+eggs	19 (A)	10 (N)	1 (A)	0 (A)	0
B1/P2	0 (A)	7 (A)+eggs	4 +4 (N+A)	3 (N)	0 (A)	1(A)	0
B2/P2	1 (A)	10 (A)+eggs	7 (N)	4 (N)	0 (A)	0	0
B3/P2	0 (A)	6(A)+eggs	4 (N)	0 (N)	0 (A)	0	0
B1/GS1	14 (A)+eggs	20 (A)+eggs	16 (L)	26+9+4 (L+N+A)	6 (A)	15(A)	1(A)
B2/GS1	12 (A)+eggs	31 (A)+eggs	22+36 (A+L)	24 (N)	6 (A)	10(A)	0
B3/GS1	10 (A)+eggs	26(A)+eggs	12+17 (A+L)	10+13 (L+N)	3 (A)	5 (A)	0
B1/G1	11 (A)+eggs	60 (A)+eggs	5+20 (A+L)	37+13+1 (L+N+A)	1+11 (A+N)	11 (A)	0
B2/G1	37 (A)+eggs	104 (A)+eggs	35+29 (L+A)	40 (N)	4 (A)	16 (A)	0
B3/G1	19 (A)+eggs	79 (A)+eggs	23+20 (A+L)	56+59+3 (L+N+A)	2 (A)	7 (A)	0
B1/G2	68 (A)+eggs	241 (A)+eggs	20+51 (A+L)	105+99 (L+N)	15 (A)	40 (A)	0
B2/G2	45 (A)+eggs	199 (A)+eggs	41 (L)	100 (N)	9 (A)	23 (A)	0
B3/G2	70(A)+eggs	407 (A)+eggs	40+58+3 (A+L+N)	88+107+5 (L+N+A)	39 (A)	65 (A)	0

*B1-B3 are the bushes analysed in each location; P1-P2 are parks analysed; GS- Green space; G1-G2 are the garden analysed; **A-adult; E-egg; L-larva; N-nymph; *** Reading 1-May 23; Reading 2- June 5; Reading 3-June 30; Reading 4- July 25; Reading 5- August 20; Reading 6 -16 September 30; Reading 7- October 15;

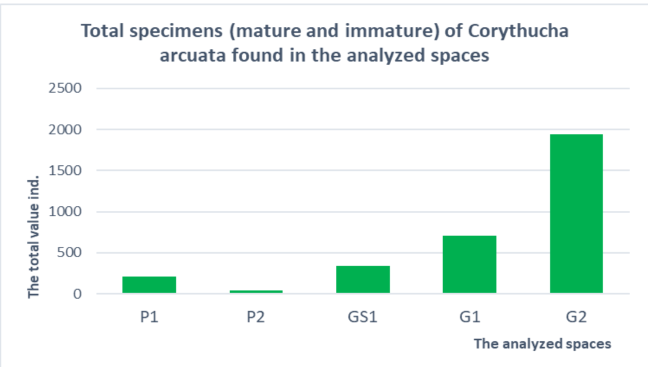

Figure 2. Total number of specimens of *Corhythuca arcuata* found on each analyzed spaces

Most specimens were found in private garden G2, where the total value of individuals on the three bushes was of 1939, followed by private garden G2 with a value of 703 ind. (figure 2). A large number was also found in the GS1 green space located between the buildings, where 342 ind. The fewest individuals were observed in parks, so in P1 there were 211 ind. and in P2 only 43 ind.

The evolution of the number of individuals on each plant in each analyzed space is represented graphically in figure 3. From here it can be seen that in May-July were registered, in all analyzed spaces, the most specimens and the fewest in August- October.

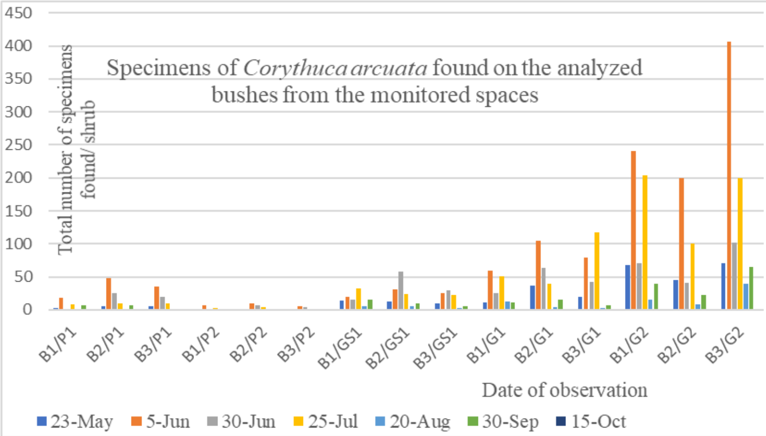

Figure 3. The monthly evolution of the populations of *Corythuca a.*, between May 23 and October 15, 2020 (where B1-B3 are the bushes analysed in each location, P1-P2 are parks analysed, GS- Green space and G1-G2 are the garden analysed)

Two maximum peaks were reported throughout the observation period, one in early June, when the value reached 1921 ind. and one in July with 821 ind. recorded (figure 4).

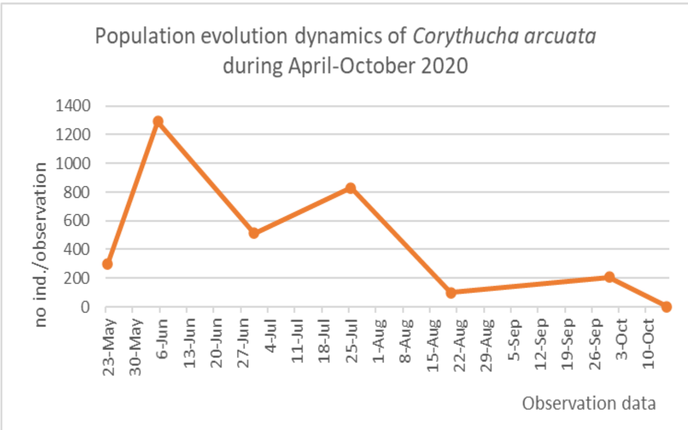

Figure 4. Dynamics of the evolution of the species during April-October 2020

Observations on plant damage. In May, when the first affected leaf was observed, in G2, and later other leaves belonging to other plants in the other locations, the attack on the plants was imperceptible, only a few yellow discoloured spots. Normally, if we refer to the low population level of insects present during this period. However, adults were observed feeding intensely on the leaves in late May, so that in early June (during the observations), visibly affected leaves were recorded on each plant analysed (figure 5).

Also, during this period, adult specimens and eggs were observed. Larvae and nymphs have been observed feeding on the underside of the leaves from late June to August. Adults were present both on the upper side of the leaf but especially on the lower face, where groups of concentrated eggs were found in the area near the main rib (figure 3). Looking at the whole, the plants have leaves, on the upper part with many yellow dots and if they return, on their backs are observed colonies of adults or single individuals (figure 5, figure 6).

Figure 5. Aspects of direct and indirect damage caused by the adult on the lower part of the leaf; the presence of adults, eggs and droppings and discolored spots

In addition to the direct damage to the foliar tissue, which fades and then dehydrates, in the area of attack, there were some small blackish, watery spots, spread everywhere and which covered the entire leaf (figure 5). These are considered indirect damages because they reduce the plant's respiratory area.

During July-August, the discolored spots joined together and took on a brownish hue, sometimes the tissue came off the ribs.

Figure 6. Aspects of indirect damage caused by an adult; discolored spots on the top of the leaves

A complete generation (spring-summer), starting with hibernating adults and another incomplete one (August-October) only with new adults were observed in the analyzed conditions.

CONCLUSIONS

In all the analyzed spaces the target species was present. The smaller the distance of the analyzed space from the Green Forest reference point, the higher the number of specimens found on Japanese quince bushes and vice versa. The explanation would be that the existence of oak in the forest, as a favorite plant, has led to excessive multiplication and leaving the space and including adaptation to other plant species. We believe that due to the high level of individuals and the damage observed on the analyzed plants, Japanese quince, as a common decorative plant in parks, gardens and green spaces, can be considered a potential host plant for the *Corythucha arcuata* insect.

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