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APHIDS (HEMIPTERA: APHIDIDAE) ON PLUM AND CHERRY PLUM IN BULGARIA

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The species complex and infestations of aphids on plum (*Prunus persica*) and cherry plum (*Prunus cerasifera*) in Bulgaria were investigated during the period 2013–2018. Nine species from the family *Aphididae* were found: *Brachycaudus helichrysi* Kaltenbach (leaf-curling plum aphid), *Hyalopterus pruni* Geoffroy (mealy plum aphid), *Phorodon humuli* Schrank (hop aphid), *Brachycaudus prunicola* Kaltenbach (brown plum aphid), *Brachycaudus cardui* Linnaeus (thistle aphid), *Brachycaudus persicae* Passerini (black peach aphid), *Rhopalosiphum nymphaeae* Linnaeus (waterlily aphid), *Aphis spiraeicola* Patch (spiraea aphid) and *Pterochloroides persicae* Cholodkovsky (peach trunk aphid). The dominant species on plum are *Hyalopterus pruni* and *Brachycaudus helichrysi*. The first species is more widespread and of significantly higher density. The dominant species on cherry plum are *Phorodon humuli* and *B. helichrysi*. The species *Brachycaudus prunicola* is widespread both on plum and cherry plum in Bulgaria. It was found only on twigs, and therefore cannot be considered as a dangerous pest on fruit-bearing plum trees. The other species, some of them described as dangerous pests on plum, are today fairly rare and occur in low density, thus posing no danger to orchards.

Keywords: *Brachycaudus*, *Hyalopterus*, *Phorodon*, *Rhopalosiphum*, *Pterochloroides*, *Aphis*

In recent years, the areas with stone fruit orchards in Bulgaria have considerably exceeded the areas with other fruit crops (Agrostatistics, 2016). Plum orchards (including cherry plum) take second place in the country, after cherries, with the area of over 6,700 ha. Plum is attacked by a number of pests and requires a well-organized system of plant protection measures for the protection of fruits, foliage and wood. The most economically important pests are red plum maggot, plum sawfly and some aphids. According to the authors of the Good plant protection practices on plum (Lecheva et al, 2006), dangerous pests from the group of aphids are only three species: plum-thistle aphid *Brachycaudus cardui* L., mealy peach aphid *Hyalopterus amygdali* Blanchard and mealy plum aphid *Hyalopterus pruni* Geoffroy. Seven aphid species on plum in Bulgaria are described by Grigorov, Tashev and Grigorov (2004): leaf-curling plum aphid *Brachycaudus helichrysi* Kalt., *B. cardui*, brown peach aphid *Brachycaudus prunicola* Kaltenbach, *H. pruni*, peach trunk aphid *Pterochloroides persicae* Chol., waterlily aphid *Rhopalosiphum nymphaeae* L. and black peach aphid *Brachycaudus persicae* B.d.F.

Aphids in Bulgaria have not been studied in depth by the end of the last century and the aim of the present study was to establish species composition, distribution and rate of infestation of aphids on plum and cherry plum in our country.

Material and method

Surveys were conducted in plum and cherry plum orchards during 2013–2018: in 2013 – only in the Plovdiv district, in

the following two years – in orchards of 128 municipalities across all 28 districts of Bulgaria – in 2014, the southern part of the country, and in 2015 the northern part. The number of the surveyed locations depended on the area of the respective district. Single observations were conducted over the next three years: 2016–2018. In each of the surveyed orchards, a minimum of 200 shoots from 10–20 trees randomly located in the area, were examined. The percentage of infested shoots for each aphid species was estimated. The data were then converted to a five-grade scale similar to the one developed by Mikhailova, Straka and Apostolov (1982), where the grade 0 indicates no infested shoots; grade 1 – less than 5% infested shoots; grade 2 – between 5 and 15% of infested shoots; grade 3 – between 15 and 50% of infested shoots and grade 4 – more than 50% of infested shoots. The maps presented in “Results and Discussion” show only where the aphids are found for the species of minor importance as pests.

When the aphid species could not be identified visually by the coloration of the individuals in a colony or by the type of the damage, microscope slides were prepared according to the method of Martin (1983). The keys of Shaposhnikov (1964), Blackman and Eastop (2000) and Leclant (2000) were used for identification.

Results and discussion

Nine aphid species (*Hemiptera: Aphididae*) were found feeding on plum (*Prunus domestica*) and cherry plum (*Prunus cerasifera*) in Bulgaria: leaf-curling plum aphid *Brachycaudus helichrysi* (Kaltenbach), mealy plum aphid *Hyalopterus*

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pruni (Geoffroy), hop aphid *Phorodon humuli* (Schrank), brown plum aphid *Brachycaudus prunicola* (Kaltenbach), thistle aphid *Brachycaudus cardui* (Linnaeus), black peach aphid *Brachycaudus persicae* (Passerini), waterlily aphid *Rhopalosiphum nymphaeae* (Linnaeus), spiraea aphid *Aphis spiraeicola* (Patch) and peach trunk aphid *Pterochloroides persicae* (Cholodkovsky).

Leaf-curling plum aphid *B. helichrysi* and Mealy plum aphid *H. pruni* are the dominant species. They were found in most of the surveyed places.

B. helichrysi is a widespread species throughout Bulgaria (Fig. 1). It attacks both plum and cherry plum. In the southern part of the country, we found a stronger attack. In the municipalities of Gotse Delchev, Simitli and Stamboliyski, the infested shoots exceeded 50%. The species was not found only in the municipality of Dimitrovgrad. The infestation in northern Bulgaria was weaker and there was no area where it exceeded 15%. The species was not found in seven of the surveyed municipalities – Antonovo, Brusartsi, Dobrich, Pleven, Ruse, Slivo Pole and Yablanitsa. The aphid causes severe deformations by stopping the growth of attacked shoots and given its widespread prevalence it can be concluded that this is one of the most dangerous pests in these fruit crops although in May it migrated to its secondary hosts.

Hyalopterus pruni is the other widespread species in our country (Fig. 2) attacking plum more strongly, but also cherry plum. The aphid was not found in 18 municipalities, all of them in the southern part of the country. However, in the area where the attack develops it is significant and in 7 of the regions surveyed the infested shoots exceeded 50%.

In North Bulgaria obviously the conditions were more favourable for the spread of this aphid and it was established in all surveyed municipalities. A strong infestation of the shoots was recorded in Misia – 53.6%, Levski and Tutrakan – 60.2% and 65.7%, respectively, and in Rouse and Slivo Pole – over 80%. None of the other aphids, found on plum and cherry plum, have shown such a high rate of infestation.

In southern Bulgaria, distribution of the species is limited. It is not established in five municipalities of the Smolyan district, four in the Blagoevgrad district, three in the Kardzhali district, two in Plovdiv and Stara Zagora districts and one in Pazardzhik and Pernik districts. Infestation over 50% was registered only in isolated orchards of the municipalities of Dimitrovgrad and Plovdiv.

Unlike *B. helichrysi*, *H. pruni* does not cause leaf-curling and stop the growth of infested shoots, but stay on trees longer – in late spring and summer. The species formed large colonies and because of its high density causes a premature leaf drop, as well as significant collateral damage with the secreted “honey dew”. It belongs to the dangerous pests on these fruit crops.

Phorodon humuli is the third most widespread species in Bulgaria (Fig. 3). It was found in more than a half (80) of the surveyed 143 municipalities. The highest density of the aphid was recorded in the Sadovo municipality – more than 50% infestation on shoots. In the municipalities of Peshtera and Panagurishte, the infested shoots made up 38.4% and 28.4% of the whole, respectively. The species was not found in 62 municipalities – 19 in northern Bulgaria and 43 in southern Bulgaria. This includes the whole districts of Burgas, Rouse and Haskovo. The pest has a preference for



Figure 1 Distribution and infestation of *Brachycaudus helichrysi* on plum and cherry plum in Bulgaria during 2013–2018



Figure 2 Distribution and infestation of *Hyalopterus pruni* on plum and cherry plum in Bulgaria during 2013–2018



Figure 3 Distribution and infestation of *Phorodon humuli* on plum and cherry plum in Bulgaria during 2013–2018

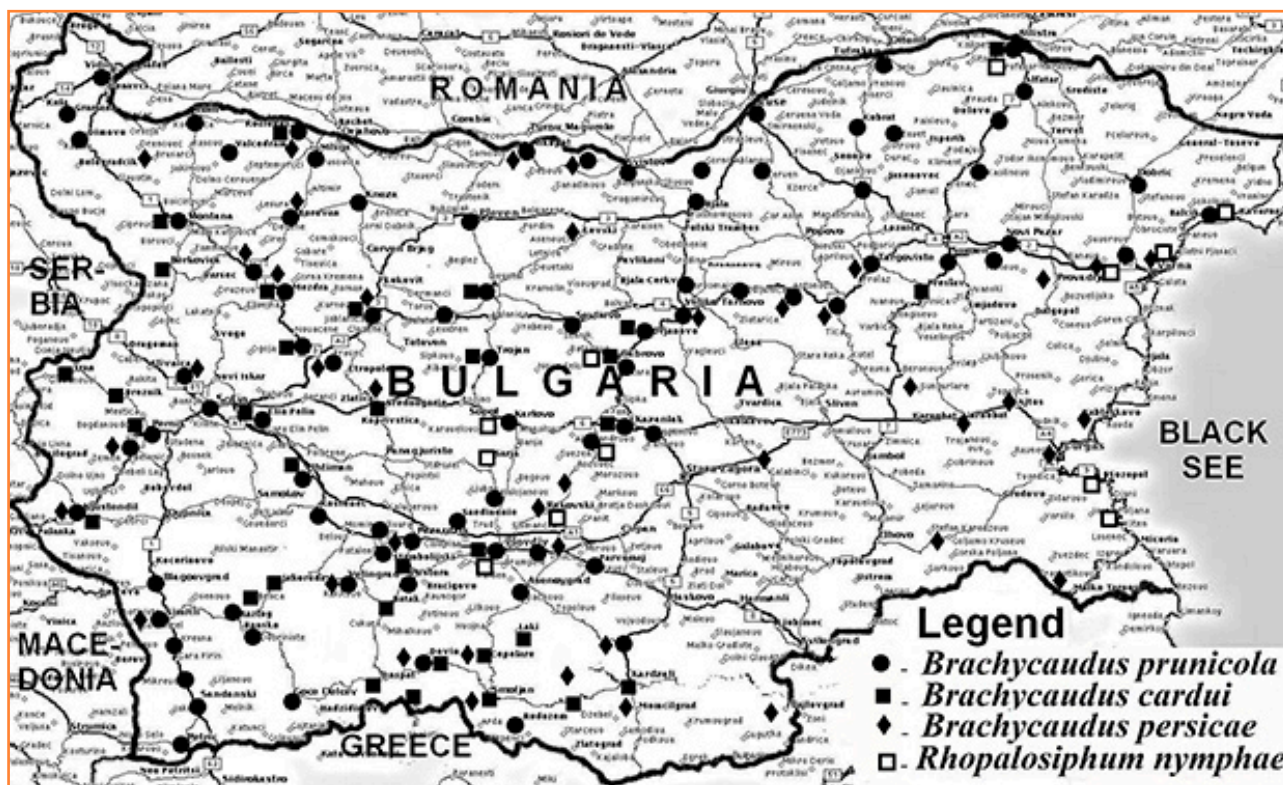


Figure 4 Distribution of *B. prunicola*, *B. cardui*, *B. persicae* and *R. nymphaeae* on plum and cherry plum in Bulgaria during 2013–2018

the cherry plum and attacks only some varieties of plums, but usually it has high population density and can cause premature fall of the leaves of infested shoots, although it does not cause leaf-curling and deformations.

Brachycaudus cardui is a relatively rare species on the territory of the country (Fig. 4). In northern Bulgaria the pest is established only in 12 of the surveyed municipalities. The infestations are weak and usually do not exceed 5%. In the southern part of the country the species has a much wider spread, demonstrating a stronger attack. It was established in 21 municipalities in nine of the districts, and in Smolyan and Chepelare the infestations were highest in the whole country, reaching almost 50%. In the municipalities of Zlatograd, Lucky and Tran, average infestations of about 15% were recorded. The infestations were up to 5% in the rest of the surveyed areas. The aphid was not found in 12 districts of the country – Burgas, Varna, Veliko Tarnovo, Vidin, Dobrich, Plevan, Razgrad, Rousse, Targovishte, Sliven, Haskovo and Yambol. The species causes leaf-curling and deformations, but has no importance as a pest because of its low spread.

It was found out that the black peach aphid *Brachycaudus persicae* infested more plum and cherry plum than peach (Andreev and Vasilev, 2017). In these orchards, the aphid was found in 44 of the surveyed regions – almost equally in the northern and southern parts of the country (Fig. 4). The infestations on the shoots made about 5%, the strongest in the municipalities of Antonovo, Kostinbrod, Omurtag and Chepelare. The species was not found in nine of the districts – Veliko Tarnovo, Vidin, Dobrich, Razgrad, Ruse, Silistra, Stara Zagora and Shumen. This species also causes leaf-curling and deformations, but is of no importance as

a pest on plum and cherry plum because of its low level of infestations.

Brachycaudus prunicola is widespread and was found in most of the areas examined, with the exception of the districts in the southeastern part of the country – Burgas, Haskovo, Yambol, Sliven and Kardzhali. The species occurred in the orchards till September. The aphid causes leaf-curling and strong deformations which stop the growth of the infested shoots, but the aphid colonized only offshoots at the base of plum trees. It can be concluded that the species is not a primary pest on plum and cherry plum despite its wide distribution (Fig. 4).

The trees from the genus *Prunus* are primary hosts for the waterlily aphid *R. nymphaeae*. Due to its specific bio-ecological characteristics, the species was found in relatively few places in the country (Fig. 4). In southern Bulgaria, the species was found only in separate gardens and plantations of the Bourgas, Plovdiv and Stara Zagora regions. In southern Bulgaria, the species was found only in separate orchards of the Bourgas, Plovdiv and Stara Zagora districts. The strongest infestation was registered in the municipality of Plovdiv: 23% on the upper shoots of young garden and 36.7% in the offshoots at the base of plum trees. In northern Bulgaria the species was established only in 4 districts – Varna, Gabrovo, Dobrich and Silistra. In the municipalities of Varna and Devnya, the infestations were the strongest – 6.4% and 5.0%, respectively. In all other areas where the species was found, the infestations were under 5%. The pest does not cause leaf-curling and deformations but can cause a delay in the growth of the attacked shoots and premature fall of the leaves and in case of higher infestations could be a dangerous pest for young orchards and nurseries.

Two more species of aphids with low density were found on plum and cherry plum: the spiraea aphid (*A. spiraeicola*) and the peach trunk aphid (*P. persicae*). The spiraea aphid was established only on offshoots in the municipality of Plovdiv and Mezdra, and the peach trunk aphid was observed on single trees only in the municipality of Plovdiv.

Conclusions

Nine aphid species (*Hemiptera: Aphididae*) were found feeding on plum (*Prunus domestica*) and cherry plum (*Prunus cerasifera*) in Bulgaria during 2013–2018.

Dominant species on plum are the mealy plum aphid (*H. pruni*) and the leaf-curling plum aphid (*B. helichrysi*), the first species being more widespread and significantly higher in density. The aphid does not stop the growth of the infested shoots, but causes retarded development. Because of its high density, the species causes a premature leaf drop as well as significant secondary damage with the secreted "honey dew". The species is a dangerous pest in late spring and summer. *B. helichrysi* causes leaf-curling and strong deformations which stop the growth of the infested shoots. The species is a dangerous pest in early spring.

Dominant species on cherry plum are the hop aphid (*P. humuli*) and (*B. helichrysi*). Both species have high density in spring. *P. humuli* usually has a higher density and can cause premature fall of the leaves of the infested twigs.

The brown plum aphid (*B. prunicola*) is widespread on both plums and cherry plums in the country. The aphid causes leaf-curling and stunted growth of the infested shoots, but the aphid colonized only offshoots at the base of the plum trees, which significantly reduces its importance as a pest.

The rest of the species – *B. cardui*, *B. persicae*, *R. nymphaeae*, *A. spiraeicola* and *P. persicae* are found

relatively rarely and in low density, because of which they are not a danger to orchards. *B. cardui* and *R. nymphaeae* however, have the potential to rapidly increase their density under certain conditions, and their significance as pests should not be underestimated.

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