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Aphids (Hemiptera, Aphidoidea) on trees and shrubs belonging to Betulaceae family in ornamental plants nurseries

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ABSTRACT

On the basis of observations conducted in years 1984-2008 in nurseries producing ornamental trees and shrubs, the presence of 12 aphid species was observed on plants belonging to the family of Betulaceae. On birches (*Betula* spp.), the most common species from the subfamily Drepanosiphinae were the following: *Calaphis flava* Mordvilko, 1928 – 40%, *Euceraphis betulae* (Koch, 1855) - 28%, *Callipterinella tuberculata* (von Heyden, 1837) – 14%, *Callipterinella calliptera* (Hartig, 1841) – 6%, *Euceraphis punctipennis* (Zetterstedt, 1828) and *Monaphis antennata* (Kaltenbach, 1843) – 2%. Species *Glyphina betulae* (Linneus, 1758) – 6% was the most common aphid species from the subfamily Thelaxinae. Species *Pterocallis alni* (de Geer, 1773), representing subfamily Drepanosiphinae was noted on black alders (*Alnus glutinosa* Gaertn.) while *Pterocallis maculata* (von Heyden, 1837), representing the same subfamily was observed on grey alders (*Alnus incana* (L.). *Myzocalis coryli* (Koch, 1855), representing subfamily Drepanosiphinae was found on common hornbeams (*Carpinus betulus* L.). The same species was present in large numbers on common hazels (*Corylus avellana* L.) while *Corylobium avellanae* (Schrank, 1801), representing subfamily Aphidinae was inhabiting common hazels in small numbers.

KEY WORDS: aphids, *Alnus* spp., *Betula* spp., *Carpinus betulus*, *Corylus avellana*

INTRODUCTION

Ornamental plants belonging to Betulaceae family such as: birches (*Betula* spp.), alders (*Alnus* spp.), hornbeams (*Carpinus betulus* L.) and hazels (*Corylus avellana* L.) are commonly grown in nurseries all over Poland as they are intended for planting in city greeneries. These plants are infested by numberous aphid species, which were previously known from urban and mid-field areas, however, were totally absent in ornamental nurseries. In Poland, previous studies on aphids species focused on those inhabiting ornamental trees and shrubs in parks (Osiadacz & Wieczorek, 2003; Wilkaniec *et al*., 2005; Borowiak-Sobkowiak & Wilkaniec, 2010), botanical and dendrological gardens (Wilkaniec, 2001; Sztukowska & Wilkaniec, 2005; Ratajczak & Wilkaniec, 2011) and urban greenery (Cichocka & Goszczyński, 1991; Wilkaniec, 1999, 2004; Ruszkowska & Wilkaniec, 2002; Wieczorek & Osiadacz, 2005).

MATERIAL AND METHODS

Observations of aphids infesting ornamental trees and shrubs were carried out in commercial nurseries in years 1994-2008 all over Poland. Fifty samples were collected from 15 nurseries located in 8 voivodships: Kuyava-Pomerania (kujawsko-pomorskie) (A – Pakość n/Inowrocław), Lublin (lubelskie) (B - Końskowola n/Puławy**,** C - Sielce n/Końskowola), Łódź (łódzkie) (D – Mokra Prawa n/Skierniewice, E – Nowy Dwór n/Skierniewice), Mazovia (mazowieckie) (F – Bronisze n/Warszawa, G - Pęchcin n/Ciechanów, H - Runów n/Piaseczno, I – Wola Mrokowska n/Tarczyn), Opole (opolskie) (J – Dobrzyń n/Brzeg, K – Pisarzowice n/Brzeg), Silesia (śląskie) (L – Będzin, Ł - Borowno n/Częstochowa, M – Goczałkowice n/Pszczyna), Świętokrzyskie (N – Boleścice n/Sędziszów), Warmia-Masuria (warmińsko-mazurskie) (O - Braniewo) and Greater Poland (wielkopolskie) (P - Dąbrówka n/Sompolno, R – Dziećmierowo n/Kórnik). Samples of infested shoots were brought to the laboratory and present aphid species we used in order to prepare permanent slides of aphids in Hoyer liquid under a stereoscopic microscope. Diagnostic features of particular aphid species and their morphs were provided on the basis of collected specimens and identification keys (Heie 1980; 1982; 1994; Węgierek & Węgierek, 2003). Latin names of aphids were applied according to "Fauna Polski – charakterystyka i wykaz gatunków" edited by PAN Museum & Institute of Zoology (Węgierek & Wojciechowski, 2004).

RESULTS AND DISCUSSION

Family: Aphididae
Subfamily: Drepanosiphinae
Calaphis flava Mordvilko, 1928

Collected material: *Betula pendula* Roth (B, 20.07.1995 – larvae); *B. pendula* (M, 4.06.1996 – alate, apterae, larvae); *B. pendula* 'Youngii' (E, 22.07.1996 – larvae); *B. pendula* (F, 6.08.1996 – alate, larvae, nymphs); *B. pendula* 'Laciniata' (F, 6.08.1996 – nymphs, larvae); *B. pendula* 'Youngii' (J, 13.05.1997 – alate), *B. pendula* (G, 28.05.1996 – nymphs, larvae); *Betula nana* L. (I, 19.07.1997 – apterae, nymphs, larvae); *B. pubescens* 'Aurea' (G, 23.06.1998 – alate, apterae, nymphs, larvae); *B. pubescens* 'Rubra' (G, 22.05.2000 – apterae, larvae); *B. pendula* 'Laciniata' (O, 24.06.1998 – apterae, larvae); *B. pendula* (K, 10.05.2000 – apterae, larvae); *B. pendula* (L, 4.06.1996 – alate, apterae, larvae); *B. pubescens* 'Aurea' (L, 22.05.2000 – alatae, larvae); *B. pendula* (R, 31.05.2000 – apterae, nymphs, larvae); *B. pendula* (H, 24.06.2000 – alate, apterae, nymphs, larvae); *B. pendula* 'Purpurea' (P, 4.07.2001 – alate, larvae); *B. pendula* (P, 28.09.2997 – alate); *B. pendula* (D, 19.05.2003 – alate, larvae); *B. pendula* (P, 15.05.1994 – nymphs, larvae).

In Poland this aphid species occurrs in such areas as the Baltic Sea Coast (Wybrzeże Bałtyku), the Pomeranian Lake District (Pojezierze Pomorskie) and the Masurian Lake District (Pojezierze Mazurskie), the Greater Poland-Kuyavia Lowlands (Nizina Wielkopolsko-Kujawska), the Mazovian Lowlands (Nizina Mazowiecka), the Lesser Poland Uplands (Wyżyna Małopolska), and Orava-Nowy Targ Basin (Kotlina Orawsko-Nowotarska), on *B. pendula*, *Betula pubescens* Ehrh., *Betula carpatica* Waldst. et Kit. ex Willd., *Betula humilis* Schrank and *B. nana* (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). Aphids feed on young leaves, particularly on shoots, which appear after cutting. In Ojców National Park it was rarely recorded on *B. pendula* (Osiadacz, 2007), but in forest associations such as: *Querco roboris-Pinetum* and *Leucobryo-Pinetum* it was a receding species (Durak & Wojciechowski, 2008). *C. flava* was neither found on *B. pendula* in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010) nor in the Botanical Garden in Poznań (Wilkaniec, 2004).

Field characters: apterous viviparous female pale green or yellowish, siphunculi pale (Węgierek & Węgierek, 2003).

Slide-mounted characters: observed alate females were 2.4-2.7 mm long, pale except dark apices of antennal segments III-V and the region of the primary rhinarium on segment VI, the base of the femur and distal parts of tibia and the tarsus. Antennae 1.3-1.4x longer than body, antennal segment III with 9-13 secondary rhinaria in a single row on the basal half, the processus terminalis 2.1-2.4x longer than the base of segment VI. Siphunculi slightly truncate, 1.4x longer than wide, pale. The cauda knobbed, pale with 7-9 hairs, 1.5x shorter than siphunculi.

Observed apterae females were 2.3-2.6 mm long, the front of the head and dorsum covered with long, capitate hairs arranged at 6-8 on each segment, placed on conical bases. Antennae about as long as body, antennal segment III with 3-11 secondary rhinaria in a single row on the basal half; processus terminalis 2.2-2.6x longer than the base of segment VI. The apical segment of the rostrum 0.8-1.0x as long as the second hind tibia (2sht). Siphunculi longer than the cauda, very wide at the base and significantly narrowed with a large flange, entirely pale. The cauda knobbed, with 7 hairs. The anal plate bilobed with a wide, divergent incision.

Nymphs similar to apterae, with two pairs of wing pads; antennae 6-segmented, pale except dark apices of segments III-V and the region of the primary rhinarium; the body covered with subcapitate long hairs placed on wide tuberculates; the cauda rounded. Legs pale, except dark knees and the tarsus.

Larvae with 5-segmented antennae, entirely pale, except dark apices of antennal segments III, IV and V, as well as the region of the primary rhinarium and the tarsus.

Callipterinella calliptera (Hartig, 1841)

Collected material: *B. pendula* 'Gracilis' (G, 28.05.1996 – apterae, nymphs, larvae); *B. pendula* (P, 31.05.2000 – nymphs, larvae); *B. pendula* 'Laciniata' (G, 12.05.1999 – nymphs).

In Poland this aphid species occurs in such regions as the Baltic Sea Coast, the Pomeranian Lake District, the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, Podlachia Lowlands (Nizina Podlaska), Upper Silesia (Górny Śląsk), Kraków-Wieluń Uplands (Wyżyna Krakowsko-Wieluńska), the Lesser Poland Uplands, the Lublin Uplands (Wyżyna Lubelska), the Roztocze Uplands (Wyżyna Roztoczańska), the Sandomierz Lowlands (Nizina Sandomierska), the Western Sudetes (Sudety Zachodnie), the Western Beskidy Mountains (Beskidy Zachodnie), Orava-Nowy Targ Basin, the Bieszczady Mountains (Bieszczady) and the Tatra Mountains (Tatry). This species is present on shoot tops and leaves of *B. pendula*, *B. pubescens* and *B. carpatica*, and its colonies are always visited by ants (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). In Ojców National Park it was rarely noted on *B. pendula* (Osiadacz, 2007). Similarly, average numbers of *C. calliptera* were recorded on *B. pendula* in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010), but it was never recorded on *B. pendula* in the Botanical Garden in Poznań (Wilkaniec, 2004). In the forest association: *Leucobryo-Pinetum* it was a subdominant species, and in the forest association: *Querco roboris-Pinetum* it was a dominant species (Durak & Wojciechowski, 2008).

Field characters: apterous viviparous female is green with blackish brown dorsal cross bars on the dorsum (Węgierek & Węgierek, 2003).

Slide-mounted characters: observed apterae females were 2.1-2.2 mm long; the body pale, the dorsum with dark bands across all tergites, sometimes invisible,

on each segment a band of dense spinules and blunt hairs, either long or short, placed on semiglobular tubercles; marginal sclerites with one long hair. The front of the head without a dark sclerite, but with long, pointed hairs. Antennae 1.6-1.8x shorter than body; pale with dark apices in segments III and IV and entirely pale in segments V and VI; the antennal segment III with 4-6 secondary rhinaria arranged in a row on the basal half; the processus terminalis 2x longer than the base of segment VI. Siphunculi dark with a few rows of dense spinules. The cauda small, semiglobular with 5 long hairs, dark. The anal plate large with a light incision.

Nymphs similar to apterae, the antenna 6-segmented**;** the dorsum covered with long, pointed hairs on semiglobular tubercles.

Larvae similar to nymphs, but smaller; the antenna 5-segmented.

***Callipterinella tuberculata* (von Heyden, 1837)**

Collected material: *B. pendula* (A, 6.07.1999 – larvae); *B. pendula* (I, 13.07.1993 – alate, apterae, nymphs, larvae); *B. pendula* (D, 15.06.1994 – nymphs); *B. pendula* (E, 26.05.1997 – apterae, nymphs); *B. pendula* 'Laciniata' (O, 24.06.1998 – apterae, nymphs, larvae); *B. utilis* 'Jackemontii' (H, 7.08.2001 – apterae, nymphs, larvae); *B. pendula* 'Purpurea' (D, 26.08.2002 – apterae, larvae).

In Poland this aphid species occurs in such regions as: the Baltic Sea Coast, the Pomeranian Lake District and the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Lower Silesia (Dolny Śląsk), Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Sandomierz Lowlands, the Western Sudetes, the Western Beskidy Mountains and the Bieszczady Mountains. This species can be found on topshoots and leaves of *B. pendula* and *B. pubescens*, and its colonies are always visited by ants (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). In Ojców National Park it was rarely observed on *B. pendula* (Osiadacz, 2007) and also as single specimens on *B. pendula* in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010), but it was in average density on *B. pendula* in the Botanical Garden in Poznań (Wilkaniec, 2004). *C. tuberculata* in the forest association: *Querco roboris-Pinetum* was a receding species and in the forest association: *Leucobryo-Pinetum* it was a subdominant species (Durak & Wojciechowski, 2008).

Field characters: the apterous viviparous female yellow with a brown head; the posterior part of the abdomen with a large, black dorsal patch (Węgierek & Węgierek, 2003).

Slide-mounted characters: observed alate females were 1.8-2.3 mm long, the dorsum covered with strong, dark hairs on each segment 6-10; the body dark apart from the pale abdomen, dark, small sclerites in the middle of segments IV-VII, a semicircular sclerite on segment VIII and marginal sclerites with 5-8 hairs. Antennae 1.4x shorter than body, the antennal segment III with 14-16 secondary

rhinaria in a row along the entire segment; the processus terminalis 2.9x longer than the base of segment VI. Siphunculi short, slightly truncate with a few rows of dense spinules, dark. The cauda very small, crater-shaped with 5 hairs, pale. The anal plate large with a slight incision. Fore wings with dark bordered veins.

Observed apterae females were 2.3-2.5 mm long, the body dark, apart from the dorsum with dark sclerites and with dark, strong hairs and spinules on each segment; marginal sclerites with 3-6 hairs; segments IV-VI with a large, dark, square patch. The front of the head with a large, dark sclerite and long, pointed hairs. Antennae 1.5x shorter than body; dark, except for the 2/3 of the length of segment III and the base of segment IV; antennal segment III with 4-7 secondary rhinaria in a row on the basal half, the processus terminalis 1.7-2.8x longer than the base of segment VI. The cauda short, semiglobular with 7 hairs. Siphunculi short, slightly truncate, dark, with densely placed rows of spinules. The anal plate with a slight incision. Legs dark except for the pale femur and the middle part of tibia.

Nymphs with antennal segment III without rhinaria. Siphunculi dark with rows of spinules. Wing pads pale. The processus terminalis shorter than the base of segment VI.

Larvae are similar to apterae, the dorsum with small, dark sclerites. Legs dark.

***Euceraphis betulae* (Koch, 1855)**

All viviparous females are alate.

Collected material: *B. pendula* (D, 15.06.1994 – alate, nymphs, larvae); *B. pendula* (D, 19.05.2003 – alatae**,** larvae); *B. pendula* (F, 5.07.1995 – alate, nymphs, larvae); *B. utilis* 'Jackemontii' (Spach) Winkl. (C, 14.05.1996 – alate, larvae); *B. pendula* 'Purpurea' (E, 12.05.1996 – alate, nymphs, larvae); *B. pendula* (E, 6.08.1996 – larvae); *B. pendula* 'Laciniata' (G, 12.05.1999 – nymphs); *B. pendula* (K, 10.05.2000 - alate, apterae, larvae); *B. pendula* 'Purpurea' (L, 30.05.2001 - alate); *B. pendula* (R, 4.06.1998 – nymphs, larvae); *B. pendula* (R, 31.05.2000 – apterae, larvae); *B. pendula* (M, 2.07.1996 – nymphs, larvae); *B. pendula* (B, 20.07.1995 – alate); *B. pendula* (O, 6.08.1996 – nymphs, larvae).

In Poland this aphid occurs in such regions as the Baltic Sea Coast, the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Sandomierz Lowland, the Western Sudetes, the Western Beskidy Mountains, Orava-Nowy Targ Basin, and the Bieszczady Mountains (Osiadacz & Hałaj, 2009). This aphid species was very rarely observed on *B. pendula* in Ojców National Park (Osiadacz, 2007), but in forest associations such as: *Leucobryo-Pinetum* and *Querco roboris-Pinetum* it was a dominant species (Durak & Wojciechowski, 2008). *E. betulae* in the Cytadela Park in Poznań was recorded on *B. pendula* both as single specimens and as numerous colonies, depending on the year (Borowiak-

Sobkowiak & Wilkaniec, 2010). It was also observed on *B. pendula* and *Betula maximowicziana* Regel in DC as single specimens in the Botanical Garden in Poznań (Wilkaniec, 2004).

Field characters: alate viviparous females pale green covered with bluish-white wax. Antennae longer than the body, legs very long (Węgierek & Węgierek, 2003).

Slide-mounted characters: alate females observed in spring were 3.3-3.7 mm long; the body pale. Antennae 1.1-1.2x longer than body; apices of segment III and the distal half of segment IV and segment V and VI dark; antennal segment III with 18-24 secondary rhinaria never placed on the line; the processus terminalis 1.6-1.7x shorter than the base of segment VI. Legs dusky, fore tibia distal ¼ or less dark, distal part of the femur and tibia, as well as the tarsus – dark; the first tarsal segment with 6 hairs. The apical segment of the rostrum with 14 hairs. Siphunculi pale. The cauda knobbed with 10 hairs.

Nymphs with the dorsum covered with capitate hairs, each segment with 6-8 long single hairs. Antennae pale with dark apices of segments III, IV, V and VI, segment III without secondary rhinaria. Siphunculi dark with rows of spinules. Legs pale, except dark distal parts of tibia and the the tarsus.

Larvae pale with dark legs and siphunculi; the processus terminalis shorter than the base of the last segment.

***Euceraphis punctipennis* (Zetterstedt, 1828)**

All viviparous females are alate.

Collected material: *B. pendula* 'Laciniata' (E, 2.09.1996 – alate); *B. pendula* (P, 28.09.2007 – alate, nymphs, larvae).

This aphid species occurs in the following regions: the Baltic Sea Coast, the Pomeranian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Lower Silesia, Upper Silesia, the Kraków-Wieluń Uplands, the Lublin Upland, the Roztocze Upland, the Sandomierz Lowlands, the Western Sudetes, the Western Beskidy Mountains, the Bieszczady Mountains and the Pieniny Mountains (Pieniny), Single specimens of the species live on shoot tops and the lower leaf surface of *B. pendula*, *B. pubescens B. carpatica* (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). The species was observed in Ojców on *B. pendula* (Piechota, 1990), but never seen in forest associations: *Querco roboris-Pinetum* and *Leucobryo-Pinetum* on *B. pendula* (Durak & Wojciechowski, 2008); it was also encountered in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010) and the Botanical Garden in Poznań (Wilkaniec, 2004).

Field characters: alate viviparous female pale green, somewhat wax powdered, very similar to *Euceraphis betulae.*

Slide-mounted characters: alate females observed in autumn were 4.4-4.8 mm long, the body pale or the dorsum with dark 2-6 bands on middle tergites. Anten-

nae 1.0-1.1 longer than body; antennal III with 21-26 narrow, transverse secondary rhinaria almost on the line at the 1/3 from the base; the processus terminalis 1.2-1.4x shorter than the base of segment VI. The apical segment of the rostrum with 10-12 hairs. The second segment of the hind tarsus 1.3-1.7x longer than the apical segment of the rostrum. The first tarsal segment with 9 hairs. The cauda knobbed with 12-14 hairs.

Nymphs 3.3 mm long; body pale, covered with long, blunt hairs on semiglobular tubercles, each segment with 4 pairs of hairs (each pair consisting of 1 long and 1 short hair). Antennae 6-segmented, roughly as long as the body length; pale, except for dark apices of segment III, the distal half of segments IV, V and the entire segment VI; antennal segment III with 21-25 secondary rhinaria; the processus terminalis 1.1-1.4x shorter than the base of segment VI. The apical segment of the rostrum with 12 hairs. Siphunculi dark with spinules. The second segment of the tarsus with 6 hairs.

Larvae similar to nymphs, but smaller.

Monaphis antennata (Kaltenbach, 1843)

Collected material: *B. pubescens* 'Aurea' (P, 31.05.2000 – nymphs, larvae).

This aphid species occurrs in the following regions: the Pomeranian Lake District and the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, Białowieża Primeval Forest (Puszcza Białowieska), Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Sandomierz Lowlands, the Western Sudetes, the Western Beskidy Mountains, Orava-Nowy Targ Basin, the Eastern Beskidy Mountains (Wschodnie Beskidy) and the Bieszczady Mountains. Single specimens of this species were found on leaves of *B. pendula* and *B. pubescens* (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). In Ojców National Park *M. antennata* was rarely recorded on *B. pendula* (Osiadacz, 2007). Furthermore, single specimens were observed on *B. pendula* in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010), but it has never been encountered in the Botanical Garden in Poznań (Wilkaniec, 2004). However, in forest associations: *Leucobryo-Pinetum* and *Querco roboris-Pinetum* it was a subdominant species (Durak & Wojciechowski, 2008).

Field characters: alate viviparous female green, antennae black except at the base (Heie, 1982), antennae of the larvae directed backwards and touching body (Węgierek & Węgierek, 2003).

Slide-mounted characters: observed larvae were 1.8-2 mm long, body pale with reticulation; the front of the head straight. Antennae 5-segmented, 1.3-1.4x longer than body, black except segment I and the ¾ of the length of segment II; segment V with a small, primary rhinarium at the base, 0.7x shorter than the rest of segments. The cauda triangular with 2 short hairs. Siphunculi small, crater-shaped. Legs very short, pale, except the dark tarsus.

Nymphs 3,7 mm long, antennae 6-segmented, 1.1x longer than body, antennal segment IV with a small, round rhinarium at the top and segment VI with a small, primary rhinarium at the base.

***Pterocallis alni* (de Geer, 1773)**

Collected material: *Alnus glutinosa* (L.) Gaertn. (Ł, 4.06.1996 – larvae); *A. glutinosa* (G, 17.09.1996 – larvae); *A. glutinosa* (E, 3.07.1997 - alate, larvae).

This aphid species is monophagous, occurring on *A. glutinosa*, overwintering as an egg covered with white wax. The aphid occurs in the following regions: the Baltic Sea Coast, the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Lower Silesia, Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Sandomierz Lowlands, the Western Sudetes, the Western Beskidy Mountains and the Bieszczady Mountains. Single specimens of the species were found on the lower leaf surface of *A. glutinosa*, and rarely also on *A. incana* (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). In Ojców National Park single specimens were recorded on *A. glutinosa* (Osiadacz, 2007), but in the forest association *Fraxino-Alnetum* it was an eudominat species (Durak & Wojciechowski, 2008).

Field characters: alate and apterae yellow-whitish to yellowish-green.

Slide-mounted characters: observed alate females were 2-2.2 mm long, pale except a dark spot on the inner side of the antennal segment I and the outer side of the hind femur, apices of segments III, IV and V, and the region of the primary rhinarium on segment VI. The antennal segment III with 4-6 round secondary rhinaria at the bases; the processus terminalis 0.6x shorter than base of segment VI. Siphunculi short, stumped, dark with pale bases. The cauda knobbed with 11 hairs. The anal plate bilobed with a wide diverged incision. Fore wings pale except the surroundings of the cubital vein.

Larvae with 6-segmented antennae, pale except dark apices of segments IV and V, the region of the primary rhinarium and the tarsus. Antennal segment III with one long hair and another shorter hair, the rest of hairs short but conspicuous. The body covered with long, fan-shaped hairs and placed on wide tubercles. Siphunculi crater-shaped.

***Pterocallis maculatus* (von Heyden, 1837)**

Collected material: *Alnus incana* (L.) Moench (N, 8.07.1997 – alate); *A. incana* (Ł, 12.06.1998 – larvae).

This aphid species occurs in such regions as: the Baltic Sea Coast, the Pomeranian Lake District, the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Upper Silesia, the

Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Roztocze Uplands, the Sandomierz Lowlands, the Eastern Beskidy Mountains. It lives in colonies on the lower, rarely also on the upper, sides of leaves of *A. glutinosa*. The colonies are always visited by ants (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). This aphid species has been classified as dominant in the forest association: *Fraxino-Alnetum* on *A. glutinosa* (Durak & Wojciechowski, 2008).

Field characters: apterae green or yellowish with more or less conspicious dark green bands on the dorsum.

Slide-mounted characters: observed alate females 1.7 mm long. Antennae 6-segmented, pale except dark apices segments III, IV and V, and the base of segment VI; antennal segment III with 5 secondary rhinaria at the bases; the processus terminalis 0.7 x as long as the base of segment VI. Siphunculi short, stump and dark. The cauda knobbed, with 10 hairs. The anal plate bilobed with a deep, diverged incision. Legs pale except the dark tarsus and a patch on the outer side of the hind femur. Fore wings with a dark-bordered costal vein.

Larvae with 6-segmented antennae. On the front of the head 3 pairs of long, fan-shaped hairs. Antennal segment III with 2 hairs of equal lengths, the rest of hairs short but conspicous. The dorsum with long fan-shaped hairs and placed on tubercles, on each segment of the abdomen 6 hairs. Siphunculi short, pale with a dark apex. The cauda semicircular.

***Myzocallis carpini* (Koch, 1855)**

All viviparous females are alate.

Collected material: *Carpinus betulus* 'Fastigiata (H, 24.06.2000 – alate, apterae, nymphs); *C. betulus* (B, 16.05.2000 – alate, nymphs).

This aphid species occurs in the following regions: the Baltic Sea Coast, the Pomeranian Lake District and the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, Białowieża Primeval Forest, Lower Silesia, Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Sandomierz Lowlands, and in the mountain ranges of Western Sudetes, Western Beskidy Mountains, Eastern Beskidy Montains, Bieszczady Mountains, Pieniny Mountains and Tatra Mountains (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). This aphid species was very rarely recorded on *C. betulus* in Ojców National Park (Osiadacz, 2007) and single specimens were observed on *C. betulus* in the Botanical Garden in Poznań (Wilkaniec, 2004). However, in the forest association *Tilio-Carpinetum* it was an eudominant species (Durak & Wojciechowski, 2008).

Field characters: alate yellowish-white.

Slide-mounted characters: observed alate females were 1.7-2.0 mm long, fore wings pale with a small, black spot in the basal part of the pterostigma, dorsal body hairs minute; antennae a little shorter than body, pale except dark apices of

segment IV, V and VI; antennal segment III with 3-4 round secondary rhinaria at the bases, hairs very short, invisible; the processus terminalis 2.4-2.7x longer than the base of segment VI. The apical segment of the rostrum vs. 2 sht 0.6-0.9x, with 8 hairs. The cauda knobbed, pale with 8 hairs. Siphunculi a little shorter than the cauda, pale. The anal plate bilobed with a wide and deep incision. Legs pale except a dark base of the femur and the tarsus.

Nymphs pale with red eyes, dorsally covered with long and short hairs, fan-shaped, arranged in 6 rows. Antennae 6-segmented, pale except dark apices of III, IV, V segments and the entirely dark segment VI; on I and II segments one capitate hair. The cauda rounded. Siphunculi very short.

Larvae with 6-segmented antennae, dorsally covered with long, short and very short capitate hairs. Siphunculi crater-shaped. The cauda rounded.

***Myzocallis coryli* (Goeze, 1778)**

All viviparous females are alate.

Collected material: *Coryllus avellana* (D, 14.09.1993 – alate, nymphs; 4.05.1994 – larvae); *C. avellana* (P, 17.05.1995 – nymphs); *C. avellana* (B, 21.05.1995 – larvae); *C. avellana* (R, 22.05.1996 – larvae); *C. avellana* 'Contorta' (M, 4.06.1996 – alate, nymphs); *C. avellana* 'Purpurea' (D, 24.05.1996 – alate, larvae); *C. avellana* (J, 13.05.1997 – nymphs); *C. avellana* 'Purpurea' (F, 16.07.1997 – nymphs, larvae; 30.05.1998 – alate, larvae); *C. avellana* (R, 22.06.1999 – alate, nymphs).

This aphid can be found in such regions as: the Baltic Sea Coast, the Pomeranian Lake District and the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlanda, Lower Silesia, Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Roztocze Uplands, Sandomierz Lowlands, the Western Sudetes, the Western Beskidy Mountains, Orava-Nowy Targ Basin, the Bieszczady Mountains and the Tatra Mountains. It is present on leaves and young shoots of *Carpinus betulus* (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). *M. coryli* was very rarely recorded on *C. avellana* in Ojców National Park (Osiadacz, 2007) and it was observed in average intensity on *C. avellana* in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010).

Field characters: alate yellowish-white.

Slide-mounted characters

Observed alate females were 2.0-2.3 mm long. The dorsum covered with short hairs, the body pale except dark apices of antennal segments III, IV,V and the region of primary rhinarium of the base segment VI as well as the base of the femur and the tarsus; segment III with 4-6 round secondary rhinaria at the bases. The apical segment of the rostrum vs. 2 sht 1.5-2.5x with 16 pairs of hairs. The cauda knobbed with 12-16 hairs. Fore wings pale with a black spot at the basal part of the pterostigma.

Nymphs – the body pale, the dorsum covered with long, capitate hairs arranged in groups, each of which consists of 2 long and 2-4 short hairs placed in 4 rows. Antennae 6-segmented, antennal segment I with one short and segment II with one long, capitate hair, segment III with 1-2 capitate hairs, the rest short, pointed but visible; the processus terminalis 2.5 times longer than the base of segment VI. Siphunculi short, truncate. The cauda rounded.

Larvae – body pale with long, capitate hairs on the front of the head and the abdomen. Antennae 5-segmented, antennal segment III with one, short, capitate hair, the processus terminalis 2.5 times as long as the base of segment VI.

Subfamily: Aphidinae

***Corylobium avellanae* (Schrank, 1801)**

Collected material: *C. avellana* (F, 10.06. 1998 – apterae, larvae); *C. avellana* (R, 22.06.1999 – apterae, larvae); *C. avellana* (I, 2.05.2000 – apterae, nymphs, larvae); *C. avellana* 'Purpurea' (Pakość, 15.06.2000 – apterae, nymphs).

This aphid species occurs in the following regions: the Baltic Sea Coast, the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Lower Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Świętokrzyskie Mountains (Góry Świętokrzyskie), the Lublin Lowlands, the Sandomierz Uplands, the Western Sudetes, the Western Beskidy Mountains. It feeds on young shoots of *C. avellana* (Szelegiewicz 1968; Osiadacz & Hałaj, 2009). This aphid was very often recorded on *C. avellana* in Ojców National Park (Osiadacz, 2007), but on shrubs found in the city greenery it was less abundant than *Myzocallis coryli* (Jaśkiewicz *et al*., 2003). Furthermore, *C. avellanae*, contrary to *M. coryli*, was not recorded in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010).

Field characters: apterae females are green, spindle-shaped.

Slide-mounted characters: observed apterae females were 1.8-2.6 mm long, pale except dark apices of III-V antennal segments and the entire VI segment and also a dark base of the femur and the tarsus. The dorsum with granulate cuticular structures; on each abdominal segment 6-8 conical warts, each with 1-2 long, capitate hairs. Antennae 1.4x longer than body, with numerous capitate hairs; segment III with 1-2 small rhinaria near the base; the processus terminalis 5.3x longer than the base of segment VI. Siphunculi 4.2x longer than the cauda, slightly curved outwards, the apical part dark with reticulation below the well-developed flange. The cauda short, triangular, pale, with 6 hairs.

Larvae covered with numerous hairs, non-capitate. Antennae 5-segmented, the processus terminalis about 10 x as long as the base of segment V. Siphunculi long. The cauda triangular.

Subfamily: Thelaxinae

***Glyphina betulae* (Linnaeus, 1758)**

Collected material: *B. nana* (D, 16.06.1994 – alate, apterae, nymphs, larvae); *B. pendula* 'Laciniata' (A, 6.07.1999 – apterae, larvae); *B. utilis* 'Jackemontii' (K, 16.07.2002 – apterae, larvae).

This aphid species occurs in such regions as the Baltic Sea Coast, the Pomeranian Lake District and the Masurian Lake District, the Greater Poland-Kuyavia Lowlands, the Mazovian Lowlands, the Podlachia Lowlands, Upper Silesia, the Kraków-Wieluń Uplands, the Lesser Poland Uplands, the Lublin Uplands, the Roztocze Uplands, the Sandomierz Lowlands, the Western Sudetes, Orava-Nowy Targ Basin, the Western Beskidy Mountains, and the Bieszczady Mountains, on young shoots of *B. pendula* and *B. pubescens*, building dense colonies visited by ants (Szelegiewicz, 1968; Osiadacz & Hałaj, 2009). In Ojców National Park it was very rarely recorded on *B. pendula* (Osiadacz, 2007), but in the forest associations *Leucobryo-Pinetum* it was a subreceding species (Durak & Wojciechowski, 2008). Furthermore, *G. betulae* was observed on *B. pendula* in average density in the Cytadela Park in Poznań (Borowiak-Sobkowiak & Wilkaniec, 2010) while it was not recorded in the Botanical Garden in Poznań (Wilkaniec, 2004).

Field characters: apterae are small, round or oval in shape (1.6-2.1 mm), dark green with white spinal stripes (Węgierek & Węgierek, 2003).

Slide-mounted characters: observed alate females were 1.8-2 mm long with dark head, antennae and the thorax, the abdomen pale with numerous, dark, small sclerites bearing spines and hairs; marginal sclerites with 3-4 hairs. Antennae 5-segmented, 2.7x shorter than body, antennal segment III with 4 circular, very small secondary rhinaria, the processus terminalis 4.9x shorter than the base of segment V. The apical segment of the rostrum with 3 pairs of hairs. Siphunculi low, truncate and placed on a dark sclerite. The cauda semicircular with 2 long hairs, pale with a dark edge.

Observed apterae 1.5-1.8 mm, pale. The body with dorsal and lateral hairs thick and spine-like; the cuticule densely covered with tear-shaped ornamentation. Eyes reduced to 3 facets. Antennae 5-segmented, 4-5x shorter than body, dark except the pale ones on segment III, without secondary rhinaria; the processus terminalis 2,8x shorter than the base of segment V. Siphunculi low, truncate. The cauda semicircular with 2 long hairs.

Nymphs similar to apterous females, 1.7-2.0 mm long, body pale with ornamentation, dark sclerites with thorn-hairs on the head and the abdomen, wing pads dark. Antennae 5-segmented, dark except the pale ones on segment III. Siphunculi low, truncate, dark. The cauda semicircular with 3 long hairs, pale with a dark distal part. Legs dark.

Larvae similar to nymphs, 1.3-1.5 mm long, body pale with ornamentation, but without dark sclerites.

DISCUSSION

In ornamental nurseries 7 species of aphids were recorded on *Betula* spp. (Tab. 1), as well as in the forest associations: *Querco-Pinetum* and *Leucobryo-Pinetum* (Durak & Wojciechowski, 2008). It was more species in comparison to the Cytadela Park and the Botanical Garden in Poznań, where 6 and 3 species were recorded, respectively (Borowiak-Sobkowiak & Wilkaniec, 2010; Wilkaniec, 2004). However, additional 4 species: *Betulaphis quadrituberculata* (Kaltenbach, 1843), *Calaphis betulicola* Mordvilko, 1928, *Hormaphis betulae* (Mordvilko, 1901) and *Symydobius oblongus* (von Heyden, 1837) were never observed on plants from Betulaceae family in nurseries, but they were common in the above mentioned forest associations and *B. quadrituberculata* in the Cytadela Park and the Botanical Garden in Poznań. the species *Pterocallis alni* was recorded in ornamental nurseries on *Alnus glutinosa*, similarly as in Ojców National Park (Osiadacz, 2007) and in the forest association: *Fraxino-Alnetum* (Durak & Wojciechowski, 2008). Two other aphid species: *Clethrobius comes* (Walker, 1848) and *Pterocallis albidus* Börner, 1940 were collected only in the forest association, but were not encountered in ornamental plants nurseries. In the Cytadela Park and the Botanical Garden in Poznań, contrary to ornamental nurseries, *Calaphis flava* and *Euceraphis punctipennis* were not recorded.

Table 1. Frequency as the number of samples with particular aphid species on *Betula* spp.

Aphid species	*Betula* species				Total number of samples	Frequency in %
	pendula	*pubescens*	*utilis*	*nana*		
Calaphis flava	16	3	0	1	20	40 E
Callipterinella calliptera	3	0	0	0	3	6 SD
Callipterinella tuberculata	6	0	1	0	7	14 D
Euceraphis betulae	13	0	1	0	14	28 E
Euceraphis punctipennis	2	0	0	0	2	4 R
Monaphis antennata	0	1	0	0	1	2 R
Glyphina betulae	1	0	1	1	3	6 SD

E – eudominant species with sample frequency over 20%
D – dominant species with sample frequency 10.1-20%
SD – subdominant species with sample frequency 5.1-10%
R – receding species with sample frequency 1.1-5%

CONCLUSIONS

1. In ornamental nurseries *Betula pendula* was infested by 6 aphid species: *Calaphis flava*, *Callipterinella calliptera*, *C. tuberculata*, *Euceraphis betulae*,

E. punctipennis and *Glyphina betulae*, among which the most common were: *C. flava* and *E. betulae*.

2. Ornamental species of birch variety: *Betula pubescens* was infested by *Calaphis flava* and *Monaphis antennata*; *B. utilis* by *Callipterinella tuberculata*, *Euceraphis betulae* and *Glyphina betulae*; *B. nana* by *Calaphis flava* and *G. betulae*.
3. In ornamental nurseries *Pterocallis alni* occurred on *Alnus glutinosa* and *P. maculata* on *A. incana*.
4. In ornamental nurseries *Myzocallis carpini* occurred on *Carpinus betulus*.
5. In ornamental nurseries *Corylus avellana* was infested by *Myzocallis coryli* in large numbers and rarely by *Corylobium avellanae*.

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Mszyce (Hemiptera, Aphidoidea) występujące na drzewach i krzewach z rodziny brzozowatych (Betulaceae) w szkółkach roślin ozdobnych

STRESZCZENIE

Na podstawie obserwacji prowadzonych w latach 1984-2008 w szkółkach produkujących drzewa i krzewy ozdobne stwierdzono na roślinach z rodziny Betulaceae występowanie 12 gatunków mszyc. Na brzozach (*Betula* spp.) z podrodziny Drepanosiphinae najczęściej występującymi gatunkami były w kolejności: *Calaphis flava* Mordvilko, 1928 - 40%, *Euceraphis betulae* (Koch, 1855)- 28%, *Callipterinella tuberculata* (von Heyden, 1837) - 14%, *Callipterinella calliptera* (Hartig, 1841) - 6%, *Euceraphis punctipennis* (Zetterstedt, 1828), *Monaphis antennata* (Kaltenbach, 1843) - 2%. i z podrodziny Thelaxi-

nae: *Glyphina betulae* (Linnaeus, 1758) - 6%. Na olszy czarnej (*Alnus glutinosa* Gaertn.) stwierdzono z podrodziny Drepanosiphinae: *Pterocallis alni* (de Geer, 1773) i na olszy szarej (*Alnus incana* (L.) Moench) - *Pterocallis maculata* (von Heyden, 1837). Na grabie pospolitym (*Carpinus betulus* L.) stwierdzono z podrodziny Drepanosiphinae *Myzocallis coryli* (Koch, 1855), a na leszczynie pospolitej (*Corylus avellana* L.) wystąpiła licznie z podrodziny Drepanosiphinae - *Myzocallis coryli* i nielicznie z podrodziny Aphidinae - *Corylobium avellanae* (Schrank, 1801).