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THE OCCURRENCE OF *Panaphis juglandis* (Goetze) AND *Chromaphis juglandicola* (Kalt.) ON WALNUT UNDER THE URBAN CONDITIONS OF LUBLIN

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Abstract. In the years 2003–2005 studies were conducted in the area of Lublin the aim of which was to study the population dynamics of aphids colonizing the trees of *Juglans regia* L. in the street and the park sites against the course of weather conditions.
The weather in spring probably had no effect on the date of hatching of the larva of fundatrix, which was usually observed in the third 10-days' period of May. On the other hand, the dry period, heat waves (above 30°C) and stormy rainfalls affected the break in the aphid population observed in July and August. The maximum population of *P. juglandis* was found in the second 10-days' period of June, while that of *Ch. juglandicola* – at he turn of June and July. The highest number of *P. juglandis* was observed in 2004, while that of *Ch. juglandicola* in 2003. In 2003 the dominating species in both sites was *Ch. juglandicola*, while in the other years of studies it was *P. juglandis.*

Key words: aphids, *Panaphis juglandis* (Goetze), *Chromaphis juglandicola* (Kalt.), walnut, weather, urban conditions

INTRODUCTION

The occurrence of two aphid species (*Hemiptera*; *Aphidoidea*; *Drepanosiphinae*) is observed on walnut: *Panaphis juglandis* (Goetze) and *Chromaphis juglandicola* (Kalt.) [Blackman and Eastop 2000, Szelęgiewicz 1968].

Aphids *P. juglandis* colonize only the top side of the walnut leaf, establishing characteristic colonies along the main nerve [Jaśkiewicz and Cichocka 2004]. It is a holocyclic, monophagous species, whose all adult morphs are winged, except oviparous females. The parthogenetic females are big (3.5–4.3 mm in length), yellow, with dark brown horizontal sclerites on the abdomen [Cichocka 1980].

Scattered colonies of *Ch. juglandicola*, on the other hand, are observed on the bottom part of the leaf blade [Jaśkiewicz 2003]. It is also a monophagous species, all adult

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specimens of which are winged. These aphids are small (1.2–2.2 mm in length), yellow-white, with no dark sclerites [Jaśkiewicz and Cichocka 2004].

The purpose of the present paper was to study the population dynamics of aphids colonizing the trees of walnut in a street and a park sites on the background of weather conditions.

MATHERIAL AND METHODS

The studies were conducted on walnut trees (*Juglans regia* L.) in Lublin in the years 2003–2005. Two sites: a street one (A) and a park one (B), were selected for the studies. The street site was situated in close vicinity of Aleja Warszawska street, which is characterized by heavy traffic. The park site was chosen in the Museum of the Lublin Countryside, where the buildings and the vegetation are typical of the countryside. In each of the sites the observations were conducted on 3 neighbouring trees. On each, aphids were counted on 100 leaves (20 leaves on 5 branches each). The observations were performed from the moment of bud bursting till the leaf falling. 10-days' intervals were made between particular observations. Larva and winged females were counted separately. The collected aphids were marked for the species using the accessible keys of Blackman and Eastop [2000], Cichocka [1980] and Szelęgiewicz [1968]. Meteorological data were obtained from the Chair of Agrometeorology of the Agricultural University in Lublin.

RESULTS

The presence of two aphid species: *Panaphis juglandis* (Goetze) and *Chromaphis juglandicola* (Kalt.) was found on walnut trees (*Juglans regia* L.) in the street site (A) and the park one (B).

Figures 1 and 2 present the population dynamics of aphids colonizing walnut trees, while table 1 shows the structure of their numbers in particular sites. Figure 3 presents the weather conditions in the years of studies as compared with the means of many years.

In 2003 the first specimens of *P. juglandis* were observed in the street site in the first 10 days of June. The following observation found out the most numerous population of aphids (20.3 aphids/100 leaves). Two next observations showed a systematic decrease of the aphid population in that site. Between the second 10-days' period of July and the first of October singular specimens of this species were found only three times: in the first and third 10-days' periods of August and the third of September.

In the park site, aphids *P. juglandis* were observed only five times throughout the period of vegetation: in the second 10-days' period of July, the first and third of August and the first and the third 10-days' periods of September. The aphid population was very small and it did not exceed 4 specimens per 100 leaves (fig. 1).

The first specimens of *Ch. juglandicola* in both sites were found in the second 10-days' period of May. In the street site a slow increase of the aphid population was observed from the beginning of June. The highest number of aphids were found in the

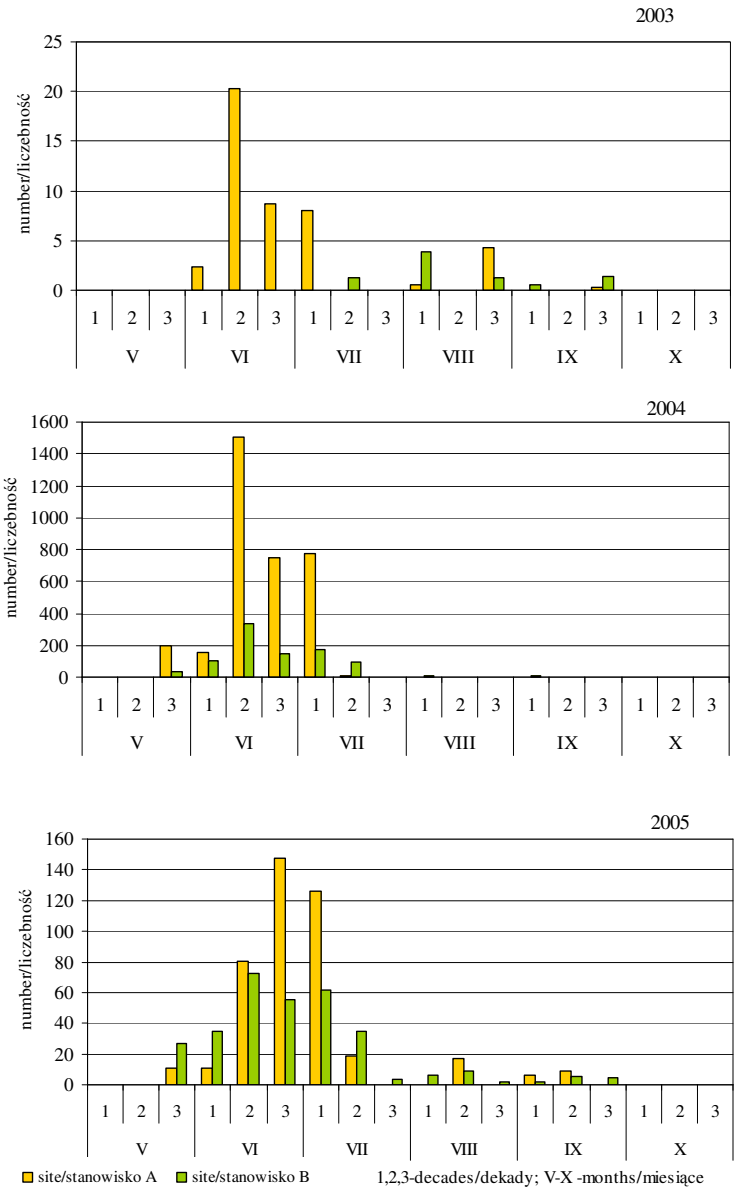


Fig. 1. Dynamics of number of *Panaphis juglandis* (Goetze) on walnut trees in the years 2003–2005 (in specimens/100 leafs)

Rys. 1. Dynamika liczebności *Panaphis juglandis* (Goetze) na orzechu włoskim w latach 2003–2005 (w sztukach/100 liści)

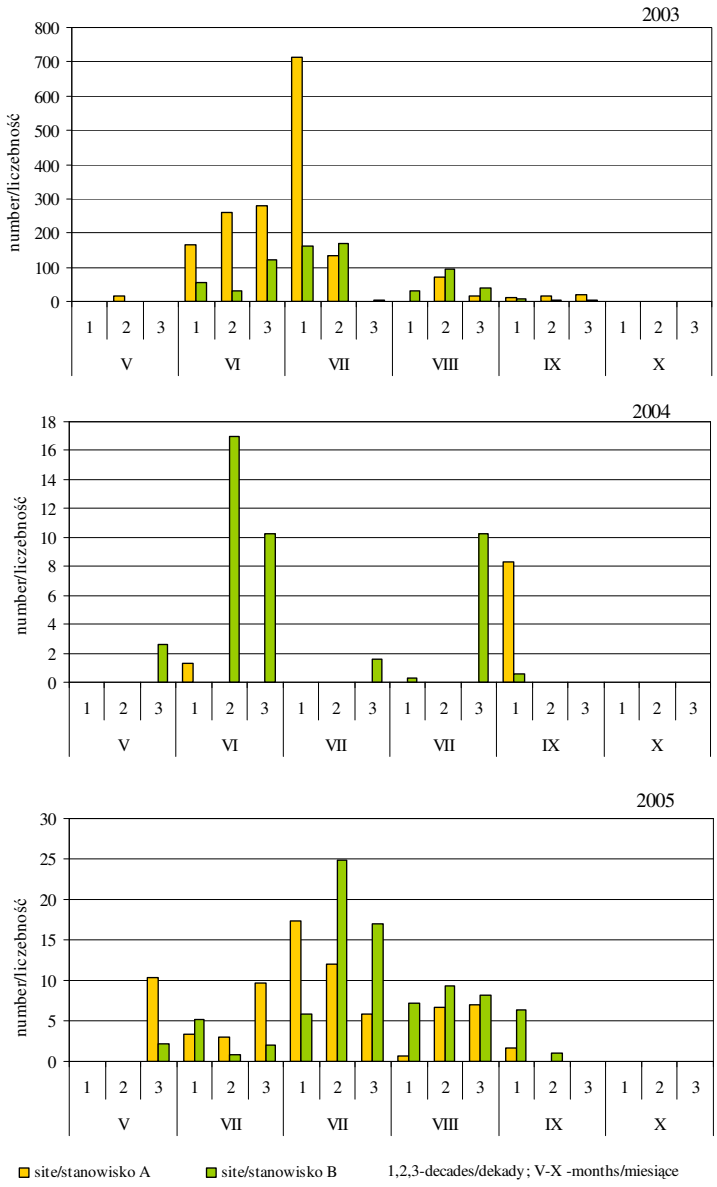
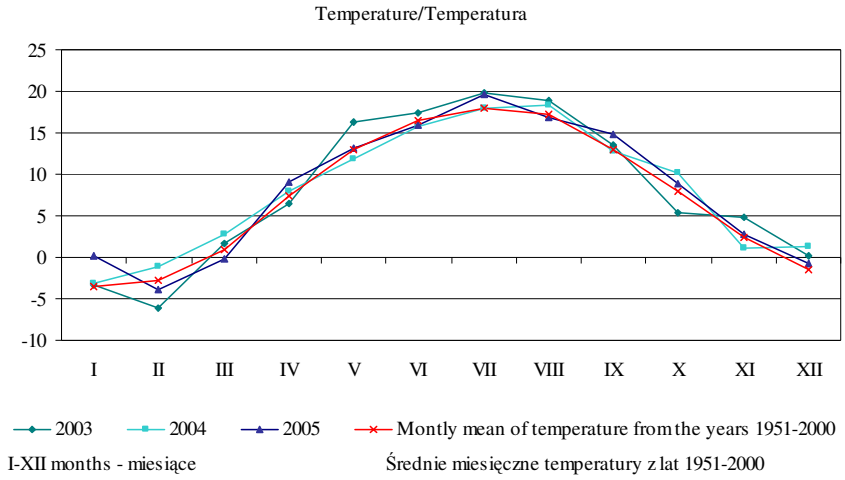


Fig. 2. Dynamics of number of *Chromaphis juglandicola* (Kalt.) on walnut trees in the years 2003–2005 (in specimens/100 leafs)

Rys. 2. Dynamika liczebności *Chromaphis juglandicola* (Kalt.) na orzechu włoskim w latach 2003–2005 (w sztukach/100 liści)



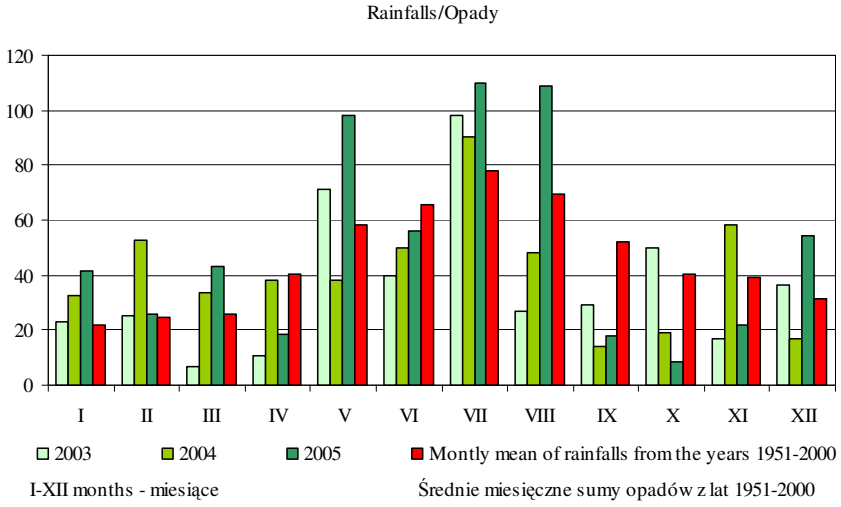


Fig. 3. Weather condition from the years of study compared with many years means from the years 1951–2000

Rys. 3. Warunki meteorologiczne w latach badań w porównaniu ze średnimi wieloletnimi z lat 1951–2000

first 10 days of July (713.4 aphids/100 leaves). In the second 10-days' period of July the aphid population radically decreased. In the third 10-days' period of July and the first of August aphids *Ch. juglandicola* were not observed in the street site. They appeared again on the trees in the second 10-days' period of August and they remained there till the first 10 days of October. Aphids of this species appeared on the trees in the park site in the first 10 days of June. The largest population (170.8 aphids/100 leaves) was observed in the second 10-days' period of July. Those insects remained on the plants till the first 10 days of October (fig. 2) and they appeared only scarcely.

In 2004 aphids *P. juglandis* appeared in the street site in the third 10-days' period of May. Like in the previous years their largest population was found in the second 10-days' period of June (1509.6 aphids/100 leaves). In the successive observations the aphid population decreased until its disappearance in the first 10 days of August. Singular aphids were still observed in the second 10-days' period of October.

In the park site aphids of this species also appeared in the third 10-days period of May. Their highest number was observed, like in the street site, in the second 10-days' period of June (338.3 aphids/100 leaves). Colonies were observed on the leaves till the first 10 days of September (fig. 1).

Singular aphids *Ch. juglandicola* were observed in the street site only during two observations: in the first 10 days of June and the first 10 days of September. In the park site aphids of this species appeared on the plants irregularly and scarcely. Throughout the season they were observed seven times, and the highest number of population was observed in the second 10-days' period of June (17.0 aphids/100 leaves) (fig. 2).

In 2005 the first aphids *P. juglandis* were observed in the street site in the third 10-days' period of May. Their biggest population was observed in the third 10-days' period of June (147.6 aphids/100 leaves). In the first and second 10-days' periods of July the aphid population systematically decreased, and beginning with the third 10-days' period of that month irregular presence of singular specimens was observed on the leaves. A complete disappearance of these aphids took place in the third 10-days' period of September.

In the park site aphids of this species appeared in the third 10-days' period of May. The highest number of *P. juglandis* in this site was observed in the second 10-days' period of June (72.6 aphids/100 leaves). In the third 10-days' period of June and the first and second of July relatively numerous aphids were observed on the plants, while between the third 10-days' period of July and the third of September only singular specimens of this species remained on the leaves.

The first aphids *Ch. juglandicola*, both in the street and the park sites, were found in the third 10-days' period of May. In June and July the population of this species varied in the analyzed sites. The biggest population of aphids in the street site was observed in the first 10 days of July (17.3 aphids/leaves), while in the park one – in the second 10-days' period of that month (24.8 aphids/100 leaves) The colonies remained on the plants till the first 10 days of September in the street site and till the second 10-days' period of that month in the park site.

Analyzing the population dynamics of the studied aphids to compare the weather conditions, it should be stated that despite a distinct course of temperature in winter and early spring of the studied years (fig. 3), the studies found out no significant differences

in the dates of occurrence of the first aphids on the plants. The first specimens were usually observed in the third 10-days' period of May (fig. 1 and 2). Heat waves, dry periods and rainfalls, especially of stormy character, probably had a negative effect on the development of aphids in July and August (fig. 3) since at that time the studies observed a break in the aphid population or a complete disappearance of the colonies on the plants in each studied year.

The number of aphids in the years of studies was clearly differentiated. The highest total number of aphids was found in 2004, while the lowest in 2005. Aphids *P. juglandis* and *Ch. juglandicola* colonized the leaf blades, occupying the top or bottom side of the leaf, respectively. The studies showed that in case of distinct domination of one species, the other occurred in very small numbers. In 2003 the dominating species in both sites was *Ch. juglandicola*. On the other hand, in 2004 and 2005 the studies observed clear domination of *P. juglandis* (tab. 1).

Table 1. Number of aphids occurring on walnut trees in the years 2003–2005 (in specimens/100 leafs)

Tabela 1. Liczebność mszyc zasiedlających drzewa orzecha włoskiego w latach 2003–2005 (w szt./100 liści)

Aphid's species/ Gatunek mszycy	Year Rok	Site/Stanowisko	
		street – przyuliczne (A)	park – parkowe (B)
Panaphis juglandis (Goetze)	2003	44.5	8.2
	2004	3390.7	903.0
	2005	425.8	319.2
	Total – Razem	3861.0	1230.4
Chromaphis juglandicola (Kalt.)	2003	1700.0	734.2
	2004	9.7	43.0
	2005	77.2	90.0
	Total – Razem	1786.9	867.2
Totally on the site – Łącznie na stanowisku		5647.9	2097.6

In the street site the studies observed a higher number of both *P. juglandis* and *Ch. juglandicola* as compared to the park site. Totally, more than 2.5 times as many aphids were found in the street site as compared to the park one.

Aphids *P. juglandis* formed colonies on the top part of the leaf blade, settling along the main nerve (photo 5). Only larva and winged parthogenetic females were observed in the colonies (photo 4 and 5). Discolouration of the main nerve into the black colour and characteristic wrinkling of the leaf blade (photo 6) were observed only with bigger aphid populations on the plants. The leaves were also covered with honeydew excreted by aphids. Scattered colonies of *Ch. juglandicola* colonized the bottom part of the leaves. Only winged females and wingless larva were also observed in this species (photo 1 and 2). No visible injuries resulting from the preying of this species were observed on the analyzed plants.

Photo 1. Larvae of *Chromaphis juglandicola* (Kalt.) on the bottom side of *J. regia* L. leaf
Fot. 1. Larwa *Chromaphis juglandicola* (Kalt.) na spodniej stronie liścia *J. regia* L.

Photo 2. Winged female of *Chromaphis juglandicola* (Kalt.) feeding on the bottom side of *J. regia* L. leaf
Fot. 2. Uskrzydlona samica *Chromaphis juglandicola* (Kalt.) żerująca na spodniej stronie liścia *J. regia* L.

Photo 3. Colony of apterae *Panaphis juglandis* (Goetze) on the upper side of *J. regia* L. leaf
Fot. 3. Kolonia bezskrzydłych mszyc *Panaphis juglandis* (Goetze) na górnej stronie liścia *J. regia* L.

Photo 4. Winged female of *Panaphis juglandis* (Goetze) preying on *J. regia* L. leaf
Fot. 4. Uskrzydlona samica *Panaphis juglandis* (Goetze) żerująca na liściu *J. regia* L.

Photo 5. Colony of aphids *Panaphis juglandis* (Goetze) occurring on the upper side of lamina along main nerve
Fot. 5. Kolonia mszyc *Panaphis juglandis* (Goetze) zasiedlająca górną stronę blaszki liściowej wzdłuż nerwu głównego

Photo 6. Injuries resulting from the preying of *Panaphis juglandis* (Goetze) on *J. regia* L. leaf
Fot. 6. Uszkodzenia powodowane żerowaniem *Panaphis juglandis* (Goetze) na liściu *J. regia* L.

CONCLUSIONS

1. The presence of two aphid species: *Panaphis juglandis* and *Chromapsis juglandicola* was observed on walnut trees in Lublin.

2. *P. juglandis* formed colonies on the main nerve on the top part of the leaf blade, while *Ch. juglandicola* preyed scattered on the bottom part of the leaves.

3. No wingless viviparous females were observed in either aphid species.

4. The weather in spring probably had no effect on the date of hatching of the fundatrix and it usually took place in the third 10-days' period of May.

5. Dry periods, heat waves (above 30°C) and stormy rainfalls had a significant effect on the break of the aphid population observed in July and August.

6. The peak population of *P. juglandis* was observed in the second 10-days' period of June, while that of *Ch. juglandicola* – at he turn of June and July.

7. The highest number of *P. juglandis* was observed in 2004, while of *Ch. juglandicola* in 2003.

8. In 2003 the dominating species in both sites was *Ch. juglandicola*, while in the other years of studies it was *P. juglandis.*

9. Totally, in the studied years more than 2.5 times as many aphids of both species were observed in the street site as compared to the park site.

10. *P. juglandis* caused the browning of the nerve and slight wrinkling of the walnut leaves where numerous specimens preyed, whereas in the case of *Ch. juglandicola* no external signs of injuries were observed on the leaves.

REFERENCES

Blackman R. L., Eastop V. F., 2000. Aphids on the World's Crops. An Identification and Information Guide. The Natural History Museum, London, 466 pp.

Cichocka E., 1980. Mszyce roślin sadowniczych Polski. PWN, Warszawa, 119 pp.

Jaśkiewicz B., 2003. Zdobniczka orzechowa (*Panaphis juglandis* Goetze) i zdobniczka podliściowa (*Chromaphis juglandicola* Kalt.) – mszyce obniżające dekoracyjność orzecha włoskiego. Ochrona Roślin, X, 10, 17–18.

Jaśkiewicz B., Cichocka E., 2004. Aphids on European Walnut (*Juglans regia* L.) in the urban conditions of Lublin. Aphids and Other Hemipterous Insects, PAS Skierniewice, vol. 10, 35–46.

Szelęgiewicz H., 1968. Mszyce – *Aphidoidea*. Katalog fauny Polski. XXI, 4, 316, PWN, Warszawa.

WYSTĘPOWANIE *Panaphis juglandis* (Goetze) I *Chromaphis juglandicola* (Kalt.) NA ORZECHU WŁOSKIM W WARUNKACH MIEJSKICH LUBLINA

Streszczenie. W latach 2003–2005 na terenie Lublina prowadzono badania, których celem było prześledzenie dynamiki liczebności mszyc zasiedlających drzewa *Juglans regia* L. na stanowisku przyulicznym i parkowym na tle przebiegu warunków pogodowych. Układ pogody wiosną prawdopodobnie nie miał wpływu na termin wylęgu larw założycielek rodów, który notowano zazwyczaj w III dekadzie maja. W istotny sposób natomiast na załamywanie się liczebności mszyc, obserwowanej w lipcu i sierpniu, wpływała susza, upały (powyżej 30°C) oraz opady typu burzowego. Maksimum liczebności *P. juglandis* notowano w II dekadzie czerwca, natomiast *Ch. juglandicola* na przełomie czerwca i lipca. Najwyższą liczebność *P. juglandis* odnotowano w roku 2004, a *Ch. juglandicola* w roku 2003. Gatunkiem dominującym na obydwu stanowiskach w roku 2003 był *Ch. juglandicola*, natomiast w pozostałych latach badań *P. juglandis*.

Słowa kluczowe: mszyce, *Panaphis juglandis* (Goetze), *Chromaphis juglandicola* (Kalt.), orzech włoski, pogoda, warunki miejskie

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