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The first record of aphid *Melanaphis pyraria* (Passerini) in Lithuania

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Abstract

In 2011, during the field studies of an alien pear inhabiting aphid species *Dysaphis pyri* (Boyer de Fonscolombe), two colonies of *Melanaphis pyraria* (Passerini) were detected on its winter host *Pyrus communis*. The Palaearctic aphid *M. pyraria*, alternating between pears (*Pyrus*) and grasses (*Poaceae*), has been recorded for the first time in Lithuania and entire Eastern Baltic region (Lithuania, Latvia, Estonia), including Belarus. The aim of this paper is to provide information about this new potential pest of cultivated pears. Original images of aphid microscope slides and results of morphometric study for apterous ($n = 7$) and alate ($n = 11$) viviparous females collected in Lithuania are given and compared with earlier published ones from Denmark, Great Britain and South Eastern Russia. Reference data on the biology, current distribution and noxiousness of this species are discussed. At present, collection sites of *M. pyraria* in Lithuania are among the northernmost ones in Europe.

Key words: *Melanaphis pyraria*, aphids, *Pyrus*, morphology, biology, distribution, noxiousness.

Introduction

The genus *Melanaphis* van der Goot contains 23 Palaearctic species (Remaudière, Remaudière, 1997; Holman, 2009). It is closely related to the genus *Rhopalosiphum* Koch (Kim, Lee, 2008; Kim et al., 2011), but differs from it by cylindrical or subcylindrical siphunculi (Heie, 1986). Most of the species are associated with grasses (*Poaceae*), but five of them use *Pyrus* as their winter host (Blackman, Eastop, 2006; Holman, 2009), where cold-resistant overwintering eggs are produced. Five species of the genus *Melanaphis* have been already recorded in Europe (Holman, 2009; Nieto Nafria et al., 2010), although no records are available for Lithuania, Latvia, Estonia, Belarus, Western and North Western Russia (Рупайтс, 1989; Buga, Stekoshchikov, 2009; Holman, 2009; Nieto Nafria et al., 2010).

During the field studies of an alien pear inhabiting aphid species *Dysaphis pyri* (Boyer de Fonscolombe) in 2011, two colonies of *Melanaphis pyraria* (Passerini) were detected on cultivated pears.

The aim of this paper was to provide information about *M. pyraria*, a new potential pest of pears and grasses in Lithuania and the entire Eastern Baltic region.

Material and methods

An extensive investigation of the distribution and abundance of an alien aphid species *D. pyri* was performed in 2010–2011. Field counts were performed in eight administrative regions (Table 1). As a result, two

samples of *M. pyraria* were collected during field studies in 2011 on cultivated pear trees in Lithuania. One of them was found in Skirgiškės village, Vilnius region (54° 50'9.97" N, 25° 21'43.5" E), on the 22nd of June. Several mat brown apterous viviparous females with larvae and nymphs were located on the curled discoloured leaf of mature pear tree together with another aphid species, *Aphis pomi* De Geer. Numerous colonies consisting mostly of nymphs and alate viviparous females were found on the curled discoloured leaves of root suckers of pruned pear tree in Druskininkai (54° 0'44.3" N, 23° 59'24.98" E) on the 12th of July.

Microscope slides in Canada balsam were prepared according to Blackman and Eastop (2000). Ethanol-preserved and mounted specimens are stored at the Department of Zoology, Vilnius University. The key for the pear inhabiting aphid species (Blackman, Eastop, 2000) together with that for European *Melanaphis* species (Heie, 1986) was used for aphid species identification. Afterwards, all morphological characters presented by Колесова (1975), Stroyan (1984) and Heie (1986) for the *M. pyraria* were checked. A comparison of the principal morphological characters of our material with those taken from Колесова (1975), Stroyan (1984) and Heie (1986) is given in Table 2. Measurements were performed with an Olympus BX40 microscope using an interactive measurement system *MicroImage*. Basic statistics were calculated using *Excel 2003*.

Table 1. Field records of the pear inhabiting aphid species *Dysaphis pyri* and *Melanaphis pyraria* in Lithuania in 2011

Locality and date	Numbers of pear trees	
	Checked	Inhabited by <i>D. pyri</i> / <i>M. pyraria</i>
Vilnius, Naujamiestis, 14 06 2011	9	1/0
Skirgiškės, Vilnius reg., 22 06 2011	8	0/1
Skirgiškės, Vilnius reg., 29 06 2011	8	1/0
Lukšiai, Šakiai reg., 01 07 2011	9	0/0
Šakiai, 01 07 2011	21	0/0
Kairėnai, Vilnius reg., 05 07 2011	34	0/0
Mindūnai, Molėtai reg., 06 07 2011	7	0/0
Zapyškis, Kaunas reg., 07 07 2011	17	0/0
Babtai, Kaunas reg., 08 07 2011	849	0/0
Bratoniškės, Vilnius reg., 13 07 2011	19	0/0
Druskininkai, 13 07 2011	18	0/1
Trasninkas, Varėna reg., 13 07 2011	7	0/0
Puvočiai, Varėna reg., 16 07 2011	25	0/0
Plateliai, Plungė reg., 04 08 2011	9	0/0
Beržoras, Plungė reg., 04 08 2011	13	0/0
Rietavas, 08 08 2011	9	0/0
Total:	1062	2/2

Results and discussion

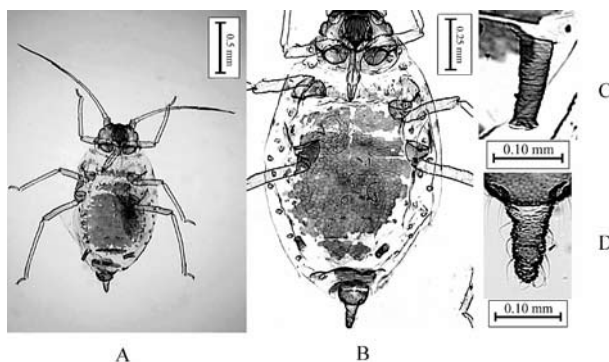
Biology. *M. pyraria* is a holocyclic aphid species. Its winter host is mainly *Pyrus communis* and sometimes *Pyrus pyraeaster* and *Pyrus amygdaliformis* (Holman, 2009). Summer hosts of *M. pyraria* are grasses (*Poaceae*) of genera *Aegilops* (Kolesova, 1975; Holman, 2009), *Agrostis* (Stroyan, 1984; Heie, 1986; Holman, 2009), *Arrhenatherum* (Blackman, Eastop, 2000), *Avena* (Kolesova, 1975; Holman, 2009), *Brachypodium* (Stroyan, 1984; Heie, 1986; Blackman, Eastop, 2000; Holman, 2009), *Briza* (Holman, 2009), *Bromus* (Kolesova, 1975; Holman, 2009), *Dactylis* (Kolesova, 1975; Stroyan, 1984; Heie, 1986; Holman, 2009), *Elymus* (Holman, 2009), *Festuca* (Kolesova, 1975; Holman, 2009), *Holcus* (Blackman, Eastop, 2000; Holman, 2009), *Hordeum* (Stroyan, 1984; Heie, 1986; Holman, 2009), *Lolium* (Kolesova, 1975; Holman, 2009), *Miscanthus* (Holman, 2009), *Panicum* (Holman, 2009), *Piptatherum* (Holman, 2009), *Poa* (Kolesova, 1975; Stroyan, 1984; Heie, 1986; Blackman, Eastop, 2000; Holman, 2009), *Stipa* (Holman, 2009), *Triticum* (Blackman, Eastop, 2000; Holman, 2009). Populations of *M. pyraria* can persist on pears until the mid-August (Blackman, Eastop, 2000). These aphids are attended by ants on pears, but not on grasses (Stroyan, 1984; Heie, 1986). Our preliminary data show *M. pyraria* being capable of living on cultivated pear varieties in Lithuania. Further investigations are needed to reveal the peculiarities of the life cycle and host specificity of local populations of this species.

Damage to the host plants. Fundatrices and the first generation of apterous viviparous females do not cause pear leaf deformations (Kolesova, 1975). Further generations of *M. pyraria* feed on the undersides of young pear leaves and cause their irregular, transverse or diagonal to mid-rib rolling or curling (Kolesova, 1975; Heie, 1986; Blackman, Eastop, 2000) and also cover them with honeydew. Under favourable conditions *M. pyraria* may cause defoliation of cultivated pear trees (Kolesova,

1975). This aphid species was also reported being able to transmit barley yellow dwarf virus (BYDV) (El-Yamani, Hill, 1991), which is the most widely distributed viral disease of cereals. Our data show *M. pyraria* causing both curling and discoloration of pear leaves. Colonies of this species were quite numerous in Druskininkai, but they were not as numerous as those of another alien pear aphid, *D. pyri*, recorded in Lithuania from 1994 onwards (Rakauskas, 1996). Noticeably, *D. pyri* appeared to be unexpectedly uncommon in Lithuania in 2010–2011 (Table 1) despite previous population outbreaks in some years (Rakauskas, 2011).

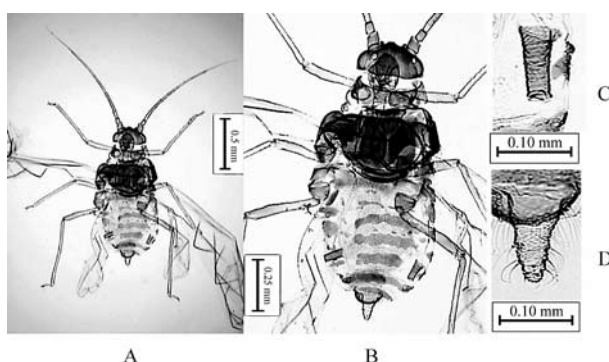
Morphology. Both apterous and alate viviparous females of *M. pyraria* on pears are dark brown. Aphids from summer hosts are yellow or light brown (Kolesova, 1975; Stroyan, 1984; Heie, 1986) or even reddish purple (Blackman, Eastop, 2000). Their dorsum is weakly sclerotized; legs, siphunculi and cauda are pale (Kolesova, 1975; Heie, 1986).

The patterns of sclerotization observed in mounted individuals collected on pears in Lithuania are shown in Figures 1–2. Apterous viviparous females are with large sclerotic patch with irregular transverse bands posteriorly and small marginal sclerites (Fig. 1). Alate viviparous females are usually with dorsal sclerites or cross bars (Fig. 2). Legs of both morphs are pale, while siphunculi and cauda are dark. Siphunculi are short stump-shaped with distinct flange (Figs 1–2). Cauda is tongue-shaped (Figs 1–2).



A – general view, B – abdomen sclerotization, C – siphunculus, D – cauda

Figure 1. *Melanaphis pyraria* apterous viviparous female (Skirgiškės, Vilnius reg., 22 06 2011, *Pyrus* sp. cult.)



A – general view, B – abdomen sclerotization, C – siphunculus, D – cauda

Figure 2. *Melanaphis pyraria* alate viviparous female (Druskininkai, 12 07 2011, *Pyrus* sp. cult.)

Morphometric data of apterous and alate viviparous females of *M. pyrararia* are given in Table 2 together with available reference data (Колесова, 1975; Stroyan, 1984; Heie, 1986).

Distribution. *M. pyrararia* is recorded from Europe, Asia and Northern Africa (Nieto Nafria et al., 2010). Its distribution area reaches the Mediterranean Sea in the south and the Near East, including Caucasus and Transcaucasia, eastwards (Nieto Nafria et al., 2010). Heie (1986) reported *M. pyrararia* from Denmark and Southern Sweden, although this aphid species was not detected in

Norway or Finland. *M. pyrararia* was also reported from British Isles (Stroyan, 1984), Germany (except for its northern regions) (Heie, 1986), Southern and Central Poland (Osiadacz, Halaj, 2009), however, no records are available for European part of Russia (Nieto Nafria et al., 2010). The record of *M. pyrararia* from Lithuania turns out to be the first one for the entire Eastern Baltic region, including Belarus (Buga, Stekoshchikov, 2009). At present, together with samples from southern Sweden (Heie, 1986) it is one the northernmost findings of this species in Europe.

Table 2. Morphometric data (mean \pm standard deviation, range in brackets) for apterous (n = 7) and alate (n = 11) viviparous females of *Melanaphis pyrararia* collected on cultivated pears in Lithuania in 2011

Character	Apterous	Alate
Length of processus terminalis / length of the base of antennal segment 6	3.3 \pm 0.6 (2.0–3.8) [2.4–4.3]	3.5 \pm 0.1 (3.1–3.7) [3–5]
Length of siphunculus / body length, excluding cauda	0.08 \pm 0.01 (0.06–0.10) [0.06–0.08]	– –
Length of siphunculus / length of cauda	0.9 \pm 0.1 (0.6–1.0) [\approx 0.7–0.8]	0.8 \pm 0.1 (0.7–0.9) [\leq 1]
Length of the last rostral segment / length of segment 2 of hind tarsus	1.0 \pm 0.1 (0.9–1.1) [\approx 1, 0.8–1.1]	– –
Number of hairs on cauda	11 \pm 1 (10–12) [8–14]	10 \pm 2 (8–13) [\geq 6]
Body length, excluding cauda	1.6 \pm 0.1 (1.5–1.8) [1.4–2.4]	– –
Number of secondary rhinaria on antennal segment 3	– –	20 \pm 3 (14–26) [8–23]
Number of secondary rhinaria on antennal segment 4	– –	5 \pm 2 (1–9) [0–8]
Number of secondary rhinaria on antennal segment 5	– –	1 \pm 1 (0–2) [0–1]

Notes. All measurements given in mm. Data from Колесова (1975), Stroyan (1984) and Heie (1986) are given in square brackets for comparison.

The analysis of climatic fluctuations in Lithuania over the last two centuries revealed gradual warming up of winters and springs (Bukantis, 2001), with air temperature rise being especially significant in the last decades of the 20th century (Bukantis, Rimkus, 2005). Therefore, southern-borne aphid species, such as *Volutaphis schusteri* (Börner), *Aphis psammophila* Szelegiewicz, *Macrosiphoniella hillerislammersi* Ossiannilsson, *Macrosiphum ptericolens* Patch, *Periphyllus singeri* (Börner) have already been registered in Lithuania (Rakauskas, 2011). *M. pyrararia* is another southern-borne species for Lithuania. Establishment of permanent local populations of any alien species is a separate question demanding further precise research. For example, southern-borne aphid species *D. pyri* has been reported from Lithuania since 1994 (Rakauskas, 1996). Despite numerous outbreaks in certain years, this species has not established any permanent overwintering populations in Lithuania yet (Rakauskas, 2004; 2011). The situation might be explained by the regular numerous albeit temporary air-borne summer invasions of *D. pyri* northwards, because aphids are capable of travelling long distances carried by air currents (Dixon, 1971).

Conclusions

1. The record of *Melanaphis pyrararia* (Passerini) is the first for Lithuania as well as for the Eastern Baltic region.
2. This aphid species is a new potential pest of pears and grasses in Lithuania.

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Amarų rūšis *Melanaphis pyraria* (Passerini), pirmą kartą aptikta Lietuvoje

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Santrauka

Lauko tyrimų metu 2011 m. kartu su svetimkrašte ant paprastosios kriaušės (*Pyrus communis*), šios rūšies žieminio mitybinio augalo, gyvenančia amarų rūšimi *Dysaphis pyri* (Boyer de Fonscolombe) buvo aptiktos dvi *Melanaphis pyraria* (Passerini) kolonijos. Palearktinė amarų rūšis *M. pyraria*, migruojanti nuo kriaušių (*Pyrus*) ant miglinių (*Poaceae*) augalų, pirmą kartą aptikta Lietuvoje ir visame Rytų Baltijos regione (Lietuvoje, Latvijoje bei Estijoje), įskaitant Baltarusiją. Tyrimų tikslas – pateikti informaciją apie šį naują potencialų kultūrinės kriaušės kenkėją. Pateiktos originalios amarų iš mikroskopinių preparatų nuotraukos ir Lietuvoje surinktų besparnių ($n = 7$) bei sparnuotų ($n = 11$) partenogenetinių patelių morfometrinių tyrimų rezultatai, kurie lyginami su anksčiau paskelbtais Danijoje, Didžiojoje Britanijoje ir Pietryčių Rusijoje atliktų tyrimų duomenimis. Aptariami literatūroje skelbti duomenys apie šios rūšies biologiją, paplitimą ir žalą mitybiniam augalui. Šiuo metu *M. pyraria* aptikimo vietos Lietuvoje yra vienos šiauriausių Europoje.

Reikšminiai žodžiai: *Melanaphis pyraria*, amarai, morfologija, biologija, paplitimas, žala.