The species composition of plant mining dipterous (Insecta: Diptera) of greenhouse surroundings in Lithuania

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The greenhouse surroundings of 37 growers were tested for *Liriomyza bryoniae* (Diptera: Agromyzidae) distribution in Lithuania. Plants as potential hosts for economically significant leaf miner pests were elucidated and most frequent species of dipterous miners were determined. In total, 119 species belonging to 7 families were indicated, and the hosts invaded 135 plant genera belonging to 40 families (2001–2002). The relative frequency of *L. bryoniae* was 38%, and this species attacked *Cucumis sativa, Lycopersicon aesculentum, Solanum tuberosum, S. nigrum, Nicotiana affinis, Datura indica* and *Gypsophila paniculata* in greenhouse surrounding. The other available hosts for dipterous miners of economic importance were found as follows: *Amaranthus, Antirrhinum, Apium, Callistephus, Chenopodium, Dahlia, Galeopsis, Helianthus, Lamium, Linaria, Petunia, Sisymbrium, Surphinia* and *Tropaeolum.* The species *Chromatomyia horticola, Liriomyza strigata, L. ptarmicae*, *L. congesta*, *L. sonchi*, *Phytomyza artemisivora, P. pullula* (Agromyzidae), *Trypeta artemisiae* (Tèphritidae) and *Cystiphora sonchi* (Cecidomyiidae) were most frequent dipterous leaf-miners in greenhouse environment, but only the first two could have the influence on crop growing in a closed system.

The life histories of *Ophiomyia bohemica* and *O. rostrata* (Agromyzidae) were confirmed for the first time; distribution data of five rare and three new to Lithuania Diptera species were supplemented. The further hosts of *Chromatomyia horticola* (*Scaevola*), *Liriomyza eupatorii* (*Stachys*), *L. strigata* (*Cistus*), *Melanagromyza submetallescens* (*Lathyrus, Medicago*) and *Ophiomyia heracleivora* (*Chaerophyllum*) were ascertained. Also, unknown feeding behavior (no galls forming) of *Melanagromyza cunctans* and stem rind mining of *Liriomyza pisivora* have been found.

A hasted reactivation method for small insects is briefly presented.

Key words: greenhouse, plant miners, host plant, bionomics, distribution

INTRODUCTION

Liriomyza bryoniae (Kaltenbach, 1858) – a quarantine agromyzid species (Quarantine…, 1997; Lietuvos…, 2000) is known in Lithuania occurring free (Pakalniški et al., 2000) as well as under greenhouse conditions (Taluntytė, 2001; 2002). Greenhouses are not strictly isolated from the nearest surrounding (absent are entomological nets or wind blinds) in Lithuania. Thus, leaf miners and other phytophagous insects occurring on wild plants have the possibility to get into greenhouses and to attack the crops. On the other hand, when the temperature reaches 40 °C, leaf miners can escape from greenhouses. A settling of further quarantine species such as *Liriomyza trifolii, L. huidobrensis or L. sativae* is quite possible. The latest data (Ostrauskas, 2002) force us to take more care about this.

The aim of this work was to test the greenhouse surroundings for *Liriomyza bryoniae*, to determine most frequent species of dipterous miners here, and to elucidate plants as potential hosts for mining pests of economic importance.

MATERIALS AND METHODS

The investigation territory comprised direct surroundings of greenhouses, the neighbouring fields and

gardens, ornamental plots (decoration bar), peat banks, compost lots and outskirts. Surroundings of 10 greenhouses (*Liriomyza bryoniae* focus of 2000) were tested in 2001. Four of them were investigated in 2002 repeatedly together with surroundings of 27 further greenhouses (15 *L. bryoniae* foci of 2001 including).

A survey was done once per year in July–August, with additional attention to cultivated, introduced or adventive foreign plants. In total, 41 surveys of 37 growers in 2001 and 2002 were carried out to test the surroundings of 25 foci of *L. bryoniae* and 12 greenhouses without the pest indicated before (Fig. 1). All regions of Lithuanian State Plant Protection Service have been embraced.

The majority of insect species were determined according to the mining features exhibited by larvae *in situ*, and the plants were identified at the site. Some plant parts with larvae were delivered to the laboratory to dipterous imago stage exterminate there. Male genitalia were mounted, special keys and descriptions (Beiger, 1978; 1989; Černý, 1994; Sasakawa, 1961; Spencer, 1964; 1966; 1973; 1976; 1990; were used.

Also, some additional material by S. Pakalniškis collected earlier and deposited at the Institute of Ecology (Vilnius) was used.

Hasted reactivation method. Dipterous, whose imagos did not emerge at the laboratory up to the first days of October, have been considered to winter diapause fallen. Tubes containing these insects were taken to the open air and kept in a box, in the shade, under natural conditions. There were two meteorological limits fixed in the storage. A first

Fig. 1. Districts of Lithuania investigated in 2001–2002.
✸ – *Liriomyza bryoniae* in greenhouse surroundings detected;
finding spots of rare dipterous species (with former data included):

□ – *Cystiphora taraxaci*,
◇ – *Chromatomyia centaurii*,
○ – *Liriomyza bulgarica*,
▣ – *Melanagromyza tschirnhausi*,
◈ – *Ophiomyia rostrata*,
⦿ – *Phytomyza conyzae*
1 pav. Lietuvos rajonai, tirti 2001–2002 metais.
* – *Liriomyza bryoniae* radvietės šiltnamių aplinkoje bei retųjų dvisparnių rūšių radvietės (įskaitant ankstesnius duomenis)

fall of air temperature to –10 °C (usually in November) means the end of reactivation. A first thaw to 0 °C (usually in December) means the day of safe return of the insects to the laboratory. Then they were kept as follows: at about +5 °C (one day), +10–15 °C (next two days) and at about +20 °C up to insect expupation. In this way we can avoid the almost inevitable loss of material in a refrigerator, where small dipterous are threatened by danger to be dried up as soon as in some days. And the emergence we have in January (leaf miners) to late March (stem miners). The method was a result of experiments with Agromyzidae and has been in use for 20 years.

RESULTS

Host plants

Liriomyza bryoniae was found on the following hosts:

1) *Cucumis sativa* grown in fields near greenhouses by 4 growers for individual purposes (3 cases of them in focus surroundings) and 1 industrial grower;

2) *Lycopersicon aesculentum*, in industrial field (1 grower, focus surroundings), in vegetable garden (1 industrial grower, focus surroundings, and 1 grower for individual purposes) and in the outskirts (1 industrial grower, focus surroundings);

3) *Nicotiana affinis*, in a field (1 industrial grower);

4) *Datura indica*, in a garden (1 industrial grower and 1 grower for individual purposes, both focus surroundings);

5) *Solanum nigrum*, near an industrial greenhouse (1 case, focus surroundings);

6) *Solanum tuberosum,* in the fields (2 industrial growers);

7) *Gypsophila paniculata*, near a greenhouse (1 industrial grower).

In total, plants of 135 genera belonging to 40 families were found to host various Diptera miners (Table 1). The representatives of three genera (all

Table 1. **The host plant list of dipterous miners found in greenhouse surroudings in 2001–2002**
1 lentelė. **Dvisparnių minuotojų augalų šeimininkų šiltnamių aplinkoje 2001–2002 metais sąrašas**

Plant family	Genus	Status, cultural (C) / wild (W)	Number of the mining dipterous species
1	*2*	*3*	*4*
Amaranthaceae	*Amaranthus*	C	1
Apiaceae	*Aegopodium*	W	1
	Angelica	W	4
	Anthriscus	W	2
	Apium	C	2
	Chaerophyllum	W	2
	Daucus	C and W	2
	Heracleum	W	3
	Peucedanum	W	1
	Pimpinella	W	3
	Selinum	W	1
	Torilis	W	1
Asteraceae	*Achillea*	W	3
	Anthemis	W	2
	Arctium	W	4
	Artemisia	W	7
	Bellis	C	2
	Bidens	W	1
	Callistephus	C	3
	Carduus	W	3
	Centaurea	W	2
	Chamomilla	W	2
	Chrysanthemum	C	3
	Cichorium	W	2
	Cirsium	W	8
	Crepis	W	1
	Dahlia	C	2
	Erigeron	W	2
	Eupatorium	W	1
	Galinsoga	W	2
	Helenium	C	1
	Helianthus	C	1
	Hypochoeris	W	1
	Inula	C	1
	Lactuca	W	2
	Lapsana	W	2
	Leontodon	W	3
	Leucanthemum	W	2
	Matricaria	W	3
	Mycelis	W	1
	Picris	W	3
	Rudbeckia	C	2
	Solidago	W	1
	Senecio	W	2
	Sonchus	W	10
	Tagetes	C	2
	Tanacetum	C and W	5
	Taraxacum	W	4
	Tragopogon	W	1
	Tussilago	W	4
	Zinnia	C	2
Balsaminaceae	*Impatiens*	W	1
Betulaceae	*Betula*	W	1
Boraginaceae	*Anchusa*	W	2
	Echium	W	2
	Myosotis	C and W	2
	Symphytum	W	1
Brassicaceae	*Armoracia*	C	2
	Barbarea	W	1
	Brassica	C	2

Table 1 (continued)
1 lentelė (tęsinys)

Table 1 (continued)
1 lentelė (tęsinys)

1	2	3	4
	Capsella	W	2
	Erucastrum	W	1
	Erysimum	W	3
	Raphanus	C and W	4
	Roripa	W	2
	Sinapis	W	4
	Sisymbrium	W	1
	Thlaspi	W	1
Campanulaceae	*Campanula*	W	2
	Jasione	W	1
Cappareceae	*Cleome*	C	2
Caprifoliaceae	*Sambucus*	W	1
Caryophyllaceae	*Gypsophila*	C	3
	Cerastium	W	1
	Saponaria	W	1
	Silene	W	3
	Stellaria	W	2
Chenopodiaceae	*Chenopodium*	W	2
	Beta	C	3
Cistaceae	*Cistus*	C	1
Convolvulaceae	*Convulvulus*	W	2
Cucurbitaceae	*Cucumis*	C	2
Cyperaceae	*Carex*	W	1
Dipsacaceae	*Knautia*	W	2
Equisetaceae	*Equisetum*	W	1
Fabaceae	*Lathyrus*	W	1
	Lotus	W	3
	Medicago	W	6
	Melilotus	W	3
	Ononis	?	1
	Pisum	C	4
	Trifolium	W	4
	Vicia	C and W	4
Gentianaceae	*Centaurium*	W	1
Geraniaceae	*Geranium*	W	1
Goodeniaceae	*Scaevola*	C	1
Lamiaceae	*Galeopsis*	W	4
	Glechoma	W	1
	Lamium	W	3
	Melissa	C	1
	Mentha	W	1
	Origanum	W	1
	Salvia	C	2
	Stachys	W	4
Malvaceae	*Althaea*	C	1
Papaveraceae	*Papaver*	C	2
Plantaginaceae	*Plantago*	W	2
Poaceae	*Dactylis*	W	3
	Echinochloa	W	2
	Milium	W	1
Polemoniaceae	*Phlox*	C	1
Polygonaceae	*Polygonum*	W	1
	Rumex	W	1
Ranunculaceae	*Aquilegia*	C	1
	Ranunculus	W	7
Rosaceae	*Malus*	C	1
	Potentilla	W	1
	Spiraea	C	1

Table 1 (continued)
1 lentelė (tęsinys)

1	2	3	4
Rubiaceae	*Galium*	W	2
Rutaceae	*Ruta*	C	1
Salicaceae	*Populus*	W	2
Scrophulariaceae	*Anthirrhinum*	W	1
	Chaenorrhinum	C	1
	Linaria	W	2
	Veronica	W	1
Solanaceae	*Datura*	C	2
	Lycopersicon	C	2
	Nicotiana	C	2
	Petunia	C	2
	Solanum	C and W	1
	Surphinia	C	1
Tropaeolaceae	*Tropaeolum*	C	2
Urticaceae	*Urtica*	W	2
Valerianaceae	*Valeriana*	W	1
Violaceae	*Viola*	W	1

Asteraceae) were mining in all the territories studied, the miners were most diverse and rather abundant. *Sonchus* spp. were frequently attacked by *Chromatomyia horticola, Cystiphora sonchi, Liriomyza sonchi*, and by 7 further dipterous species more occasionally. *Chromatomyia horticola, Phytomyza cirsii* and 6 further species were found on *Cirsium* spp. (mainly *C. arvense*). Very often *Artemisia* spp. (*A. vulgaris* mainly) were attacked also by *Calycomyza artemisiae*, Phytomyza artemisivora. Trypeta artemisiae and 4 further miners.

New host plants have been confirmed for 5 Agromyzidae species:

1) *Chaerophyllym aromaticum* as a new host-plant genus for *Ophiomyia heracleivora*, in greenhouse surroundings and other territories (see below);

2) *Cistus* sp. (Cistaceae) as a new host-plant family for *Liriomyza strigata*;

3) *Medicago* spp. as a new host-plant genus for *Melanagromyza submetallescens* (in greenhouse surroundings). Further data: Paežeriai (Šiauliai distr.), 23 07 1999, puparium in *Lathyrus pratensis* (new host-plant genus), imago 24 05 2000, 1 male; Ražiškiai (Kaunas distr.), 29 07 1999, puparium in *Medicago falcata*, imago 24 02 2000, 1 male.

4) *Scaevola* sp. (Goodeniaceae), a new host family for *Chromatomyia horticola*;

5) *Stachys arvensis* as a new host genus for *Liriomyza eupatorii*;

All new hosts have been verified with imago males reared subsequently.

The first hosts have been confirmed for the poorly known species *Ophiomyia bohemica* and *O. rostrata* (see below).

Species frequency and distribution

There were 119 species belonging to 7 families of dipterous insects that were found in the greenhouse surroundings (Table 2).

Table 2. **The relative frequency and trophic relation scale of dipterous miners in greenhouse surroundings (2001–2002)**
2 lentelė. **Dvisparnių minuotojų santykinis dažnumas ir trofinių ryšių skalė šiltnamių aplinkoje 2001–2002 metais**

Family, species	Relative frequency (%)	Number of host plant genera
1	*2*	*3*
AGROMYZIDAE		
Agromyza abiens Zetterstedt	13	4
Agromyza albitarsis Meigen	3	1
Agromyza alnibetulae Hendel	3	1
Agromyza frontella (Rondani)	35	1
Agromyza idaeiana (Hardy)	8	1
Agromyza nana Meigen	62	4
Agromyza nigrescens Hendel	3	1
Agromyza reptans Fallén	32	1
Agromyza spiraeoidearum Hering	3	1
Agromyza vicifoliae Hering	13	1
Amauromyza chenopodivora Spencer	35	1
Amauromyza flavifrons (Meigen)	27	3
Amauromyza labiatarum (Hendel)	5	2
Aulagromyza tremulae (Hering)	3	1
Aulagromyza trivittata (Loew)	3	1
Calycomyza artemisiae (Kaltenbach)	49	1
Cerodontha incisa (Meigen)	5	2
Cerodontha muscina (Hendel)	3	1
Cerodontha suturalis (Hendel)	3	1
Chromatomyia centaurii Spencer	3	1
Chromatomyia horticola (Goureau)	100	72
Chromatomyia milii (Kaltenbach)	3	1
Chromatomyia ramosa (Hendel)	8	1
Liriomyza amoena (Meigen)	3	1
Liriomyza artemisicola de Meijere	5	1
Liriomyza bryoniae (Kaltenbach)	38	5
Liriomyza buhri Hering	3	1
Liriomyza bulgarica Beiger	19	1
Liriomyza centaureae Hering	5	1
Liriomyza congesta (Becker)	76	6
Liriomyza demeijerei Hering	35	1
Liriomyza endiviae Hering	11	1
Liriomyza eupatorii (Kaltenbach)	35	1
Liriomyza flaveola (Fallén)	3	1
Liriomyza flavopicta Hendel	19	1
Liriomyza pisivora Hering	5	1
Liriomyza ptarmicae de Meijere	73	2
Liriomyza pusilla (Meigen)	8	2
Liriomyza sonchi Hendel	76	2
Liriomyza soror Hendel	27	1
Liriomyza strigata (Meigen)	76	38
Liriomyza tanaceti de Meijere	13	1
Liriomyza taraxaci Hering	35	2
Liriomyza tragopogonis de Meijere	3	1
Liriomyza violicaulis Hering	8	1
Liriomyza virgo (Zetterstedt)	3	1
Melanagromyza aeneoventris (Fallén)	30	1
Melanagromyza albocilia Hendel	3	1
Melanagromyza angeliciphaga Spencer	3	1
Melanagromyza cunctans (Meigen)	3	1
Melanagromyza lappae (Loew)	8	1
Melanagromyza nigrissima Spencer	8	1
Melanagromyza submetallescens Spencer	8	2
Melanagromyza tschirnhausi Pakalniškis	5	1
Napomyza lateralis (Fallén)	24	2
Ophiomyia alliariae Hering	27	4
Ophiomyia beckeri (Hendel)	3	1
Ophiomyia bohemica Černż	22	5
Ophiomyia cunctata (Hendel)	51	7
Ophiomyia curvipalpis (Zetterstedt)	3	1
Ophiomyia galii Hering	8	1
Ophiomyia heracleivora Spencer	3	1
Ophiomyia heringi Starż	38	4
Ophiomyia labiatarum Hering	8	1
Ophiomyia longilingua (Hendel)	3	1
Ophiomyia melandricaulis Hering	19	2
Ophiomyia ononidis Spencer	22	1
Ophiomyia ranunculicaulis Hering	3	1
Ophiomyia rostrata (Hendel)	5	1
Ophiomyia vitiosa Spencer	3	1
Phytoliriomyza melampyga (Loew)	8	1
Phytomyza angelicae Kaltenbach	11	1
Phytomyza angelicastri Hering	8	1
Phytomyza aquilegiae Hardy	3	1
Phytomyza artemisivora Spencer	76	1
Phytomyza brischkei Hendel	19	1
Phytomyza chaerophylli Kaltenbach	32	3
Phytomyza cirsii Hendel	59	1
Phytomyza clematidis Kaltenbach	5	1
Phytomyza conyzae Hendel	3	1
Phytomyza crassiseta Zetterstedt	8	1
Phytomyza erigerophila Hering	8	1
Phytomyza fallaciosa Brischke	3	1
Phytomyza flavicornis Fallén	11	1
Phytomyza glechomae Kaltenbach	16	1
Phytomyza heracleana Hering	5	1
Phytomyza heringiana Hendel	3	1
Phytomyza lappae Goureau	46	1
Phytomyza leucanthemi Hering	3	1
Phytomyza marginella Fallén	5	2
Phytomyza mylini Hering	24	1
Phytomyza nigritula Zetterstedt	8	1
Phytomyza obscurella Fallén	24	1
Phytomyza pastinacae Hendel	19	2
Phytomyza pauliloewi Hendel	5	2
Phytomyza petoei Hering	3	1
Phytomyza pimpinellae Hendel	3	1
Phytomyza plantaginis Robineau-Desvoidy	22	1
Phytomyza pullula Zetterstedt	70	3

Table 2 (continued)
2 lentelė (tęsinys)

1	2	3
Phytomyza ranunculi (Schrank)	3	1
Phytomyza ranunculivora Hering	13	1
Phytomyza spinaciae Hendel	38	1
Phytomyza solidaginis Hendel	5	1
Phytomyza stolonigena Hering	5	1
Phytomyza tanaceti Hendel	16	1
Phytomyza tetrasticha Hendel	3	1
ANTHOMYIIDAE		
Pegomya betae (Curtis)	8	1
Pegomya bicolor (Wiedemann)	38	2
Pegomya hyoscyami (Panzer)	8	1
Pegomya steini (Hendel)	3	1
CECIDOMYIIDAE		
Cystiphora sonchi (Bremi)	70	1
Cystiphora taraxaci (Kieffer)	3	1
DROSOPHILIDAE		
Scaptomyza flava (Fallén)	22	5
Scaptomyza graminum (Fallén)	35	3
EPHYDRIDAE		
Hydrellia griseola (Fallén)	5	1
SCIARIDAE		
Phytosciara halterata (Lengersdorf)	8	1
TEPHRITIDAE		
Acidia cognata (Wiedemann)	27	1
Trypeta artemisiae (Fabricius)	81	3
Trypeta zoe Meigen	3	1

Chromatomyia horticola was discovered in all checked territories, and it attacked 72 plant genera, common weeds mostly: *Sonchus* spp. (32 growers), *Cirsium* spp. (24), *Galinsoga* spp. (23).

Liriomyza strigata was a very frequent species. It occurred on plants of 38 genera, particularly on *Beta vulgaris* and *Galeopsis tetrahit*.

Frequent species were *Liriomyza ptarmicae* (2 genera of Asteraceae, especially *Achillea millefolium*), *Liriomyza congesta* (6 genera of Fabaceae, peculiarly *Trifolium* spp. and *Medicago* spp.), *Liriomyza sonchi* (*Sonchus* spp.), *Phytomyza artemisivora* (*Artemisia vulgaris*) and *Phytomyza pullula* (4 genera of Asteraceae, notably *Matricaria maritima*). Two species – *Chromatomyia horticola* and *Liriomyza strigata* – could affect the crop in greenhouses (Beiger, 1989).

Three agromyzid species had been found in Lithuania earlier (not published):

1) *Ophiomyia bohemica,* found on *Angelica archangelica, Daucus carota, Heracleum sibiricum, Pimpinella saxifraga, Selinum carvifolia* in greenhouse surroundings and on some more hosts (see below) in other cenoses;

2) *Ophiomyia rostrata,* found on *Convolvulus arvensis* (see below) in the Mažeikiai and Panevėžys districts;

3) *Phytomyza stolonigena,* found on *Ranunculus repens* in the Mažeikiai and Panevėžys districts, near greenhouses as well as on *Ranunculus* spp. in other cenoses of the Kaišiadorys, Kaunas, Marijampolė, Šakiai, Šiauliai, Švenčionys districts and in Palanga, Neringa, Vilnius.

No imagos of the latter, little-known species were reared in Lithuania, but the mines are very characteristic and cannot be misidentified.

Rare for Lithuania species also were identified in the greenhouse surroundings:

1) *Chromatomyia centaurii* (Agromyzidae) found on *Centaurium erythraea* in the Tauragė district;

2) *Cystiphora taraxaci* (Cecidomyiidae), found on *Taraxacum* cf. *officinale* in the Mažeikiai and Panevėžys districts;

3) *Liriomyza bulgarica* (Agromyzidae) has been known only from Plovdiv (Bulgaria) (Beiger, 1978) and Einoraičiai (Lithuania) (Pakalniškis, 2000) up to now, and we confirmed it to be rather common in the northwestern part of Lithuania (the Kėdainiai, Klaipėda, Mažeikiai, Panevėžys, Šiauliai districts). This is probably a monovoltine autumnal species in our climate and seems to show a boreo-mountain distribution;

4) *Melanagromyza tschirnhausi* (Agromyzidae), found on *Galeopsis tetrahit* in the Kėdainiai and Mažeikiai districts, further hosts known are *Lycopus europaeus* and *Stachys betonica* (Pakalniškis, 1996);

5) *Phytomyza conyzae* (Agromyzidae), found in the Kaunas district on *Inula magnifica*.

Bionomics and identification

Liriomyza bulgarica Beiger, 1978

The species is closely related to *L. strigata*, differs in male aedeagus, but some attention needs the fact that protuberant apical lobes of distiphallus are entirely transparent, not as distinct as were shown in Figure 2a by M. Beiger (Beiger, 1978). The mine is somewhat similar to leaf mines of *L. strigata* and *Ophiomyia* spp., but displays a very characteristic exterior (Fig. 2), when larva (even 2–3 ones) feeds on large leaves.

Liriomyza pisivora Hering, 1957

Mines of this species, in a leaf stalk or a tentacle of *Pisum* spp., often acquire an unusual shape, stretching up to 8 cm along a stalk and stem. This is characteristic also of *L. strigata* (Pakalniškis, 1998), and imagos are desirable for identification each time.

Melanagromyza cunctans (Meigen, 1830)

The galls of this species, near the stem tops of *Lotus corniculatus,* are well known (Spencer, 1966; 1973; 1976; 1990) and were found in Lithuania, too

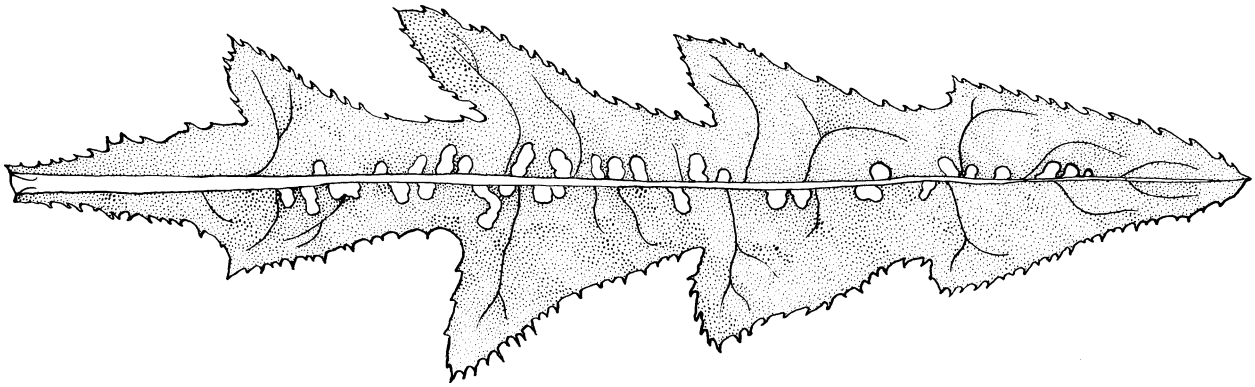

Fig. 2. *Sonchus* leaf mine of *Liriomyza bulgarica*
2 pav. *Liriomyza bulgarica* mina *Sonchus* lape

(Pakalniškis, 1996b). We discovered some larvae and puparia in the Kaunas district in 2002 in the lover parts of long, lodged stems of the host. They mined the stem pith (like many of *Melanagromyza* spp.), no galls forming. One female and one male were reared subsequently.

Ophiomyia bohemica Černý, 1994
(= *heracleivora:* Pakalniškis, 1988–1998; nec Spencer, 1957)

Ražiškiai (Kaunas distr.), 28 07 1999, puparia in *Chaerophyllum aromaticum* and *Heracleum sibiricum*, imago 31 07 1999 – 09 01 2000, 1 female and 1 male; Rekčiai (Šiauliai distr.), 11 08 1998, puparium in *H. sibiricum*, imago 18 01 1999, 1 male; Varviškė (Lazdijai distr.), 20 08 1998, puparium in *Peucedanum palustre*, imago male 21 01 1999. Two more females and two males were reared from *Angelica archangelica* and *H. sibiricum* from greenhouse surroundings.

Earlier was found in *Angelica, Cenolophium, Cnidium, Daucus, Peucedanum, Pimpinella, Selinum* and *Seseli* and erroneously recorded as *O. heracleivora* (Pakalniškis, 1994; 1996a; 1996b; 1998; 2000).

Larva forms a short (up to 15 cm) surface mine in the upper parts of stem (in the very umbella usually), pupating in mine. The puparium is shiny-black with incomplete ellipse of 10 to 14 bulbs on each posterior spiracle. The imago closely resembles that of *O. heracleivora*, especially males with the weakly sclerotized aedeagus (Fig. 3).

Early stages of the two closely related species, *Ophiomyia bohemica* and *O. heracleivora,* are rather different in their morphology and feeding biology, but imagos are very similar. The feature of both species is a rather wide scale of sclerotization of male genitalia, which are almost uniform in fact.

The aedeagus of *O. bohemica* is more compact (see M. Černý's Fig. 56 (Černý, 1994)), and the

Fig. 3. *Ophiomyia bohemica* (A) and *O. heracleivora* (B) male genitalia. Aedeagus
3 pav. *Ophiomyia bohemica* (A) ir *O. heracleivora* (B) patinų genitalijos. Aedeagus

structure covering it dorsally is various spinulate very often.

Basiphallus and distiphallus of *O. heracleivora* are more elongate (see K. A. Spencer's Fig. 43 (Spencer, 1964) in which the transparent, bent distal tubes of the distiphallus are not figured at all). Also, *O. melandryi* sensu Sasakawa, 1961 in Fig. 39 (Sasakawa, 1961) represents this species very probably.

Ophiomyia heracleivora Spencer, 1957

Karkazai (Kaunas distr.), larva 28 07 1999, imago 26 01 2000, 1 female; Ringovė (Kaunas distr.), larva 19 07 1999, imago 28 07 1999, 1 female, puparium 29 07 1999, imago 26 01 2000, 1 male; Santariškės (Vilnius), puparium 10 09 2000, imago 14 02 2001, 1 female. All mines in leaf stalks and the lover parts of stem of *Chaerophyllum aromaticum* (new host-plant).

The only known host has been *Heracleum* up to now (Spencer, 1964; Spencer, 1990). Only part of species swept in Lithuania and recorded by S. Pakalniškis earlier (Pakalniškis, 1994; 1996a; 1996b; 1998; 2000) was identified correctly.

Larva forms a very long linear mine, which is mainly interparenchymal and reaches the epidermis in some short distances only. The yellow or pale brown puparium has 30–40 bulbs on posterior spiracles (Spencer, 1964). The imago closely resembles that of *O. bohemica*, especially males with the strongly sclerotized aedeagus (Fig. 2).

Ophiomyia rostrata (Hendel, 1920)

New to Lithuania: Visoriai (Vilnius), 29 06 1999, larva in *Convolvulus arvensis* (the first confirmed host-plant), imago 24 02 2000, 1 male. Empty mines were found in the greenhouse surroundings, in the Mažeikiai and Panevėžys districts.

The larva feeds as a stem-rind miner of *Convolvulus arvensis*, pupating externally; mine linear, 8 to 14 cm long, white, with sparse, big, black cot-spots.

Puparium: dark brown, posterior spiracles, protuberant and wearing an incomplete ellipse of 14 to 16 bulbs.

DISCUSSION

Late summer was chosen for this investigation as most fit for *Liriomyza bryoniae* prospecting in field, whereas in June some usual Diptera species (especially Fabaceae miners) should be detected in all territories, and the host-plant spectrum of *Chromatomyia horticola* would be ascertained to be still wider. The latter feature was expected during repeated surveys.

There were by 5 to 42 (on the average 22.8 ± ± 8.9) species of mining Diptera registered during each survey of greenhouse surroundings. They fed on 5 to 36 (on the average 20.8 ± 7.5) plant genera. These numbers were rather distinctly subject to the areas around greenhouses (from 20 m^2 to 20 ha), and the least species diversity was found in small areas of urban cenoses. A repeated survey of 4 industrial growers next year supplemented the list to 45.75 ± 4.02 species on 41.25 ± 3.56 host genera here. The ratio of numbers remained the same, implying that the diversity of trophic relations is not defined only by polyphagous miners, however, they were abundant during this investigation.

The collected material on *Liriomyza bryoniae* contributes to our knowledge of insects moving from outside to greenhouses (unpublished data) and from them to the environment. The species was found to feed simultaneously in the surroundings and inside (9 greenhouses), also in different years, inside or outside only (4 greenhouses) as well as outside only (2 cases) without *L. bryoniae* foci detected in the greenhouses over the last three years.

A round the greenhouses in which tomatoes or/ and cucumbers were attacked by *L. bryoniae*, the same plants or more Solanaceae and Cucurbitaceae were found outdoors every time, planted or spontaneous.

Representatives of plant genera fit for *Liriomyza bryoniae* feeding (Spencer, 1973; 1990) and growing in greenhouse surroundings (*Ajuga, Amaranthus, Anthirrhinum, Apium, Atriplex, Callistephus, Cannabis, Capsicum, Chenopodium, Dahlia, Galeopsis, Helianthus, Lamium, Leonurus, Linaria, Lupinus, Mercurialis, Nicandra, Phaseolus, Petroselinum, Petunia, Saponaria, Sisymbrium, Verbascum*) were not attacked by this pest in 2001 and 2002, their presence here is unwanted, though.

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References

1. Beiger M. *Liriomyza bulgarica* sp.n. and *Phytomyza rhodopaea* sp.n. (Diptera, Agromyzidae), the new mining flies from Bulgaria. *Bulletin de L'Academie Polonaise des Sciences. Serie des sciences biologiques. Cl. II*. 1978. Vol. 26(10). P. 687–693.
2. Beiger M. Miniarki (Agromyzidae) szkodniki roślin użytkowych. *Seria Zoologia*. No. 16. Wydawnitstwo Nauk UAM. Poznań, 1989.
3. Černý M. Eight new species of *Ophiomyia* from the Czech Republic and Slovak Republic (Diptera: Agromyzidae). *Eur. J. Entomol.* 1994. Vol. 91. P. 455–476.
4. Ostrauskas H. Šilumamėgė minamusė, išauginta Lietuvoje. *Baltasis gandras*. 2002. Nr. 5–6. P. 28–29.
5. Pakalniškis S. The Lithuanian Agromyzidae (Diptera). Descriptions of 6 new species and other notes. *Acta Entomol. Lit.* 1994. Vol. 12. P. 5–34.
6. Pakalniškis S. On the bionomics and knowledge of Agromyzidae (Diptera) feeding on plant stems. *Ekologija.* 1996a. Nr. 3. P. 19–24.
7. Pakalniškis S. The Lithuanian Agromyzidae (Diptera). Descriptions of 4 new species and other notes. *Lietuvos entomologų darbai (Lietuvos entomologų draugijos 30-mečiui)*. Lietuvos entomologų draugija. Vilnius, 1996b. P. 17–34.

8. Pakalniškis S. On the bionomics and knowledge of Agromyzidae (Diptera) feeding on plant stems. Report 2. *Ekologija.* 1998. Nr. 2. P. 36–42.
9. Pakalniškis S. New data on the bionomics and distribution of Agromyzidae (Diptera) with the description of a new species. *Acta Zoologica Lituanica*. 2000. Vol. 10(1). P. 59–62.
10. Pakalniškis S., Rimšaitė J., Sprangauskaitė-Bernotienė R., Butautaitė R., Podėnas S. Checklist of Lithuanian Diptera. *Acta Zoologica Lituanica.* 2000. Vol. 10(1). P. 3–58.
11. Quarantine Pests for Europe. Data Sheets on quarantine pests for the European Union and for the European and Mediterranean Plant Protection Organisation. I. M. Smith, (ed.). *CAB International*. Paris, 1997.
12. Sasakawa M. A study of the Japanese Agromyzidae (Diptera). Part 2. *Pacific Insects*. 1961. Vol. 3(2–3). P. 307–472.
13. Spencer K. A. A revision of the palaearctic species of the genus *Ophiomyia* Braschnikov (Diptera: Agromyzidae). *Beitr. Ent.* 1964. Vol. 14(7/8). P. 773–822.
14. Spencer K. A. A revision of the European species of the genera *Melanagromyza* Hendel and *Hexomyza* Enderlein, with a supplement on the genus *Ophiomyia* Braschnikov. *Beitr. Ent.* 1966. Vol. 16(1/2). P. 3–60.
15. Spencer K. A. Agromyzidae (Diptera) of economic importance. *Ser. ent.* 1973. Vol. 9. P. 1–418.
16. Spencer K. A. The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna ent. Scand.* 1976. Vol. 5(1–2). P. 1–606.
17. Spencer K. A. Host specialization in the world Agromyzidae (Diptera). *Ser. ent.* 1990. Vol. 45. P. 1–444.
18. Taluntytė L. 2000 metais Fitosanitarinių tyrimų laboratorijoje atliktų tyrimų suvestinė. *Augalų apsauga 2001*. Vilnius: Vyturys, 2001. P. 2–28.
19. Taluntytė L. Fitosanitarinių tyrimų laboratorijos tyrimų 2001 metais suvestinė. *Augalų apsauga 2002. Apžvalga–2001*. Vilnius: Baltijos kopija, 2002. P. 26–29.
20. Lietuvos Respublikos žemės ūkio ministro 2000 11 20 įsakymas Nr. 315: Dėl karantininių organizmų, augalų, augalinių produktų ir kitų objektų sąrašų patvirtinimo ir 1998 12 28 įsakymo Nr. 321 pripažinimo netekusiu galios. *Valstybės žinios*. 2000. Nr. 102. P. 59.
21. Пакальнишкис С. 30 новых для СССР и 40 новых для Литовской ССР видов минирующих мушек, обнаруженных в 1982–1987 гг. *Новые и редкие для Литовской ССР виды насекомых. Сообщения и описания 1987 года.* Вильнюс, 1988. С. 88–99.

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AUGALUS MINUOJANČIŲ DVISPARNIŲ (INSECTA: DIPTERA) RŪŠINĖ SUDĖTIS LIETUVOS ŠILTNAMIŲ APLINKOJE

S a n t r a u k a

Tirta 37 augintojų šiltnamių artimiausia aplinka dėl bulvinės minamusės *Liriomyza bryoniae* (Diptera: Agromyzidae) išplitimo Lietuvoje, apžiūrint augalus – potencialius ekonomiškai svarbių minuojančiųjų kenkėjų šeimininkus – ir nustatant dažniausias dvisparnių minuotojų rūšis. 2001–2002 m. aptiktos 119 rūšių, priklausančių 7 dvisparnių šeimoms, bei nustatytos 135 jų mitybos augalų gentys iš 40 botaninių šeimų. *L. bryoniae* santykinis dažnumas šiltnamių aplinkoje buvo 38%, ir ji čia minavo *Cucumis sativa, Lycopersicon aesculentum, Solanum tuberosum, S. nigrum, Nicotiana affinis, Datura indica* ir *Gypsophila paniculata* lapus. Rasti ir kiti ekonomiškai svarbių dvisparnių minuotojų mitybos augalai: *Amaranthus, Antirrhinum, Apium, Callistephus, Chenopodium, Dahlia, Galeopsis, Helianthus, Lamium, Linaria, Petunia, Sisymbrium, Surphinia* bei *Tropaeolum.* Dažniausios dvisparnių rūšys buvo *Chromatomyia horticola, Liriomyza strigata, L. ptarmicae*, *L. congesta*, *L. sonchi*, *Phytomyza artemisivora, P. pullula* (Agromyzidae), *Trypeta artemisiae* (Tephritidae) ir *Cystiphora sonchi* (Cecidomyiidae). Tik dvi pirmosios gali pakenkti augalams uždaruose plotuose.

Pirmą kartą išaiškinta rūšių *Ophiomyia bohemica* ir *O. rostrata* (Agromyzidae) biologija. Papildytos žinios apie 5 retų ir 3 naujų Lietuvos faunoje rūšių paplitimą. Penkioms rūšims papildomai išaiškinti nauji mitybos augalai: *Chromatomyia horticola* (*Scaevola*), *Liriomyza eupatorii* (*Stachys*), *L. strigata* (*Cistus*), *Melanagromyza submetallescens* (*Lathyrus, Medicago*) ir *Ophiomyia heracleivora* (*Chaerophyllum*). Dvi rūšys aptiktos maitinantis joms nebūdingu būdu.

Straipsnyje trumpai aprašomas smulkių vabzdžių pagreitintos reaktyvacijos metodas.

Raktažodžiai: šiltnamis, augalų minuotojas, augalas šeimininkas, bionomika