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A Contribution to the Agromyzid Leaf Miners (Diptera: Agromyzidae) of Kermanshah, Iran

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ABSTRACT

A survey was carried out for identification of the agromyzid leaf miners in common host plants in Kermanshah province (Western part of Iran) during 2008-2010. The samples were collected from various cultivated and non-cultivated plants and reared until emergence of adult agromyzids. Six species belonging to four genera were collected and identified in association with 10 host plants. Among them, three species including *Liriomyza sonchi* Hendel, 1931; *Phytomyza lappae* Goureau, 1851 and *Phytomyza plantaginis* Robineau-Desvoidy, 1851 are newly recorded for the fauna of Iran. A brief description of the diagnostic characters for the newly recorded species is presented.

Key words: Diptera, Agromyzidae, Fauna, new records, Iran.

INTRODUCTION

Agromyzidae is a large family of dipterans including more than 3,000 species belonging to 30 genera, widely distributed throughout the world (Spencer, 1989; Sasakawa, 1997; Pakalniskis, 2000). More than 1170 species of this family are distributed in the Palaearctic region (Spencer 1990; Černý and Merz, 2006; Çıkman and Sasakawa, 2008), while less than 30 species have been recorded from Iran (Dousti, 2010; Shahreki *et al*., 2012).

All agromyzid species undermine the internal tissue of different organs of plants. Depending on their eating habits they can be classified as leaf miners, stem miners, cambium miners, and even as parasites of flower buds or fruits (Braunt *et al*., 2008; Spencer, 1973). Many species are miners in leaves, where they produce a characteristic form of mine, in some of the cases a substantial aid in identifying the agromyzid (Spencer, 1990). Some agromyzid species are serious pests of cultivated

plants (Spencer, 1973). Direct damage given by feeding larvae can reduce the photosynthetic capacity of the plant (Johnson *et al*., 1983). Indirect injury never occurs by the adults except for many punctures by ovipositor of female before true oviposition. Also at the time of oviposition, the female agromyzids may act as vectors for some plant diseases (Matteoni and Broadbent, 1988; Zitter and Tsai, 1977).

Because of its pest status, Agromyzidae is one of the most important groups of insect, especially on vegetable and ornamental plants in the greenhouses (Parrella and Keil, 1984). The fauna and host association of the Iranian agromyzids is poorly known (Dousti, 2010; Haghani *et al*., 2007; Asadi *et al*., 2006; Fathi, 2011; Shahreki *et al*., 2012), indicating the necessity of further studies. Here we present the early results of an on-going research project on diversity and host association of the agromyzid leaf miners on various cultivated and non-cultivated host plants in western Iran.

MATERIAL AND METHODS

Sampling and collecting the material were performed at different localities of Kermanshah province during 2008-2010. The leaf samples of various host plants bearing the larvae and puparia of mining agromyzids were carefully cut off and transferred to the laboratory inside the plastic boxes. The collected material were subdivided into the smaller pieces and placed inside the rearing boxes (10 cm diameter and 12 cm height) with a circular opening covered with mesh for ventilation. The rearing boxes were then placed inside the climatic chamber, under the constant conditions with the temperature of 25 ± 1ºC and 65 ± 5% RH and were kept for about 2-4 weeks until emergence of the adult leaf miners. The emerged agromyzids were caught using an aspirator dropped into the empty test tubes until they naturally died.

The sampling data were supplemented with coordinates (Latitude, Longitude) using a GPS. The external morphology of the leaf miners was studied and illustrated using Trinocular Zoom Stereo Microscope (XTS-3022) equipped with Sony Exwave™ HAD color video camera. The exact identification at the species level was performed by the third author. Specimens were deposited in insect collection of University of Kermanshah and the collection of the third author. The morphological terminology used in this paper follows Spencer (1989).

RESULTS

Six species of the agromyzid leaf miners belong to four genera were identified in association with 10 different species host plants, of which 3 species are newly recorded from the fauna of Iran, indicated by an asterisk (*). A brief description of the diagnostic characters for the newly recorded species is presented.

Chromatomyia horticola (Goureau, 1851)

Material examined: 16 ♂♂, 18 ♀♀, on *Capsella bursa-pastoris* (L.) Medikus (Brassicaceae), Bistoon (34° 28’ 19”N, 47° 00’ 39”E), 10-V-2009, 3 ♂♂; Kermanshah (34° 34’ 73”N, 47° 08’ 56”E), 01-X-2009, 1♂, 3 ♀♀; on *Cucumis sativus* L. (Cucurbitaceae), Sanandaj (34° 32’ 25”N, 46° 58’ 82”E), 10-V-2009, 1 ♂,

2 ♀♀; on *Lactuca orientalis* (Boiss) (Asteraceae), Kermanshah (34° 34' 57"N, 47° 08' 74"E), 24-V-2009, 2 ♀♀; on *Malva neglecta* Wallr. (Malvaceae), Taghebostan (34° 23' 54"N, 47° 7' 38"E), 18-V-2009, 1 ♂, 2 ♀♀; on *Origanum vulgare* L. (Lamiaceae), Bistoon (34° 39' 38"N, 47° 44' 13"E), 24-V-2009, 3 ♂♂; Sanandaj (34° 26' 8"N, 47° 01' 8"E), 09-V-2009, 1 ♂, 5 ♀♀; on *Sinapis arvensis* L. (Brassicaceae), Bistoon (34° 39' 36"N, 47° 44' 14"E), 24-V-2009, 3 ♂♂; Kermanshah (34° 29' 02"N, 47° 41' 15"E), 01-X-2009, 2 ♂♂, 2 ♀♀; on *Veronica* sp. (Scrophulariaceae), Bistoon (34° 39' 39"N, 47° 44' 12"E), 26-V-2009, 1 ♂, 2 ♀♀.

General distribution: Palaearctic, Oriental, Nearctic, Afrotropical.

Liriomyza bryoniae (Kaltenbach, 1858)

Material examined: 2 ♂♂, 2♀♀; on *Sinapis arvensis* L. (Brassicaceae), Bistoon (34° 39' 36"N, 47° 14' 44"E), 01-X-2009, 1♂; Kermanshah (34° 29' 02"N, 47° 41' 15"E), 19-VI-2010, 1 ♂; on *Malva neglecta* Wallr. (Malvaceae), Kermanshah (34° 34' 53"N, 47° 08' 73"E), 11-X-2009, 2 ♀♀.

General Distribution: Palaearctic, Oriental.

Liriomyza sonchi Hendel, 1931 (Figs. 1, 4)*

Material examined: 2 ♂♂, 1 ♀; on *Sonchus oleraceus* L. (Asteraceae), Sahneh (34° 23' 47"N, 47° 26' 37"E), 06-VII-2010.

General Distribution: Western Palaearctic, Europe.

Diagnosis: This species is closely related to *L. bryoniae* from which it can be differentiated by the characters of wing venations. *Liriomyza sonchi* has a small discal cell and ultimate section of vein M_{3+4} three to four times as long as penultimate section, while in *L. bryoniae* has a larger discal cell and the ultimate section of vein M_{3+4} is only twice as long as the penultimate section. Three strong upper orbital bristles directed upwards, two lower orbital bristles directed inwards and upwards, meosonotum with 3+1 strong dorso-central bristles, acrostichals bristles in 4 rows; Length of wing 1.5-1.9 mm. Frons, parafrontalia and antenna entirely yellow, both vertical bristles growing on yellow ground; mesoscutum black, weakly shining, pleura largely yellow, anepisternum entirely yellow or with a small black bar at middle of ventral margin, wings lucid, fringe on squama pale or white, legs yellowish.

Ophiomyia sp.

Material examined: 2 ♂♂; on *Petonia* sp. (Solanaceae), Kermanshah (34° 35' 03"N, 47° 10' 87"E), 08-VII-2010.

General distribution: Cosmopolitan.

Diagnosis: Facial keel broad, distrinctly widened below the base of antennae. A pair of strong orbital bristle, equal in length, directed upward and out, lower orbital bristle directed up and innerward. Orbital setulae sparsely located in single irregular row. Length of wing 1.7-1.8 mm, costa reaching to the tip of vein R_{4+5}, vein R_{2+3}, slightly curved, vein R_{4+5} distinctly curved in the middle. Basal sclerites of the male genitalia elongated, vibrissal fasciculus fused. Head, mesonotum and abdomen uniformly black without metallic coloration, squamae whitish with a narrow dark margin, ocellar triangle distinct with shining black color. The larvae feed arround the basal part of the leave midrib.

Phytomyza lappae Goureau, 1851 (Figs. 2, 5)*

Material examined: 3 ♂♂, 2 ♀♀, on *Arctium lappa* (Asteraceae), Harsin (34°16'16"N 37°33'35"E), 06-V-2009.

General distribution: Palaearctic.

Diagnosis: Upper fronto-orbital bristles two or three, first one weak; acrostichals arranged in 5-6 rows; third antennal segment elongated, arista long; length of wing 1.8-2.2 mm, second costal section three to four times as long as the fourth section. Frons entirely yellow, eyes dark brown, inner vertical bristle on yellow ground but outer vertical on brown; antenna black but scape and pedicel paler; mesoscutum matt, gray-dusted black, with lateral side including dorsal half of anepisternum whitish yellow; coxae and femora black, kees yellow.

Phytomyza plantaginis Robineau-Desvoidy, 1851. (Figs. 3, 6)*

Material examined: 3 ♂♂, 2 ♀♀; on *Plantago major* (Plantaginaceae), Bistoon (34° 39' 39" N, 47° 44' 14" E), 06-V-2009.

General Distribution: Palaearctic, Nearctic, Neotropical, Oriental and Australian.

Diagnosis: This species is closely related to *P. lappae* from which it can be differentiated by the following characters: both vertical bristles growing on dark ground; a pair of upper fronto-orbital bristles, equal in length; gena broad, about one-third as high as eye; mesonotum with 1+3 strong dorsocentral bristles, acrostichals bristles sparsely sorted in 2 rows, wing 1.8-2.0 mm long, second costal section about 1.6 times as long as the fourth; Frons entirely yellow, eyes oval and red-brownish, hind margin of eye black, mesoscutum with lateral side dark, anepisternum with dorsal margin narrowly yellow, femora black medially, fore coxa yellow, abdomen black.

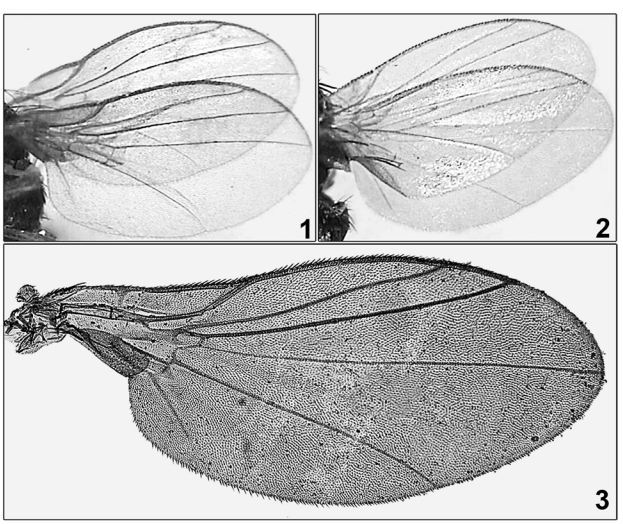

Fig. 1-3. Fore wing of the agromyzid leafminers. 1. *Liriomyza sonchi*, 2. *Phytomyza lappae*, 3. *Phytomyza plantaginis*.

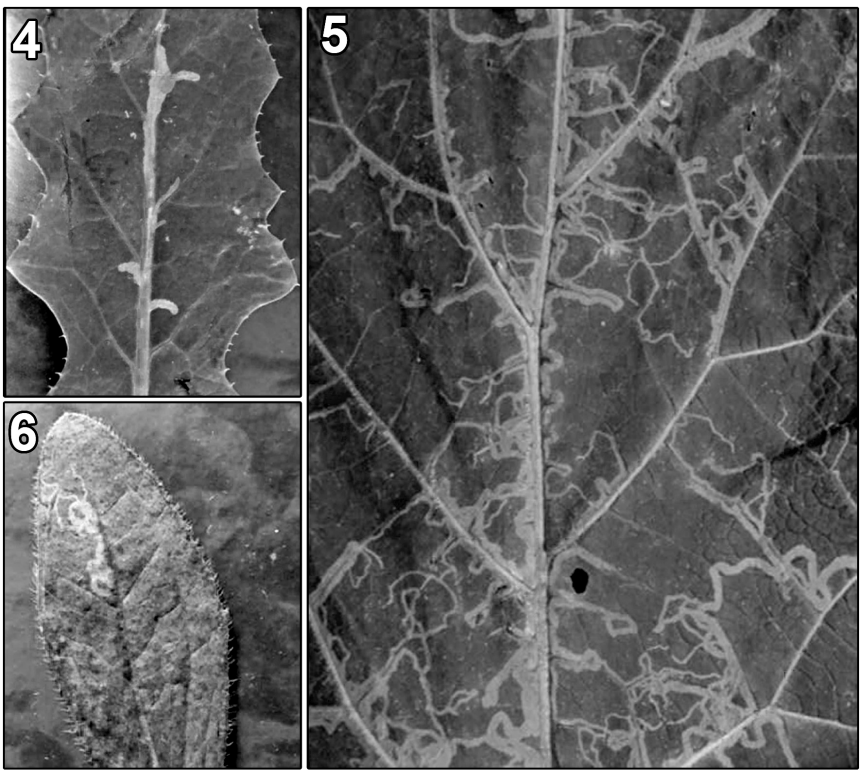

Fig. 4-6. leafmines. 4. *Liriomyza sonchi* on *Sonchus oleraceous*, 5. *Phytomyza lappae* on *Arctium lappa*, 6. *Phytomyza plantaginis* on *Plantago major*.

CONCLUSION AND DISCUSSION

The early evidences indicated the occurrence of six agromyzid species on commonly found host plants, which belonging to six different plant families. The most common agromyzid species was *Chromatomyia horticola* that was found in association with seven plant species, while other species were less frequent, comparatively. *Chromatomyia horticola* and *Liriomyza bryoniae* are extremely polyphagous (Spencer, 1990) and have been categorized as serious pests of several vegetative and ornamental plants (Darvas *et al*., 2000). *Liriomyza sonchi* was newly recorded in this paper in association with *Sonchus oleraceus*. This species is restricted to *Sonchus* species, and other records even on Asteraceae are suspicious. The host-specificity of *L. sonchi* has been experimentally tested (Peschken and Derby, 1988).

Phytomyza plantaginis is strictly associated with Plantaginaceae (Spencer, 1976, 1990). This species has also recorded as an invasive species in Japan, Australia, Canada, U.S.A. (Spencer, 1976) and New Zealand, where appears to be parthenogenetic (Spencer, 1990; Lambkin *et al*., 2008). Here we found both female

and male specimens. Another species, *Phytomyza lappae* seems to feeds exclusively on species of *Arctium* (Spencer, 1990). Few different host records are also might be of different species which synonymized with *P. lappae* (Tschirnhaus, 1999). While, both species considered as economically indifferent, they can be potential biological agents for weed control.

The genus *Ophiomyia* is a moderately large group of agromyzids, bearing about 250 species which occur in all zoogeographical region (Černý, 1994). The species of this genus as external miners of stems or leaves of different plant families (Spencer, 1990; Černý, 1991), but here the family Solanaceae is newly recorded as a host for *Ophiomyia* sp. Further samplings are necessary to collect the female specimens for determination of the exact identity of this species.

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