

A checklist of the Iranian Agromyzid leaf-miner flies with 11 new records

H. Ranji^{1&*}, Y. Karimpour² and A. Dousti³

1. Department of Plant Protection, Agricultural and Natural Resources Research Center of West -Azarbaijan, Urmia, Iran, 2. Department of Plant Protection, University of Urmia, Urmia, Iran, 3. Department of Entomology, Islamic Azad University, Jahrom Branch, Fars, Iran.

*Corresponding author, E-mail: h.tekantapeh@gmail.com

Abstract

The paper presents the first contribution to the knowledge of the leaf miner flies (Diptera: Agromyzidae) of the Urmia region in the West Azerbaijan province and a list of the 46 recorded species of agromyzid flies of Iran. During a three-year survey, 20 agromyzid species were identified belonging to nine genera. The species *Amauromyza (Cephalomyza) luteiceps* (Handel 1920), *Aulagromyza populi* (Kaltenbach, 1864), *Cerodontha (Poemyza) lapplandica* Ryden, 1956, *Liriomyza hieracii* (Kaltenbach, 1862), *Melanoagromyza aeneoventris* (Falleh, 1823), *Melanoagromyza albocilia* Handel, 1931, *Melanoagromyza nigrissima* Spencer, 1976, *Ophiomyia beckeri* (Hendel, 1923), *Ophiomyia curvipalpis* (Zerterstedt, 1848), *Ophiomyia orbiculata* (Hendel, 1931) and *Pseudonapomyza europaea* Spencer, 1973 were reported as new records for the Iranian insect fauna.

Key words: Agromyzidae, leaf miners, new records, Urmia, Iran

چکیده

فهرست دوبالان مینوز خانواده Agromyzidae (Diptera) و گزارش ۱۱ گونه جدید از ایران

حسین رنجی، یونس کریمپور و ابوظافل دوستی

مقاله حاضر نتایج اولین بررسی برای شناخت فون مگس‌های مینوز خانواده Agromyzidae منطقه ارومیه در استان آذربایجان- غربی و فهرستی از مگس‌های این خانواده را در ایران ارائه می‌کند. در طول سه سال بررسی مجموعاً ۲۰ گونه متعلق به ۹ جنس از مگس‌های این خانواده در منطقه ارومیه شناسایی شدند که از میان آن‌ها یازده گونه شامل، *Amauromyza (Cephalomyza) luteiceps* (Hendel 1920)، *Cerodontha (Poemyza) lapplandica* (Rydén, 1956)، *Aulagromyza populi* (Kaltenbach, 1864)، *Melanoagromyza aeneoventris* (Fallén, 1823)، *Liriomyza hieracii* (Kaltenbach, 1862)، *Ophiomyia beckeri* (Hendel, 1923)، *Melanoagromyza nigrissima* Spencer, 1976، *Ophiomyia orbiculata* (Hendel, 1931)، *Ophiomyia curvipalpis* (Zerterstedt, 1848) و *Pseudonapomyza europaea* Spencer, 1973 برای فون ایران جدید بوده و با اضافه کردن گونه‌های فوق، فهرست مگس‌های مینوز ایران شامل ۴۶ گونه می‌شود.

واژگان کلیدی: Agromyzidae، دوبالان، مینوز، گزارش جدید، ارومیه، ایران

Introduction

Agromyzidae is a large family of Diptera, including more than 3000 species and 31 genera, which is widely distributed throughout the world (Spencer, 1989; Sasakawa, 1997; Pakalniskis, 2000). More than 1170 species of this family occur in the Palaearctic region (Spencer, 1990; Cerny & Merz, 2006; Cikman & Sasakawa, 2008) of which 35 species are known in Iran (Dousti, 2010; Shahreki *et al.*, 2012; Hazini *et al.*, 2013). Most of the species are the cosmopolitan polyphagous pests of agricultural crops and ornamental plants with economic importance (Spencer, 1973; Dempewolf, 2006). Direct damage is caused through feeding punctures by adults. Leaf miners in some genera such as *Liriomyza* Mik, 1894 cause yield loss in vegetable and ornamental crops (Murphy & LaSalle, 1999). These insects are economically important pests in melon, bean, onion, potato, lettuce, cucumber and Chrysanthemum (Costa-

Lima *et al.*, 2014). Adult females and larvae feed on the leaf mesophyll tissue, which leads to total yield reduction or death of the host plants in high densities (Spencer, 1989). Larvae of agromyzid species are the internal plant feeders mostly feed within the leaf parenchyma causing the destruction of leaves and their chlorophyll content (Yildirim *et al.*, 2010). Some species are known as stem borers then develop inside roots, seeds and galls. Leaf miners usually damage to the photosynthetic tissues of their host plants (Johnson *et al.*, 1983). Adults of the leaf-miner-flies suck the sap from the parenchyma cells when the females produce punctures after oviposition (Spencer, 1973). Hazini *et al.* (2013) recorded six agromyzid species and four genera from western province of Kermanshah. Shahreki *et al.* (2012) reported eight species and five genera in southeast region of Sistan. In the latest checklist of Iranian leaf-miner flies, Dousti (2010) listed 26 species of Agromyzidae. The West Azarbaijan province borders

Turkey whose agromyzid fauna consists of 165 species (Civelek *et al.*, 2009). The Iranian agromyzid fauna is poorly known largely because of the difficulties in the identification of the Agromyzidae at species level. To date, 35 species of agromyzid flies have been reported from Iran (Griffiths, 1964; Dousti, 2010; (Mahmoodi *et al.*, 2011); Shahreki *et al.*, 2012; Hazini *et al.*, 2013). This study was intended to improve the knowledge of the leaf-miner fauna of Iran and provide basic information for the future Iranian agromyzid experts.

Material and methods

This study was conducted between 2012- 2014 in Urmia region of Iran. The leaf miner flies were collected using Malaise traps or reared in different locations in Urmia. The infested leaves, stems and other parts of the host plants were collected in both cultivated and natural areas; placed in plastic boxes (10 x 12 cm) covered with mesh on the top. The rearing boxes were then transferred to the lab to stay for about two weeks. After the emergence of adults, they were collected by an aspirator and put in the test tubes containing ethanol (75%). To identify the specimens, the male abdomens were boiled in 10% of KOH and moved into glacial acetic acid for five minutes and alcohol (96%) for another five minutes. The male terminalia was dissected under a microscope. Identifications of the species were made possible by using the keys by Spencer (1972, 1973, 1976, 1989, 1990) and Cerny (2007a; 2007b).

Results

We have provided a list of 35 species in addition to 11 new records (totally 46 species), of which 13 species belong to the subfamily Agromyzinae and 32 species to the subfamily Phytomyzinae. The new records are marked by asterisks.

Subfamily Agromyzinae

Genus *Agromyza* Fallén, 1810

Agromyza alnibetulae Hendel, 1931

Host plant- Birch (*Betula pendula* Roth.) (Spencer, 1976).

Iranian records- Mazandaran and Tehran provinces (Abai, 1984); Shiraz (Dousti, 2006).

Distribution- Great Britain and Ireland (Spencer, 1972), Denmark, Finland, Germany, Norway and Sweden (Spencer, 1976), Belgium (Bruyn & Tschirnhaus, 1991). Austria, Czech Republic, Italy, Romania, Slovakia and Switzerland (Martinez, 2011).

Agromyza ambigua Fallén, 1823

Host plants- Wheat, barley and other cultivated or wild cereals (Spencer, 1981).

Iranian records- Karaj (Afshar, 1938); Tehran (Farahbakhsh, 1961); Shiraz (Dousti, 2006).

Distribution- The Netherlands, Denmark, Sweden, Finland, Germany (Spencer, 1976), Czech Republic, Hungary, Italy (including Sicily), Slovakia, Spain (including Canary Is.), Switzerland and former Yugoslavia (Martinez, 2011).

Agromyza parvicornis Loew, 1869

Host plant- Maize (*Zea mays* L.) (Esmaili *et al.*, 1996; Zhu *et al.*, 2004).

Iranian record- Locality not given (Esmaili *et al.*, 1996).

Distribution- United States (Phillips, 1914) and Canada (Zhu *et al.*, 2004).

Genus *Hexomyza* Enderlein, 1936

Hexomyza schineri (Giraud, 1861)

Host plants- Willow (*Salix* sp.) and Poplar (*Populus* sp.) (Spencer, 1972; Robbins, 1983).

Iranian records- (Farahbakhsh, 1961; Abai, 1984; Behdad, 1988).

Distribution- Austria, Germany, France, Spain (Spencer, 1976), Belgium, Italy and Poland (Martinez, 2011).

Genus *Melanagromyza* Hendel, 1920

Melanagromyza aeneoventris (Fallén, 1823)*

Host plant- *Cirsium vulgare* L. (Asteraceae) (Spencer, 1972).

Iranian record- Urmia.

Material examined- 3 ♂♂, 4 ♀♀, Nazloo, Urmia (37°39'N, 44°58'E, 1372 m. s. l. 25. April. 2013).

Distribution- Spain, Denmark, Finland, Sweden, Germany (Spencer, 1976), Austria, Belgium, Czech Republic, Estonia, France, Hungary, Italy, Lithuania, Poland, Slovakia, Switzerland and former Yugoslavia (Martinez, 2011).

Melanagromyza albocilia* Hendel, 1931

Host plant- Convolvulaceae

Iranian record- Urmia.

Material examined- 2 ♂♂, 3 ♀♀, Emamzadeh, Urmia (37°32'N, 45°12'E, 1287 m. s. l.) 11 September 2014.

Distribution- Denmark, Sweden, Austria, Hungary (Spencer, 1976), Czech Republic, Germany, Lithuania, Poland, Slovakia and Spain (including Canary Is.), France, Near East; Oriental region (Spencer, 1972, 1976, 1990; Martinez, 2011).

***Melanagromyza cunctans* (Meigen, 1830)**

Host plants- *Lycopersicon esculentum* (L.) H. Karst (Shahreki *et al.*, 2012), *Lotus corniculatus* (Spencer, 1976, 1990).

Iranian record- Sistan (Shahreki *et al.*, 2012).

Distribution- Sweden, Germany, Italy, Spain (including Canary Is.), former Yugoslavia (Spencer, 1976), Belgium, Czech Republic, European Turkey, France (including Corsica), Hungary, Lithuania, Poland, Slovakia and Switzerland (Spencer, 1972, 1976, 1990; Martinez, 2011).

Melanagromyza nigrissima* Spencer, 1976

Host plants- Unknown.

Iranian record- Urmia.

Material examined- 2 ♂♂, 1 ♀, Kahriz, Urmia (37°53'N, 44°59'E, 1323 m. s. l.) 23 June 2014.

Distribution- Belarus, Czech Republic, Denmark, Estonia, Finland, France, Latvia, Lithuania, Sweden (Spencer, 1972, 1976, 1990; Martinez, 2011).

***Melanagromyza sativae* Spencer, 1957**

Host plants- *Pimpinella affinis* Ledeb. *Torilis japonica*, *Pastinaca sativa*, *Pimpinella* sp. (Apiaceae) (Spencer, 1990).

Iranian records- Gach-i-sar (Griffiths, 1964); Spencer, K. A., 1990. [New record for Urmia, 2♂♂, 1♀, Urmia (37°53'N, 45°03'E, 1331 m. s. l.) 30 May 2014].

Distribution- Czech Republic, Germany, Lithuania, Great Britain, Ireland, Lithuania, Slovakia and Turkey (Spencer, 1990; Martinez, 2011).

Genus *Ophiomyia* Barschnikov, 1897

Ophiomyia beckeri* (Hendel, 1923)

Host plant- Unknown. Iranian record: Urmia.

Material examined- 2♂♂, 3♀♀, Urmia (37°53'N, 45°03'E, 1331 m. s. l.) 26 June 2014.

Distribution- Denmark, Finland (Spencer, 1976), The Netherlands, Belgium (Scheirs *et al.*, 1995), Austria, Czech Republic, Germany, Lithuania, Madeira (Portugal), Poland, Sicily (Italy), Spain (including Balearic and Canary Is.), former Yugoslavia (Martinez, 2011), South Africa and India (Spencer, 1976).

***Ophiomyia curvipalpis* (Zetterstedt, 1848) ***

Host plant- Unknown.

Iranian record- Urmia.

Material examined- 2♂♂, 2♀♀, Emamzadeh, Urmia (37°32'N, 45°12'E, 1287 m. s.l.) 6. September, 2014.

Distribution- Spain (including Canary Is.), former U.S.S.R., Denmark, Sweden (Spencer, 1976), Belgium (Bruyn & von Tschirnhaus, 1991), Austria, Czech Republic, Estonia, European Turkey, Germany, Hungary, Italy, Lithuania, Poland, Switzerland and former Yugoslavia (Martinez, 2011).

Ophiomyia orbiculata* (Hendel, 1931)

Host plant- Unknown.

Iranian record- Urmia.

Material examined- 2 ♂♂, 0♀, Emamzadeh, Urmia (37°32'N, 45°12'E, 1287 m. s. l.) 11 August 2014.

Distribution- Denmark, Finland, Norway, Sweden, Hungary, former U. S. S. R., Germany (Spencer, 1976), Austria, Belarus, Czech Republic, Turkey, France, Lithuania, Poland, Slovakia, Spain and former Yugoslavia (Martinez, 2011).

***Ophiomyia phaseoli* (Tryon, 1895)**

Host plants-*Phaseolus*, *Pisum*, *Vigna* (Subasinghe & Fellewes, 1978).

Iranian record- Khonj (Mahmoodi *et al.*, 2011).

Distribution- Sri Lanka (Subasinghe & Fellewes, 1978), Flores Island (Portugal), Taiwan, India, Philippines, Vietnam, Africa, Australia, Hawaii (Spencer, 1972, 1976, 1990; Martinez, 2011).

Subfamily Phytomyzinae**Genus *Amauromyza* Hendel, 1931**

***Amauromyza (Amauromyza) balcanica* (Hendel, 1931)**

Hostplants-*Phlomis* (Ortiz, 2010), Lamiaceae (Martinez, 2011).

Iranian Record- Iran (Ortiz, 2010).

Distribution- France, Greece (including Crete), Spain (Martinez, 2011).

***Amauromyza (Amauromyza) carlinae* (Hering, 1944)**

Host plants-*Echinops* sp. and *Carlina vulgaris* L. (Martinez, 2011).

Iranian record- Shiraz (Dousti, 2006).

Distribution- France, Poland (Martinez, 2011).

***Amauromyza (Cephalomyza) gyrans* (Fallen 1823)**

Host plant-*Campanula* sp. (Griffiths, 1964).

Iranian record- Gach-i-sar (Griffiths, 1964).

Distribution- Britain, Cyprus, Czech Republic, Finland, France, Hungary, Ireland, Italy, Lithuania, Norway, Poland, Romania, Spain, Sweden and former Yugoslavia (Pape & Beuk, 2011).

Amauromyza (Cephalomyza) luteiceps* (Hendel, 1920)

Host plant-*Atriplex hastate* (Spencer, 1990; Dempewolf, 2006; Martinez, 2011).

Iranian record-Urmia.

Material examined- 2 ♂♂, 1♀, Emamzadeh, Urmia (37°32'N, 45°12'E, 1287 m. s. l.) 11 Sept. 2014.

Distribution-Germany, Denmark, Finland, Sweden, Russia, Belgium, Czech Republic, European Turkey, France and The Netherlands (Spencer, 1972, 1976, 1990; Martinez, 2011).

Genus *Aulagromyza* Enderlein, 1936

***Aulagromyza fraxini* (Beiger, 1980)**

Host plant- Ash (*Fraxinus*) (Dousti, 2006).

Iranian record- Shiraz (Dousti, 2006).

Distribution- Bulgaria, Moldova (Pape & Beuk, 2011).

***Aulagromyza populi* (Kaltenbach, 1864) ***

Host plants-*Populustricho carpa* and *Populus nigra* (Chandler, 1998).

Iranian record- Urmia.

Material examined- 1♂, 1♀, Lashinloo (37°31' N, 45°12'E, 1287 m. s. l.) 11 June 2014.

Distribution- Austria, Belgium, Bulgaria, Cyprus, Denmark, France, Germany, Ireland, Italy, Moldova, Romania, United Kingdom, Turkey, The Netherlands (Pape & Beuk, 2011; (Spencer, 1972; Martinez, 2011).

Genus *Calycomyza* Hendel, 1931

***Calycomyza humeralis* (von Roser, 1840)**

Host plant- Asteraceae (Spencer, 1972).

Iranian record- Shiraz (Dousti, 2006).

Distribution- Holarctic region (Pape & Beuk, 2011).

Genus *Cerodontha* Rondani, 1861

***Cerodontha (Cerodontha) denticornis* (Panzer, [1806])**

Host plant- Wheat (*Triticum aestivum* L.) (Spencer, 1972).

Iranian records- Zanjan (Radjabi & Behrozin, 2002); Sari (Radjabi *et al.*, 1997).

Distribution- Holarctic region, Near East, North Africa (Pape & Beuk, 2011).

***Cerodontha (Icteromyza) geniculata* (Fallén, 1823)**

Host plant-*Eriophorum latifolium* Hoppe (Spencer, 1990; Robbins, 1991).

Iranian record- (Sasakawa, 2005).

Distribution- Palaearctic, Afrotropical and Oriental regions, Central Europe (Cerny, 2012).

Subgenus *Poemyza* Hendel, 1931

***Cerodontha (Poemyza) albineura* Zlobin, 1993**

Host plant- Unknown.

Iranian records- Iran (Zlobin, 1993).

Distribution- Mongolia (Pape & Thompson, 2013).

Cerodontha (Poemyza) lapplandica (Rydén, 1956)*

Host plants-*Lolium temulentum* L., *Calamagrostis*, *Festuca* (Ortiz, 2010).

Iranian record- Urmia.

Material examined- 4 ♂♂, 2 ♀♀, Urmia (37°53' N, 45°03' E, 1331 m. s. l.) 14 April 2014.

Distribution- Czech Republic, Estonia, Germany, Great Britain, Lithuania, Norway, Poland, Slovakia, Sweden (Spencer, 1972, 1976, 1990; Martinez, 2011) and Spain (Ortiz *et al.*, 2010).

Cerodontha (Poemyza) pygmaea (Meigen, 1830)

Host plants-*Brachypodium sylvaticum* (Huds.), *Phalaris*, *Lolium*, *Molinia*, *Elymus*, *Dactylis*, *Calamagrostis*, *Dactylis*, *Bromus*, *Brachypodium*, *Arrhenatherum*, *Avena sativa*, *Poa* (Spencer, 1972, 1976, 1990; Robbins, 1981, 1991).

Iranian record- Gach-i-sar (Griffiths, 1964).

Distribution- Austria, Belgium, Bulgaria, Cyprus, Denmark, France, Germany, Ireland, Italy, Moldova, Romania, United Kingdom (Spencer, 1972, 1976, 1990; Martinez, 2011).

Genus *Chromatomyia* Hardy, 1849***Chromatomyia horticola (Goureaux, 1851)***

Host plants-*Cirsium* spp., tomato, cabbage (Brassica), Alcea. *Allium ampeloprasum* L.; Amaranthaceae, Amaryllidaceae, Apiaceae, Asteraceae, Brassicaceae, Boraginaceae, Caprifoliaceae, Caryophyllaceae, Chenopodiaceae, Convolvulaceae, Fabaceae, Gesneriaceae, Lamiaceae, Liliaceae, Linaceae, Malvaceae, Plantaginaceae, Papaveraceae, Primulaceae, Polemoniaceae, Polygonaceae, Ranunculaceae, Resedaceae, Rosaceae, Rubiaceae, Rutaceae, Scrophulariaceae and Solanaceae (Spencer, 1972, 1976; Robbins, 1991; Dempewolf, 2006; Martinez, 2011).

Iranian records- Gach-i-sar (Griffiths, J 964), Khuzestan (Kalantar Hormozi *et al.*, 2000), Moghan (Lotfalizadeh, 2004), Shiraz (Dousti, 2006), Sistan (Shahreki *et al.*, 2012), Tabriz (Pourhaji *et al.*, 2012), Kermanshah (Hazini *et al.*, 2013), [New record for Urmia, 4 ♂♂, 2 ♀♀, Urmia (37°30' N, 45°03' E, 1331 m. s. l.) 2 May 2014].

Distribution- Holarctic, Oriental and Afrotropical regions, Central Asia, Europe and South Africa (Spencer, 1972, 1976; Robbins, 1991; Dempewolf, 2006; Martinez, 2011).

Chromatomyia nigra (Meigen, 1830)

Host plants-*Triticum aestivum*; *Anthoxanthum odoratum*; *Dactylis glomerata*; *Poa* sp.; *Aegilops* sp.; *Festuca rubra* (Bland, 2002; Robbins, 1991; Spencer, 1972, 1976).

Iranian record- Sistan (Shahreki *et al.*, 2012).

Distribution- Europe, northern Asia, North America (Spencer, 1972, 1976, 1990; Robbins, 1991; Dempewolf, 2001).

Genus *Galiomyza* Spencer, 1981***Galiomyza violiphaga (Hendel, 1932)***

Host plant-*Viola amigua*; *Viola biflora* (Spencer, 1976, 1990; Martinez, 2011).

Iranian record- Gach-i-sar (gachsar- Karaj) (Griffiths, 1964).

Distribution- Great Britain, Ireland, Western Europe (Spencer, 1976, 1990; Martinez, 2011).

Genus *Liriomyza* Mik, 1894***Liriomyza bryoniae (Kaltenbach, 1858)***

Host plants-*Sinapis arvensis* L., *Malva neglecta* Wallr., *Dahlia pinnata*, *Cucumis sativus*, *Atrropa belladonna* (Spencer, 1976).

Iranian records- Kermanshah (Hazini *et al.*, 2013), [New record for Urmia, 4 ♂♂, 3 ♀♀, Urmia (37°53' N, 45°03' E, 1331 m. s. l.) 30 April 2014].

Distribution- Albania, Austria, Belarus, Belgium, Britain Islands, Bulgaria, Croatia, Cyclades Islands, Czech republic, Denmark, Estonia, European Turkey, Finland, France (including Corsica), Germany, Greece (including Crete), Hungary, Italy (including Sicily), Lithuania, Malta, Moldova, Norway, Poland, Portugal (including Azores), Romania, Slovenia, Spain (including Canary Is.), Sweden, The Netherlands, Ukraine, East Palearctic; Near East; North Africa; Oriental region (Spencer, 1972, 1976; Bruyn &

Tschirrinhaus, 1991; Dempewolf, 2001; Martinez, 2011).

***Liriomyza congesta* (Becker, 1903)**

Host plants-*Astragalus cicer*, *Vicia* sp. Common pea, Vetch and Celery, *Vicia sativa* L., *Trigonella foenumgraecum*, *Medicago sativa*, *Galega officinalis*, *lotus coriiculatus*, *pisum sativum*, *Trifolium reoens* (Spencer, 1972, 1976, 1990; Robbins, 1991).

Iranian records- Gach-i-sar (Griffiths, 1964), Esfahan, Tehran and other northern provinces (Behdad, 1993), Karaj (Esmaili *et al.*, 1996), Sistan (Shahreki *et al.*, 2012), [New record for Urmia, 3♂♂, 4♀♀, Torkaman (37°27'N, 45°12'E, 1321 m. s.l.) 2 May 2014].

Distribution- India, Albania, Austria, Belgium, Britain, Spain (including Canary Is.), France (including Corsica), Czech Republic, Denmark, Estonia, European Turkey, Finland, Germany, Hungary, Ireland, Italy (including Sardinia), Latvia, Lithuania, Malta, Moldova, Norway, Poland, Romania, Slovakia, Sweden. Switzerland, The Netherlands, former Yugoslavia: East Palearctic; Near East, North Africa, Oriental region (Spencer, 1972, 1973, 1976, 1990; Martinez, 2011).

Liriomyza hieracii* (Kaltenbach, 1862)

Host plants-*Hibiscus syriacus* L., *Tragopogon pratensis* L., *Hieracium* sp. (Spencer, 1972, 1976, 1990; Robbins, 1991).

Iranian record- Urmia.

Material examined- 14♂♂, 17♀♀, Urmia (37°53'N, 45°03'E, 1331 m. s. l.) 30 April 2014, Khormabad (37°26'N, 45°05'E, 1377 m. s. l.) 30 July 2014.

Distribution- Finland, Norway, Sweden, Germany, The Netherlands, Czech Republic and Lithuania (Spencer, 1972, 1976, 1990; Robbins, 1991; Martinez, 2011).

***Liriomyza pedestris* Hendel, 1931**

Host Plants- Poaceae, grasses, formerly Graminae (Stang, 2004; Cerny & Merz, 2006).

Iranian record- Iran (Martinez, 2011).

Distribution- Russia, Turkey, U. S. A. (Stang, 2004; Cerny & Merz, 2006).

***Liriomyza persica* Griffiths, 1963**

Host plant-*Vicia persica* Boiss var. *stenophylla* (Griffiths, 1964).

Iranian record- Gach-i-sar (Griffiths, 1964).

Distribution- Iran (Griffiths, 1964).

***Liriomyza pusilla* (Meigen, 1830)**

Host plants-*Arctium lappa* L., *Bellis perennis*, *Solidago canadensis*, *Solidago gigantean* (Spencer, 1972; Dempewolf, 2001).

Iranian record- Urmia (Tschimhaus & Karimpour, 2006).

Distribution- Albania, Belgium, Britain, Czech Republic, Denmark, European Turkey, Finland, France (including Corsica), Germany, Ireland, Italy (including Sicily), Lithuania, Moldova, Poland, Romania, Slovakia, Spain, Sweden, The Netherlands; Oriental region (Spencer, 1972, 1976, 1990; Robbins, 1991; Dempewolf, 2001; Martinez, 2011).

***Liriomyza pusio* (Meigen, 1830)**

Host plants-*Arrhenatherum elatius*, *Tragopogon* sp. (Spencer, 1972, 1976; Robbins, 1991).

Iranian record- Gach-i-sar (Griffiths, 1964).

Distribution- Great Britain, Ireland, Czech Republic, The Netherlands, Germany, Belgium, Poland, Italy (Spencer, 1976; 1990; Martinez, 2011).

***Liriomyza sativae* Blanchard, 1938**

Host plants- Tomato, cucumber, cowpea, mung bean; *Chrysanthemum*, *Rumex alpinus* L. *Malva sylvestris*, Malvaceae, *Rumex alpinus* L. (Spencer, 1990).

Iranian records- Khuzestan (Kalantar Hormozi *et al.*, 2000), Varamin (Zahiri *et al.*, 2003), Sistan (Shahreki *et al.*, 2012), [New record for Urmia, Urmia, 3♂♂, 4♀♀, (37°53'N, 45°03'E, 1331 m. s. l.) 30 April 2014 and Captured by malaise trap in Nazloo (37°39'N, 44°58'E, 1372 m. s. l.) 20 July 2013, Urmia (37°53'N, 45°03'E, 1331 m. s. l.) 16 July 2014, Emamzadeh (37°32'N, 45°12'E, 1287 m. s. l.) 11 Sept. 2014.].

Distribution- Cosmopolitan (Spencer, 1976; 1990).

***Liriomyza sonchi* Hendel, 1931**

Host plant-*Sonchus oleraceus* L. (Spencer, 1972; Robbins, 1991).

Iranian records- Kermanshah (Hazini *et al.*, 2013).

Distribution- Palearctic: Austria, Belgium, Britain, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Norway, Poland, Slovakia, Spain, Sweden, The Netherlands; East Palearctic; Near East; Nearctic region; North Africa; Oriental region (Spencer, 1972, 1976, 1990; Martinez, 2011).

***Liriomyza trifolii* (Burgess in Comstock, 1880)**

Host plants- Cucumber, cotton, bean etc. (Minkenberg & Lenteren, 1986).

Iranian records- Darab and Varamin (Amin *et al.*, 2002), Varamin (Farrokhi *et al.*, 2004), Shiraz (Dousti, 2006), [New record for Urmia, Urmia, 4♂♂, 6♀♀, Captured by malaise trap in Nazloo (37°39'N, 44°58'E, 1372 m. s. l.) 20 July 2013, Urmia (37°53'N, 45°03'E, 1331 m. s. l.) 16 July 2014].

Distribution- Cosmopolitan (Spencer, 1976; 1990; Robbins, 1991).

Genus *Phytobia* Lioy 1864***Phytobia* sp.**

Host plants- Aceraceae, Betulaceae, Fagaceae, Rosaceae and Salicaceae (Benavent-corai *et al.*, 2005).

Iranian records- Varamin (Esmaili *et al.*, 1996).

Distribution- Palaearctic, Afrotropical and Nearctic regions (Pape & Thompson, 2013).

Genus *Phytoliriomyza* Hendel, 1931***Phytoliriomyza dorsata* (Siebke, 1863)**

Host plant-*Gaillardia* sp. (Shahreki *et al.*, 2012).

Iranian record- Sistan (Shahreki *et al.*, 2012).

Distribution- West Palearctic and North America (Spencer, 1976; 1990; Martinez, 2011).

Genus *Phytomyza* Fallen, 1810***Phytomyza lappae* Goureau, 1851**

Host plant-*Arctium lappa* (Spencer, 1972, 1976; Robbins, 1991; Dempewolf, 2006).

Iranian record- Kermanshah (Hazini *et al.*, 2013).

Distribution- Cosmopolitan (Martinez, 2011; Spencer, 1972, 1976; Robbins, 1991; Dempewolf, 2006).

***Phytomyza minuscula* Goureau, 1851**

Host plants-*Aquilegia vulgaris*, *Thalictrum minus* (Spencer, 1972, 1976, 1990; Robbins, 1991).

Iranian record- Iran (Esmaili *et al.*, 1996).

Distribution- Europe (Spencer, 1972, 1976; de Bruyn & Tschirinhaus, 1991, Dempewolf, 2001; Martinez, 2011).

***Phytomyza orobanchia* Kaltenbach, 1864**

Host plants- Broomrape, *Orobancha* spp. (Spencer, 1972).

Iranian records- Urmia (Jafarzadeh & Pourmirza, 1998), Shahrar (Tehran) (Movahedi-Fazel *et al.*, 1998).

Distribution- Europe (Martinez, 2011); western Asia (Spencer, 1990).

***Phytomyza plantaginis* Goureau, 1851**

Host plants-*Plantago major* L., *P. Coronopus*, *P. lanceolata*, *P. maritime* (Spencer, 1972; Bland, 1994, 1994; Martinez, 2011).

Iranian records- Kermanshah (Hazini *et al.*, 2013), [New record for Urmia, Urmia (37°35'N, 45°03'E, 1331 m. s. l.) 29 April 2014].

Distribution- Palaearctic, Nearctic, Neotropical, Oriental and Australasian regions (Spencer, 1972; Bland, 1994, 1994; Scheirs *et al.*, 1994; de Bruyn & Von Tschirinhaus, 1991, Dempewolf, 2001; Martinez, 2011).

Genus *Pseudonapomyza* Hendel, 1920***Pseudonapomyza atra* (Meigen, 1830)**

Host plants- Sorghum, *Bromus japonicus* Thunb. *Avena sativa*, *Hordeum vulgare*, *Secale cereale*, *Lolium* sp., *Poa* sp., *Triticum aestivum*, *Zea mays* (Spencer, 1972, 1976, 1990; Martinez, 2011).

Iranian record- Shiraz (Dousti, 2006), [New record for Urmia, Urmia (37°35'N, 45°03'E, 1331 m. s. l.) 28 April 2014].

Distribution- Austria, Azores (Portugal), Belarus, Belgium, Britain, Bulgaria, Czech Republic, Denmark, Estonia, European Turkey, France, Germany, Hungary, Italy, Latvia, Lithuania, Madeira (Portugal), Poland,

Romania, Slovakia, Spain (including Canary Is.), Sweden, The Netherlands, Ukraine, former Yugoslavia; Nearctic region, North Africa, Oriental region (Spencer, 1972; de Bruyn & Von Tschirnhaus, 1991, Bland, 1994, 1994; Scheirs *et al.*, 1994; Dempewolf, 2001; Ortiz, 2010; Martinez, 2011).

Pseudonapomyza europaea* Spencer, 1973

Host plant- Unknown.

Iranian record- Urmia.

Material examined- 2♂♂, 1♀, Kahriz, Urmia (37°53'N, 44°59'E, 1323 m. s. l.), 7 Sept. 2013.

Distribution- Belgium (Scheirs *et al.*, 1995). Austria, Czech Republic, Estonia, France, Germany, Hungary, Italy, Lithuania, Poland, Romania, Slovenia, Switzerland, Ukraine and former Yugoslavia (Spencer, 1972, 1976, 1990; Martinez, 2011).

References

- Abai, M.** (1984) *List of pests of forest trees and shrubs of Iran*. 147 pp. Plant Pests and Diseases Research Institute, Tehran.
- Afshar, D. J.** (1938) *Pest of summer crops, vegetables, industrial plants and forages in Iran and their control*. 124 pp. Plant Pests and Disease Research Institute, Tehran.
- Amin, Gh. A., Nouri, P. & Gilassian, E.** (2002) Identification of cotton leaf miner, determination of its host plants and population fluctuation in Darab and Varamin regions. *Proceeding of the 15th Iranian Plant Protection Congress*. Vol. 1. pp. 42.
- Behdad, E.** (1988) *Pests and diseases of forest trees and shrubs of Iran*. 807 pp. Plant Pests and Diseases Research Institute, Esfahan.
- Behdad, E.** (1993) *Pest of field crops in Iran*. 589 pp. Plant Pests and Disease Research Institute, Esfahan.
- Benavent-Corai, J.; Martinez, M.; & JiménezPeydró R.** (2005) Catalogue of the hosts-plants of the world Agromyzidae (Diptera). *Bollettino di Zoologia agraria e di Bachicoltura* 37: 1-97.
- Bland, K. P.** (1994) Some leaf mining Diptera from North Uiiist Outer Hebrides. *Glasgow Naturalist* 22 (4), 385-387.
- Bland, K. P.** (2002) *Chromatomyia fuscula* Zetterstedt (1838) (Diptera; Agromyzidae) is definitely a British species. *Dipteristis Digest* 7 (2), 101-102.
- Cerny, M.** (2007a) Description of eight new species of Agromyzidae (Diptera) from North Korea, including new records. *Studia dipterologica* 14, 209-229.
- Cerny, M.** (2007b) New faunistic records of Agromyzidae (Diptera) from Andorra including descriptions of three new species. *Boletin Sociedad Entomologica Aragonesa* 41, 43-51.
- Cerny, M.** (2012) The fauna of Agromyzidae (Diptera) in the Gemer region (central Slovakia) with descriptions of three new species from Slovakia. *Cas Slezske muzeum opava (A)* 61, 49-76.
- Cerny, M. & Merz, B.** (2006) New records of Agromyzidae (Diptera) from the Palearctic Region. *Mitteilungen Der Schweizerischen Entomologischen Gesellschaft* 79, 77-106.

Discussion

This study was intended to expand our understanding on the Iranian leaf-miner fly (Diptera: Agromyzidae) fauna in Urmia region. The most common polyphagous species was found to be *Chromatomyia horticola*. This species attacks seven plant species in Kermanshah province (Hazini *et al.*, 2013). This study raised the number of leaf miner species of Iran to 46 species from previously 35 known species. The results suggested the high diversity of the leaf miner flies in the West Azerbaijan province. The subfamilies Agromyzinae and Phytomyzinae comprise 35% and 65% of the collected specimens, respectively.

Acknowledgments

We are grateful to Drs. Civelek and Dursun (Turkey) and Dr. Tschimhause (Germany) for their help in this work.

- Chandler, P. J.** (1998) *Checklists of insects of the Isles* (New series) Part 1: Diptera. Handbooks for the identification of British insects. *Royal Entomological Society* 12, 1-234.
- Cikman, E. & Sasakawa, M.** (2008) The Turkish Agromyzidae (Diptera), with descriptions of four new species. *Entomological Science* 11, 81-86.
- Civelek, H. S., Cikman, E. & Dursan, O.** (2009) Revised checklist of Turkish Agromyzidae (Diptera) fauna of Turkey. *Turkish Journal of Zoology* 33, 349-358.
- Costa-Lima, T. C., Geremias, L. D. & Parra, J. R. P.** (2014) Temperature Dependent Development of Two Neotropical Parasitoids of *Liriomyza sativae* (Diptera: Agromyzidae). *Journal of Insect Science* 14, 245-249.
- De Bruyn, L. de, & Tschirnhaus, M.** (1991) Agromyzidae. pp. 151-154 in Grootaert, P. Bruyn, L. De. & Meyer, M. De. (Eds) *Catalogue of the Diptera of Belgium*. Studiedokumenten van het KBIN 70, 151-154
- Dempewolf, M.** (2001) *Larval morphologie und phylogenie der Agromyzidae (Diptera)*. Diss. Bielefeld, Germany. 256 pp.
- Dempewolf, M.** (2006) Agromyzidae (Diptera) of economic importance. CD-ROM, Institute for Biodiversity and Ecosystem Dynamics, Zoological Museum Amsterdam. Available from: <http://www.science.uva.nl/entomollAgromyzidae.html> (accessed 23 September 2014).
- Dousti, A. F.** (2006) Biodiversity of leaf miners (Dip.: Agromyzidae), Biology of the major species and their natural enemies in Shiraz region. Ph. D. thesis. Islamic Azad University, Science & Research Branch.
- Dousti, A.** (2010) Annotated list of Agromyzidae (Diptera) from Iran, with four new records. *Journal of Entomological Research Society* 12, 1-6.
- Esmaili, M., Mirkarimi, A. A., & Azmayeshfard, P.** (1996) *Agricultural Entomology, Destructive insects, mites, rodents, mollusks and their control*. 550 pp. Tehran University Publications.
- Farahbakhsh, Gh.** (1961) *Checklist of important insects and other enemies of plants and agricultural products in Iran*. Ministry of Agriculture. 153 pp. Department of Plant protection, Tehran.
- Farrokhi, S., Ebrahimi, E. & Noori, P.** (2004) Study on population fluctuation of *Liriomyza trifolii* and its parasitoids on cucumber in Varamin region. *Proceeding of the 16th Iranian Plant Protection Congress*. Vol. 1. pp. 16.
- Griffiths, G. C. D.** (1964). A note on some Agromyzidae (Diptera) from northern Persia, including a new *Liriomyza* species. *Entomologist's Monthly Magazine* 99, 75-79.
- Hazini, F., Zamani, A. A., Sasakawa, M., Rakhshani, E. & Torabi, M.** (2013) A Contribution to the Agromyzid Leaf Miners (Diptera: Agromyzidae) of Kermanshah, Iran. *Journal of the Entomological Research Society* 15 (3), 10 1-107
- Jafarzadeh, N. & Pourmirza, A. A.** (1998) Studies on biology of *Phytomyza orobanchia* Kalt. In field and under laboratory conditions. *Proceeding of the 13th Iranian Plant Protection Congress*. Vol. 1. pp. 80.
- Johnson, M. W., Welter, C., Toscano, N. C., Ting, I. P. & Trumble, J. T.** (1983) Reduction of tomato leaflet photosynthesis rates by mining activity of *Liriomyza sativae* (Diptera: Agromyzidae). *Journal of Economic Entomology* 76, 1061-1063.
- Kalantar Hormozi, F., Sahragard, A., Mohajeri, R. & Jalalisandi, J.** (2000) Introduction of vegetable leaf miner *Liriomyza sativae* (Dip.: Agromyzidae) in Khuzestan province. *Proceeding of the 14th Iranian Plant Protection Congress*. Vol. 1. pp. 251.
- Lotfalizadeh, H.** (2004) Report of cabbage leaf miner fly. *Newsletter of Entomological Society of Iran* 21, 1.
- Mahmoodi, A., Dousti, A. & Fallahzadeh, M.** (2011) Identification of leaf miners (Dip.: Agromyzidae), and their natural enemies in Khonj region. *National Conference Management of Agriculture* 1, (7).
- Martinez M** (2011) Agromyzidae. in Pape, T. & Beuk, P. (Eds) *Fauna europaea: Diptera*. Fauna europaea version 2.4. <http://www.faunaeur.org>.

- Minkenbergh, O. P. J. M. & van Lenteren, J. C.** (1986) The leafminers *Liriomyza bryoniae* and *L. trifolii* (Diptera: Agromyzidae), their parasites and host plants: a review. *Wageningen Agricultural University Papers*, 86: (2). 50 pp.
- Movahedi-Fazel, M., Shojai, M. & Esmaili, M.** (1998) The efficiency of broomrape-miner fly *Phytomyza orobanchiae* Kaltenschach (Dip.: Agromyzidae) to decrease the ability of seed production in broomrape in Shahriar region. *Proceeding of 13th Iranian Plant Protection Congress*, pp.96.
- Murphy, S. T. & LaSalle, J.** (1999) Review article: balancing biological control strategies in the IPM of new world invasive *Liriomyza* leaf miners in field vegetable crops. *Biocontrol News and Information* 20, 91-104.
- Ortiz, R. G.** (2010) *Biosystematics contributions to Agromyzidae (Diptera)*. 444 pp. Thesis Doctoral University of Valencia.
- Ortiz, R. G., Martinez, M. & Jimenez, R. P.** (2010) New species records of Agromyzidae (Diptera) from Spain. *Journal of Entomological Science* 45, 91-105.
- Pakalinskis, S.** (2000) New data on the bionomics and distribution of Agromyzidae (Diptera) with the description of a new species. *Acta Entomologica Lituanica* 10 (1), 59-62.
- Pape, T. & Beuk, P.** (2011) Fauna Europaea: Agromyzidae. *Fauna Europaea Version 2.0*. Available from: <http://www.faunaeur.org> (accessed 12 July 2015).
- Pape, T. & Thompson, F. C.** (2013) *Systema Dipteriorum*. The Biosystematic Database of World Diptera. Available from: <http://www.diptera.org/>(accessed 10 July 2015)
- Phillips, W. J.** (1914) Corn-leaf blotch miner. *Journal of Agricultural Research* 2, 15-31.
- Pourhaji, A., Alipanah, H. Gharali, B. & Lotfalizadeh, H.** (2012) Fauna of alfalfa leaf miners in East Azerbaijan province. *Proceeding of the 20th Iranian Plant Protection Congress*. Vol. 1. pp. 7.
- Radjabi, Gh. & Behrozin, M.** (2003) *Pests and diseases of wheat in Iran*. 186 pp. Agricultural Research and Education Organization Iran.
- Radjabi, Gh., Hosseyni, S. M. & Mansoor-Ghaazi, M.** (1997) Diptera species occurring in wheat and barley in Iran. *Applied Entomology and Phytopathology* 64 (1, 2), 60-71.
- Robbins, J.** (1983) Leaf-mining insects in Warwickshire: an introduction. *Proceedings of the Birmingham Natural History Society* 25 (1), 5-30.
- Robbins, J.** (1991) *The leaf miners of Warwickshire with notes on other species occurring in the Midlands*. 182pp. Warwickshire Museum, Market Place, Warwick, CV34 4SA.
- Sasakawa, M.** (1997) Lauxaniidae and Agromyzidae (Diptera) of the Ryukyus. *Esakia* 37, 141-148.
- Sasakawa, M.** (2005) Notes on the Japanese Agromyzidae (Diptera), Japanese species of the genus *Cerodontha* Rondani, with the description of five new species. *Scientific Reports of Kyoto Prefectural University Human Environment and Agriculture* 57, 47-61.
- Scheirs, J., Bruyn, L. D. & Tschirnhaus, M. V.** (1995) Agromyzidae (Diptera) of the nature reserve "Hobokense Polder": faunistics and life-history aspects. *Bulletin et Annales de la Societeroyale beige Entomologie* 131, 191-205.
- Scheirs, J. Bruyn, L. D., Vandenbussche, P. & Jordaen, K.** (1994) Leafminers (Diptera; Agromyzidae) new to the Belgian fauna. *Bulletin et Annales de Societe royale belge d'Entomologie* 130, 54-57.
- Shahreki, Z., Rakhshani, E. & Sasakawa, M.** (2012) A Contribution to the agromyzid leaf miners (Diptera: Agromyzidae) of Iran. *Biologia Nyssana* 3 (1), 31-36.
- Spencer, K. A.** (1972) *Diptera, Agromyzidae*. 136 pp. Handbooks for the Identification of British Insects.
- Spencer, K. A.** (1973) *Agromyzidae (Diptera) of Economic Importance*. 418 pp. Springer Science & Business Media.
- Spencer, K. A.** (1976) The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinaviaca* 5 (1), 1-304.

- Spencer, K. A.** (1981) *A Revisionary Study of the Leaf-mining Flies (Agromyzidae) of California*. 469 pp. University of California, Agriculture and Natural Resources.
- Spencer, K. A.** (1989) Family Agromyzidae. pp. 538-547 in Evenhuis, N. L. (Ed.) *Catalogue of the Diptera of the Australasian and Oceanian regions*. Bishop Museum Special Publication, Bishop Museum Press, Honolulu. E. J. Brill, Leiden. 1156 pp.
- Spencer, K. A.** (1990) *Host Specialization in the World Agromyzidae (Diptera)*. 444 pp. Kluwer Academic Publishers, Netherland.
- Stang, D. J.** (comp.) 2004-present. *Zipcode Zoo*. The BayScience Foundation, Inc., Bethesda, Maryland, USA. Available from: <http://ZipcodeZoo.com/> (accessed)
- Subasinghe, S. M. C. & Fellowes, R. W.** (1978) Recent trends in grain legume pest research in Sri Lanka, pp. 37-41 in Singh, S. R.; Van Emden, H. F. & Ajabola Taylor, T. (Eds) *Insect Pests of Grain Legumes: Ecology and Control*. Academic Press, London
- Tschirnhaus, M. V. & Karimpour, Y.** (2006) First record of *Liriomyza pusilla* (Meigen, 1830) (Diptera: Agromyzidae) from Iran. *Proceedings of the 17th Iranian Plant Protection Congress*. Vol. 1. pp. 251.
- Yildirim, E. M., Unay, A. & Civelek, H. S.** (2010) The effect of *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae) on some leaf characteristics of bean (*Phaseolus vulgaris* L.). *Journal of Food, Agriculture & Environment* 8 (3 & 4), 839-841.
- Zahiri, B., Moharramipour, S., Talebi, A. A. & Fathipour, Y.** (2003) Leaf miner *Liriomyza sativae* (Dip.: Agromyzidae) as a potential pest of chrysanthemum in Iran. *The Second Applied Scientific Seminar on Flowers and Ornamental Plants* 12.
- Zhu, X., Reid, L. M., Woldemariam, T., Tenuta, A. & Lachance, P.** (2004) Survey of corn diseases and pests in Ontario and Quebec in 2003. *Canadian Plant Disease Survey* 84, 1-136.
- Zlobin, V. V.** (1993) Review of mining flies of the genus *Cerodontha*. IV. Subgenus *Poemyza* (Diptera: Agromyzidae). *Zoosystematica Rossica* 1, 117-141.

Received: 1 March 2015

Accepted: 3 April 2015