

A Contribution to the agromyzid leaf miners (Diptera: Agromyzidae) of Iran

Zahra Shahreki¹, Ehsan Rakhshani*¹, Mitsuhiru Sasakawa²

¹Department of Entomology, College of Agriculture, University of Zabol, 98615-538, Zabol, I.R. IRAN

²Korigaoka, Hirakata City, Osaka Pref., 573 Japan

* E-mail: rakhshani@uoz.ac.ir

Abstract:

Shahreki, Z., Rakhshani, E., Sasakawa, M.: A Contribution to the agromyzid leaf miners (Diptera: Agromyzidae) of Iran, *Biologica Nyssana*, 3 (1), September 2012: 31-36.

A study was carried out during 2009 and 2010 in Sistan region located in the eastern part of Iran, for elucidating the agromyzid fauna. The specimens were collected by rearing of the mine-infested leaves of different cultivated and non-cultivated host plants. The leafminers of two subfamilies, Agromyzinae and Phytomyzinae, were studied in this paper. Eight species belonging to five genera of the Agromyzidae were collected. Among them, three species, including *Chromatomyia nigra* (Hardy, 1849), *Melangromyza cunctans* (Meigen, 1830) and *Phytoliriomyza dorsata* (Siebke, 1863), are recorded for the first time for the territory of Iran. The last species is also representative of the new genus record for Iran. Comments on general distribution of each species are presented here.

Key words: Agromyzinae, eastern Iran, host association, new record, Phytomyzinae

Introduction

The Agromyzidae (leaf mining flies) is one of the largest dipteran families, with more than 3000 species belonging to 30 genera worldwide. About 1165 species have been recorded from the Palaearctic region (Civelek, 2003, 2008; Çikman & Sasakawa, 2008; Dursun et al., 2010). One of the largest genera, the genus *Liriomyza* Mik, with over 300 species worldwide (Spencer, 1973) appear common in the Palaearctic region, but poorly represented in the Oriental region (Sasakawa, 1972).

The agromyzid leaf miners including many species of economic importance, limiting production in several agroecosystems (Spencer, 1973). Most of species are cosmopolitan, polyphagous pests of agricultural crops and ornamental plants with an economic importance (Spencer, 1973; Dempewolf, 2006). They undermine the internal tissues of

leaves, stems, fruits and even roots. Leafminers can cause direct damage to the photosynthetic tissue of host plants caused by larval leaf mining (Johnson et al., 1983) and esthetic damage caused by oviposition. Adult males and females suck the exuding sap from the parenchyma cells on the punctures produced by adult females just after oviposition (Spencer, 1973). Extensive mining can result in premature leaf drop and leading to lack of shading (Capinera, 2001). Apart from direct damage caused by larval feeding on leaf tissues, the females may even act as vectors for diseases during oviposition (Matteoni & Broadbent, 1988; Zitter & Tsai, 1977).

Taxonomically, the agromyzids are considered one of the most difficult groups among the Diptera order. This is because of high degree of uniformity between species and the small size of specimens. Identification of species is an important

step prerequisite for establishment of effective pest control program and the quarantine measures, especially in the case of biological control (Parrellaa & Keil, 1984).

A few attempts have been made for investigation of faunal diversity (Dousti, 2010), biology (Haghani et al., 2007; Farrokhi et al., 2004) and the natural enemies (Asadi et al., 2006; Fathi, 2011) of the leafminer flies in Iran. The scanty information were summarized by Dousti (2010), in which the record of 26 species from Iran, indicating the necessity of further investigations to extend the knowledge about the diversity and taxonomy of this poorly known group of Insects. In spite of substantial efforts that have been made on systematic of Agromyzidae species, there is a significant lack of knowledge in Iran. Furthermore, there is no record from Sistan region which is located in the eastern part of the country. Here, we present the data of the faunistic survey on Agromyzidae from Sistan region, including host associations and comments on their general distributions.

Materials and methods

The leaves, stems and other parts of the host plants infested by the mining agromyzid larvae were collected in the various cultivated and non-cultivated areas in Sistan region during the period of 2009–2010. The infested plant materials were cut, preferably with representative part of the plants and then directly placed in plastic boxes (10 × 12 cm) covered with mesh on the upper side due to ventilation. The rearing boxes were then transferred to laboratory, inside the climatic chamber, under the constant conditions with the temperature of 25±1°C and 65±5% RH. Samples were kept for about 1–2 weeks expecting of emergence of the adults. Adults were caught by an aspirator and gathered in the test tubes containing of 75% ethanol. Illustrations were made using the Nikon SMZ645 stereomicroscope and Nikon Eclips E200 Microscope equipped with the Canon Ixus 100 IS digital camera. All the samples are preserved in the collection of second author.

Results and discussion

Eight species of Agromyzidae belong to five genera and two subfamilies were identified in association with 11 different species of host plants. One genus and three species listed below are

considered to be new records for Iran. The newly recorded taxa are indicated by an asterisk (*).

Subfamily: Agromyzinae

Melanagromyza cunctans (Meigen, 1830)*

(Figures 7, 15)

Distribution: Mediterranean and western European countries.

Material examined: 2♀ 2♂, reared from *Lycopersicon esculentum* – Solanaceae, Zabol, 11-III-2010; leg.: Z.S.

Subfamily: Phytomyzinae

Calycomyza humeralis (Von Roser, 1840)

(Figures 1, 9)

Distribution: Nearctic and Palaearctic region.

Material examined: 1♂, reared from *Triticum aestivum* – Poaceae, Hamoon plain, 28-V-2009; leg.: Z.S.

Chromatomyia horticola (Gourea, 1851)

(Figures 2, 10)

Distribution: Holarctic, Oriental and Afrotropical. Expanded to Central Asia and Europe.

Material examined: 30♀ 8♂, reared from *Gaillardia grandiflora* – Asteraceae, Sistan Dam, 20-I-2009; 2♀ 20♂, reared from *Helianthus annuus* – Asteraceae, Zahak, 24-III-2009; 10♀ 8♂, reared from *Silybum marianum* – Asteraceae, Zabol, 11-XI-2009; 8♀ 12♂, reared from *Brassica rapa* – Brassicaceae, Zahak, 06-IV-2010; 5♀ 3♂, *Cucumis sativus* – Cucurbitaceae, Zahak, 02-V-2009; leg.: Z.S.

Chromatomyia nigra (Meigen, 1830)*

(Figures 3, 11)

Distribution: Europe, Northern Asia, Northern America. New record from Iran.

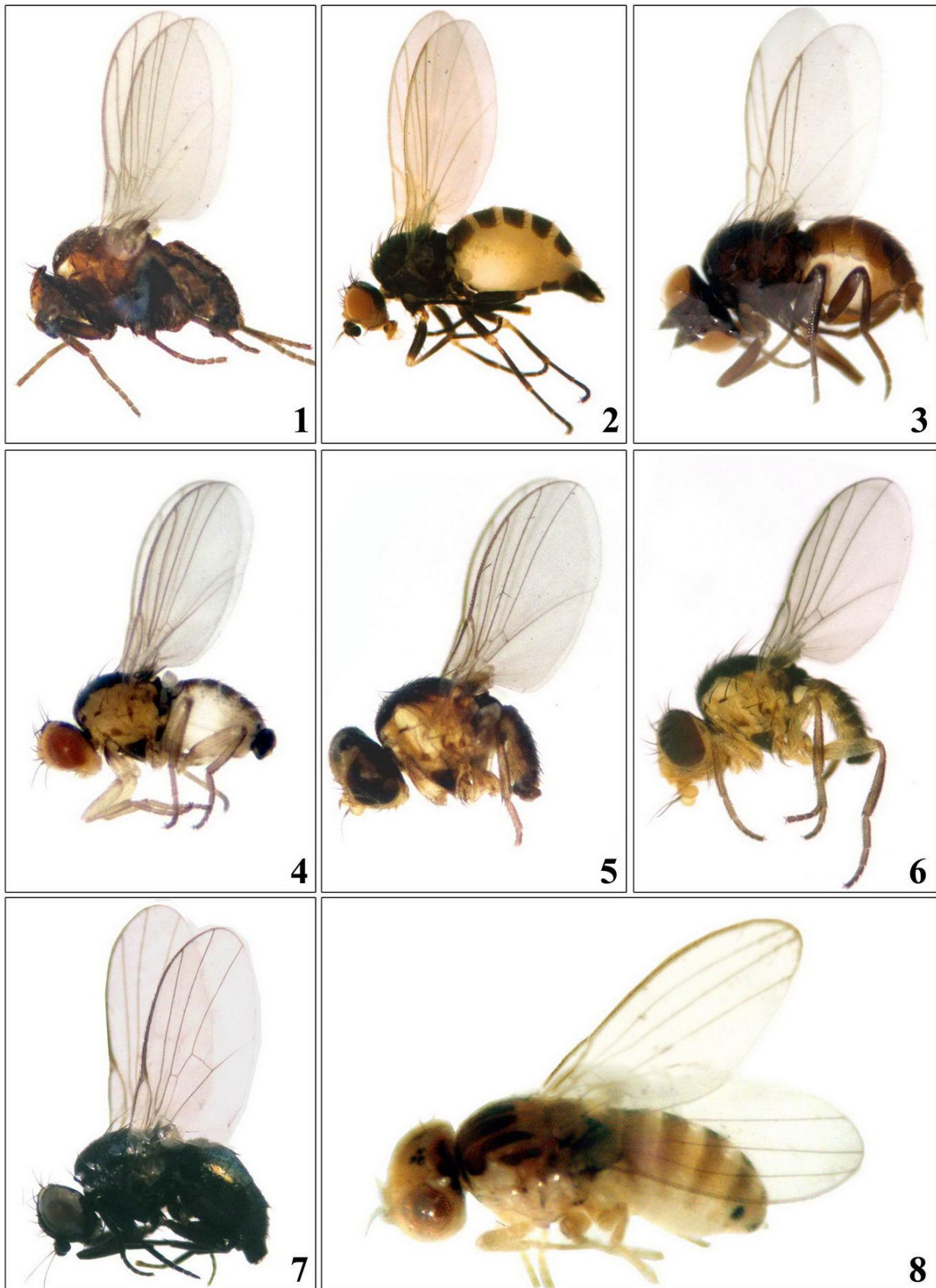
Material examined: 5♀ & 3♂, reared from *Triticum aestivum* – Poaceae, Hirmand, 28-V-2009; leg.: Z.S.

Liriomyza congesta (Becker, 1903)

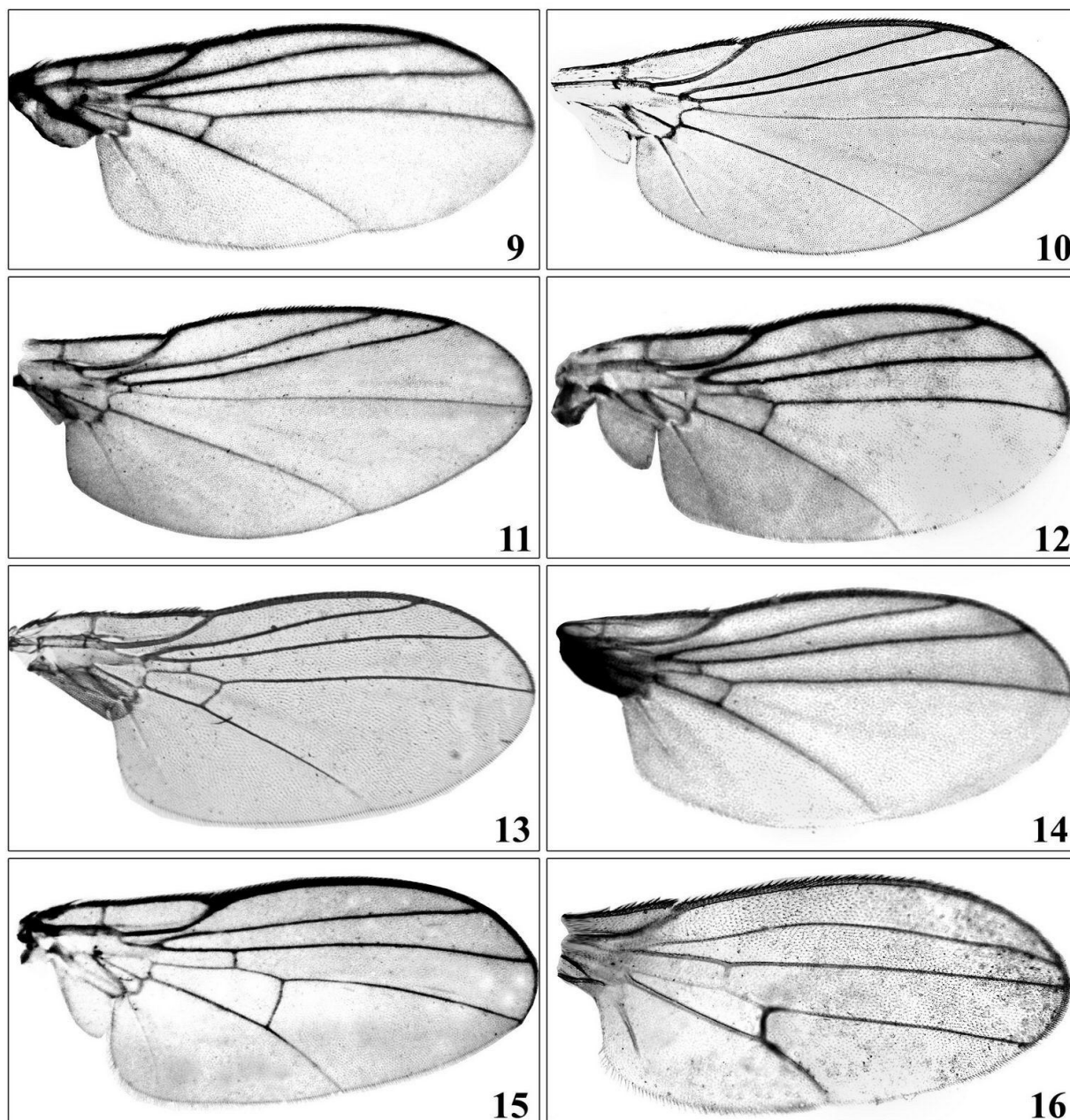
(Figs. 4, 12)

Distribution: Widespread in Europe and North Africa. Also recorded from the Eastern Palaearctic and India.

Material examined: Material: 1♀, reared from *Trigonella foenum-graecum* – Fabaceae, Hamoon plain, 05-IV-2009; 2♀, reared from *Medicago sativa* – Fabaceae, Zabol, 21-IV-2010; 2♂, Hamoon plain, 05-XI-2009; leg.: Z.S.



Figures 1-8. Lateral hibatate of the adult leafminers. 1. *Calycomyza humeralis*, 2- *Chromatomyia horticola*, 3. *Chromatomyia nigra*, 4. *Liriomyza congesta*, 5. *Liriomyza sativae*, 6. *Liriomyza trifolii*, 7. *Melanagromyza cunctans*, 8. *Phytoliriomyza dorsata*.



Figures 9-16. Wing of agromyzid leafminers, 9. *Calycomyza humeralis*, 10- *Chromatomyia horticola*, 11. *Chromatomyia nigra*, 12. *Liriomyza congesta*, 13. *Liriomyza sativae*, 14. *Liriomyza trifolii*, 15. *Melanagromyza cunctans*, 16. *Phytoliriomyza dorsata*.

Liriomyza sativae (Blanchard, 1938)
(Figure 5, 13)

Distribution: Cosmopolitan.

Material examined: 1♀ 22♂, reared from *Malva sylvestris* – Malvaceae, Zabol, 04-V-2009; leg.: Z.S.

Liriomyza trifolii (Burgess, 1880)
(Figure 6, 14)

Distribution: Nearctic in origin, but a cosmopolitan species.

Material examined: Material: 5♀ 10♂, reared from *Cucumis sativus* – Cucurbitaceae, Zahak, 05-IV-

2009; 25♀ 6♂, reared from *Lactuca serriola* – Asteraceae, Zahak, 19-IV-2009; leg.: Z.S.

Phytoliriomyza dorsata (Siebke, 1864)*
(Figures 8, 16)

Distribution: Western Palaearctic, North America. New record of the genus *Phytoliriomyza* Hendel from Iran.

Material examined: 1♀, *Gaillardia grandiflora* – Asteraceae, Zabol, 8-X-2009; leg.: Z.S.

Eight species belonging to five genera are known to occur in Sistan region. All of them are newly recorded from eastern part of Iran, too. Mining larvae of different host plants are observed in cultivated or non-cultivated fields attacking crops in Sistan region. Most of these species have been found in warm or temperate and humid regions in the world (Spencer, 1990). Two species, *L. trifolii* and *L. sativae* are polyphagous leafminers known as important agricultural pests (Darvas et al., 2000). Among the studied agromyzids, three species, *Melanagromyza cunctans*, *Phytoliriomyza dorsata* and *Chromatomyia nigra* were recorded for the first time for Iran.

The genus *Chromatomyia* includes the polyphagous leafminer species, which are common agricultural pests on cosmopolitan plant species of grasses: Poaceae (Gramineae) (Griffiths 1974, 1980). *Chromatomyia nigra* was another newly recorded species from Iran, which is an unusual species in having the densely hairy eyes and a pair of ventral processes on the distiphallus. This is an almost cosmopolitan species occurs on leaves of grasses, Poaceae (Gramineae) and Asteraceae (Compositae), *Aster* and *Bellis*. Next species *Chromatomyia horticola* considered also as a polyphagous species feeding on more than 30 plant families (Griffiths 1974, 1980).

Melanagromyza Hendel is the second large genus (Spencer, 1966) and one of the most homogeneous taxa within the family Agromyzidae (Spencer, 1990). It is characterized by having a wide range of hosts undermining 23 plant families (Benavent-Corai et al., 2005). *Melanagromyza* genus represents mainly internal stem-borers, but the species which has been described as *Melanagromyza symphyti* Griffiths, 1963 undermining thick-leaf stalks. The species such as *Melanagromyza cunctans* that is newly recorded from Iran, it is known as a gall-causer on *Lotus* spp. in Europe (Spencer, 1976). It was collected in late winter from stems of tomato. Another species of this genus, *Melanagromyza sativae* Spencer has already been recorded from the Northern part of Iran (Spencer, 1990). It was also reared from the stems of the plants belong to the family Apiaceae in Fars province (Dousti, 2010).

The genus *Phytoliriomyza* Hendel is reported here for the first time from Iran. Less than 20 species of the genus *Phytoliriomyza* have been recorded in the Palaearctic region (Zlobin, 2005). As a new host record, *Phytoliriomyza dorsata* has been reared from the leaves of *Gaillardia grandiflora* in spring.

Conclusion

The present contribution increased our knowledge about the occurrence and the host associations of agromyzid leaf miner at a small area of eastern Iran. The identified species were mostly the common and frequently encountered agricultural pests, as well as the new records, which have also economic importance in some other countries. On the other hand, further investigations are necessary to expand the data about the occurrence of other species and their host plants as an ecological refugia for the natural enemies especially the parasitoids.

Acknowledgements. This study was supported by the grant No. 89-9198, University of Zabol, Iran.

References

- Asadi, R., Talebi, A.A., Fathipour, Y., Moharramipour, S. & Rakhshani, E. 2006: Identification of parasitoids and seasonal parasitism of the agromyzid leafminers genus *Liriomyza* (Dip.: Agromyzidae) in Varamin, Iran. *Journal of Agricultural Science and Technology*, 8: 293-303.
- Benavent-Corai, J., M. Martinez & Jiménez-Peydró, R. 2005: Catalogue of the Host-Plants of the world Agromyzidae (Diptera). *Bolletino di Zoologia agraria e di Bachicoltura. Serie II*, 37: 1-97.
- Capinera, J.L. 2001: *Handbook of Vegetable Pests*. Academic Press, New York. 729 pp.
- Çikman, E. & Sasakawa, M. 2008: The Turkish Agromyzidae (Diptera), with descriptions of four new species. *Entomological Science*, 11 (1): 81-86.
- Civelek, H.S. 2003: Checklist of Agromyzidae (Diptera) of Turkey, with a new record. *Phytoparasitica*, 31 (2): 132-138.
- Darvas, B., Skuhrav, M., & Andersen, A. 2000: Agricultural dipteran pests of the Palaearctic Region. In: Papp, L. & Darvas, B. (eds.), *Contributions to a manual of Palaearctic Diptera (with special reference to flies of economic importance)*. 1. General and applied dipterology 565-649, Science Herald, Budapest.
- Dempewolf, M. 2006: Agromyzidae (Diptera) of economic importance. CD-ROM, Institute for Biodiversity and Ecosystem Dynamics, Zoological Museum Amsterdam, <http://www.science.uva.nl/entomol/Agromyzidae.html>.
- Dousti, A. 2010: Annotated List of Agromyzidae (Diptera) from Iran, with four new records.

- Journal of Entomological Research Society, 12(3): 1-6.
- Dursun, O., Eskin, A. & Atahan, T. 2010: Contributions to the Turkish Agromyzidae (Diptera) fauna with ten new records. *Türkiye Entomology Dergisi*, 34 (3): 299-306.
- 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: p. 16.
- Fathi, A.A. 2011: Tritrophic interactions of nineteen canola cultivars- *Chromatomyia horticola* - parasitoids in Ardabil region. *Munis Entomology and Zoology*, 6 (1): 449-454.
- Griffiths, G.C.D. 1974: Studies on boreal Agromyzidae (Diptera) V. On the genus *Chromatomyia* Hardy, with revision of Caprifoliaceae-mining species. *Quaestiones entomologicae*, 10: 15-69.
- Griffiths, G.C.D. 1980: Studies on boreal Agromyzidae (Diptera) XIV. *Chromatomyia* miners on Monocotyledones. *Entomologica Scandinavica*, Suppl. 13: 1-61.
- Haghani, M., Fathipour, Y., Talebi, A.A. & Baniameri, V. 2007: Thermal requirement and development of *Liriomyza sativae* (Diptera: Agromyzidae) on cucumber. *Journal of Economic Entomology*, 100(2): 350-356.
- 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.
- Matteoni, J.A. & Broadbent, A.B. 1988: Wounds caused by *Liriomyza trifolii* (Diptera: Agromyzidae) as sites for infection of *Chrysanthemum* by *Pseudomonas cichorii*. *Canadian Journal of Plant Pathology*, 10: 47- 52.
- Parrella, M.P. & Keil, C.B. 1984: Insect pest management: the lesson of *Liriomyza*. *Bulletin of the Entomological Society of America*, 30: 22-25.
- Sasakawa, M. 1972: Formosan Agromyzidae (Diptera). *The Scientific Reports of Kyoto Prefectural University, Agriculture*, 24: 43- 82.
- Spencer, K.A. 1966: A revision of European species of the genera *Melanagromyza* Hendel and *Hexomyza* Enderlein, with a supplement on the genus *Ophiomyia* Braschnikov (Diptera: Agromyzidae). *Beiträge zur Entomologie*, 16: 1-60.
- Spencer, K.A. 1973: Agromyzidae (Diptera) of Economic Importance. *Series Entomologica*, Vol. 9. Dr. W. Junk B.V. The Hague, The Netherlands. 418 pp.
- Spencer, K.A. 1976: The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica*, 5 (1): 1-304.
- Spencer, K.A. 1990: Host specialization in the World Agromyzidae (Diptera). *Bulletin of the Entomological Society of America*, 30: 22-25.
- Spencer, K.A. 1972: Diptera, Agromyzidae. *Handbooks for the Identification of British Insects*, 10: 1-136.
- Zitter, T.A. & Tsai, J.H. 1977: Transmission of three potyviruses by the leafminer *Liriomyza sativae* (Diptera: Agromyzidae). *Plant Disease Report*, 61: 1025-1029.
- Zlobin, V.V. 2005: Studies on European species of the genus *Phytoliriomyza* Hendel (Diptera: Agromyzidae). *Russian Entomological Journal*, 14(2): 119-123.