GSC Biological and Pharmaceutical Sciences
eISSN: 2581-3250 CODEN (USA): GBPSC2
Cross Ref DOI: 10.30574/gscbps
Journal homepage: https://gsconlinepress.com/journals/gscbps/

(RESEARCH ARTICLE)

Check for updates

Survey and revision of leaf miners to some plants from different localities of Iraq

Hanaa H Al-Saffar [1,*] Razzaq Shalan Augul [1] and Zainab Abid Aun Ali [2]

[1] *Iraq Natural History Research Center and Museum/ University of Baghdad.*
[2] *College of Science for Women/ University of Baghdad.*

GSC Biological and Pharmaceutical Sciences, 2021, 17(03), 124–136

Publication history: Received on 11 November 2021; revised on 12 December 2021; accepted on 14 December 2021

Article DOI: https://doi.org/10.30574/gscbps.2021.17.3.0358

Abstract

This investigation showed (31) species belonging to (15) genera under (five) families and two orders. The leafminers Dipter families (Agromozidae, Anthomyiidae, Drosophilidae), Agromyzid flies is the highest level of investigated many host plants, but other families have lowest host plants. The synonyms of species were provided from GBIF scarlet's. The date and localities of sampling collection were recorded.

Keywords: Leaf miners; Agromyzidae; Anthomyiidae; Drosophilidae; Lepidoptera; Iraq

1. Introduction

The leaf miner, showed any of insect larvae which habitats and feed in leaf plants. The miners include caterpillars of some lepidopterans (Order Lepidoptera), sawfly larvae (Order Hymenoptera), beetle and weevil grubs or larvae (order Coleoptera), and maggots (larvae) of true flies (order Diptera [1]

Most leaf-miner of order Diptera is Family Agromyzidae made burrows or tunnels in leaves of host plants, some of them are stem borer with galls maker [2]. This family is widely distributed at the world with loss species southern part of hemisphere than in hot areas of Nearctis and Palaearctic regions then it had many studies in deferent localities f the world [3, 4].

Agromyzidae consist of more than 2,500 species round the world, its member's small with wing length2-3mm in maximum about 6.5mm. The adults can be diagnosed with characters; head sclerotizes and the upper part of frons lightly sclerotized and loss seta, but the lower and dorsal of head with more heavily sclerotized with setulae and pubescent, frontal vita sometimes made patch and tuff in different colors compare with the rest of head. The frons with 1-7 frontal bristles, with presence of vibrissae. Compound eyes ovate in shape, small usually but in some species circular and large. Wings usually hyaline, often with marks (dark spots and shaped) of tropical spcies. Costal vein has break on the apex of subcost; cup cell small; 1st anal vein not reached the wing margen. Abdomen has pach andcolor spot on tergites in male using to differ from species, female abdomen fused tergal (T 6-8) which has two spiracles located between (T5 and genital segment) while the seventh one forming an oviscape. [2, 5, 6, 7, 8, 9].

Family Anthomyiidae is one of the most important flies which distributes at all the zoogeographical region. They found with deferent conditions from vegetables, dead animals and most of them phytophagus caused injuries and damaged plants, such genera *Delia* and *Pegomya; (Pegomya hyoscami* species group). Some species had economic importance which infested cultivated crops [10].

* Corresponding author Hanaa H Al-Saffar
Iraq Natural History Research Center and Museum/ University of Baghdad.

The Spinach leafminer *Pegomya hyoscyami* small fly, female inserted ovipositor and laid eggs on leaf surface and maggot made tunnel on it. Larvae whit maggot caused blotches, then pupal stage and adults emerge in spring from soil. [11].

The family Drosophilidae is a cosmopolitan of acalyptrate consists of more than 3,950 species [12]. The important genus is *Scaptomyza* Hardy, a lot of species belong to it as leaf miners. *Scaptomyza flava* is an alienate species of European origin [13]

The most important lepidopteran leafminers (Tomota Leaf miner and Citrus leaf miner). Which economically importance. *Tuta absoluta* is phytophagus insect attacking Solanaceae family plants [14].

2. Material and methods

Many infested leaf of plants were collected from different Localities of Iraq, (25-40) leaves per each plants) during 2020 year. The collecting leaves were brought to the department of Entomology and Invertebrates at Iraq Natural History Research Center and Museum, then kept in Petri Dishes under room temperature. The dishes were labeled and the places and date of collecting were recorded. After 2-3 weeks the insect left leaves as adults.

The plants and insects of orders Diptera and Lepidoptera were diagnosed by authors and used taxonomical keys such as: [2, 8, 10, 11] The specimens were storage at department of Entomology and invertebrate.

3. Results and discussion

This investigation showed (31) species belonging to (15) genera under (5) families with two orders (Diptera and Lepidoptera) as fallow:

Order, Diptera
Family, Agromyzidae
Subfamily, Agromyzinae
Genus, *Agromyza* Fallén, 1810
Synonyms: *Adromyza* Meigen, 1830
Calyptomyza Hardy, 1850
Mesonevra Lioy, 1864
Stomacrypolus Enderlein, 1936

3.1. *Agromyza albipennis* Meigen, 1830

Synonyms: *Agromyza albohyalinata* Zetterstedt, 1848
Agromyza dubitata Malloch, 1913
Agromyza fennica Griffiths, 1963
Common name: black wheat leaf miner
Material examined: 30 specimens, 6♀♀,8 ♂♂in *Medicago sativa* L. (Fabaceae) on 15.iv.2020 and , 2♀♀,2 ♂♂in *Trigonella foenum- graecum* L. (Fabaceae)on 21.ii.2020 from Baghdad; , 3♀♀,3 ♂♂in *Hordeum vulgare* on 10.iv.2020 from Al-Najaf; , 4♀♀,2 ♂♂in *Meloletis indica* on 10.iv.2020.from Kerbala.
Distribution: Iraq[15]; Denmark, Finland, Norway, Sweden, Germany[16] Austria, Belarus, Corsica, Czech Republic, Estonia, European Turkey, Finland, Hungary, Italian mainland, Latvia, Lithuania, Poland, Slovakia, Spanish mainland and Switzerland; Also recorded in Canada, Japan and China [17]; Netherlands, Luxembourg , Belgium[18]; Turkey [19] Portugal [20].

3.2. *Agromyza megalopsis* Hering, 1933

Material examined: 4specimens**,** 2♀♀, 2 ♂♂ in *Triticum aestivum* L. (Poaceae) on 30.iii. 2020 from Baghdad.
Distribution: Iraq [21]; in Europe, it's distributed from Poland to Spain and from France to Crete [22]; Bulgaria, Corfu, Crete and Croatia [23]; Former Yugoslavia; Egypt, Cyprus, Saudi Arabia, Turkey, Uzbekistan, Morocco [24].

3.3. *Agromyza nana* Meigen, 1830

Synonyms: *Agromyza anthracipes* (Rondani, 1875)
Agromyza brevinervis (Rondani, 1875)
Agromyza medicaginis Robineau-Desvoidy, 1851

Agromyza trifolii Kaltenbach, 1872
Domomyza anthracipes Rondani, 1875
Domomyza brevinervis Rondani, 1875
Material examined: 20 specimens, 6♀♀, 6 ♂♂in *Melilotus indeca* (L.) All. (Fabaceae) at 13.ii.2020 from Kerbala; 6♀♀, 2 ♂♂in *Medicago sativa* L. (Fabaceae) on 4.ii.2020. From Baghdad.
Distribution: Iraq [25] Palearctic Region [26]; Turkey [19] Portugal [20].

3.4. *Agromyza nigrescens* Hendel, 1920

Synonyms: *Agromyza heringi* Meijere, 1925
Agromyza japonica Tsujita, 1951
Agromyza microchaeta Hendel, 1920
Agromyza oycoviensis Beiger, 1960
Common name: Geranium leaf miner
Material examined: 4specimens, 3♀♀, 1 ♂ in *Geranium dissectum* L. (Geraniaceae) on 3.iii.2020 from Baghdad.
Distribution: Iraq [15]; **Denmark**, Finland, Germany, Norway [16]; Turkey [19]; Netherlands, Greece, Luxembourg, UK, Switzerland, Spain, Japan, Croatia, Cyprus, Colombia, Italy, Sweden, Austria, Switzerland, Estonia [27].

Genus, *Melanagromyza* Hendel, 1920
Synonym: *Limnoagromyza* Malloch, 1921

3.5. *Melanagromyza azawii* Spencer, 1973

Material examined: This species previously collected from stem of *Vicia faba* L. (Fabaceae) and *Sesamum indicum* L. (Pedaliaceae) on July 1979 [15].
Distribution: Iraq and Greece [15]; Palaearctic Region [29]; India and Somalia [30]; Secretariat, 2021b).

Genus, *Phytoliriomyza* Hendel, 1931
Synonyms: *Lemurimyza* Spencer, 1965
Nesomyza Spencer, 1973
Pteridomyza Nowakowski, 1962
Xyraeomyia Frick, 1952

3.6. *Phytoliriomyza oasis* (Becker, 1907)

Synonym: *Agromyza oasis* Becker, 1907
Material examined: We cannot collect this species but previously recorded on March in Mousl[15].
Distribution: Iraq [15]; Kyrgyzstan, Lithuania, Morocco, Poland, Spain, Sweden, Turkey and Uzbekistan [22]; Turkey [19]; Portugal [20]; Norway and Greece [27].

Genus: *Ophiomyia* Braznikov, 1897
Synonyms: *Aulomyza* Enderlein, 1936
Carinagromyza Sasakawa, 1954
Siphonomyza Enderlein, 1936
Siridomyza Enderlein, 1936
Solenomyza Enderlein, 1936
Stiropomyza Enderlein, 1936
Stirops Enderlein, 1936
Tylomyza Hendel, 1931

3.7. *Ophiomyia phaseoli* (Tryon, 1951)

Synonyms: *Agromyza destructor* Malloch, 1916
Agromyza fabae Tryon, 1897
Agromyza fabalis Jack, 1953
Agromyza phaseoli Coquillett, 1899
Ophiomyia gangetica Garg, 1971
Ophiomyia sanctuarii Singh & Ipe, 1973
Oscinis fabae Tryon, 1897
Oscinis phaseoli Tryon, 1895

Common name: Bean fly; snap bean fly.
Material examined: 10 specimens**,** (5♀♀,5 ♂♂) in *Vigna unguiculata* (L.) Walp. (Fabaceae) on 5.v.2020 from Abu-Ghr*aib/* Baghdad.
Distribution: Iraq [15]; (Spencer, 1981); Afrotropical, Australian, Oriental and Palaearctic Regions [29]; Turkey [19]; Bangladesh [31].

Subfamily, Phytomyzinae
Genus, *Calycomyza* Hendel, 1931

3.8. *Calycomyza humeralis* (Roser, 1840)

Synonyms: *Agromyza atripes* Brischke, 1881
Agromyza bellidis Kaltenbach, 1873
Agromyza humeralis von Roser, 1840
Calycomyza bellidis (Kaltenbach, 1873)
Calycomyza humerella (von Roser, 1840)
Material examined: 4 specimens, 3♀♀ and 1♂ in *Tripolium pannonicum* subsp. *Tripolium* (L.) Greuter (Asteraceae) on 4.iii.2020 from Tarmiyah/ Baghdad.
Distribution: Iraq 15]; Turkey [19]; Argentina, Germany, Bulgaria, Norway, Switzerland, Netherlands, UK, South Africa, Zimbabwe, Ethiopia, Australia, Canada, USA [30].

Genus, *Cerodontha* Rondani, 1861
Synonyms: *Cerodonta* Hendel, 1910
Cerodonta Hering, 1926

3.9. *Cerodontha denticornis* (Panzer, 1806)

Synonyms: *Agromyza acuticornis* Meigen, 183
Agromyza confinis Meigen, 1830
Agromyza nigritarsis Meigen, 1830
Agromyza tarsella Zetterstedt, 1848
Ceratomyza nigriventris Strobl, 1900
Ceratomyza nigroscutellata Strobl, 1900
Ceratomyza semivittata Strobl, 1909
Cerodontha acuticornis (Meigen, 1830)
Cerodontha confinis (Meigen, 1830)
Cerodontha ghooma Singh & Ipe, 1973
Cerodontha lacustris Garg, 1971
Cerodontha meigenii (Fallén, 1823)
Cerodontha narkandae Singh & Ipe, 1973
Cerodontha nigriscutellata (Strobl, 1900)
Cerodontha nigritarsis (Meigen, 1830)
Cerodontha nigriventris (Strobl, 1900)
Cerodontha semivittata (Strobl, 1909)
Cerodontha tarsella (Zetterstedt, 1848)
Cerodontha testae Singh & Ipe, 19731
Chlorops denticornis Panzer, 1806
Chlorops meigeni Pa 1984
Chlorops meigenii Fallen, 1823
Material examined: 1 specimen in *Alopecurus partensis* L. (Poaceae)on 15.iii.2020 from Sulaymaniyah city.
Distribution: Iraq[15]; Iran[32]; Turkey[19]; Albania, Andorra, Austria, Belgium, Bulgaria, Czech, Dalmatia, Denmark, Estonia, Finland, France, Germany, UK, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Maltese Islands, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain,, Sweden, Switzerland, Ukraine, North Africa, Central and East Asia[20].

3.10. *Cerodontha luctuosa* (Meigen, 1830)

Synonyms: *Agromyza luctuosa* Meigen, 1830
Cerodontha effusi (Karl, 1926)
Dizygomyza effusi Karl, 1926

Material examined: 2 ♀♀, specimens in *Juncus effuses* L. (Juncaceae) on 17.iii.2020.
Distribution: Iraq[15]; Turkey[19]; Albania, Austria, Belgium, Belarus, Czech, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, former Yugoslavia, Israel, Tunisia, China, Japan, Uzbekistan, Canada and United States[20].

Genus, *Chromatomyia* Hardy, 1849

3.11. Chromatomyia horticola Goureau, 1851

Synonyms: Chromatomyia bidensivora (Séguy, 1951)
Chromatomyia cucumidis (Macquart, 1854)
Chromatomyia fediae (Kaltenbach, 1860)
Chromatomyia lactucae (Vimmer, 1928)
Chromatomyia linariae (Kaltenbach, 1862)
Chromatomyia meliloti (Brischke, 1882)
Chromatomyia nainiensis (Garg, 1971)
Chromatomyia pisi (Kaltenbach, 1864)
Chromatomyia subaffinis (Malloch, 1914)
Chromatomyia tropaeoli (Dufour, 1857)
Napomyza lactucae Vimmer, 1928
Phytomyza bidensivora Séguy, 1951
Phytomyza cucumidis Macquart, 1854
Phytomyza fediae Kaltenbach, 1860
Phytomyza horticola Goureau, 1851
Phytomyza linariae Kaltenbach, 1862
Phytomyza meliloti Brischke, 1882
Phytomyza nainiensis Garg, 1971
Phytomyza pisi Kaltenbach, 1864
Phytomyza subaffinis Malloch, 1914
Phytomyza tropaeoli Dufour, 1857
Common name: Pea leaf miner
Material examined: 45 specimens; 6♀♀, 6 ♂♂in *Lepidium darba* L. (Brassicaceae) on 3.iii.2020 from Tarmyiah/ Baghdad; 4♀♀, 5 ♂♂in Sonchus sp. on 10.iii.2020 from Nasiriya/ Thi- Qar; 8♀♀ and 6♂♂in Carthamus lanatus on 20.iii.2020 from Basra; 5♀♀,5 ♂♂in Cucurbita pepo on 29.iii.2020 from Samarra.
Distribution: Iraq[15]; Turkey[33]; Portugal[20]; Norway, UK, Germany, Sweden, Netherlands, Finland, Pakistan, Korea, China, Japan, India, Portugal, South Africa, Eritrea, , Finland, Spain, Israel, Malta, Kenya, Ethiopia, Afghanistan, Zimbabwe, Italy, Denmark, Hungary and Austria[30].

Genus*, Japanagromyza* Sasakawa, 1958

3.12. *Japanagromyza salicifolii* Collin, 1911

Synonyms: *Agromyza salicifolii* Collin, 1911
Material examined: 3♀♀specimens in poplar trees and *Quercus* L. (Fagaceae) on 4.iv.2020 from Mosul**.**
Distribution: Iraq [15] (Spencer, 1981); Palearctic Region [29]; Turkey [19]; Portugal [20].

Genus, *Liriomyza* Mik, 1894
Synonyms: *Agrophila* Lioy, 1864
Antineura Melander, 1913
Haplomyza Hendel, 1914
Praspedomyza Hendel, 1931
Triticomyza Blanchard, 1938

3.13. Liriomyza brassicae (Riley, 1885)

Synonyms: *Liriomyza hawaiiensis* Frick, 1952
Liriomyza ornephila Garg, 1971
Oscinis brassicae Riley, 1885

Phytomyza mitis Curran, 1931
Material examined: 50 specimens, 10♀♀, 6 ♂♂in *Medicag sativa* L. (Fabaceae) on 10.v. 2020 from Basra; 6♀♀, 6 ♂♂ in *Pistum sativum* on 17.iii.2020 from Kerbala; 10♀♀, 10 ♂♂ in *Vigna mungo* (L.) Hepper (Fabaceae) on 20.iii.2020 from Baghdad; 1♀, 1 ♂ in *Dolichos sesuipedialis* on 4.iv.2020 from Baghdad.
Distribution: Iraq [25]; Ethiopian, Australian, Nearctic. Neotropical and Palaearctic regions [29]; Turkey [19].

3.14. *Liriomyza bryoniae* (Kaltenbach, 1858)

Synonyms: *Agromyza bryoniae* Kaltenbach, 1858
Liriomyza citrulli Rohdendorf, 1950
Liriomyza hydrocotylae Hering, 1930
Liriomyza mercurialis Hering, 1932
Liriomyza nipponallia Sasakawa, 1961
Liriomyza solani Hering, 1927
Liriomyza triton Frey, 1945
Common name: Tomato Leaf-miner
Material examined: 40 specimens, 5♀♀,5 ♂♂ in *Cucribta maxima* Duchsne (Cucurbitaceae) on 21.iii.2020 from Kerbala; 8♀♀,10 ♂♂ in *Cucumis melo* on 20.v.2020 from Baghdad; 6♀♀,6 ♂♂ in *Melilotis indica* on 20.iv.2020 from Baghdad.
Distribution: Iraq [21]; Oriental and Palearctic Regions [29]; Turkey [19]; Portugal [20].

3.15. *Liriomyza congesta* (Becker, 1903)

Synonyms: *Agromyza congesta* Becker, 1903
Liriomyza centaureana Hering, 1936
Liriomyza leguminosarum Meijere, 1924
Liriomyza minima Hendel, 1931
Liriomyza nigripleura Ryden, 1956
Liriomyza parva Hendel, 1931
Liriomyza taraia Garg, 1971
Common name: Broad bean, bean and pea leaf-miner
Material examined: 20 specimens, 6♀♀, 6 ♂♂ in *Brassica rapa* L. (Brassicaceae) on 20.ii.2020 from Baghdadsds; 4♀♀, 4 ♂♂ in *Melilotis indica* on 28.iv.2020 from Kerbela.
Distribution: Iraq [25]; Oriental and Palaearctic Regions [29]; Turkey [19]; Portugal [20].

3.16. *Liriomyza orbona* (Meigen, 1830)

Synonyms: *Agromyza fuscolimbata* Strobl, 1900
Agromyza orbona Meigen, 1830
Liriomyza fuscolimbata (Strobl, 1900)
Liriomyza orbonella Hendel, 1931
Material examined: previously recorded 1♀♂ from south of Mosul on 13.iii.1979 [15].
Distribution: Iraq [15]; Palaearctic Region [29]; Turkey [19]; Portugal [20].

3.17. *Liriomyza sativae* Blanchard, 1938

Synonyms: *Agromyza subpusilla* Frost, 1943
Lemurimyza lycopersicae Pla & de la Cruz, 1981
Liriomyza canomarginis Frick, 1952
Liriomyza guytona Freeman, 1958
Liriomyza minutiseta Frick, 1952
Liriomyza munda Frick, 1957
Liriomyza propepusilla Frost, 1954
Liriomyza properpusilla Frost, 1954
Liriomyza pullata Frick, 1952
Liriomyza verbenicola Hering, 1951
Common name: Vegetable leaf miner
Material examined: 30 specimens, 6♀♀, 6 ♂♂in *Melolitis indica* (L.) All. (Fabaceae) on 25.iv.2020 from Baghdad; 10♀♀, 8 ♂♂ in *Cucurbita moschata* Duchesne (Curcurbitaceae) on 20.x.2020 from Duhok, North of Iraq.
Distribution: Iraq [34]; Ethiopian, Australian, Nearctic. Neotropical and Palaearctic Regions [29]; Bangladesh [31].

3.18. *Liriomyza* strigata Meigen, 1830

3.18. *Liriomyza* strigata Meigen, 1830

Synonyms: *Agromyza galeopsios* Hardy, 1853
Agromyza pumila Meigen, 1830
Agromyza strigata Meigen, 1830
Agromyza violae Curtis, 1844
Liriomyza galeopsios (Hardy, 1853)
Liriomyza pumila (Meigen, 1830)
Liriomyza violae (Curtis, 1844)
Material examined: 20 specimens**,** 8♀♀, 8 ♂♂ in *Brassica rapa* L. (Brassicaceae) on 2.iv.2020 from Al-Nejef; 3♀♀,1 ♂ in *Pisum sativum* on 10.iv.2020.
Distribution: Iraq [21]; (Oriental and Palearctic Regions [29]; Turkey [19].

3.19. *Liriomyza trifolii* Burgess, 1880

Synonyms: *Agromyza phaseolunat*a Frost, 194
Agromyza phaseolunulata Frost, 1943
Liriomyza alliovora Frick, 1955
Liriomyza phaseolunulata (Frost, 1943)
Oscinis trifolii Burgess, 188
Common name: American serpentine Leaf-miner
Material examined: 10 specimens, (6♀♀, 4 ♂♂) in *Ricinus communis* L. (Euphorbiaceae) on 28.x.2020 from Baghdad.
Distribution: Iraq [35]; Ethiopian, Australian, Nearctic, Neotropical and Palaearctic Regions [29]; Turkey [33].

Genus, *Napomyza* Westwood, 1840
Synonyms: *Dinevra* Lioy, 1864
Napomyia Schiner, 1868

3.20. *Napomyza lateralis* (Fallen, 1823)

Synonym: *Phytomyza lateralis* Fallén, 1823
Common name: Calendula fly
Material examined: 2specimens, 1♀1 ♂ in Stachys sp. on 22.iii.2020 from Kirkuk.
Distribution: Iraq [15]; Nearctic and Palaearctic Regions [29]; Turkey [19]; Portugal [20].

Genus: *Phytomyza* Fallén, 1810
Synonyms: *Lonicera* Meijere, 1924
Phythomyza Rondani, 1874
Phytomyia Haliday, 1833

3.21. *Phytomyza ferulivora* Griffiths, 1956

Material examined: 10 specimens**,** (4♀♀, 6 ♂♂) in *Daucus carota* L. (Apiaceae) on 10.iii.2020 from Baghdad.
Distribution: Iraq [15]; Palaearctic Region [29].

3.22. *Phytomyza ranunculi* (Schrank, 1803)

Synonyms: *Musca ranunculi* Schrank, 1803
Phytomyza albipes Meigen, 1830
Phytomyza cinereovittata Zetterstedt, 1848
Phytomyza cinerovittata Zetterstedt, 1848
Phytomyza citrina Roser, 1840
Phytomyza flava Fallen, 1823
Phytomyza flaveola Fallen, 1810
Phytomyza flavoscutellata Fallen, 1823
Phytomyza flavoscutellata Meigen, 1830
Phytomyza flavotibialis Strobl, 1902
Phytomyza incisa Macquart, 1835

Phytomyza islandica Ryden, 1953
Phytomyza maculipes Brulle, 1833
Phytomyza maculipes Zetterstedt, 1848
Phytomyza pallida Meigen, 1830
Phytomyza pentalinearis Kuroda, 1954
Phytomyza praecox Meigen, 1830
Phytomyza ranunculi Kaltenbach, 1867
Phytomyza ranunculi Robineau-Desvoidy, 1851
Phytomyza scutellata Meigen, 1830
Phytomyza tenuipennis Singh & Ipe, 1973
Material examined: 4 specimens, (2♀♀,2 ♂♂) in *Anemon cornaria* L. (Ranunculaceae) on 30.v.2020 from Baghdad.
Distribution: Iraq [15]; Nearctic, Oriental and Palaearctic Regions [29]; Turkey [19]; Portugal [20].

3.23. *Phytomyza rufipes* Meigen, 1830

Synonyms: *Phytomyza bistrigata* Strobl, 1906
Phytomyza brassicae Hardy, 1853
Phytomyza femoralis Brischke, 1881
Phytomyza genislatissimus Strobl, 1893
Phytomyza ruficornis Zetterstedt, 1848
Phytomyza sulphuripes Meigen, 1830
Phytomyza suphuripes Meigen, 1830
Common name: Cabbage leaf- miner
Material examined: 15 specimens, (8♀♀, 7 ♂♂) in *Brassicae rapa* L. (Brassicaceae) on 28.ii.2020 from Basra.
Distribution: Iraq [15]; Nearctic, Neotropical and Palaearctic Regions [29]; Turkey [19]; Portugal [20].

3.24. *Phytomyza tetrasticha* Hendel, 1927

Material examined: 12specimens, (8♀♀, 4 ♂♂) in *Mentha longifolia* (L.) L. (Lamiaceae) on 20.iii.2020 from Baghdad.
Distribution: Iraq [15]; Palaearctic Region [29]; Turkey [19]; Portugal [20].
Family: Anthomyiidae
Genus, *Pegomya* Robineau-Desvoidy, 1830

Synonyms: *Pegomaya* Macquart, 1835
Patermia Albuquerque, 1954
Forai Robineau-Desvoidey, 1830
Forie Macquart, 1835

3.25. *Pegomya bicolor* Wiedemann, 1817

Synonyms: *Anthomyia mitis* Meigen, 1826
Anthomyia rumicis Bouché, 1834
Pegomya cinereorufa (Ringdahl, 1930)
Pegomya mitis (Meigen, 1826)
Pegomyia cinereorufa Ringdahl, 1930
Pegomyia sapporensis Kato, 1941
Zabia longipes Robineau-Desvoidy, 1830
Material examined: 4specimens, 2♀♀, ♂♂2 in *Rumex sanguineus* L. (Polygonaceae) on 25.iv.2020 from Baghdad.
Distribution: Iraq [36]; Japan[37]; Czech Republic[38]; India[39]; Finland[40]; Scotland[41]; Iran[42]; UK [43]; Palaearctic [44]; Korea[11].

3.26. *Pegomya cunicularia* (Rondani, 1886)

Synonyms: Chorthophila cunicularia Rondani, 1866
Chortophila cunicularia Rondani, 1866
Pegomya mixta Villeneuve, 1922
Pegomyia tristriata Stein, 1908
Material examined: 5specimens, 3♀♀, ♂♂2 in *Chenopodium murale* L. (Amaranthaceae) on 14.iv.2020 from Baghdad.
Distribution: Iraq [36]; Canary Island [45]; Spin [46]; Korea [11].

3.27. *Pegomya hyoscyami* (Panzer, 1809)

Synonyms: *Anthomyia hyoscyami* Panzer, 1809
Chortophila stlemba Giglio-Tos, 1893
Material examined: 4specimens, 2♀♀, ♂♂2 in *Chenopodium* sp. L. (Amaranthaceae) in ix.2020.from Baghdad.
Distribution: Iraq[47]; Cyprus, Jordan, Israel, Egypt, Turkey, Libya, Europe[48]; Finland[40] Scotland[41]; Turkey[49]; Iran[42]; Korea[11]; Russia[50].

3.28. *Pegomya terebrans*(Rondani, 1866)

Synonyms: *Pegomya sylvatica* (Rondani, 1866)
Chorthophila brasiliensis Rondani, 1866
Pegomya incisa Villeneuve, 1923
Pegomyia unicolor Strobl, 1909
Material examined: 4 specimens, 2♀♀, and ♂♂2 in *Carduus nutans* subsp. *Platypus* (Lang) **Greuter (Asteraceae)** on 18.1.2020 from Baghdad.
Distribution: Iraq [36]; Spin [46].

Family: Drosophylidae
Genus, *Scaptomyza* Hady, 1850

Synonyms: *Alloscaptomyza* Hackman, 1962
Boninoscaptomyza Okada, 1972
Bunostoma Malloch, 1932
Ctenoscaptomyza Frey, 1954
Dentiscaptomyza Hardy, 1965
Euscaptomyza Séguy, 1938
Exalloscaptomyza Hardy, 1965
Lauxanomyza Tsacas & Cogan, 1976
Macroscaptomyza Frey, 1954
Metascaptomyza Hackman, 1959
Rosenwaldia Malloch, 1934
Scaptomyzella Hendel, 1928
Scaptomyzetta Hendel, 1928
Tantalia Malloch, 1938
Tristanomyia Frey, 1954
Trogloscaptomyza Frey, 1954

3.29. *Scaptomyza flava* (Fallen, 1823)

Synonyms: *Drosophila flava* Fallén, 1823
Notiphila flaveola Meigen, 1830
Scaptomyza apiralis Duda, 1921
Scaptomyza flaveola (Meigen, 1830)
Material examined: 20 Specimens, 5♀♀, 5♂♂ in *Raphanus raphanistrum* subsp. *sativus* (L.) Domin (Brassicaceae) on 20.iii.2020 from Basra and 6♀♀, 4♂♂ on 30.iii.2020. From Baghdad.
Distribution: Iraq [51]; New Zealand [52]; Fennoscandia and Denmark [53]; UAE [54] Hawaii [55]; Malta [56]; Arizona [57]; UK [58].

Order: Lepidoptera
Family: Gelechiidae
Genus, *Tuta* Kieffer & Jörgensen, 1910

3.30. *Tuta bsoluta* (Meyrick, 1917)

Synonyms: Phthorimaea Absolute Meyrick, 1917
Gnorimoschema absoluta (Meyrick, 1917)
Common names: Tomato leafminer and tomato pinworm.

Materials examined: 55 Adult sprcimens in *Solanum lycopersicum* L. (Solanaceae) 10♀♀, 10♂♂ on 5.v.2020 from Baghdad; 8♀♀, 7♂♂in Plastic houses on 20.vi.2020 from Kut; 12♀♀, 8♂♂ on 10.vii.2020 from Kerbala.
Distribution: Iraq [59] Argentina, Brazil, Paraguay, Venezuela [60]; Spain [61]; European and North African [62].

Family, Gracillariidae
Genus, *Phyllocnistis* Zeller, 1848

3.31. Phyllocnistis citrella Stainton, 1856

Synonyms: *Phyllocnistis citricola* (Shiraki, 1913)
Phyllocnistis minutella van Deventer, 1904
Common name: Citrus Leaf Minor (CLM)
Material examined: Many leaves of mandarin orange *Citrus reticulata* Blanco (Rutaceae) were infested by CLM on 22.iii.2020 from Baghdad; and Citrus L. (Rutaceae) infested leaves collected on 10.ii.2020 from Kerbala.
Distribution: Iraq[63]; Egypt[64]; Morocco[65]; Syria[66]; Pakistan[67]; Turkey[68]; Greece[69]; Algeria[70].

4. Conclusion

The investigation showed the agromyzid flies the most important leaf miners attacked many various host plant types and caused damages The research noticed that the insects were found in the leaves of Fabaceae plants more than other Families.

Compliance with ethical standards

Acknowledgments

The authors are grateful to the farmers who help us when collecting the infesting leaves plants from their farms in different localities in Iraq.

Disclosure of conflict of interest

The authors have no conflicts of interest to declare.

References

[1] http: //www.ukflymines.co.uk/index.php available 8.12.2021.

[2] Spencer KA. Diptera: Agromyzidae. Handbooks for the identification of British insects, R. Entomol. Soc. London. 1972; 10(5): 136.

[3] Spencer KA. A synopsis of the Oriental Agromyzidae (Diptera). Trans. R. Entomol. Soc. Lond. 1961; 113(4): 55-100.

[4] Spencer KA. A synopsis of the Neotropical Agromyzidae (Diptera). Trans. R. Entomol. Soc. Lond. 1963; 115(12): 291-389.

[5] Hennig W. Die Familien der dipteral Scizophora und ihre phylogenetischen verwandschafstsbeziehug. Beiträge zur Entomologie. 1958; 8: 505-688.

[6] Spencer KA. Agromyzidae. *In* (McAlpine J. F. Ed.) Manual of Nearctic Diptera volume 5 Research. Branch Agriculture Canada, Monoghaph. 1987; 28. 675-1332.

[7] Oldroyd H. Diptera, Introduction and key to families. Handbk. Identif. Br. Insects, R.Entomol. Soc. Lond. 1970; 9(1): 104.

[8] Unwin DM. A key to the families of British Diptera. Field studies. 1981; 5: 513-553.

[9] Scudder G GE, Cannings R. A. The Diptera families of British Colombia. The Diptera families of British Colombia. 2006; 1-158.

[10] Suh SJ. Taxonomic investigation of the family Anthomyiidae from Korea. M.Agr. thesis, Kyungpook Nat. Univ. 1985; 39.

[11] Suh SJ. Anthomyiidae, Arthropoda: Insecta: Diptera: Muscoidea. Insect Fauna of Korea. 2019; 5(4): 1-227.

[12] Brake I. Bachli GE. World Catalogue of Insect: Drosophilidae (Diptera). Stenstrup, Denmark. 2008; 9: 412.

[13] Bock IR. Drosophilidae of Australia. II. *Scaptomyza* (Insecta: Diptera). Aust. J. Zool. 1977; 25: 337-345.

[14] Muszinski T, Lavendowski IM, Maschio LMA. 'Constatação de *Scrobipalpula absoluta* (Meyrick) (Lepidoptera: Gelechiidae), como praga do tomateiro (*Lycopersicon esculentum* Mill.), no litoral do Paraná', *An. Soc. Entomol. Brasil*. 11: 291-292.

[15] Spencer KA. Agromyzidae (Diptera) in Iraq. *Entomologist's Gazentte*. 1981; 32: 177-180.

[16] Spencer KA. The Agromyzidae (Diptera) of Fennoscandia and Denmark. Fauna entomologica scandinaviaca. 1976; 5(1): 1-304; 5(2): 305-606.

[17] Spencer KA. Host specialization in the world Agromyzidae (Diptera). Series Entomologica, Kluwer Academic Publishers, Dordrecht. 1990; 45: 444.

[18] Scheirs J, Bruyn L De, Verdyck P. Leafminers (Diptera; Agromyzidae) of the Belgian fauna. Bulletin et Annales de la Société royale belge d'Entomologie. 1993; 129: 113-119.

[19] Cİvelek HS, Cikman E, Dursun O. Revised checklist of Turkish Agromyzidae (Diptera) fauna of Turkey. *Turkish Journal of Zoology*. 2009; 33: 349-358.

[20] Černý M, Andrade R, Gonçalves A R, von Tschirnhaus M. New records of Agromyzidae (Diptera) from Portugal, with an updated checklist. Acta Musei Silesiae, Scientiae Naturales. 2018; 67: 7-57.

[21] Al Ali AS. Phytophagous and entomophagous insects and mites of Iraq. Nat. Hist Res. Center, 1977; 33: 142.

[22] Černý M, Merz B. 2006. New records of Agromyzidae (Diptera) from Palaearctic Region. Mitteilungen der schweizerischen entomologischen Gesellschaft. 2006; 79: 77-106.

[23] Černý MNew faunistic data on the Agromyzidae (Diptera) from the West Palaearctic Region. Klapalekiana. 2009; 45: 9-21.

[24] Černý M, von Tschirnhaus M, Winqvist K. First records of Palaearctic Agromyzidae (Diptera) from 40 countries and major islands. Acta Musei Silesiae, Scientiae Naturales. 2020; 69: 193-229.

[25] Al- Azawi AF Agromyzid Leaf miners and their parasitites in Iraq. *Bull. Entomol. Res.* 1967; 57(2): 285-287.

[26] Bei-Bienko GY, Steyskal GC. Keys to the Insects of the European Part of the USSR, Diptera and Siphonaptera, Amerind Publishing Co., New Delhi. 1988; 5(11).

[27] GBIF Secretariat. GBIF Backbone Taxonomy. Checklist dataset https: //doi.org/10.15468/39omei accessed via GBIF.org on. 2021-11-15.

[28] Benavent- Corai, J, Martinez M, Jimenez Peydro R. Catalogue of the host –plants of the world Agromyzidae(Diptera), Part 1: List of Agromyzidae species and their hosts-plants, Part2: List of hosts-plants and Agromyzidae associated. *Bollettino Di Zoologia Di Bachicoltura,* Ser. II, 2005; 37: 1-50.

[29] Benavent- Corai J, Martinez M, Jimenez Peydro R. Catalogue of the host –plants of the world Agromyzidae(Diptera), Part 1: List of Agromyzidae species and their hosts-plants, Part2: List of hosts-plants and Agromyzidae associated. *Bollettino Di Zoologia Di Bachicoltura.* 2005; Ser. II, 37: 1-50.

[30] GBIF Secretariat. GBIF Backbone Taxonomy. Checklist dataset https: //doi.org/10.15468/39omei accessed via GBIF.org on. 2021-11-17.

[31] Mazumdar S, Bhuiya BA. Vegetable leafminers (Diptera: Agromyzidae) and their plant hosts in Bangladesh. Journa of Threatened Taxa. 2014; 6(6): 5894-5899.

[32] Radjabi Gh, Hosseyni SM, Mansoor-Ghaazi M. Diptera species occurring in wheat and barley in Iran. Applied Entomology and Phytopathology. 1997; 64(1, 2): 60-71.

[33] Bayhan SÖ, Kaplan M, Bayhan E. Agromyzid (Diptera) species and their parasitoids in Batman Province, Turkey. Middle East Journal of Sciense. 2017; 3(2): 98-106.

[34] Abdul Rassoul MS, Al–Saffar HH. Survey of the genus *Liriomyza* Mik. (Diptera: Agromyzidae) of Iraq. Advances in Bioresearch. 2013; 4(3): 92-94.

[35] Al-Jorany RS, Flaih SK, Alhamawandy Sh A, Al-Saffar HH. New record of *Liriomyza trifolii* (Burgess, 1880) (Diptera; Agromyzidae) in Baghdad, Iraq. Int. j. Curr. Microbiol. Sci. 2016; 5(5): 205-211.

[36] Mekhlif AF. Records of some leaf miner of Anthomyiidae, (Diptera) and their host plants in Iraq. Bulletin of Iraq Natural History Museum. 1999; 1(9): 117-121.

[37] Suwa M. Anthomyiidae of Japan (Diptera). Insecta Matsumurana New Series. 1974; 4: 247.

[38] Komzáková1 O, Barták M, Bartáková D, Kubík Š. Community structure of Anthomyiidae (Diptera) of six peat-bogs in the Šumava Mts (Czech Republic). *Biologia.* 2011; 66/3: 518—527, Section Zoology.

[39] Suwa M. Some Anthomyiidae from India (Diptera). Insecta Matsumurana. 1981; 22: 15-28.

[40] Fischer M, Koponen M. A survey of Opiinae (Hymenoptera, Braconidae) of Finland, part 2. - Entomol. Fennica. 1999; 10: 129-160.

[41] Skidmore P. A review of the Diptera of the Western Isles of Scotland. *Dipterists Digest.* 2008; 15(2): 99-194.

[42] Gadallah NS, Ghahari H, Peris-Felipo FJ, Fischerm M. Updated checklist of Iranian Opiinae (Hymenoptera: Braconidae). Zootaxa. 2016; 4066(1): 001–040.

[43] Telfer MG. Invertebrate survey of Tilbury2. Report to Bioscan (UK). 2017; 142.

[44] Tschorsnig, H-P. Preliminary host catalogue of Palaearctic Tachinidae (Diptera). 2017.

[45] First version, provided online on http: //www.nadsdiptera.org/Tach/WorldTachs/CatPalHosts/Home.html.

[46] Michelsen. **V,** Briez M. The Anthomyiidae (Diptera) of the Canary Island. Ent. Scan. 1985; 16: 777-304.

[47] Suwa M, Blasco-Zumeta J. Some Anthomyiid flies from Monegros, Spain (Diptera: Anthomyiidae). Insecta Matsumurana. 2003; 60: 43-54.

[48] Hussain AA. Provisional list of Insect pests and Bibliography of Insect fauna of Iraq. Bulletin of the College of Science Baghdad. 1963; 7: 43 – 83.

[49] Gentry JW. Crop Insects of Northeast Africa-Southwest Asia. Agriculture Handbook. 1965; 273: 214.

[50] Beyarslan A. A faunal study of the subfamily Doryctinae in Turkey (Hymenoptera: Braconidae). Turkish Journal of Zoology. 2015; 39: 126-143**.**

[51] Belokobylskij SA, Lelej AS. Annotated catalogue of the Hymenoptera of Russia. Volume II, Apocrita: Parasitica, Supplement № 8, 596 Proceedings of the Zoological Institute of the Russian Academy of Sciences. 2019.

[52] Mehdi HA, Najim ShA, Aufi BG. Chemical and biological control of radish leave miner insect *Scaptomyza flava* Fallen (Diptera: Drosophilidae) under the Conditions of Basrah Province. Syrian Journal of Agricultural Research – SJAR. 2019; 6(4): 549-556.

[53] Seraj AA. Biology and host plant relationships of *Scaptomyza flava* leaf miner. A thesis of degree Doctor of Philosophy in Entomology, Plant Science Department, Massey University, Palmerstone North New Zealand. 1995.

[54] Bachli G, Vilela CR, Escher SA, Saura A. The Drosophilidae (Diptera) of Fennoscandia and Denmark. Fauna Entomologica Scandinavica. 2004; 39: 1-187.

[55] Sidorenko VS, Nakonechnaya OV. Order Diptera, Family Drosophilidae. Arthropod Fauna of the UAE. 2010; 3: 661-672.

[56] Lapoint, RT, O'Grady PM, Whiteman NK. Diversification and dispersal of the Hawaiian Drosophilidae: the evolution of *Scaptomyza*. Molecular phylogenetics and evolution. 2013; 69(1): 95- 108.

[57] Ebejer MJ**.** A short note on additional records of fruitfly (Diptera, Drosophilidae) from Malta. Bulletin of Entomological Society of Malta. 2015; 7: 143.

[58] Goldman-Huertasa B, Robert RF, Lapointa RT, Faucherb CP, Hildebrandb JG, Whitemana NK. Evolution of herbivory in Drosophilidae linked to loss of behaviors, antennal responses, odorant receptors, and ancestral diet. Pans. 2015; 112 (10): 3026-3031.

[59] Hackett T, Sauve AMC, Davies NE, Montoya D, Tylianakis J, Memmott J. Reshaping our understanding of species'roles in landscape-scale networks. *Ecology Letters.* 2019.

[60] Abdul Razzak AS, Al-Yasiri I I, Fadhil HQ. First record of tomato borer (tomato moth) *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) on tomato crop in Iraq. Arab and Near East Plant Protection Newsletter. 2010; 51: 31.

[61] Urbaneja A, Vercher R, Navarro V, Garcı´a Marı´ F, Porcuna JL. La polilladeltomate, *Tuta absoluta*. Phytoma Espana. 2007; 194: 16–23.

[62] Desneux N, Wajnberg E, Wyckhuys KAG, Burgio G, Arpaia SCA, , Narva´ezVasquez S C A, lez-Cabrera J G, Ruescas D C, Tabone E, Frandon J, Pizzol, J, Poncet C, Cabello T, Urbaneja A. Biological invasion of European tomato crops by *Tuta absoluta*: ecology, geographic expansion and prospects for biological control. Journal Pest Science. 2010; 83: 197–215.

[63] Gentry JW. Crop Insects of Northeast Africa- Southwest Asia. Agricultural Research Service, United States Department of Agriculture, Agriculture Handbook 1965; 273, Washington, 210.

[64] Abd El-Aziz SE. Biological studies of citrus leaf miner, *Phyllocnistis citrella* (Staint.) in Egy Bulletin of Entomological Society of Egypt. 1995; 73: 97-105.

[65] Boughdad A, Bouazzaoui Y, Abdelkhalek L. Pest status and biology of citrus leaf miner, *Phyllocnistis citrella* in Morocco. Proceedings of 5th International Conference on Pest in Agriculture. 1999; 2: 251-259.

[66] Abo-Kaf M, Aslan A, Ahmed I. Morphology and biology of citrus leaf miner *Phyllocnistis citrella* (Lepidoptera: Gracillaridae) in Syria. Arab Journal of Plant Protection. 2006; 24(1): 45-48.

[67] Mustafa I, Raza AM, Aqeel MA, Ahmed H, RiazKhan M, Ahmed I, Arshad M. Correlation of Citrus Leaf Miner (*Phyllocnistis citrella* Stainton) with Snail Population in District Sargodha, Punjab, Pakistan. Pakistan Journal of Zoology. 2013; 45(2): 453-458.

[68] Elekcioğlu NZ, Uygun N. Population Fluctuation of Citrus Leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) and its Parasitoids in the Eastern Mediterranean Region of Turkey. Pakistan J. Zool. 2013; 45(5): 1393-1403.

[69] Tsagkarakis AH, Kalaitzaki AP, Lykouressis DP. *Phyllocnistis citrella* and its parasitoids in three citrus species in Greece. Phytoparasitica. 2013; 41: 23-29.

[70] Dahmane M, Chakali G. Distribution pattern of developmental stages of *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) on the surface of citrus leaves. Polish Journal of Entomology. 2020; 89(1): 1–6.