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Parasitoids of the leafminers (Diptera: Agromyzidae) from Adıyaman province

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Summary

This study was carried out in order to determine parasitoid species attacking leafminers in the family Agromyzidae (Diptera) in Adıyaman province during 2004-2005. Infested leaves with leafminer larvae were collected from both cultivated and non-cultivated plants twice a month. Adults parasitoids were obtained by rearing them from infested leaves in the laboratory. Three parasitoid species belonging to the Braconidae (Hymenoptera) were found: ***Opius basalis*** Fischer, 1958, ***O. exiguus*** Wesmael, 1835, ***O. monilicornis*** Fischer, 1962. Eight parasitoid species belonging to the Eulophidae (Hymenoptera) were found: ***Chrysocharis pentheus*** (Walker, 1839), ***Chrysocharis pubicornis*** (Zetterstedth, 1838), ***Cirrospilus vittatus*** Walker, 1838, ***Diglyphus isaea*** (Walker, 1838), ***D. pachyneurus*** (Graham, 1963), Hemiptarsenus zilahisebessi Erdös, 1951, ***Pediobius metallicus*** (Nees,1834), Ratzeburgiola incompleta Boucek, 1971. Two parasitoid species belonging to the Pteromalidae (Hymenoptera) were found: ***Halticoptera circulus*** (Walker, 1833), ***Thinodytes cyzicus*** (Walker, 1839). Among the parasioids reared, ***H. circulus*** and ***T. cyzicus*** were recorded for the first time from Agromyzidae in Turkey. In this study, ***D. isaea*** was the most predominant parasitoid species found, accounting for 56.18 % of parasitism.

Key words: Parasitoid, leafminer, Adıyaman, Turkey
Anahtar sözcükler: Parazitoit, galerisineği, Adıyaman, Türkiye

Introduction

The Southeastern Anatolia Project (GAP) is a large developmental project of Turkey. The GAP Region has 3.1 million hectares of cultivated land and 1.7 million hectares of this land will be brought under an irrigation scheme combining the state

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and private irrigation. Upon the introduction of irrigation, the agricultural component of the GAP region will become a changing process.

Irrigating agricultural systems and polycultural cropping has already dominated since 1995 in some provinces of the GAP Region (Karlı, 1999). This change of agricultural constitution of the GAP Region has caused some problems. Among these problems, increase of agricultural pests can be one of the most important plant protection problems in near future. Among these pests, leafminers (Diptera: Agromyzidae) feed on cultivated and non-cultivated plants. Both larvae and adults cause damage. Larvae primarily mine the palisade mesophyll, which contains chloroplasts, thereby disrupting photosynthesis (Parella et al., 1985). Adults females puncture the upper and lower leaf epidermis with their ovipositor to feed and lay eggs (Spencer, 1990). This behavior result in cosmetic damage to crops and also facilitates the spreading of various plant diseases (Miranda et al., 1998). Damage caused by leafminers is therefore both direct and indirect.

A number of parasitoids of leafminers have been recorded throughout the world (Neder de Roman & Arch de Hamity, 1985; Schuster, 1993; Shepard et al., 1998; Heimpel & Meloche, 2001). Most of the parasitoid species belong to three families of Hymenoptera: Braconidae, Eulophidae and Pteromalidae. The species of the Braconidae are endo and ectoparasitoids on the egg and larval hosts, whereas those of Eulophidae are solitary or gregarious ectoparasitoids or endoparasitoids on larval and pupal hosts. Growers in Turkey frequently apply large quantities of insecticide, especially in greenhouse environments. Insecticides have a negative impact on the beneficial fauna (Weintraub & Horowitz, 1998). To control the leaf-mining flies by non-chemical means, it is first necessary to identify the key parasitoids species. 45 parasitoid species of leafminers have been identified in Turkey until this study (Çıkman & Uygun, 2003; Civelek & La Salle, 2005; Gençer, 2005; Çıkman et al., 2006). The goal of this study is to contribute to the naturally occurring parasitoids of leafminers in Southeast Turkey. Also this study will provide a base for future research regarding the biological control of leafminer species.

Materials and Methods

This study was carried out during 2004 and 2005 in Adıyaman province, which was divided into four subareas for convenience of the collection of the specimens. The leafminer species were collected from both cultivated and non-cultivated plants of different areas twice in a month.

The sample of leaves infested with leafminers were randomly collected from the first week of spring until the end of the autumn. Leafminer-infested leaves were taken to the laboratory at 25 ± 2 ºC, 70 ± 5 % RH, photoperiod 14:10 (L:D) h for the emergence of pests and parasitoids. A small piece of leaf containing the larvae was cut and placed in a small glass vial and then closed with a cotton ball covered

with muslin. They were checked for the emergence of leafminers and parasitoids and relevant notes were recorded. After the completion of emergence, all reared pest and parasitoid specimens were identified.

The emerged Braconidae were identified by Prof. Dr. Ahmet Beyarslan (Trakya University, Art and Science Faculty, Biology Department, Edirne), Eulophidae were identified by Prof. Dr. Miktat Doğanlar (Mustafa Kemal University, Agricultural Faculty, Plant Protection Department, Hatay) and Dr. John La Salle (CSIRO Entomology, Australia). The species of Agromyzidae were identified by author and Mitsuhiro Sasakawa (7-6-7 Korigaoka, Hirakata City, Osaka Pref. 573-0084 Japan). Representative species were deposited in the laboratory of Harran University, Agricultural Faculty, Plant Protection Department, Şanlıurfa, Turkey.

Results

In this study 13 parasitoid species were identified. Among these species ***Halticoptera circulus*** (Walker) and ***Thinodytes cyzicus*** (Walker) (Hymenoptera: Pteromalidae) were recorded for the first time from Agromyzidae in Turkey.

Diglyphus isaea (Walker) (Hymenoptera: Pteromalidae) was recorded as the most common parasitoids. Thus, this species was considered to be the most important natural enemies of the Agromyzidae in Adıyaman province. The ecological and distribution information of these thirteen species are provided below. The taxa are presented alphabetically.

Braconidae

Opius Wesmael

Opius basalis Fischer, 1958

Material examined: ***O. basalis*** was found in Gölbaşı (Tecirli) on ***Liriomyza trifolii*** (Burgess) and ***Citrullus vulgaris*** L. on 20.IX.2004 (4♀♀, 5♂♂).

Hosts: Unknown.

This species has previously been recorded from ***Agromyza albitarsis*** Meigen and ***L. trifolii*** from Turkey (Çıkman et al., 2006).

General distribution: Former Czech Republic, Hungary (Fischer, 1972).

Distribution in Turkey: Diyarbakır, Mardin (Çıkman et al., 2006).

Opius exiguus Wesmael, 1835

Material examined: ***O. exiguus*** was found in Gölbaşı (Küçük Cerit) on ***Chromatomyia horticola*** (Goureou) and ***Sinapis arvensis*** L. on 10.V.2005 (3♀♀, 3♂♂); Kahta (Oluklu) on ***Phytomyza orobanchia*** Kaltenbach and ***Orobanche*** spp. on 02.VI.2004 (2♀♀, 3♂♂).

Hosts: ***Liriomyza*** (***Calycomyza***) ***solidaginis*** Kaltenbach, ***L. centaureae*** Hering, ***L. strigata*** (Meigen), ***Phytomyza alpina*** Goureau, ***P. atricornis*** Meigen, ***P. crassiseta*** Zetterstedt, ***P. gentianae*** Hendel, ***P. griffithsi*** Spencer, ***P. matricoriae*** Hendel, ***P. plantaginis*** Robineau-Desvoidy, ***P. scabiosae*** Hendel, ***P. succisae*** Hering (Fischer, 1980).

This species has previously been recorded from ***C. horticola***, ***L. trifolii*** and ***P. orobanchia*** from Turkey (Çıkman & Uygun, 2003; Çıkman et al., 2006).

General distribution: Caucasus, North, West and Central Europe, Greece, Israel, Italy, Kazakhstan, Mongolia, North Korea, Russia, Turkey, Egypt, Ethiopia, Northern Africa (Tobias, 1986a; Fischer, 1990).

Distribution in Turkey: Diyarbakır, Mardin, Şanlıurfa (Çıkman & Uygun, 2003; Çıkman et al., 2006).

Opius monilicornis, Fischer, 1962

Material examined: ***O. monilicornis*** was found in Adıyaman-center (Yazlıca) on ***Liriomyza cicerina*** (Rondani) and ***Cicer arietinum*** L. on 06.V.2005 (2♀♀, 2♂♂); Besni (Balk) on ***L. cicerina*** and ***C. arietinum*** on 10.IV.2004, (2♀♀, 2♂♂); Gölbaşı (Tecirli) on ***L. cicerina*** and ***C. arietinum*** on 10.IV.2005 (2♀♀; 1♂); Kahta (Erikdere) on ***L. cicerina*** and ***C. arietinum*** on 26.V.2005 (2♀♀, 4♂♂).

Host: ***L. cicerina*** (Hıncal et al., 1996; Öde & Heinz, 2002; Çıkman et al., 2006).

This parasitoid species has previously been reported from ***L. cicerina*** in Turkey (Hıncal et al., 1996; Çıkman et al., 2006).

General distribution: Jordan, Moldovia, Northern Africa, Turkey (Fischer, 1972; Tobias, 1986 b).

Distribution in Turkey: Aegean Region (Hıncal et al., 1996), Southeast Turkey (Çıkman et al., 2006).

Eulophidae

Chrysocharis Förster

Chrysocharis pentheus (Walker, 1839)

Material examined: ***C. pentheus*** was found in Besni (Sofraz) on ***C. horticola*** and ***Vaccaria pyramidata*** Medik. on 06.V.2004 (3♀♀, 2♂♂).

Hosts: It is a parasite mainly of Agromyzidae and ***Stigmella*** (Lepidoptera: Nepticulidae), but also attacks various other Lepidoptera and Coleoptera (Boucek & Askew, 1968; Hansson, 1985).

This parasitoid species has previously been recorded from ***L. trifolii*** in Turkey (Civelek & La Salle, 2005).

General distribution: ***C. pentheus*** is widespread in the Palaearctic Region, and is also known from the Nearctic Region (Boucek & Askew, 1968; Hansson, 1985).

Distribution in Turkey: Aegean Region (Civelek & La Salle, 2005).

Chrysocharis pubicornis (Zetterstedth, 1838)

Material examined: ***C. pubicornis*** was found in Kahta (Narince) on ***C. horticola*** and ***Calendula*** sp. on 30.IV.2004 (4♀♀, 3♂♂).

Hosts: It is a parasite mainly of Agromyzidae but also attacks various the other families of Diptera and Lepidoptera (Noyes, 2005).

General distribution: ***C. pubicornis*** is widespread in the Palearctic Region, and is also known from the Nearctic Region, Australia, New Zealand, India and Pakistan (Boucek & Askew, 1968; Hansson, 1985).

Distribution in Turkey: Mediterranean Region (Uygun *et* al., 1995).

Cirrospilus Westwood

Cirrospilus vittatus Walker,1838

Material examined: ***C. vittatus*** was found in Besni (Sarıyaprak) on ***L. trifolii*** and ***Solanum melongena*** L. on 18.X.2005, 14.V.2004 (5♀♀, 5♂♂).

Hosts: ***Liriomyza*** spp. (Cabello *et* al., 1994).

This parasitoid species has previously been recorded from ***C. horticola*** and ***A. albitarsis*** in Turkey (Çıkman & Uygun, 2003; Çıkman *et* al., 2006).

General distribution: Cosmopolitan species. Europe, Asia, North Africa, Canada, U.S.A. (Hansson, 1985).

Distribution in Turkey: Southeast Anatolian Regions of Turkey (Çıkman & Uygun, 2003; Çıkman *et* al., 2006).

Diglyphus Walker

Diglyphus isaea (Walker, 1838)

Material examined: ***D. isaea*** was found in Adıyaman-center (Hacihalil) on ***C. horticola*** and ***Lactuca sativa*** L. on 24.IV.2004 (4♀♀, 2♂♂); Besni (Başlı) on ***L. trifolii*** and ***Lens culinaris*** Med. on 05.V.2004 (17♀♀,12♂♂); Besni (Şambayat) on ***C. horticola*** and ***Zinnia*** spp., on 06.V.2004 (13♀♀, 9♂♂); Besni (Toklu) on ***C. horticola*** and ***Medicago sativa*** L. on 28.IV.2005 (15♀♀, 17♂♂); Çelikhan (Mutlu) on ***Liriomyza strigata*** and ***Heliotropium eurapaeum*** L. on 27.IX.2005 (2♀♀,1♂); Gölbaşı (Akpınar) on ***L. strigata*** and ***Cucurbita*** sp., on

20.IX.2004 (1♀, 1♂); Gölbaşı (Yukarı Çöplü) on ***L. trifolii*** and ***S. melongena*** on 20.IX.2004 (6♀♀,7♂♂); Kahta (Hasancık) on ***C. horticola*** on ***Sonchus*** sp., on 24.X.2005 (5♀♀, 7♂♂), (Gürgen) on ***L. trifolii*** and ***Centaurea*** sp. on 12.V.2005 (4♀♀, 4♂♂); Samsat (Çaybaşı) on ***L. trifolii*** and ***Cucurbita*** sp. on 27.V.2004 (10♀♀, 13♂♂).

Hosts: Many species of Agromyzidae and also Lyonetiidae and Tephritidae (Lepidoptera) (Ciampolini, 1952; Gordh & Hendrickson, 1979; Minkenberg & van Lenteren, 1986; Zhu *et* al., 2000).

This species has previously been recorded from ***A. albitarsis***, ***C. horticola***, ***Liriomyza congesta*** (Becker), ***Liriomyza huidobrensis*** (Blanchard), ***L. strigata, L. trifolii***, ***Phytomyza petoei*** Hering, ***Phytomyza tetrasticha*** Hendel, in Turkey (Uygun *et* al., 1995; Civelek & Önder, 1999; Çıkman & Uygun, 2003; Çıkman *et* al., 2006).

General distribution: Widespread in Palearctic Regions, and also Afrotropical, Australian, Pacific, Nearctic, and Oriental Regions (Boucek, 1965).

Distribution in Turkey: Adana, Ankara, Izmir, Sivas, Southeast Anatolian (Uygun *et* al., 1995; Civelek & Önder, 1999; Çıkman & Uygun, 2003; Gençer, 2004, 2005, Çıkman *et* al., 2006).

Diglyphus pachyneurus (Graham, 1963)

Material examined: ***D. pachyneurus*** was found in Adıyaman-center (Bağpınar) on ***L. trifolii*** and ***Tagetes*** sp. on 18.X.2005 (1♀, 4♂♂).

Hosts: It has been from ***Agromyza salicifolii*** (Collin), although it may have a wider host range as most species of this genus attack a variety of leaf-mining Agromyzidae (Boucek & Askew, 1968).

This species has previously been reared from ***C. horticola*** (Gençer, 2005).

General distribution: ***D. pachyneurus*** is known from Europe (Britain, Sweden, Italy, Moldavia) (Boucek & Askew, 1968).

Distribution in Turkey: Erzurum (Doğanlar, 1985 b), Sivas (Gençer, 2005).

Hemiptarsenus Westwood

Hemiptarsenus zilahisebessi Erdös, 1951

Material examined: ***H. zilahisebessi*** was found in Çelikhan (Mutlu) on ***L. trifolii*** and ***Phaseolus vulgaris*** *L.* on 27.IX.2005 (1♀, 2♂♂); Samsat (Taşkuyu) on ***L. trifolii*** and ***P. vulgaris*** on 10.X.2005 (2♀♀, 3♂♂).

Hosts: ***Liriomyza*** spp. (Cabello *et* al., 1994).

This species has previously been reared from ***L. trifolii*** and ***Liriomyza bryoniae*** (Kaltenbach) (Yaşarakıncı & Hıncal, 1997; Çıkman *et* al., 2006).

General distribution: Widespread and common in Palearctic Region (Yefremova, 2002).

Distribution in Turkey: Izmir, Diyarbakır (Yaşarakıncı & Hıncal., 1997; Çıkman *et* al., 2006).

Pediobius Walker

Pediobius metallicus (Nees, 1834)

Material examined: ***P. metallicus*** was found in Besni (Sofraz) on ***C. horticola*** and ***V. pyramidata*** on 06.V.2004 (3♀♀, 2♂♂); Gölbaşı (District Agriculture Office) on ***Calycomyza humeralis*** (von Roser) and ***Cannabis*** sp. on 10.V.2004 (1♀, 1♂); Gölbaşı (State Hospital) on ***L. trifolii*** and ***Solanum nigrum*** L. on 10.IV.2004 (2♀♀, 2♂♂).

Hosts: Primary sometimes secondary, solitary endoparasites of larvae and pupae of mining forms of Lepidoptera and Diptera particularly agromyzid genera including ***Phytomyza***, ***Liriomyza*** and ***Chromatomyia*** (Boucek, 1965; Boucek & Askew, 1968).

This species has previously been reported from ***C. horticola***, ***L. strigata***, ***L. cicerina***, ***L. trifolii*** (Doğanlar, 1985 a; Uygun *et* al., 1995; Civelek & Önder, 1999; Civelek, 2002; Çıkman & Uygun, 2003; Gençer, 2005; Çıkman *et* al., 2006).

General distribution: Europe, Asia, North America (Noyes, 2005).

Distribution in Turkey: Adana, Ankara Mardin, Izmir, and Şanlıurfa (Doğanlar, 1985a; Uygun *et* al., 1995; Civelek & Önder, 1999; Çıkman & Uygun, 2003; Gençer, 2005; Çıkman *et* al., 2006).

Ratzeburgiola Erdös

Ratzeburgiola incompleta Boucek, 1971

Material examined: ***R. incompleta*** was found in Besni (Köseceli) on ***C. horticola*** and ***Cardaria draba*** L. on 06.V.2004 (3♀♀, 2♂♂).

Hosts: Lepidoptera and Diptera. Particularly agromyzids ***Agromyza hiemalis*** Becker, ***C. horticola***, ***Liriomyza*** sp. and ***L. huidobrensis*** (Noyes, 2005).

This species has previously been reported from ***Liriomyza pascuum*** Meigen (Civelek, 2004)

General distribution: Azerbaijan, Bulgaria, Czechoslovakia, Israel, Italy, Sicily, Jordan, Moldova, Slovokia, Syria, Turkey (Noyes, 2005).

Distribution in Turkey: Mediterranean Region (Uygun *et* al., 1997)

Pteromalidae

Halticoptera Spinola

Halticoptera circulus (Walker, 1833)

Material examined: ***H. circulus*** was found in Adıyaman-center (Çençen) on ***Japanagromyza salicifolii*** (Collin) and ***Salix*** sp. on 06.V.2004, (4♀♀, 4♂♂); Besni (Sofraz), on ***J. salicifolii*** and ***Populus*** sp., on 05.V.2004, (3♀♀, 2♂♂); Gölbaşı (Tecirli), on ***J. salicifolii*** and ***Salix*** sp. on 10.V.2005, (4♀♀, 3♂♂); Kahta (Narince), on ***J. salicifolii*** and ***Populus*** sp. on 15.V.2005, (2♀♀; 2♂♂).

Hosts: ***H. circulus*** is species in several genera of Agromyzidae (Peck, 1963; Burks, 1979; Noyes, 2005)

H. circulus is a new record from Agromyzidae in Turkey.

General distribution: Wide distribution throughout United States and Southern Canada; also Mexico and Europe (Peck, 1963; Burks, 1979).

Distribution in Turkey: Erzurum (Doğanlar, 1985 a).

Thinodytes Graham

Thinodytes cyzicus (Walker, 1839)

Material examined: ***T. cyzicus*** was found in Kahta (Narince) on ***C. horticola*** and ***Calendula*** sp. on 30. IV. 2004 (2♀♀, 3♂♂).

Hosts: ***C. horticola***, ***L. huidobrensis*** and ***P. atricornis*** (Noyes, 2005).

T. cyzicus is a new record from Agromyzidae in Turkey.

General distribution: Wide distribution throughout Europe, China, India, (Noyes, 2005).

Distribution in Turkey: Erzurum (Doğanlar, 1985 a)

Conclusion

Thirteen parasitoid species were obtained from infested leaves in the laboratory. The identified parasitoid species their percentages and agromyzid species are given Table 1.

In this study, the percentage of parasitism ***O. basalis***, ***O. exiguus,*** ***O. monilicornis***, ***C. pentheus***, ***C. pubicornis***, ***C. vittatus***, ***D. pachyneurus***, ***H. zilahisebessi***, ***P. metallicus***, ***R. incomplete***, ***H. circulus***, ***T. cyzicus*** was generally low. However, several species of ***Chrysocharis*** and ***Hemiptarsenus*** have been reported as important agromyzid parasitoids and the percentage of these parasitoids belonging to ***Chrysocharis*** and ***Hemiptarsenus*** have been reported to be up to 60 % in some regions (Civelek & Önder, 1999; Murphy and La Salle, 1999; Sivapragsam et al., 1999; Uygun et al., 1995).

In particular, ***Hemiptarsenus varicornis*** (Girault) is an important parasitoid of leafminer species in South East Asia (Murphy & LaSalle, 1999; Sivapragsam et al., 1999).

Table 1. Parasitoid species, their host, and percentage of emergence from host species

Family	Parasitoid species	Number of parasitoid species	Percentage of parasitoids (%)	Agromyzidae species (Host)
Braconidae	***Opius basalis*** Fischer	9	3.37	***Liriomyza trifolii*** (Burgess)
	O. exiguus Wesmael	11	4.11	***Chromatomyia horticola*** Goureau
				Phytomyza orobanchia Kaltenbach
	O. monilicornis Fischer	17	6.37	***L. cicerina*** (Rondani)
Eulophidae	***Chrysocharis pentheus*** (Walker)	5	1.87	***C. horticola*** (Walker)
	C. pubicornis (Zetterstedth)	7	2.62	***C. horticola***
	Cirrospilus vittatus Walker	10	3.75	***L. trifolii***
	Diglyphus isaea (Walker)	150	56.18	***C. horticola***,
				L. strigata (Meigen),
				L. trifolii
	D. pachyneurus (Graham)	5	1.87	***L. trifolii***
	Hemiptarsenus zilahisebessi Erdös	8	2.99	***L. trifolii***
	Pediobius metallicus (Nees)	11	4.11	***Calycomyza humeralis*** (von Roser),
				C. horticola and ***L. trifolii***
	Ratzeburgiola incompleta Boucek	5	1.87	***C. horticola***
Pteromalidae	***Halticoptera circulus*** (Walker)	24	8.98	***Japanagromyza salicifolii*** (Collin)
	Thinodytes cyzicus (Walker)	5	1.87	***C. horticola***

D. isaea, was found to be the most common species with percentage of parasitism 56.18 % and this finding agrees with reports by Uygun et al. (1995), Çıkman & Uygun (2003) and Çıkman et al. (2006) in the East Mediterranean and the South East of Turkey.

D. isaea, is considered to be an important parasitoid of agromyzid flies. A rate of emergence higher than 10 % among all parasitoids is reported to be significant, and such parasitoids are to be considered as potential biological control agents (Murphy & La Salle, 1999). The relatively higher parasitism level may suggest that parasitoids could be an important mortality factor in the population dynamics of leafminers populations. However, in addition to high parasitoid levels, several important factors have to be taken into account in order to increase success rates in biological control programs. These factors include distribution, climate and host specifity. More detailed studies considering these factors are required in order to explore the potential use of agromyzid parasitoids for biological control program.

Özet

Adıyaman ilinde galerisinekleri (Diptera: Agromyzidae)'nde saptanan parazitoid türler

Bu çalışma Agromyzidae (Diptera) familyası türlerinin parazitoitlerinin saptanması amacıyla 2004-2005 yıllarında Adıyaman ilinde gerçekleştirilmiştir. Galerisineği larvalarıyla bulaşık yapraklar kültürü yapılan ve yapılmayan bitkilerden ayda 2 kez toplanmıştır. Ergin parazitoitler laboratuvarda bulaşık yapraklardan yetiştirilmek suretiyle elde edilmiştir. Braconidae (Hymenoptera) familyasına bağlı 3 tür bulunmuştur. Bu türler; ***Opius basalis*** Fischer, 1958, ***O. exiguus*** Wesmael, 1835, ***O. monilicornis*** Fischer, 1962'dir. Eulophidae (Hymenoptera) familyasına bağlı 8 parazitoit saptanmıştır. Bunlar; ***Chrysocharis pentheus*** (Walker, 1839), ***Chrysocharis pubicornis*** (Zetterstedth, 1838), ***Cirrospilus vittatus*** Walker, 1838, ***Diglyphus isaea*** (Walker, 1838), ***D. pachyneurus*** (Graham, 1963), ***Hemiptarsenus zilahisebessi*** Erdös, 1951, ***Pediobius metallicus*** (Nees,1834) ve ***Ratzeburgiola incompleta*** Boucek, 1971'dır. Pteromalidae familyasına bağlı 2 tür bulunmuştur. Bunlar; ***Halticoptera circulus*** (Walker, 1833), ***Thinodytes cyzicus*** (Walker, 1839)'dur. Elde edilen parazitoit türlerden, ***H. circulus*** ve ***T. cyzicus*** Türkiye'de Agromyzidae familyasında ilk defa saptanmıştır. Bu çalışmada, türler arasında, ***D. isaea*** % 56.18 lük bir yüzdeyle en baskın parazitoit tür olarak bulunmuştur.

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