SECONDARY HOST CHANGING BETWEEN APHIDS (HEMIPTERA: APHIDIDAE) AND THEIR PARASITOIDS IN WHEAT FIELDS OF SOUTHEAST ANATOLIAN REGION

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ABSTRACT: This study carried out in wheat growing areas and natural areas that nearby of wheat fields of Diyarbakır (Yenişehir, Central villages, Plant Protection Research Institute experimental area) and Şanlıurfa (Akçakale, Siverek) provinces in 2014-2015. Studies were conducted during April, May and June by sampling once a week, while in November and February months by sampling once a month, by irregular controlling of 60 different locations. According to the results; 24 aphid species of 18 genera and 10 parasitoid species of 6 genera were determined on 20 plant species [*Alopecurus myosuroides* Huds; *Amaranthus retroflexus* L.; *Avena fatua* L.; *Avena sterilis* L.; *Carduus crispus* L.; *Centaurea solstitialis* L.; *Cirsium vulgare* (Savi) A-Sw.; *Daucus carota* L. var. *carota*; *Galium aparine* L.; *Lens culinaris* Medicus; *Lolium perenne* L.; *Lupinus albus* L.; *Onopordum acanthium* L.; *Orobanche* sp.; *Papaver rhoeas* L. *Silybum marianum* (L.) Grtn.); *Sonchus oleraceus* L.; *Triticum aestivum* L. Emd. Fri & Pao.; *Triticum durum* Desf.; *Vicia sativa* L.]. Determining of Aphids (Hemiptera: Aphididae) and their parasitoid species including specialization of parasitoids to both aphids and host plants, demonstrated once more the importance of richness of natural enemies in Southeast Anatolian region in terms of biological control.

KEY WORDS: Wheat, cultivated plants, weeds, Aphididae, parasitoid

Turkey is one of them most important country in terms of wheat producing and among the ten the most wheat producing countries in the world. The amount of wheat crop in the world is 705.378.000 tons, while in Turkey the amount of wheat crop is nearly 20.100.000 tons (Anonymous, 2013). The amount of wheat production and cultivated areas are changing year by year in Southeastern Anatolia Region of Turkey, and it ranks the second with Marmara Region after Middle Anatolian Region. Diyarbakır and Şanlıurfa provinces are the most wheat cultivated and produced provinces in Southeast Anatolian Region.

Harmful organisms which they can cause crop losses by giving damage so many crops including wheat, which is a main strategic crop in Turkey. One of the most important harmful organisms is aphid. There are 4000 aphid species belonging to Aphidoidea family in the world (Blackman & Eastop, 2000, 2014), and according to the Turkish records, totally 510 aphid species belong to 8 subfamilies of Aphidoidea were identified in Turkey (Remaudiére et al., 2006; Şenol et al., 2014). Aphids generally prefer the perennial crops as a primary host, while they also prefer annual or biennial herbaceous and shrubby plants as a

seconder host. As aphid could rapidly increase their population exponentially, they could gain resistance against pesticides and also they could easily transfer virus from one plant to another plant by migrating and changing their nutrition habit makes the aphid control very difficult and deemed as a significant problem (Goszcynski & Cichocka, 1998; Wilkaniec, 1998; Gray & Bonerjee, 1999). However, aphid are obligate or facultative, they constitute a highly risk group, due to their migration. They can be determined as annual around a crop or can immigrate seasonally. Therefore, it becomes more difficult to control aphid as long as they migrate. Aphids could usually be found in the non-cultivated areas or natural environment as they are available in the cultivated areas or exterior of the fields it is completely depend on the resources of pests where they could have.

In recent years, in the Southeast Anatolian Region mostly in early spring when low temperature occurs with high moisture in the rainy days, the population of aphid is increasing in wheat cultivated areas and consequently sometime wheat producing farmers seek how to control aphid, so they could use pesticides in a non-recommended manner at intervals. In the Southeast Anatolian Region, due to altering climate conditions, farming techniques and increase of irrigated farming areas show us, in the future aphid could have a potential risk in terms of being the main pest of wheat, therefore, it is needed to investigate more effectively control methods for this pest.

There is very few research in terms of aphid species in the wheat cultivated areas in Turkey. In the Southeast Anatolian Region, some faunistic investigation were made on aphid species in terms of their, biological and ecological properties. It was mentioned that due to the changing their ecological conditions, the population of aphid in the region would be increased in the future. Also aphids can take an important role as they are virus vector even they are potential pest species at present, but they could be the main harmful organism by giving damage or transferring virus (Karaat et al., 1986; Kıran, 1994; Uygun et al., 1995; Akkaya & Uygun, 1996).

Pesticide use is generating a risk for both natural balance, human and environment health. Furthermore, it is known that chemical use isn't always a remedy to control aphids. Even if most insecticides are commonly and simultaneously used, a few number of aphid can survive and after in a short period of insecticide application, their number can rapidly grow, and a new generation may occur that created resistance against pesticides.

Although chemical control is often preferred method due to its efficiency in a short period and due to its ease application, but also chemical control has so many risks such as human and other living health, nature and environment, soil, water or so many natural resources could be badly affected by chemical using. While struggling against pests the implementation of sustainable and environmentally friendly alternative control methods will be more useful than chemical control.

It is possible to decrease aphid population by using biological control method as it is natural method there is no any side effect and also it is possible to benefit from natural enemies that they are already existing in nature only, they need some favorable condition for their hosting and living. It is also possible to produce and release natural enemies when they are insufficient in the nature by preparing a suitable environment for them. The aphid parasitoids are the most important biological agents, which have the ability to be used for this purpose.

Ecological conditions which wheat plants are grown in, is a favorable environment especially for some small pests such as aphids that their population can rapidly increase. Weeds are also a favorable reservoir for aphids and their

parasitoids as a secondary host plant and could support potential increase of aphids and parasitoids. As many weeds species always could be found in abundant in the nature even in the absence of cultivated plants, they are suitable secondary host plants for pests by giving opportunity to them for living, feeding and sheltering (Güncan, 2013). The reason why aphid population increase at the beginning of wheat season and then decrease gradually its population without using any pesticide or without any intervene depends on the presence of weeds in the region, as they are very important secondary host plants both for aphids and for their parasitoids (Aphidiidae). The behavior of Aphidiidae parasitoid species is solitary endoparasitoid type. Female adults twitch their abdomen under the thorax during oviposition period, lay their eggs towards integument of aphids by the sink of their ovipositor into aphids and they generally lay one egg in each aphid. Even though they sometime lay two or more eggs into aphids, but only one individual complete its development period. Aphids generally live in diapause in winter as prepupa into mummified aphids in the regions where temperate is mild (climate, weather). By migration of aphids from one host to another host plant habitat with summer or in the warmer season conditions, seasonal diapause of parasitoids also could be observed (Minsk & Harrewijn, 1988).

This study carried out to determine weed species and their secondary host plant situation, to determine aphid and parasitoid species and to investigate possibility of using parasitoids with the aim of biological control. Studies carried out in wheat growing areas and natural areas that nearby of wheat fields of Diyarbakır (Yenişehir, Central villages, Plant Protection Research Institute experimental area) and Şanlıurfa (Akçakale, Siverek) provinces in 2014-2015. during April, May and June by sampling once a week, while in November and February months by sampling once a month, by irregular controlling of 60 different locations. According to the results; 20 host plant species, 24 aphid species of 18 genera and 10 parasitoid species of 6 genera were determined in Southeast Anatolian region. These results demonstrated once more the importance of richness of natural enemies in terms of biological control.

MATERIAL AND METHOD

MATERIAL

The main materials of the study consists of wheat and different plants of nearby natural areas, aphid species and their parasitoids that living on these plants. In order to determine aphid and parasitoid species KOH, 70 % ethyl alcohol, Chloral Hydrate, Phenol, Hoyer and Berlese feedlot environment were used. The other used materials are such as lam, slides, plate, glass tube, plastic container, zero (0) number brush and tight textured nylon muslin.

METHOD

Field Studies

Studies carried out in wheat growing areas and natural areas that nearby of wheat fields of Diyarbakır (Yenişehir and Central districts, villages and Plant Protection Research Institute experimental area) and Şanlıurfa (Akçakale, Siverek districts) provinces in 2014-2015. Field studies were conducted during April, May and June by examining and sampling shoots, plants, leaves, branches and trunk of each plant once a week, while in November and February months by sampling once a month, with irregular controlling of 60 different locations. Moreover, in order to determine aphids that could be present in the roots, some easy detachable plants removed from the root, the other such as in the form of tree the

soil of 5-10 cm in depth was excavated and the main stem and branches of plants and the soil of beneath has been checked.

Laboratory Studies

Laboratory studies carried out under controlled conditions (25±3°C temperature, 70% ±10% humidity and a 16:8 hour light- dark long day). Plant materials with mummified aphids which were thought to be parasitized were taken into plastic boxes and required label information was written on the boxes. The cover of the box plastic parts were cut as widely round and closed with tight textured nylon muslin so as to provide ventilation. Samples were kept at least 14 days for parasitoid adult emerging and daily controlled until the end of all parasitoid emerging.

Preparation of Samples

As plant materials, mummified or dead aphids and their parasitoid adults mixed in culture containers, their pre-extraction and separation process were made on white paper. Then, aphids and parasitoids examined and separated under binocular and were placed into small bottles or tubes with 70% alcohol. The tubes and bottles that aphids and parasitoids kept were labeled with required information and prepared for identification. The color of aphid mummies was also recorded, considering being useful for parasitoid identification.

RESULTS AND DISCUSSION

This study carried out in wheat growing areas and natural areas that nearby of wheat fields of Diyarbakır and Şanlıurfa provinces in 2014-2015. Studies were conducted during April, May and June by sampling once a week, while in November and February months by sampling once a month, by irregular controlling of 60 different locations. According to the results; 24 aphid species of 18 genera, 10 parasitoid species of 6 genera were determined on 20 plant species. The list of host plants, aphids and their parasitoids were given on Table 1.

According to the results of this study; 20 grouped cereals, uncultivated and cultivated plants [*Alopecurus myosuroides* Huds; *Amaranthus retroflexus* L.; *Avena fatua* L.; *A. sterilis* L.; *Carduus crispus* L.; *Centaurea solstitialis* L.; *Cirsium vulgare* (Savi) A-Sw.; *Daucus carota* L. var. *carota*; *Galium aparine* L.; *Lens culinaris* Medicus; *Lolium perenne* L.; *Lupinus albus* L.; *Onopordum acanthium* L.; *Orobanche* sp.; *Papaver rhoeas* L. *Silybum marianum* (L.) Grtn.); *Sonchus oleraceus* L.; *Triticum aestivum* L. Emd. Fri & Pao.; *T. durum* Desf.; *Vicia sativa* L.] were determined.

24 aphid species [*Anoecia corni* (Fabricius); *Aphis craccivora* Koch; *Aphis fabae* Scopoli; *Aphis galiiscabri* Schrank; *Aphis gossypii* Glover; *Aulacorthum solani* (Kaltenbach); *Brachycaudus* (*Acaudus*) *cardui* (L.); *Brachycaudus helichrysi* (Kaltenbach); *Capitophorus elaeagni* (deI Guercio); *Diuraphis noxia* (Kurdjumov); *Dysaphis foeniculus* (Theobald); *Hyperomyzus lactucae* (L.); *Lipaphis erysimi* (Kaltenbach); *Macrosiphum euphorbiae* (Thomas); *Metopolophium dirhodum* (Walker); *Myzus* (*Nectarosiphon*) *persicae* (Sulzer); *Rhopalosiphum maidis* (Fitch); *Rhopalosiphum padi* (L.); *Sipha* (*Rungsia*) *maydis* Passenger; *Sitobion avenae* (F.); *Smynthurodes betae* Westwood; *Uroleucon* (*Uromelan*) *jaceae* (L.); *Uroleucon cichorii* (Koch); *Uroleucon* sp.] and including 10 parasitoid species [*Aphelinus paramali* Zehavi & Rosen; *Aphidius colemani* Viereck; *Aphidius ervi* Haliday; *Aphidius matricariae* Haliday; *Aphidius rhopalosiphi* de Stefani-Perez; *Binodoxys acalephae* (Marshall); *Diaeretiella rapae* (M'Intosh); *Lysiphlebus fabarum* (Marshall);

Lysiphlebus testaceipes (Cresson); *Praon volucre* (Haliday)] were determined on different aphid species and on different host plants as shown on Table 1.

It was revealed that *Lysiphlebus fabarum* is parasitising *Brachycaudus* (*Acaudus*) *cardui*; *Praon volucre* is parasitising *Rhopalosiphum padi, Uroleucon* (*Uromelan*) *jaceae* and *Macrosiphum euphorbiae*; *Aphidius ervi* is parasitising *Myzus* (*Nectarosiphon*) *persicae; Aphidius rhopalosiphi* is parasitising *Rhopalosiphum maidis*; *Aphidius matricariae* is parasitising *Brachycaudus helichrysi*; *Lysiphlebus testaceipes*; and *Aphelinus paramali* is parasitising *Aphis gossypii*; and *Diaeretiella rapae* is parasitising *Diuraphis noxia*.

It was reported that *Myzus persicae* leave in summer from its primary host plants to over 40 different weed species that secondary host plants such as Solanaceae, Chenopodiaceae, Compositae, Cruciferae and Cucurbitaceae families (Anonymous, 2016).

The aphid species that found highly intense in this study, fed on different plants from different families as stated in the catalog of Holman (2009).

The relation between dioecious aphids and their parasitoid is even more complex. These aphid species always change their habitats throughout the season from primary host plants to secondary host plants due to their migration behavior. Therefore, their parasitoids also change their habitat throughout the season in connection with the migration of aphids. In this case, any Dioecious aphid could be parasitized by different parasitoid species complex according to its habitat type such as *Brachycaudus cardui* could be given as a typical example. This aphid species could be found on the edges of wooded areas and in the parks on *Prunus spinosa* and *P. domestica* plants in winter and in spring and parasitized by *Ephedrus plagiator*, while this species migrate towards the end of spring and at the beginning of summer to weeds such as *Carduus* sp. and *Arctium* sp. and parasitized by *Lysiphlebus fabarum* and *Lipolexis gracilis* (Stary, 1964).

Monoecious aphids even if migrate to other plants for the purpose of feeding, they don't change their habitat types throughout the season. Therefore, studies revealed that these aphid species generally parasitized by the same parasitoid species.

According to the former studies that conducted in Turkey and in the world about aphids and their parasitoids; Elmalı (1993), reported that 13 aphid species, 5 parasitoid and 21 predator species in wheat fields of Konya province. Kıran (1994), reported that five aphid psecies [*Sitobion avenae* F., *Rhopalosiphum padi* L., *R. maidis* Fitch., *Schizaphis graminum* Rond. and *Myzus persicae* Sulz.] and two parasitoid [*Lysiflebus faborum* Marsh. and *Ephedrus plagiator* Nees] species in wheat fields of Southeast Anatolian Region. Majani & Rezwani (1995), investigated density of aphid species in wheat fields of Gorgian region of İran and ordered aphid species according to their density level as; *Sitobion avenae* (F)., *Rhopalosiphum maidis* (L)., *R. padi* (L)., *Metapolophium dirhodum* (Walk), *Schizaphis graminum* (Rondani), *Sipha elegans* del Guercio, *Tetraneura ulmi* (L.), *Anoecia corni* (F.) and *Anoecia vagans* (Koch) species respectively. Petrovic (1996) determined nine aphid species [*D. noxia, M. dirhodum, R. maidis, R. padi*, *S. graminum, Sitobion avenae, S. fragariae, S. elegans* and *S. maydis*] in wheat fields of Yugoslavia. Güz & Kılınçer (2005) were determined 10 aphid parasitoids belonging to 6 genus on weeds from Ankara Capital city of Turkey.

Stary & van Harten (1972) reported four aphid parasitoid species belonging to Aphidiidae family in Angola region. *D. rapae* and *Ephedrus persicae* parasitoid species were determined as cosmopolitan species. *Aphidius platensis*, which is known in South Africa, Africa, and Middle East of Australia, was obtained from some domestic aphids or some materials that collected from out. This species also

recorded in Mozambique. *A. camerunensis* was only determined on some *Sitobion* species in Cameroon. They also discussed importing of parasitoid species for using them as biological tools against aphids. Pungerl (1983) reported that separating characters of some aphidius species that commonly parasitizing pea and cereal aphid species was seems to be more variable than previously thought. He also separated *A. ervi*, *A. picipes* and *A. rhopalosiphi* species according to the number of antenna segments, the patterns that in the anterolateral region and changes in the tutorial index. The number of segments of antenna was changed for one of all three species as three segments for females, while four segments for males. The number of ridges in anterolateral region of petiole of *A. rhopalosiphi* was ranged as 6-8. Tentorial index of *A. ervi* ranged as 0.35-0.62 and tentorial index of *A. rhopalosiphi* 0.35-0.60., while tentorial index of *A. picipes* ranged as 0.34-0.54. Previously published tentorial index values of *A. ervi, A. principles* and *A. rhopalosiphum* were ordered as 0.30-0.40, 0.28-0.37 0.30-0.35 respectively. These differences revealed that the identification of *A. rhopalosiphi* and *A. uzbekistanicus* could not be identified as reliably by used former rate of wing vein length.

Stary (1986) investigated relationship of so many aphids and their parasitoids on *Cirsium arvense* in Czechoslovakia. The most dominant aphid species were *Aphis fabae* and *Cirsii acanthoidis*, while the most related parasitoids were *L. cardui* and *L. fabarum*. Tomanovich et al. (1996) collected pea aphid (*A. pisum*) from the vicinity of Belgrade during two years to determine seasonal dynamics, interference of color polymorphism and parasitism and four parasitoid species (*A. ervi, A. eadyi, A. picipes* and *P. barbatum*) were found on pea aphid in Yugoslavia, while *A. ervi* was found as the most dominant species. Tomanovich (2000) identified 8 new aphid species with their host plants in Serbia and Montenegro including 12 Aphidiinae parasitoids, four of which new record in the world. Tomanovic & Brajkovic (2000) determined important aphid parasitoids in wheat fields of southern agro-eco systems of the Pannonia region and *A. ervi*, *A. uzbekistanicus*, *A. rhopalosiphi* and *P. gallicum* were found as the most intense parasitoid species. Tomanovich et al. (2003) recorded a new aphid parasitoid species which was *Praon uroleucon* in Yugoslavia, and this parasitoid species parasitize *Uroleucon* aphid species on *Carduus acanthoides* host plant.

It is clear that there is a strong relationship between agro eco-systems and the other systems. Weeds are known as common elements that contribute to vegetation diversity in cultivated and uncultivated areas. However, it is always preferred that cultivated areas should be clear and uninfected with weeds. Unlike many plant species, weeds that grow along roadsides and field edges are capable of staying alive in spite of so many chemical applications. Weeds have food chain relation both for pests and for beneficial insects, while so many of them don't have any effect on cultivated plants. However, there are some basic differences between host plant, aphid, and their parasitoid in terms of classifying their relationships. While some aphid parasitoids never have any relation in food chain, so specific and represent the isolated complexes, the other aphid parasitoids have more complex relationship. One of the reasons of differences is the change of the host plant in connection with aphid host series. The composition of parasitoid species and the presence of their percentage into this composition are quite different on primary and secondary host plants species. The second reason of difference may be connected to the presence of cultivated or uncultivated host plants which are found in the vicinity of wheat fields.

The relationship of aphids and their parasitoids depend on vegetation diversity of the same or different areas. According to some studies while only a

few aphid species could give damage in monoculture areas, so many aphid populations could give damage according to host plant diversity in roadsides, borders or edges of the fields and aphid populations could show different attitude as to host plant diversity. It means that the fields that surrounded by herbaceous plants have so many plant species and heterogenic fauna. The aphid species are generally significant food source both for parasitoids and for predator.

Determination of aphid parasitoids that are a part of the habitat interactions of aphids with wild herbaceous plants will contribute valuable information for understanding complex life of host plants, aphids and their parasitoids. Undoubtedly, determination of beneficial fauna has great importance in terms of successful applications for biological control and integrated pest management approaches. With this approach, this study determined secondary host plants which are very suitable reservoir for aphids and their parasitoids and determined aphid species and their parasitoids. The reason of numerous cereal aphid species below the threshold of economic damage is depend on these herbaceous plants in the vicinity of grain fields, as their presence give opportunity to parasitoids both increases their efficiency and sustain their life. Moreover, as these weeds exit early spring before vegetables, cottons or other cultivated productions, parasitoids living on these weeds together with aphids and then, they are migrating other cultivated areas. Thus, the benefit of these herbaceous and secondary host plants is more important by hosting parasitoids to live in their habitats for suppressing and reducing the aphid population and taking under control both in wheat fields and by migrating in the fields of summer production and parasitizing aphid species in these cultivated areas.

In conclusion, so many studies emphasized the importance of different weed species as host plant of aphids and as a good reservoir of aphid parasitoid. Therefore, the approaches of biological control and integrated pest management in the framework of interaction of host plant, aphids and their parasitoids in the same ecosystem will be useful to take into account. By this study elements of this complex interaction has been determined and useful basic information has been established for the next studies. Moreover, availability of natural enemies their potential role in Southeast Anatolia region and possibility of use of biological control as an alternative control method or as supplementary part of integrated pest management were introduced.

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Table 1. Host plants, aphid and parasitoid species in wheat field of Diyarbakır and Şanlıurfa provinces in 2014-2015.

Host Plants	**Aphid Species**	**Parasitoid Species**
Amaranthus retroflexus	*Aphis fabae*	*Binodoxys acalephae* 3♀♀ 2♂♂
	Macrosiphum euphorbiae	*Praon volucre* 7♀ ♀ 4♂♂
Alopecurus myosuroides	*Diuraphis noxia*	*Diaeretiella rapae* 9♀♀ 7♂♂
Avena sterilis	*Sipha* (*Rungsia*) *maydis*	-
	Anoecia corni	-
Orobanche sp.	*Smynthurodes betae*	-
Carduus crispus	*Aphis gossypii*	*Aphelinus paramali* 3♀♀ 2♂♂ *Lysiphlebus testaceipes* 8♀♀ 6♂♂
Cirsium vulgare	*Uroleucon* (*Uromelan*) *jaceae*	*Praon volucre* 11♀♀ 9♂♂
Triticum aestivum	*Metopolophium dirhodum*	-
	Rhopalosiphum padi	*Praon volucre* 45♀♀ 33♂♂
	Rhopalosiphum maidis	*Aphidius rhopalosiphi* 3♀♀ 5♂♂
	Aulacorthum solani, Uroleucon sp.	*Diaeretiella rapae* 7♀♀ 3♂♂
Sonchus oleraceus	*Hyperomyzus lactucae*	*Aphidius colemani* 7♀♀ 4♂♂
Galium aparine	*Aphis galiiscabri*	*Praon volucre* 3♀♀ 2♂♂
Papaver rhoeas	*Lipaphis erysimi*	*Diaeretiella rapae* 5♀♀ 4♂♂
	Rhopalosiphum padi	*Praon volucre* 6♀♀ 5♂♂
	Macrosiphum euphorbiae	*Praon volucre* 5♀♀ 3♂♂
Centaurea solstitialis	*Brachycaudus* (*Acaudus*) *cardui*	*Lysiphlebus fabarum* 2♀♀
Lolium perenne	*Anoecia corni*	-
	Metopolophium dirhodum	-
Lupinus albus	*Aphis craccivora*	*Binodoxys acalephae* 2♀♀ 2♂♂
Triticum durum	*Sitobion avenae*	-
	Rhopalosiphum padi	*Praon volucre* 7♀♀ 6♂♂
	Rhopalosiphum maidis	*Aphidius rhopalosiphi* 2♀♀ 3♂♂
Lens culinaris	*Aphis craccivora*	*Binodoxys acalephae* 2♀♀ 2♂♂
Silybum marianum	*Brachycaudus* (*Acaudus*) *cardui*	*Lysiphlebus fabarum* 20♀♀ 11♂♂
	Brachycaudus (*Acaudus*) *cardui*	*Aphidius ervi* 7♀♀ 3♂♂
	Aphis fabae	*Lysiphlebus fabarum* 2♀♀
	Uroleucon cichorii	*Praon volucre* 5♀♀ 4♂♂
	Capitophorus elaeagni	-
	Myzus (*Nectarosiphon*) *persicae*	-
	Aulacorthum solani	*Diaeretiella rapae* 9♀♀ 7♂♂
Onopordum acanthium	*Brachycaudus* (*Acaudus*) *cardui*	*Lysiphlebus fabarum* 22♀♀ 11♂♂
	Rhopalosiphum maidis	*Aphidius rhopalosiphi* 5♀♀ 3♂♂
	Brachycaudus helichrysi	*Aphidius matricariae* 8♀♀ 5♂♂
	Brachycaudus (*Acaudus*) *cardui*	*Lysiphlebus fabarum* 8♀♀ 6♂♂
Vicia sativa	*Myzus* (*Nectarosiphon*) *persicae*	*Lysiphlebus fabarum* 4♀♀ 6♂♂
	Aphis craccivora	*Lysiphlebus fabarum* 5♀♀ 6♂♂
Avena fatua	*Rhopalosiphum maidis*	*Aphidius rhopalosiphi* 2♀♀ 3♂♂
Daucus carota L. var. *carota*	*Dysaphis foeniculus*	*Lysiphlebus fabarum* 4♀♀ 3♂♂