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Determined Aphid and Ant Associations from Trabzon, Rize and Artvin Provinces of the Turkey

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ABSTRACT

Aphids and ant species are both diverse and extremely succesful groups of insects and often share the same habitats and therefore both have many oportunities to interact with each other. It has been shown that aphid-ant relationships have been shaped by various factors particularly aphid host plant's physological features, honeydew composition, feeding position and so on. Despite there are more than 500 aphid species and about 315 ant taxon in Turkey, there are very few studies conducted on their mutual relationship. This study was carried out in the Trabzon, Rize and Artvin provinces of Turkey. As a result of the evaluation of samples, it was determined that 48 aphid species associated with 15 ant species. The most encountered ant species, which interacted with different number of aphid species, were *Formica cinereofusca* Karawaiew, 1929, *Lasius turcicus* Santschi, 1921 and *Lasius emarginatus* (Olivier, 1792). Among determined aphid species *Aphis fabae* Scopoli, 1763 had the highest ant attraction and then *Brachycaudus cardui* (Linnaeus, 1758), *Aphis gossypii* Glover, 1877, *Aphis spiraecola* Patch, 1914, *Cinara pilicornis* (Hartig, 1841) and *Toxoptera aurantii* Boyer de Fonscolombe, 1841 respectively. Determined aphid-ant associations are shaped by both ecological conditions of the study area, composition of aphid and ant populations and it was shown that there is no new aphid-ant species association. Findings of the presented study indicated that much more detailed study should be conducted to investigate aphid-ant mutualistic associations in Turkey.

Key words: Aphid, Turkey, trophobiosis, ant attendance, myrmecophily

INTRODUCTION

Aphids show a wide range of interactions with ants such as antagonistic, facultatively mutualistic or obligately mutualistic (Stadler and Dixon, 2005). There are about 4500 aphid species worldwide (http://www.aphidsonworldsplants.info; Remaudière and Remaudière, 1997) and they feed on phloem sap, which is generally rich in sugars but low in nitrogen. Thus, aphids need to ingest large volumes of phloem sap - most of which is excreted as honeydew (Dixon, 2004; Stadler and Dixon, 1998). Ants live almost everywhere but their favorite habitats are the tropical regions. There are about 12,000 species of ants and many ant species protect and cultivate flock of greenfly, coccids and aphids (Ulgenturk, 2001; Dixon, 2004; Keller and Gordon, 2010). In habitats where aphids are under the risk of natural enemy attack, there may be high

possibility to detect aphid - ant association. Aphids are soft bodied and have very weak defense strategies against natural enemies. Therefore, it is likely that a major benefit of ant attendance for aphids is protection from their natural enemies. Although almost all aphids produce honeydew, are susceptible to predation, and co-occur in the same habitats as ants (Bristow, 1991; Billick *et al*., 2007), only 60% of aphid species have a relationship with ants in where 40 % of the relations are obligatory (Stadler, 1997). The aphid provides the ant with carbohydrates in the form of "honeydew," the waste product of its sugar-rich diet of plant sap. The ants obtain food and the aphids get protection from these mutualistic relations vice versa.

The composition of the honeydew of the aphids is affected by the presence of ants and feaures of the aphid host plant. It was shown that *Chaitophorus populialbae* (Boyer de Fonscolombe, 1841) and *C. populeti* (Panzer, 1801) feeding on the *Populus tremula* Linnaeus, 1753 increased the melezitose proportion in produced honeydew in the presence of ant attendance than feeding on *Populus alba* Linnaeus, 1753 and decreased the melezotise proportion in the absence of ant attendance. In contrast, *C. tremulae* Koch, 1854 which was totally ant untended species produced lower proportion of melezitose. These findings indicate that honeydew production and composition differs not only between species but also within a species (Fischer and Shingleton, 2001).

It has been also proposed that the pattern of ant mutualism among aphids may be explained by differences in feeding position on their host plant (Dixon, 1998; Stadler *et al*., 2003; Shingleton *et al*., 2005) and also host plant's physiological and morphological features. Aphids feed by extending their stylets into their host plant's phloem elements. Aphid species feeding on the branches and trunks of trees need to have particularly long mouthparts to reach deeply located phloem. Their long mouthparts may impede their ability to withdraw from their feeding position and escape from natural enemies as it was shown for genus *Stomaphis* by Depa *et al.* (2012). Such aphids may therefore benefit from protection by ants more than those feeding on smaller and superficial phloem, and this may be why some aphids form ant mutualisms whereas others do not. It was shown that 112 European aphid species have a strong association between feeding on woody parts of the host plant and ant tending (Stadler *et al*., 2003).

Common relationships between ants and aphids have not been well documented in Turkey although there are more than 500 aphid species and about 294 species and 20 subspecies of ants in Turkey (Görür *et al*., 2012; Kıran and Karaman, 2012; Karaman, 2012; Karaman and Aktaç, 2013; Karaman *et al*., 2013; Şenol *et al*., 2014a,b). There is only one study published related with aphid-ant relationships in Turkey that is Özdemir *et al*. (2008), which reported the relationships betweeen 16 ant and 19 aphid species in Ankara Province. Their findings indicated that *Camponotus aethiops* (Latreille), *Camponotus piceus* (Leach), *Formica glauca* Ruzsky, *Lasius paralienus* Seifert and *Crematogaster sordidula* (Nylander) were the most encountered ant species that associated with many aphid species.

So far, 165 aphid species and 45 ant species have been recorded from Trabzon, Rize and Artvin provinces of the Turkey (Görür *et al*., 2009; Kıran and Karaman, 2012). This study aimed to find out possible aphid-ant relationships in study area.

MATERIAL AND METHODS

In order to find out possible relationships between aphid species and ant species, both aphid samples and ant species that were found on aphid colony were collected from Trabzon, Rize and Artvin provinces of Turkey in summer 2009. Each sampled species of aphids, ants and host plants of the aphid were preserved separately and brought back to the laboratory for identifications. Specimens were collected both urban and rural areas of the study area. Aphid species were identified by Prof. Dr. Gazi Görür and ant species were identified by Prof. Dr. Nihat Aktaç. Host plant species were identified by study team and helped by researchers in Botany Department of the Nigde University.

Voucher specimens of the determined aphid species and ant species are preserved in Nigde University Laboratory and Trakya University Laboratory respectively.

RESULTS AND DISCUSSION

Despite 164 aphid species belonging to 2 families and 71 genera reported from study area, it was shown that only 48 aphid species belonging to 25 genera had mutualistic interactions with 15 ant species belonging to 6 genera from Trabzon, Rize and Artvin provinces of the Turkey. Determined ant-aphid interaction ratio in study area is nearly 28 % which is lower than general pattern as about 40 % of the aphid species tended by ant species (Kunkel and Kloft, 1985). It might be related with the released honeydew composition of aphid species and thus this is also important subject to study. *Formica cinereofusca*, *Lasius turcicus*, *Lasius emarginatus* were the most encountered ant species that associated with determined aphid species. *Formica cinereofusca* sampled 51 times associated with 27 aphid species, *Lasius turcicus* sampled 26 times associated with 19 aphid species and *Lasius emarginatus* sampled 19 times associated with 15 aphid species respectively (Table 1). Among these determined ant species, *Formica cinereofusca* which is the most enocuntered ant species has been only recorded from Trabzon so far (Kıran and Karaman, 2012), with this study it was also recorded from Artvin and Rize. Most of the aphid associated ant species belongs to the Formicinae subfamily as majority of the ant species in Turkey and study area are in the Formicinae family (Kıran and Karaman, 2012). In addition it was pointed out that members of this family including *Formica* and *Lasius* mainly prefer honeydew as a primary food sources. Furthermore, some ant species, particularly *Formica* spp. take care of aphids under the heavy rain and strong wind conditions and *Lasius* spp. construct shelters over aphid colonies to protect them from heavy rain (Novgorodova, 2005). These ecological conditions supported our findings that why dominant ant species in these mutuliastic relations in study area are *Formica* and *Lasius* species. It was shown that *Aphis fabae* had the highest ant attraction with 8 different ant species association, *Brachycaudus cardui* had association with 6 different ant species, *Aphis gossypii* had association with 5 ant species and then *Aphis spiraecola, Cinara pilicornis* and *Toxoptera aurantii* had relationships with 4 different ant species (Table 1). There is no simple answer to give why *A. fabae* has

the highest ant attraction as the studies of the various researchers indicated how higly dynamic the mutualistic relations between aphid and ant species. There are different factors might influence this relations such as density of both groups, host plants species and its features, climatic coniditions and seasonal differences (Depa and Wojciechowski, 2009). It was shown that both *A. fabae* and *F. cinereofusca* are the dominant species in study area and therefore it was considered that it was normal to record higher attraction for both species.

Table 1. Determined aphid-ant species interaction from Trabzon, Rize and Artvin Provinces of Turkey.

Aphid Species	**Ant Species**	**Aphid Host Plant**	**Locality**	**Collection Date**
Acyrthosiphom pisum	*Lasius turcicus*	*Rhamnus* sp.	Trabzon-Center	22.6.2009
Anoecia corni	*Lasius turcicus*	*Cornus sanguinea*	Trabzon-Vakfıkebir	21.6.2009
Anoecia corni	*Lasius emarginatus*	*Cornus sanguinea*	Trabzon-Çarşıbaşı	21.6.2009
Aphis craccivora	*Lasius turcicus*	*Sonchus arvensis*	Trabzon-Beşikdüzü	20.6.2009
Aphis craccivora	*Formica cinereofusca*	*Wisteria sinensis*	Trabzon-Beşikdüzü	20.6.2009
Aphis craccivora	*Formica cinereofusca*	*Eriobotrya japonica*	Trabzon-Tonya	20.6.2009
Aphis craccivora	*Lasius turcicus*	*Rumex patienta*	Trabzon-Şalpazarı	20.6.2009
Aphis craccivora	*Formica cinereofusca*	*Trifolium pratense*	Trabzon-Şalpazarı	20.6.2009
Aphis craccivora	*Formica cinereofusca*	*Trifolium pratense*	Trabzon-Beşikdüzü	20.6.2009
Aphis craccivora	*Lasius turcicus*	*Trifolium* sp.	Trabzon-Araklı	23.6.2009
Aphis craccivora	*Formica cinereofusca*	*Vicia* sp.	Artvin-Şavşat	12.7.2009
Aphis craccivora	*Formica cinereofusca*	*Tanacetum* sp.	Artvin-Karagöl	12.8.2009
Aphis fabae	*Formica cinereofusca*	*Photinia serrulata*	Trabzon-Beşikdüzü	20.6.2009
Aphis fabae	*Tetramorium caespitum*	*Heracleum sp.*	Trabzon-Şal Pazarı	20.6.2009
Aphis fabae	*Lasius emarginatus*	*Petroselinum crispum*	Trabzon-Çarşıbaşı	21.6.2009
Aphis fabae	*Formica fusca*	*Vicia faba*	Trabzon-Düzköy	21.6.2009
Aphis fabae	*Lasius emarginatus*	*Tanecetum* sp.	Trabzon-Tonya	22.6.2009
Aphis fabae	*Formica cinereofusca*	*Seseli libanotis*	Trabzon-Tonya	22.6.2009
Aphis fabae	*Formica fusca*	*Digitalis ferruginea*	Trabzon-Uzungöl	24.6.2009
Aphis fabae	*Lasius turcicus*	*Valeriana* sp.	Rize-İkizdere	25.6.2009
Aphis fabae	*Formica cinereofusca*	*Rosa* sp	Rize-İkizdere	25.6.2009
Aphis fabae	*Formica cinereofusca*	*Anthemis* sp.	Artvin-Sarp	10.8.2009
Aphis fabae	*Formica cinereofusca*	*Rumex* sp.	Artvin-Hopa	10.8.2009
Aphis fabae	*Formica cinereofusca*	*Digitalis* sp.	Artvin-Camili	11.8.2009
Aphis fabae	*Lasius alienus*	*Solanum nigrum*	Artvin-Muratlı	11.8.2009
Aphis fabae	*Formica cinereofusca*	*Arctium minus*	Artvin-Şavşat	12.8.2009
Aphis fabae	*Formica cinereofusca*	*Onopordum sp.*	Artvin-Şavşat	13.8.2009

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Table 1. Determined aphid-ant species interaction from Trabzon, Rize and Artvin Provinces of Turkey.

Aphid Species	**Ant Species**	**Aphid Host Plant**	**Locality**	**Collection Date**
Aphis fabae	*Lasius emarginatus*	*Hedera helix*	Rize-Ardeşen	15.8.2009
Aphis fabae	*Myrmica ruginodis*	*Swertia iberica*	Rize-Ayder-Kavrun	16.8.2009
Aphis farinosa	*Formica gagates*	*Salix* sp.	Trabzon-Şalpazarı	20.6.2009
Aphis farinosa	*Formica cinereofusca*	*Salix* sp.	Trabzon-Şalpazarı	20.6.2009
Aphis farinosa	*Lasius turcicus*	*Salix* sp.	Trabzon-Vakfıkebir	21.6.2009
Aphis farinosa	*Lasius turcicus*	*Salix* sp.	Trabzon-Çankaya	23.6.2009
Aphis farinosa	*Formica cinereofusca*	*Salix* sp.	Artvin-Yusufeli	13.8.2009
Aphis farinosa	*Tetramorium caespitum*	*Salix* sp.	Artvin-Arhavi	14.8.2009
Aphis gossypii	*Tetramorium caespitum*	*Salvia verticillata*	Trabzon-Tonya	20.6.2009
Aphis gossypii	*Lasius alienus*	*Convolvulus* sp.	Trabzon-Çarşıbaşı	21.6.2009
Aphis gossypii	*Formica cinereofusca*	*Verbascum* sp.	Trabzon-Maçka	23.6.2009
Aphis gossypii	*Formica cinereofusca*	*Boraginaceae*	Rize-İkizdere	25.6.2009
Aphis gossypii	*Lasius emarginatus*	*Camelia sinensis*	Trabzon-Hayrat	25.6.2009
Aphis gossypii	*Lasius emarginatus*	*Diospyros lotus*	Trabzon-Hayrat	25.6.2009
Aphis gossypii	*Formica cinereofusca*	*Salvia verticillata*	Rize-Güneyce	09.8.2009
Aphis gossypii	*Lasius turcicus*	*Clerodendron* sp.	Artvin-Hopa	11.8.2009
Aphis gossypii	*Formica cinereofusca*	*Rhamnus* sp.	Artvin-Yusufeli	13.8.2009
Aphis gossypii	*Lasius alienus*	*Eriobotrya japonica*	Rize-Ardeşen	14.8.2009
Aphis impatientis	*Lasius emarginatus*	*Impatiens nolitangere*	Trabzon-Araklı	23.6.2009
Aphis longituba	*Lasius emarginatus*	*Clematis vitalba*	Trabzon-Çarşıbaşı	21.6.2009
Aphis molluginis	*Lasius alienus*	*Galium aparine*	Trabzon-Yomra	23.6.2009
Aphis nasturtii	*Formica cinereofusca*	*Hypericum* sp.	Trabzon-Şalpazarı	20.6.2009
Aphis nasturtii	*Lasius emarginatus*	*Alcea pallida*	Trabzon-Tonya	20.6.2009
Aphis nasturtii	*Formica cinereofusca*	*Malva nicaeensis*	Trabzon-Çankaya	23.VI.2009
Aphis nasturtii	*Formica cinereofusca*	*Eupatorium cannabinum*	Rize-Çayeli	10.6.2009
Aphis pomi	*Formica rufibarbis*	*Malus sylvestris*	Artvin-Yusufeli	14.6.2009
Aphis sambuci	*Lasius turcicus*	*Sambucus ebulus*	Trabzon-Düzköy	21.6.2009
Aphis sambuci	*Formica cinereofusca*	*Sambucus* sp.	Artvin-Borçka	11.6.2009
Aphis serpylli	*Formica cinereofusca*	*Thymus* sp.	Trabzon-Maçka	22.6.2009
Aphis spiraecola	*Lasius emarginatus*	*Cydonia oblonga*	Trabzon-Tonya	20.6.2009
Aphis spiraecola	*Plagiolepis taurica*	*Spirea vanhouttei*	Trabzon-Center	22.6.2009
Aphis spiraecola	*Lasius turcicus*	*Erica* sp.	Trabzon-Center	23.6.2009
Aphis spiraecola	*Formica cinereofusca*	*Foeniculum* sp.	Trabzon-Maçka	23.6.2009

Table 1. Determined aphid-ant species interaction from Trabzon, Rize and Artvin Provinces of Turkey.

Aphid Species	**Ant Species**	**Aphid Host Plant**	**Locality**	**Collection Date**
Aphis spiraecola	*Lasius emarginatus*	*Cornus sanguinea*	Trabzon-Dernekpazarı	24.6.2009
Aphis spiraecola	*Formica cinereofusca*	*Geranium robertianum*	Artvin-Sarp	10.8.2009
Aphis spiraecola	*Formica cinereofusca*	*Crassocephalum crepidioides*	Artvin-Muratlı	11.8.2009
Aphis spiraecola	*Lasius turcicus*	*Malus* sp.	Artvin-Arhavi	14.8.2009
Aphis verbasci	*Formica cinereofusca*	*Verbascum nigrum*	Trabzon-Yeşilyalı	23.6.2009
Brachycaudus cardui	*Formica cinereofusca*	*Tanecetum* sp.	Trabzon-Beşikdüzü	20.6.2009
Brachycaudus cardui	*Tetramorium chefketi*	*Echium vulgare*	Trabzon-Düzköy	21.6.2009
Brachycaudus cardui	*Lasius turcicus*	*Sinapis* sp.	Trabzon-Düzköy	21.6.2009
Brachycaudus cardui	*Myrmica ruginodis*	*Echium vulgare*	Trabzon-Sümela	22.6.2009
Brachycaudus cardui	*Lasius emarginatus*	*Salvia* sp.	Trabzon-Uzungöl	25.6.2009
Brachycaudus cardui	*Formica cinereofusca*	*Carduus* sp.	Rize-Çayeli	09.8.2009
Brachycaudus cardui	*Formica cinereofusca*	*Crassocephalum crepidioides*	Artvin-Muratlı	11.8.2009
Brachycaudus cardui	*Formica fusca*	*Sinapis sp.*	Rize-Ayder-Kavrun	16.8.2009
Brachycaudus helichrysi	*Myrmica scabrinodis*	*Silene* sp.	Rize-İkizdere	25.6.2009
Brachycaudus helichrysi	*Formica cinereofusca*	*Carduus* sp.	Rize-Arhavi	10.8.2009
Brachycaudus schwartzi	*Lasius emarginatus*	*Prunus persica*	Trabzon-Hayrat	25.6.2009
Brachycaudus lychnidis	*Formica cinereofusca*	*Silene alba*	Trabzon-Torul	22.6.2009
Brachyunguis tamaricis	*Formica cinereofusca*	*Tamarix* sp.	Artvin-Şavşat	12.8.2009
Chaetosiphon tetrarhodum	*Lasius turcicus*	*Rosa* sp.	Trabzon-Beşikdüzü	20.6.2009
Chaitophorus kapuri	*Lasius alienus*	*Populus* sp.	Artvin-Kafkasör	14.8.2009
Chaitophorus longisetosus	*Lasius paralienus*	*Populus* sp.	Trabzon-Tonya	20.6.2009
Chaitophorus longisetosus	*Lasius emarginatus*	*Populus* sp.	Trabzon-Vakfıkebir	21.6.2009
Chaitophorus longisetosus	*Lasius paralienus*	*Populus* sp.	Trabzon-Düzköy	21.6.2009
Chaitophorus longisetosus	*Formica cinereofusca*	*Populus* sp.	Trabzon-Maçka	23.6.2009
Chaitophorus salicti	*Lasius turcicus*	*Salix* sp.	Trabzon-Düzköy	22.6.2009
Cinara acutirostris	*Formica cinereofusca*	*Pinus nigra*	Trabzon-Şalpazarı	20.6.2009
Cinara maritimae	*Formica cinereofusca*	*Pinus* sp.	Trabzon-Beşikdüzü	20.6.2009
Cinara pilicornis	*Formica cinereofusca*	*Picea* sp.	Trabzon-Beşikdüzü	20.6.2009
Cinara pilicornis	*Formica cinereofusca*	*Picea* sp.	Trabzon-Beşikdüzü	20.6.2009
Cinara pilicornis	*Lasius turcicus*	*Picea* sp.	Trabzon-Sürmene	24.6.2009
Cinara pilicornis	*Tetramorium chefketi*	*Picea* sp.	Artvin-Ardanuç	13.8.2009
Cinara pilicornis	*Formica fusca*	*Picea* sp.	Rize-Ayder-Goler	15.8.2009

Determined Aphid and Ant Associations from Trabzon, Rize and Artvin Provinces

Table 1. Determined aphid-ant species interaction from Trabzon, Rize and Artvin Provinces of Turkey.

Aphid Species	**Ant Species**	**Aphid Host Plant**	**Locality**	**Collection Date**
Cinara pini	*Lasius emarginatus*	*Pinus* sp.	Trabzon-Düzköy	22.6.2009
Cinara pini	*Lasius turcicus*	*Pinus* sp.	Trabzon-Maçka	22.6.2009
Cinara pini	*Lasius turcicus*	*Pinus* sp.	Trabzon-Hayrat	25.6.2009
Cinara pruinosa	*Formica cinereofusca*	*Picea* sp.	Trabzon-Dernekpazarı	24.6.2009
Dysaphis pyri	*Lasius alienus*	*Pyrus communis*	Trabzon-Tonya	20.6.2009
Lachnus roboris	*Proformica kobachidzei*	*Castanea sativa*	Trabzon-Hoyrat	25.6.2009
Macrosiphoniella sanborni	*Tetramorium caespitum*	*Anthemis* sp.	Trabzon-Şal Pazarı	20.6.2009
Myzus cerasi	*Lasius turcicus*	*Cerasus avium*	Trabzon-Tonya	20.6.2009
Myzus cerasi	*Lasius emarginatus*	*Cerasus avium*	Trabzon-Vakfıkebir	21.6.2009
Myzus cerasi	*Proformica kobachidzei*	*Cerasus avium*	Trabzon-Hoyrat	25.6.2009
Myzus lythri	*Lasius turcicus*	*Lythrum salicaria*	Trabzon-Kömürcü	23.6.2009
Myzus lythri	*Formica cinereofusca*	*Trifolium* sp.	Trabzon-Ormansever	24.6.2009
Myzus lythri	*Lasius emarginatus*	*Lythrum salicaria*	Trabzon-Köprübaşı	24.6.2009
Nearctaphis bakeri	*Formica cinereofusca*	*Trifolium pratense*	Trabzon-Beşikdüzü	20.6.2009
Neobetulaphis pusilla	*Lasius alienus*	*Alnus glutinosa*	Trabzon-Tonya	20.6.2009
Neobetulaphis pusilla	*Lasius turcicus*	*Alnus glutinosa*	Trabzon-Araklı	24.6.2009
Neobetulaphis pusilla	*Lasius turcicus*	*Alnus glutinosa*	Trabzon-Köprübaşı	24.6.2009
Periphyllus aceris	*Formica cinereofusca*	*Acer* sp.	Artvin-Camili	11.8.2009
Periphyllus aceris	*Lasius emarginatus*	*Acer* sp.	Artvin-Camili	12.8.2009
Phleomyzus passerini	*Lasius turcicus*	*Populus* sp.	Trabzon-Çarşıbaşı	21.6.2009
Pterochloroides persicae	*Lasius turcicus*	*Persica vulgaris*	Artvin-Karagöl	12.8.2009
Pterocallis albidus	*Formica cinereofusca*	*Alnus glutinosa*	Trabzon-Çarşıbaşı	21.6.2009
Pterocallis alni	*Formica cinereofusca*	*Alnus glutinosa*	Trabzon-Çarşıbaşı	21.6.2009
Schizaphis miscanthi	*Formica cinereofusca*	*Phleum* sp	Trabzon-Tonya	20.6.2009
Schizolachnus pineti	*Formica cinereofusca*	*Pinus* sp.	Artvin-Borçka	11.8.2009
Sipha maydis	*Formica cinereofusca*	*Poa* sp.	Trabzon-Dernekpazarı	24.6.2009
Symydobius oblongus	*Formica cinereofusca*	*Betula* sp.	Artvin-Şavşat	12.8.2009
Thelaxes californica	*Lasius emarginatus*	*Quercus* sp.	Trabzon-Vakfıkebir	21.6.2009
Thelaxes californica	*Crematogaster schmidti*	*Quercus* sp.	Artvin-Murgul	12.8.2009
Toxoptera aurantii	*Plagiolepis taurica*	*Hypericum* sp.	Trabzon-Şal Pazarı	20.6.2009
Toxoptera aurantii	*Lasius turcicus*	*Malus sylvestris*	Trabzon-Şal Pazarı	21.6.2009
Toxoptera aurantii	*Lasius turcicus*	*Citrus nobilis*	Trabzon-Şal Pazarı	21.6.2009

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Aphid Species	Ant Species	Aphid Host Plant	Locality	Collection Date
Toxoptera aurantii	*Formica cinereofusca*	*Eupatorium cannabinum*	*Rize-Çayeli*	*09.8.2009*
Toxoptera aurantii	*Lasius alienus*	*Camelia sinensis*	Artvin-Borçka	11.8.2009
Uroleucon kikioense	*Formica fusca*	*Campanula* sp.	Artvin-Camili	11.8.2009

Aphid species have relations with ant species were collected on 70 different plants species which are common pattern. There is no interesting aphid-host plant-ant trofic relations were found.

Turkey is an important geographical region in terms of faunal richness, climatic diversity and transition between European and Asian biological components. Therefore, there are nonignorable proportion of the both aphid and ant species (Görür *et al*., 2012; Kıran and Karaman, 2012), but there are very few studies conducted to find out aphid-ant associations (Özdemir *et al*., 2008) which is one of the famous mutualistic relations among insect species. Compared with first published study dealt with ant-aphid interactions in Turkey (Özdemir *et al*., 2008) only 6 ant species are also recorded from study area, 9 of them different from previous findings including most encountered ant species *Formica cinereofusca*. All determined aphid-ant interactions are previously known information, there is no new aphid-ant association.

In this study, all determined aphid-ant interactions are determined from aerial parts of the plants, Depa and Wojciechowski (2008) studied root aphid-ant interaction and discussed morphological, behavioral and ecological interactions. Therefore, undergound living aphid-ant interaction also is interesting and should be further searched and discussed in the frame of this mutuliastic relations. Findings of the presented study showed that detailed studies are going to bring up important indications related with aphid-ant associations.

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