

INVESTIGATIONS OF THE ASSOCIATED BETWEEN APHIDS AND ANTS ON WILD PLANTS IN ANKARA PROVINCE (TURKEY)

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ABSTRACT: Differences in feeding position consequently affect the benefits of myrmecophily for different aphid species. Tending also seems to be associated with differences in the honeydew quality and quantity of the aphids. This study yielded 16 ant species associated with 19 aphid species. The most encountered ant species that associated with many aphid species were *Camponotus aethiops* (Latreille), *Camponotus piceus* (Leach), *Formica glauca* Ruzsky, *Lasius paralienus* Seifert, *Crematogaster sordidula* (Nylander). On the other hand, the ant species that associated with only 1 aphid species were *Aphis chloris* Koch, *Aphis euphorbiae* Kaltenbach, *Aphis fabae* ssp. *circiicanthoidis* Scopoli, *Aphis gossypii* Glover, *Aphis nasturtii* Kaltenbach, *Aphis verbasci* Schrank, *Brachcaudus helicrysi* (Kaltenbach), *Hyadaphis foeniculi* (Passerini), *Hydaphias hofmanni* Börner and *Protaphis terricola* Rondani. The results indicated that the ant-aphid interaction is important on biological control.

KEY WORDS: Ants, aphids, associated, wild plant, Ankara

INTRODUCTION

Many insects develop symbiotic relationships with other organisms to help defend them in their environment. These relationships are mainly mutualistic. Many ant species cultivate herds of greenfly, coccids (Ulgenturk, 2001) and aphids, either above ground on young plant stems or underground on roots. An example of this type of relationship is between aphids and several ant species. Aphid-ant relationships are easy to manipulate and an ideal system for defining the driving forces in the ecology and evolution of antagonistic/mutualistic relationships.

Aphids and ants have many species relationships where both the ants and aphids benefit. Aphids secrete honeydew through their anus. The ants eat or store the honeydew. The ants sometimes incorporate the aphid territory into their own territory, which allows easier access to the aphids and affords the aphids protection by a greater number of ants (Holldobler and Wilson, 1990a). However, Aphids are soft bodied and have little defense against natural enemies other than avoidance. Therefore, it is likely that a major benefit of ant attendance for aphids is protection.

There are known about 4000 species of aphids worldwide (Eastop, 1973; Remaudière and Remaudière, 1997; Blackman and Eastop, 2000), and 410 species in Turkey (Remaudière et al., 2006).

Ants live practically everywhere but are most abundant in temperate climates. There are about 10,000 species, of ants. Within each species there are usually many different types. Ants are social insects that live in colonies and are some of the most successful insects (Hölldobler and Wilson, 1990b).

Aphids have to process very large quantities of phloem sap to sustain their very high growth rates, so honeydew is often likely to be abundant and available for fueling ant foraging. However, because phloem sap contains very little amino nitrogen and aphids are very good at assimilating most of it, honeydew is unlikely to be a source of N for ants (Stadler and Dixon, 2005).

For aphids, the present study is the first to follow single individuals throughout their life, both in the presence and the absence of tending ants. In the field, recently founded aphid colonies often consist of a few or more individuals.

The association of ants and homopters which is a very common phenomenon in plants has not been extensively studied in Turkey (Ulgenturk, 2001; Elmali and Toros, 1996). Although Aphididae and Formicidae are the largest families among insects in terms of number of species, studies carried out in Turkey to determine the relation between aphid-ants are not we known completely.

Aphis species on wild plants in Ankara province had been determined by Özdemir et al. (2006) and the ants living together with aphis species also have been collected during this study.

Therefore the aim of this study was to determine aphid-ants and their range of habitats in the Ankara province of Turkey.

METHODS

To determine the mutualistic interaction between ants and aphids on wild plants from Ankara province of Turkey, specimens were collected at random from live aphids on different wild plants. Each sample of aphids, ants and wild plants were placed separately in a plastic bag and then brought to the laboratory for identifying the species. The preserving techniques mainly based on the method of Hille Ris Lambers (1950). Host plants were identified according to Davis (1965–1985) and Davis et al. (1988) by Dr. Ayşegül Yıldırım (Plant Protection Central Research Institute, Head of Department of Herbology).

The ants and aphid species collected have been considered in alphabetical order.

Aphid slides of the species have been deposited in the Department of Taxonomy and Plant Protection Museum, Plant Protection Central Research Institute, Ministry of Agriculture, Ankara, Turkey and ant

specimens at the Department of Biology, Faculty of Science and Letters, Tırakya University, Edirne, Turkey.

RESULTS AND DISCUSSION

Sixteen species of ants (Figure 1) from 19 aphid species were determined in the Ankara province. The results were considered as two parts, which the first part consists of ant species determined, the host plant and the collection date of the aphids they were collected together with altitude values. In the second part, the list of aphid species visited by different ant species was given.

Ants and Aphid species collected together

Camponotus aethiops (Latreille, 1798)

Material examined: -Kalecik: Çandır, 14.VI.2001, Unknown species on Compositae – Nallıhan: Bozyaka, 20.VI.2001, 350m., from Unknown species on Unknown plant. – Nallıhan: Bozyaka, 20.VI.2001, 350m., from *Brachycaudus (Acaudus) cardui* Linnaeus on *Carduus pycnocephalus* – Akyurt, 25.VI.2001, 1124m., from *Ammiaphis sii* (Koch) on *Falcaria vulgaris*. –Bala: Küre dağı, 02.VII.2001, 1350m., *Aphis brotericola* Mordvilko on *Euphorbia* sp. – Kalecik: Tekebeli, 03.VII.2001, 1145m., from *Aphis salviae* Walker on *Salvia* sp. and from *Brachcaudus helicrysi* (Kaltenbach) on Compositae.

Camponotus piceus (Leach, 1825)

Material examined: - Kalecik: Aktepe, 14.VI.2001, from *Aphis euphorbiae* Kaltenbach on *Euphorbia* sp. – Haymana: Karahoca, 14.VI.2001, from *Aphis craccivora* Koch on *Anthemis* sp. – Bala: Küre dağı, 02.VII.2001, 1350m., from *Aphis brotericola* Mier Durante on *Euphorbia* sp. – Kalecik: Tekebeli, 03.VII.2001, from *Aphis salviae* Walker on *Salvia* sp. – Akyurt, 03.VII.2001, 1124m., from *Aphis fabae* Scopoli and *Hydaphias hofmanni* Börner on *Galium verum* – Ayaş, 10.VII.2001, 656m., from Unknown species on *Alhagi pseudoalhagi* – Çubuk, 12.VII.2001, 1600m., from *Aphis chloris* Koch on *Hypericum* sp. – Elmadağ, 24.VII.2001, 747m., from *Aphis craccivora* Koch on *Alhagi pseudoalhagi*.

Cataglyphis aenescens (Nylander, 1849)

Material examined: - Polatlı, 31.05.2001, 740m., from *Aphis craccivora* Koch on *Crepis* sp.

Crematogaster sordidula (Nylander, 1848)

Material examined: - Kalecik: Aktepe, 14.06.2001, from *Aphis* sp. on Labiatae, - Bala: Küre dağı, 02.07.2001, 1074m., from Unknown species on Labiatae, - Bala: Küre dağı, 03.07.2001, 1074m., from *Brachycaudus (Acaudus) cardui* Linnaeus on *Anchusa leptophylla*, - Ayaş, 10.07.2001, 675m., from *Brachycaudus (Acaudus) cardui* Linnaeus on *Onopordium* sp.

Formica cunicularia Latreille, 1798

Material examined: - Elmadağ, 24.07.2001, 1190m., from *Aphis craccivora* Koch on *Alhagi pseudoalhagi*.

Formica glauca Ruzsky, 1895

Material examined: - Polatlı, 31.05.2001, 740m., from *Brachycaudus (Appelia) tragopogonis* (Kaltenbach) on *Tragopogon* sp. - Haymana, 31.05.2001, 1022m., from *Aphis fabae* ssp. *circiicanthoidis* Scopoli on *Cirsium arvense*, - Kızılcahamam: Salin, 19.06.2001, 1110m., from *Aphis* sp. on *Anthemis* sp., - Kızılcahamam: Doğanözü, 19.06.2001, 1102m., from *Aphis craccivora* Koch on *Urtica urens*, - Kızılcahamam: Salin, 19.06.2001, 1110m., from *Brachycaudus (Acaudus) cardui* Linnaeus on *Carduus pycnocephalus*, - Beypazarı: İnözü, 10.07.2001, 1203m., from *Aphis galliiscabri* Schrank on *Rubia tinctorium*.

Formica rufibarbis Fabricius, 1793

Material examined: - Kazan, 30.05.2001, 1050m., from *Aphis* sp. on *Tragopogon* sp.

Lasius alienus Emery (Emery, 1878)

Material examined: - Beypazarı: Akkaya, 21.06.2001, 563m., from *Aphis galliiscabri* Schrank on *Galium* sp. - Çubuk: Karagöl, 12.07.2001, 1668m., from *Brachycaudus (Appelia) tragopogonis* (Kaltenbach) on *Tragopogon* sp. - Güdül: Sorgun, 07.08.2001, from *Capitophorus hippophaes* (Walker) on Polygonaceae.

Lasius paralienus Seifert, 1992

Material examined: - Çamlıdere: Alakoç, 30.05.2001, 1360m., from *Aphis fabae* Scopoli on *Rumex* sp., - Polatlı: Central, 31.05.2001, 740m., from *Brachycaudus (Acaudus) cardui* Linnaeus and *Aphis* sp. on *Carduus pycnocephalus*, - Kızılcahamam: Salin, 19.06.2001, 1110m., from *Aphis craccivora* Koch on *Vicia* sp., - Kızılcahamam: Salin, 19.06.2001, 1110m., from *Aphis craccivora* Koch on *Crepis foetida* - Kızılcahamam: Salin, 19.06.2001, 1110m., from *Aphis galliiscabri* Schrank on *Galium* sp., - Beypazarı: Haydarlar, 21.06.2001, 1245m., from *Aphis fabae* Scopoli on *Galium* sp., and from *Aphis gossypii* on Unknown host plant, - Bala, Buğlecik, 02.07.2001, 1078m., from *Brachycaudus (Acaudus) cardui* Linnaeus on *Cirsium* sp. - Ayaş, 27.08.2001, 906m., from *Aphis fabae* Scopoli on *Chenopodium album*.

Lasius turcicus Santschi, 1921

Material examined: - Kızılcahamam: Yukarıçanlı, 19.06.2001, 1039m., from *Aphis fabae* Scopoli on *Rumex* sp., - Çubuk: Kışlacık, 12.07.2001, 1215m., from *Protaphis terricola* Rondani on *Centaurea iberica*.

Myrmica ruginodis (Brian, 1985)

Material examined: - Unknown species, from on *Galium* sp., Nallıhan: Göynük border, 20.06.2001, 670m.,

Plagiolepis pallescens Forel, 1889

Material examined: - Kalecik: Çandır, 14.06.2001, from *Brachycaudus (Appelia) tragopogonis* (Kaltenbach), on *Tragopogon* sp., - Haymana: Karahoca, 27.06.2001, from *Staegeriella necopinata* Börner, on *Galium verum*, - Sincan: Central, 16.07.2001, from on *Onopordium* sp., - Elmadag: Hasanoğlu, 24.07.2001, 747m., from *Aphis craccivora* Koch on *Dipsacus laciniatus*.

Plagiolepis vindobonensis (Lomnicki, 1925)

Material examined: - Haymana: Karahoca, 27.06.2001, from *Staegeriella necopinata* Börner on *Galium verum*, - Şereflikoçhisar: Central, 09.08.2001, from Unknown species on *Daucus carota*.

Tapinoma erraticum (Latreille, 1798)

Material examined: - Çubuk: Karagöl, 12.07.2001, 1668m., from Unknown species on *Urtica* sp.

Tetramorium forte (Forel, 1904)

Material examined: - Gölbaşı: Central, 23.05.2001, 983m., from *Aphis craccivora* Koch on *Crepis* sp., - Haymana: Central: 31.05.2001, 1033m., from *Aphis craccivora* Koch on *Crepis foetida*, - Nallıhan, 20.06.2001, 663m., from *Aphis rumicis* Linnaeus on *Rumex* sp.

Tetramorium chefteki Forel, 1911

Material examined: - Kazan, 30.05.2001, 1035m., from *Aphis rumicis* Linnaeus on *Rumex* sp. Polatlı: Central, 31.05.2001, 740m., from *Aphis craccivora* Koch on *Crepis* sp., - Çubuk: Kışlacık, 27.05.2003, 1215m., from on *Senecio* sp.

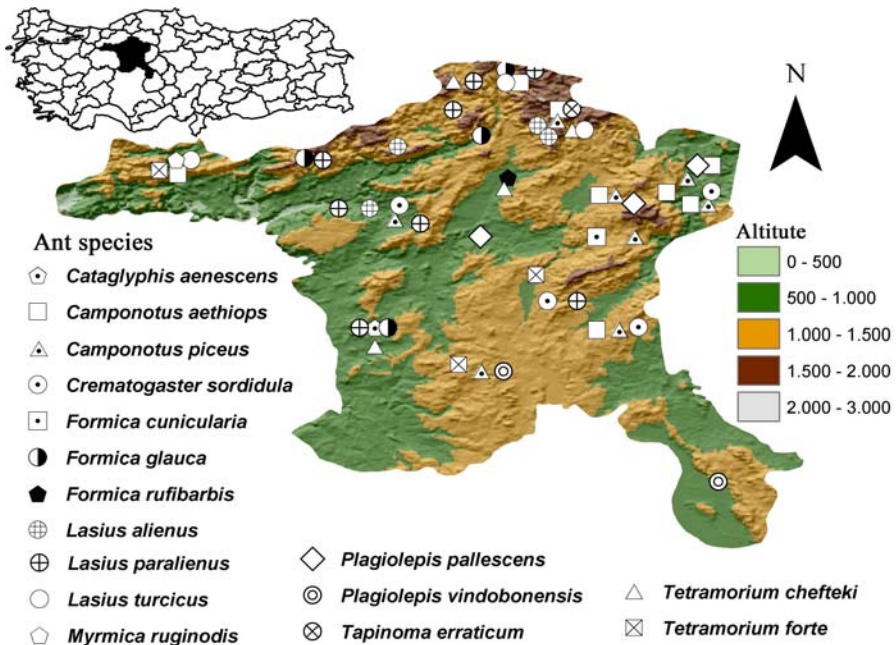


Figure 1. Ants from Aphididae in Ankara province

APHIDS AND ANTS LIST

- Aphis brotericola*** Mier Durante, 1978a
Camponotus aethiops (Latreille, 1798)
Camponotus piceus (Leach, 1825)
- Aphis chloris*** Koch, 1854
Camponotus piceus (Leach, 1825)
- Aphis craccivora*** Koch, 1854
Tetramorium forte (Forel, 1904)
Tetramorium chefteki Forel, 1911
Cataglyphis aenescens (Nylander, 1849)
Lasius paralienus Seifert, 1992
Formica glauca Ruzsky, 1895
Camponotus piceus (Leach, 1825)
Formica cunicularia Latreille, 1798
Plagiolepis pallescens Forel, 1889
- Aphis euphorbiae*** Kaltenbach, 1843
Camponotus piceus (Leach, 1825)
- Aphis fabae*** Scopoli, 1763
Lasius paralienus Seifert, 1992
Camponotus piceus (Leach, 1825)
- Aphis fabae* ssp. *circiicanthoidis*** Scopoli, 1763
Formica glauca Ruzsky, 1895
- Aphis galliiscabri*** Schrank, 1801
Lasius paralienus Seifert, 1992
Lasius alienus Emery (Emery, 1878)
Formica glauca Ruzsky, 1895
- Aphis gossypii*** Glover, 1877
Lasius paralienus Seifert, 1992
- Aphis nasturtii*** Kaltenbach, 1843
Lasius alienus Emery (Emery, 1878)
- Aphis rumicis*** Linnaeus, 1758
Tetramorium chefteki Forel, 1911
Lasius paralienus Seifert, 1992
Tetramorium forte (Forel, 1904)
- Aphis salviae*** Walker, 1852
Camponotus aethiops (Latreille, 1798)
Camponotus piceus (Leach, 1825)
- Aphis verbasci*** Schrank, 1801
Lasius alienus Emery (Emery, 1878)
- Brachycaudus (Acaudus) cardui*** (Linnaeus, 1758)
Lasius paralienus Seifert, 1992
Camponotus aethiops (Latreille, 1798)
Formica glauca Ruzsky, 1895
Crematogaster sordidula (Nylander, 1848)
- Brachcaudus helicrysi*** (Kaltenbach, 1843)
Camponotus aethiops (Latreille, 1798)

Brachycaudus (Appelia) tragopogonis (Kaltenbach, 1843)*Formica glauca* Ruzsky, 1895*Plagiolepis pallescens* Forel, 1889*Lasius alienus* Emery (Emery, 1878)***Capitophorus hippophaes*** (Walker, 1852)*Lasius alienus* Emery (Emery, 1878)***Hyadaphis foeniculi*** (Passerini, 1860)*Lasius paralienus* Seifert, 1992***Hyadaphis hofmanni*** Börner, 1950*Camponotus piceus* (Leach, 1825)***Protaphis terricola*** Rondani, 1847*Lasius turcicus* Santschi, 1921***Staegeriella necopinata*** Börner, 1939*Plagiolepis vindobonensis* (Lomnicki, 1925)*Camponotus piceus* (Leach, 1825)

Despite the widespread recognition that ants provide a reliable indication of ecological change associated with land-use, their cost-effectiveness is as indicators compared with more familiar groups such as vascular plants, birds and aphids. It is clear that the number of ant species could be much more overall the country. The presence of ants in aphid colony effects natural enemy visit. And also it is known that the ants show aggressive behaviors against natural enemies. So the ant-aphid interaction is important on biological control.

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