

## SOME OBSERVATION ABOUT FORMICIDAE (HYMENOPTERA) IN ALMOND AGROECOSYSTEMS IN EAST-SOUTHEAST ANATOLIAN REGION OF TURKEY

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**ABSTRACT:** Nine species of the family Formicidae are recorded in almond agroecosystems from East-Southeast Anatolia of Turkey. Among them, many first regional records had been reported from Turkey. These species were especially found in the almond areas of the locations where they were found, especially Aphididae, Diaspididae, Tingidae and Cicadellidae family. The most diverse genera in terms of species and subspecies richness are *Camponotus* (4), *Cataglyphis* (2) *Crematogaster* (1), *Lepisiota* (1), and *Tapinoma* (1). Individuals are distributed from 1043 m to 1280 m.

**KEY WORDS:** Almond, Formicidae, fauna, altitude, South-East Anatolia, Turkey

The total amount of almond produced in Turkey is about 82000 tons. With the total production capacity of 10649 tons in Diyarbakır, Elazığ and Mardin region, where this study is held, account for 7.7 % of Turkey's total almond production (Anonymous, 2014). Almond gardens are an important biodiversity area. This is important in harmful and beneficial insect biodiversity. Some pests have caused important crop losses affecting almond growth. It is reported that 130 species of almond gardens in the GAP region have been done little or no damage (Bolu et al., 2011). Many insect species are associated in terms of harmful and beneficial relationships in this fauna. There are totally 286 species and 20 subspecies in Turkey (Kiran & Karaman, 2012).

Ants are important in below ground processes through the alteration of the physical and chemical environment and through their effects on plants, microorganisms, and other soil organisms. There are many roles in different agroecosystems. Santos et al. (2007) have reported that ant species have many ecological functions in olive agroecosystems. Marin et al. (2011) was reported three subfamilies, the Myrmicinae Formicinae and Dolichoderinae a total of 13 ant species in almond orchards from Portugal. This study was reported four most abundant ant species in almond orchards. There are no detailed studies on Formicidae species found in almond fields in our country. The aim of this study to make contribution to some faunistical records and some ecological interaction of Hymenoptera (Formicidae) in almond agroecosystems.

### MATERIAL AND METHODS

This study was conducted during 2002-2004, is based on the collection from different locations of Diyarbakır Elazığ and Mardin provinces. Samples were taken from the almond orchards by knock down methods and visual examination. Samplings were made between March to September. All of material is put into the tubes (%70 alcohol). All individuals were sorted, identified and counted using a binocular microscope.

## RESULTS AND DISCUSSION

The species belonging to the family of Formicidae found in almond orchards are shown in table 1. A total of 159 individuals of 9 species were collected. Individuals are distributed from 1043 m to 1280 m (Fig. 1). The *Cataglyphis viaticoides* and *Crematogaster ionia* were determined only at 1043 m. Many researchers have been recorded on distribution of ant species with altitude. For example; *Camponotus gestroi* Emery was distributed from 200-420-2100 m from olive forests and other habitat in the Mountains (Aktaç, 1988; Kıran & Aktaç, 2006; Karaman et al., 2011).

Species, especially in the almond trees where *Mercetaspis halli* Green (Hemiptera Diaspididae) were intensively and commonly contaminated. It has been observed that these species feed sweet foods that the pests secrete. Especially *Crematogaster ionia* among these species was collected from the almond trees in which the species belonging to the Diaspididae family are concentrated in the area where the study was carried out. This species is the most intensively visited species of harmful *Marchalina hellenica* (Hemiptera: Marchaliniae) in pine trees in our country (Ülgentürk et al., 2012).

Redolfi et al. (1999), in line with these conclusions, he reported that especially ant species play an important role in the soil-nutrient-ecosystem cycle. These species have been reported to play an important role as predators, mutualists and scavengers, especially in the olive agroecosystem, and Pereira et al. (2012) reports that these species are intensely present in the trees where sweetmint is secreted in almond orchards. It is necessary to elaborate more closely the relationship of these species to predators and pests in fruit plantations and to elaborate the roles of almond agroecosystem. Thus, ant-aphid-plant interactions have significant implications for biological control.

Because of these relationships in agroecosystems have attracted interest of researchers in recent years, it is also useful to evaluate the work from the point of view of the relationship of ant-aphid. The mutualistic relationship between ants and aphids has been the subject of many studies (Novgorodova, 2005). Many ant species was shown that only ants with large protected territories attacked the adults and larvae of the predator (Reznikova & Novgorodova, 1998). In additionally ants are decrease pathogen occurrence and promote a healthy aphid colony and host plant, they also known to clean honeydew residue from host plants (Nielsen et al., 2010). But costs and benefits associated with an aphid-ant interaction are hard to measure (Tegelaar, 2015). The most of species obtained in this study have been intensively identified especially in aphid afflicted almond trees. In particular, the species of *Camponotus* genus obtained in the study have been collected intensively in the trees infected with *Pterochloroides persicae* and *Hyalopterus amygdali*. In parallel with this study, it has been determined that these genus-related species have an association with ants in *Pterochloroides persicae*-infected trees in Iraq (Stary, 1969). These genus-related species are attracted by honey-like substances of many aphid species (Lokeshwari et al., 2015). In future studies, detailing of aphid-ant and natural enemy relations in almond agroecosystem will provide benefits in terms of pest management in almonds.

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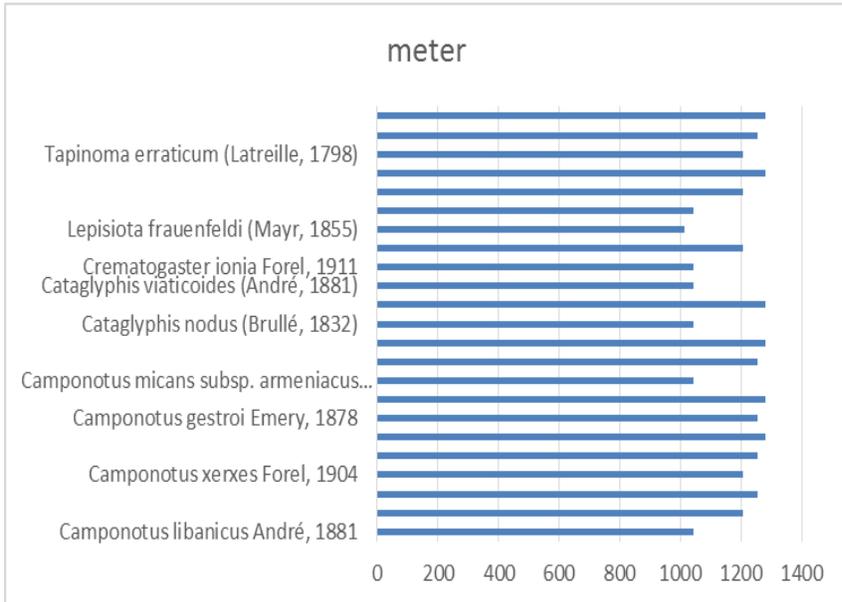


Figure 1. Altitude distribution of Formicidae in East-Southeast Anatolia.

Table 1. Species of Formicidae in Almond Orchards.

Species	Date	Altitude	Locality
<i>Camponotus libanicus</i> André, 1881	15.09.2004	1206m.	Elazığ-Keban
	07.09.2004	1043m.	Diyarbakır-Ergani
	15.09.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
	07.09.2004	1043m.	Diyarbakır-Ergani
	15.09.2004	1256m.	Elazığ-Sivrice-Gezin
	07.09.2004	1043m.	Diyarbakır-Ergani
	31.08.2004	1256m.	Elazığ-Sivrice-Gezin
	31.08.2004	1206m.	Elazığ-Keban
	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
<i>Camponotus xerxes</i> Forel, 1904	15.09.2004	1206m.	Elazığ-Keban
	31.08.2004	1280m.	Elazığ-Sivrice
	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1280m.	Elazığ-Sivrice
	15.09.2004	1280m.	Elazığ-Sivrice
	15.09.2004	1280m.	Elazığ-Sivrice
<i>Camponotus gestroi</i> Emery, 1878	03.06.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1280m.	Elazığ-Sivrice
<i>Camponotus micans</i> subsp. <i>armeniacus</i> Arnol'di, 1967	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1280m.	Elazığ-Sivrice
	07.09.2004	1043m.	Diyarbakır-Ergani
<i>Camponotus</i> sp.	07.09.2004	1043m.	Diyarbakır-Ergani
	07.09.2004	1043m.	Diyarbakır-Ergani
<i>Cataglyphis nodus</i> (Brullé, 1832)	18.08.2004	1280m.	Elazığ-Sivrice
	07.09.2004	1043m.	Diyarbakır-Ergani
	15.09.2004	1280m.	Elazığ-Sivrice
	07.07.2004	1280m.	Elazığ-Sivrice
<i>Cataglyphis viaticoides</i> (André, 1881)	07.09.2004	1043m.	Diyarbakır-Ergani
<i>Crematogaster ionia</i> Forel, 1911	15.09.2004	1206m.	Elazığ-Keban
	07.09.2004	1043m.	Diyarbakır-Ergani
<i>Lepisiota frauenfeldi</i> (Mayr, 1855)	03.09.2004	1012m.	Mardin-Merkez
	07.09.2004	1043m.	Diyarbakır-Ergani
	18.08.2004	1280m.	Elazığ-Sivrice
	07.07.2004	1280m.	Elazığ-Sivrice
	24.08.2004	1012m.	Mardin-Merkez
	15.09.2004	1206m.	Elazığ-Keban
<i>Tapinoma erraticum</i> (Latreille, 1798)	15.09.2004	1206m.	Elazığ-Keban
	15.09.2004	1206m.	Elazığ-Keban
	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1256m.	Elazığ-Sivrice-Gezin
	18.08.2004	1280m.	Elazığ-Sivrice