

SOME RECORDS OF PARASITOID WASPS ASSOCIATED WITH GALL WASPS (HYMENOPTERA: CYNIPIDAE) IN ISTANBUL, TURKEY

Özlem Mete*, Musa Azmaz**,
Hossein Lotfalizadeh*** and Yusuf Katılmış****

* Department of Biology, Faculty of Science, Hacettepe University, Ankara, TURKEY. E-mail: ozlmmete@gmail.com

** Department of Veterinary, Acıpayam Vocational High School, Pamukkale University, Denizli, TURKEY.

*** Department of Plant Protection, East-Azerbaijan Agricultural and Natural Resources Research and Education Center, AREEO, Tabriz, IRAN.

**** Department of Biology, Faculty of Arts and Sciences, Pamukkale University, Denizli, TURKEY.

[Mete, Ö., Azmaz, M., Lotfalizadeh, H. & Katılmış, Y. 2018. Some records of parasitoid wasps associated with gall wasps (Hymenoptera: Cynipidae) in Istanbul, Turkey. *Munis Entomology & Zoology*, 13 (2): 542-547]

ABSTRACT: Cynipid galls, represent physically bounded microcosms for parasitoid wasps along with other inhabitants of galls, such as gall wasps and phytophagous inquilines. In the current work, 11 parasitoid species and one seed-feeder were identified belonging to five families; Eurytomidae, Ormyridae, Pteromalidae, Torymidae, and Ichneumonidae. The species *Torymus cerri* Mayr and *T. notatus* (Walker) are new records for Turkey. In addition, some new associations between parasitoid wasp species and host cynipid galls were recorded.

KEY WORDS: Hymenoptera, parasitoid wasps, Chalcidoidea, Ichneumonidae, gall wasps, Cynipidae, new records

Parasitoid lifestyle is one of the most remarkable characteristics which can be seen among the order Hymenoptera, and the parasitoid wasps have a high species diversity besides a wide range of hosts. Approximately 200 species of hymenopteran parasitoids associated with gall wasps are known in the Western Palaearctic (Askew, 1961; Fulmek, 1968; Graham & Gijswit, 1998).

Cynipid gall wasps (Hymenoptera: Cynipidae) induce complex plant galls on oaks, roses, and a wide diversity of other plants (Csóka et al., 2005). Each species induce a characteristic gall structure, and these structural traits represent the extended phenotypes of the gall wasp genes (Crespi et al., 1997; Stern, 1995). Studies support a defensive role for several gall traits on the outer gall tissues such as sticky resins and spines (Bailey et al., 2009; Stone & Cook, 1998). However, even they have surrounded by protective gall tissues, cynipid galls host diverse communities consisting parasitoids, inquilines, and predators. The mortality rates of the gall wasps can reach to 90% with mutual effects of parasitoids and inquilines (Hawkins et al., 1988; Shorthouse et al., 2005; Stone et al., 1995).

There is an increasing number of studies about the gall wasp fauna in Turkey and new records are continuing to be added on this knowledge (Azmaz & Katılmış, 2015, 2017a; Dinç et al., 2014; Güçlü et al., 2008; Katılmış & Kiyak, 2009a,b, 2010, 2011a,b,c,d,e, 2012; Kemal & Koçak, 2010; Kiyak et al., 2008; Kiyak & Katılmış, 2010; Koçak & Kemal, 2012; Melika & Stone, 2001; Melika et al., 2004; Mete & Demirsoy, 2012; Mutun & Dinç, 2011, 2015; Mutun et al., 2014). Recently, Azmaz & Katılmış (2017b) have listed 148 species of cynipid gall wasps

in Turkey. There are also some studies on the parasitoid wasps related with cynipid galls in Turkey (Bayram et al., 1998; Boyadzhiev et al., 2017; Çoruh et al., 2004; Doğanlar, 1984, 1990, 2014, 2016, 2017; Doğanlar & Çam, 1991; Kılınçer, 1983; Özbek et al., 1999; Mete & Mergen, 2016, 2017). All of the parasitoids associated with cynipid galls in Western Palaearctic are listed in Askew et al. (2006, 2013) and Lotfalizadeh et al. (2007, 2012).

Here, we aimed to contribute to the knowledge on parasitoid wasps associated with gall wasps in Istanbul, the west of Turkey.

MATERIALS AND METHODS

All gall specimens on host plants were collected from different localities in Istanbul between 2012 and 2013 by MA and YK. Gall specimens were kept in laboratory conditions and checked weekly for emerged wasps. Adult gall wasps and parasitoids were subsequently fixed in ethanol. The adults were then air-dried, fixed on cards (5x10 mm), and pinned. Reared wasp specimens were identified using the works of Bouček and Rasplus (1991), Goulet & Huber (1993), Graham & Gijswijt (1998), Lotfalizadeh et al. (2006), Melika (2006), Noyes (2017), Roques & Skrzypczynska (2003), Yu et al. (2012), and Zerova & Seryogina (1999, 2006). Identifications were made by HL and OM.

Specimens are deposited in insect collection of the Department of Plant Protection, East-Azerbaijan Research & Education Center for Agriculture & Natural Resources, Tabriz, Iran.

RESULTS

Family Eurytomidae

Eurytoma caninae Lotfalizadeh & Delvare, 2007

Materials examined: İSTANBUL, Eyüp, Belgrad Forest, Binbaşı Çeşmesi Promenade, 41°09'N, 28°55'E, 50 m, 20.X.2012, galls of *Diplolepis nervosa*, on *R. canina*, emerged 01.II.2013, 1♀; Pendik, Aydos Forest, 40°55'N, 29°15'E, 313 m, 19.X.2012, galls of *D. nervosa*, on *R. canina*, emerged 30.XII.2012, 1♀.

Sycophila biguttata (Swederus, 1795)

Materials examined: İSTANBUL, Beykoz, Kaynarca, 41°10'N, 29°09'E, 135 m, 03.III.2013, galls of *C. quercusfolii*, on *Q. frainetto*, 1♀.

Family Ormyridae

Ormyrus nitidulus (Fabricius, 1804)

Materials examined: İSTANBUL, Beykoz, Anadolu Feneri, 41°12'N, 29°09'E, 68 m, 31.V.2013, galls of *A. curvator*, on *Q. frainetto*, 2♂♂; Çatalca, Binkılıç-Yahıköy 12. km, 41°29'N, 28°13'E, 207 m, 25.XI.2012, galls of *C. quercusfolii*, on *Q. frainetto*, 1♂; Eyüp, Belgrad Forest, Falih Rıfki Atay-Ayvad Bendi Promenade 4. km, 41°11'N, 28°55'E, 83 m, 20.X.2012, galls of *C. quercusfolii*, on *Q. frainetto*, 2♀♀; Eyüp, Kemerburgaz, Odayeri, 41°14'N, 28°51'E, 120 m, 20.X.2012, galls of *A. galeatus*, on *Q. petraea*, 1♂; Pendik, Aydos Forest, 40°55'N, 29°15'E, 360 m, 19.X.2012, galls of *C. quercusfolii* and *A. gallaearnaeformis*, on *Q. infectoria*, 2♀♀; Silivri, Danamandıra-Yaylacık 3. km, 41°19'N, 28°14'E, 177 m, 25.XI.2012, galls of *Ap. cerricola*, on *Q. cerris*, 7♀♀, 2♂♂; Şile, Çayırbaşı-Yeniköy 2. km, 41°08'N, 29°39'E, 150 m, 24.XI.2012, galls of *A. conglomeratus*, on *Q. infectoria*, 1♂; Şile, Korucu-Kalealtı 3. km, 41°07'N, 29°32'E, 30 m, 03.III.2013, galls of *Andricus* sp., on *Quercus* sp., 2♂♂; Şile, Korucu-Kalealtı 7. km, 41°07'N, 29°30'E, 40 m, 03.III.2013, galls of *A. mitratus*, on *Q. petraea*, 1♀; Şile, Kurna-Karakiraz 1. km, 41°11'N, 29°21'E, 88 m, 03.III.2013, galls of *A. glutinosus*, on *Q. frainetto*, 1♀; Şile, Sortullu-Hacılı 1.

km, Doğan Yuvası Fire Watch-Tower, 41°03'N, 29°43'E, 308 m, 24.XI.2012, galls of *A. lucidus*, on *Q. cerris*, 1♂.

Family Pteromalidae

Pteromalus bedeguaris Thomson, 1878

Materials examined: İSTANBUL, Silivri, Çeltik-Çerkezköy 3. km, 41°08'N, 28°06'E, 122 m, 25.XI.2012, galls of *Diplolepis rosae*, on *R. canina*, emerged 25.I.2013, 06.V.2013, 9♀♀, 1♂.

Family Torymidae

Bootanomyia almusiensis (Doğanlar, 1989)

Materials examined: İSTANBUL, Şile, Sofular-Doğançalı 1. km, 41°10'N, 29°29'E, 21 m, 03.III.2013, galls of *Synophrus politus*, on *Q. cerris*, 1♀.

Bootanomyia stigmatizans (Fabricius 1789)

Materials examined: İSTANBUL, Şile, Akçakese-Kabakoz 2. km, 41°08'N, 29°41'E, 14 m, 02.III.2013, galls of *A. quercustozae*, on *Q. infectoria*, 1♂.

Glyphomerus stigma (Fabricius, 1793)

Materials examined: İSTANBUL, Sarıyer, Gümüşdere-Bahçeköy 2. km, 41°13'N, 28°58'E, 90 m, 04.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 4♀♀; Sarıyer, Rumelifeneri, İstanbul Villas, 41°14'N, 29°06'E, 40 m, 04.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 1♀, 1♂.

Megastigmus rosae Bouček, 1971

Materials examined: İSTANBUL, Sarıyer, Gümüşdere-Bahçeköy 2. km, 41°13'N, 28°58'E, 90 m, 04.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 7♀♀; Sarıyer, Rumelifeneri, İstanbul Villas, 41°14'N, 29°06'E, 40 m, 04.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 21♀♀; Şile, Korucu-Kalealtı 7. km, 41°07'N, 29°30'E, 40 m, 03.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 1♀; Şile, Sofular, 41°10'N, 29°29'E, 37 m, 03.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 3♀♀; Şile, Yeşilvadi-Sofular 2. km, 41°08'N, 29°28'E, 140 m, 03.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 4♀♀.

Torymus bedeguaris (Linnaeus, 1758)

Materials examined: İSTANBUL, Arnavutköy, Tayakadın, Tayakadın Promenade 2, 41°14'N, 28°41'E, 178 m, 30.V.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 12♀♀, 2♂♂; Beykoz, Hz. Yûşa Tomb, 41°09'N, 29°05'E, 169 m, 31.V.2013, galls of *D. spinosissimae*, on *R. canina*, emerged 18.VI.2013, 3♀♀, 1♂; Silivri, Çeltik-Çerkezköy 3. km, 41°08'N, 28°06'E, 122 m, 25.XI.2012, galls of *D. rosae*, on *R. canina*, emerged 25.I.2013, 06.V.2013, 2♀♀, 1♂; Şile, Yeşilvadi-Sofular 2. km, 41°08'N, 29°28'E, 140 m, 03.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 2♀♀, 1♂.

Torymus cerri Mayr, 1874

Materials examined: İSTANBUL, Şile, Sofular-Doğançalı 1. km, 41°10'N, 29°29'E, 21 m, 03.III.2013, galls of *C. quercusfolii*, on *Q. cerris*, 1♀. New record for the Turkish fauna.

Torymus notatus (Walker, 1833)

Materials examined: İSTANBUL, Şile, Akçakese-Kabakoz 2. km, 41°08'N, 29°41'E, 14 m, 02.III.2013, galls of *C. divisa*, on *Q. frainetto*, 1♀. New record for the Turkish fauna.

Family Ichneumonidae

Orthopelma mediator (Thunberg, 1822)

Materials examined: İSTANBUL, Şile, Yeşilvadi-Sofular 2. km, 41°08'N, 29°28'E, 140 m, 03.III.2013, galls of *D. rosae*, on *R. canina*, emerged 18.VI.2013, 2♀♀, 2♂♂.

DISCUSSION

In the current work, 12 hymenopteran species from five families associated with cynipid galls were identified. One of them, *Megastigmus rosae* (Hymenoptera: Chalcidoidea) is a seed-feeder on *Rosa* spp. (Roques & Skrzypczynska, 2003; Daneshvar et al., 2009). The other specimens which identified here is parasitoid wasps from the superfamilies Chalcidoidea and Ichneumonoidea. Among them, *Ormyrus nitidulus* has the broadest range of associated gall wasp species (Table 1).

The species *T. cerri* and *T. notatus* are new records for Turkey, and their relationship with the galls of *C. quercusfolii* and *C. divisa*, respectively were first defined here. This is also the first record of the association between *O. nitidulus* and *A. gallaearnaeformis*. *Bootanomyia almusiensis* was reared from the oak gall specimens infested by the cynipid species *S. politus*, and the association between these two species is also new for our knowledge. The relation between these species needs to be investigated more detailed in further studies focusing on feeding relationships of the community members.

ACKNOWLEDGEMENT

This study was supported by the Pamukkale University Scientific Research Project Unit (Project No: 2012FBEO45).

LITERATURE CITED

- Askew, R. R. 2013. Catalogue of parasitoids and inquilines in cynipid oak galls in the West Palearctic. *Zootaxa*, 3643: 1-133.
- Askew, R. R., Melika, G., Pujade-Villar, J., Schönrogge, K., Stone, G. N. & Nieves-Aldrey, J. L. 1961. On the biology of inhabitants of oak galls of Cynipidae (Hymenoptera) in Britain. *Transactions of the Society for British Entomology*, 14: 237-268.
- Askew, R. R., Plantard, O., Gómez, J. F., Nieves, M. H. & Nieves-Aldrey, J. L. 2006. Catalogue of parasitoids in galls of Aylacini, Diplepidini and Pediaspidini (Cynipidae) in the West Palearctic. *Zootaxa*, 1301: 1-60.
- Azmaz, M. & Katılmış, Y. 2015. Four new records of oak gall wasp (Hymenoptera: Cynipidae, Cynipini) from Turkey. *Munis Entomology & Zoology*, 10: 201-204.
- Azmaz, M. & Katılmış, Y. 2017a. Cynipidae (Insecta: Hymenoptera) fauna of Istanbul. *Munis Entomology & Zoology*, 12: 151-167.
- Azmaz, M. & Katılmış, Y. 2017b. Updated species list of Cynipidae (Hymenoptera) from Turkey. *Zootaxa*, 4303: 361-378.
- Bailey, R., Schönrogge, K., Cook, J. M., Melika, G., Csóka, G., Thuróczy, C. & Stone, G. N. 2009. Host niches and defensive extended phenotypes structure parasitoid wasp communities. *PLoS Biol.*, 7: 1-12.
- Bayram, Ş., Ülgentürk, S. & Toros, S. 1998. Ankara ilinde kuşburnu (*Rosa* spp.)'da gal yapan böcekler ve bunların parazitoidleri üzerinde araştırmalar. *Türkiye Entomoloji Dergisi*, 22: 259-268 (in Turkish).
- Bouček, Z. & Rasplus, J. Y. 1991. Illustrated key to West-Palearctic genera of Pteromalidae (Hymenoptera: Chalcidoidea). *Techniques et Pratiques series*, INRA Editions, Paris, France, 140 pp.
- Boyadzhiev, P. S., Yefremova, Z., Tozlu, G., Mergen, Y. O. & Mete, Ö. 2017. Description of *Stepanovia fructirosae* sp. n. (Hymenoptera: Chalcidoidea: Eulophidae) from Turkey. *Acta Zoologica Bulgarica*, Supplement: 113-117.
- Crespi, B. J., Carmean, D. A. & Chapman, T. W. 1997. Ecology and evolution of galling thrips and their allies. *Annual Review of Entomology*, 42: 51-71.
- Csóka, G., Stone, G. N. & Melika, G. 2005. Biology, Ecology, and Evolution of Gall-Inducing Cynipidae. In: Raman, A., Schafer, C. W. & Withers, T. M. (Eds.), *Biology, Ecology and Evolution of Gall-Inducing Arthropods*. Vol 2. Science Publishers, Enfield, New Hampshire, USA, 573-642.
- Çoruh, S., Özbek, H., Kolarov, J. & Tozlu, G. 2004. Bayburt ve Gümüşhane illerinde *Diptolepis mayri* Schld.'nin Ichneumonid parazitoidleri. I. Bitki Koruma Kongresi Bildirileri, Samsun, p.65 (in Turkish).
- Daneshvar, S., Talebi, A. A. & Fathipour, Y. 2009. The wasps associated with seeds and galls of *Rosa canina* in Iran. *Advances in Environmental Biology*, 3: 61-68.
- Dinc, S., Mutun, S. & Melika, G. 2014. A new species of *Andricus* Hartig oak gall wasp from Turkey (Hymenoptera: Cynipidae: Cynipini). *North-Western Journal of Zoology*, 10: 122-127.
- Doğanlar, M. 1984. Notes on Chalcidoidea of Turkey, I. Chalcididae, Eurytomidae, Torymidae, Orymidae, Perilampidae, Eucharitidae. *Turkish Journal of Plant Protection*, 8: 151-158.
- Doğanlar, M. 1990. Bazı Türkiye Eurytomidae (Hymenoptera: Chalcidoidea) türleri. II. Biyolojik Mücadele Kongresi, Ankara, 165-172 (in Turkish).
- Doğanlar, M. 2014. Yalova'da (Türkiye) kestane gal arısı, *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera: Cynipidae)'nin doğal düşman faunası hakkında ilk kayıtlar. *Türkiye Biyolojik Mücadele Dergisi*, 5: 67-74 (in Turkish).
- Doğanlar, M. 2016. *Pseudertimerus* Gahan, 1919 (Hymenoptera: Torymidae: Microdontomerini) species from Turkey, with descriptions of new species. *Munis Entomology & Zoology*, 11: 230-237.

- Doğanlar, M.** 2017. Turkish species of *Torymus* Dalman, 1820 (Hymenoptera: Torymidae: Torymini), with descriptions of new species. *Munis Entomology & Zoology*, 12: 5-22.
- Doğanlar, M. & Çam, H.** 1991. The species of *Eurytoma* III. with two-three strong setae on hind tibiae from Türkiye, and description of a new species from Tokat, Türkiye (Hymenoptera, Eurytomidae). *Turkish Journal of Entomology*, 15: 143-151.
- Fulmek, L.** 1968. Parasiteninsekten der Insektengallen Europas. Beiträge zur Entomologie, 18: 719-952 (in German).
- Goulet, H. & Huber, J.** 1993. Hymenoptera of the World: An Identification Guide to Families. Agriculture Canada, Ottawa, ON, Canada.
- Graham, M. W. R. de Vere, Gijswijt, M. J.** 1998. Revision of the European species of *Torymus* Dalman (Hymenoptera: Torymidae). *Zoologische Verhandelingen Leiden*, 317: 1-202.
- Güçlü, S., Hayat, S., Shorthouse, J. D. & Tozlu, G.** 2008. Gall-inducing wasps of the genus *Diplolepis* (Hymenoptera : Cynipidae) on shrub roses of Turkey. *Proceedings of the Entomological Society of Washington*, 110: 204-217.
- Hawkins, B. A.** 1988. Do galls protect endophytic herbivores from parasitoids - a comparison of galling and non-galling Diptera. *Ecological Entomology*, 13: 473-477.
- Katılmış, Y. & Kiyak, S.** 2009a. New records of oak gallwasps of the genus *Andricus* (Burgsdorf, 1783) from Turkey (Hymenoptera, Cynipidae). *Zoology in the Middle East*, 48: 108-110.
- Katılmış, Y. & Kiyak, S.** 2009b. The oak gallwasp *Aphelonyx persica*: a new record from Turkey, with some new host records. *Phytoparasitica*, 37: 95-97.
- Katılmış, Y. & Kiyak, S.** 2010. Distribution, phenology and effects of *Diplolepis* spp. (Hymenoptera: Cynipidae) on *Rosa canina* in the inland Western Anatolian. *Journal of the Entomological Research Society*, 12: 31-36.
- Katılmış, Y. & Kiyak, S.** 2011a. Oak gallwasps (Hymenoptera: Cynipidae) fauna of Inner Western Anatolia. *Munis Entomology & Zoology*, 6: 735-757.
- Katılmış, Y. & Kiyak, S.** 2011b. Herb gallwasp *Neaylax salviae* (Giraud, 1859) (Hymenoptera, Aylacini) – new record from Turkey. *Turkish Journal of Zoology*, 35: 707-710.
- Katılmış, Y. & Kiyak, S.** 2011c. New records of herb gallwasps (Hymenoptera, Cynipidae, Aylacini) from Turkey. *North-Western Journal of Zoology*, 7: 17-19.
- Katılmış, Y. & Kiyak, S.** 2011d. First records of inquiline wasps of the genus *Ceroptres* Hartig, 1840 (Hymenoptera, Cynipidae, Synergini) from Turkey. *Journal of the Entomological Research Society*, 13: 65-69.
- Katılmış, Y. & Kiyak, S.** 2011e. Further study on *Perichistus brandtii* (Ratzeburg, 1831) (Hymenoptera, Cynipidae) from Turkey. *Entomological News*, 122: 51-54.
- Katılmış, Y. & Kiyak, S.** 2012. Two new records of inquiline wasp of the genus *Saphonecrus* Dalla Torre and Kieffer, 1910 (Hymenoptera: Cynipidae: Synergini) from Turkey, their associated galls and hosts. *Munis Entomology & Zoology*, 7: 1141-1144.
- Kemal, M. & Koçak, A. Ö.** 2010. Winter trips to South Van Lake and the cynipid galls on oaks (Hymenoptera, Cynipidae). *Cesa News*, 56: 1-66.
- Kılınçer, N.** 1983. Ankara'da gül gal arıları (*Rhodites* spp.)'nin (Hym, Cynipidae) parazitleri üzerine araştırmalar. *Bitki Koruma Bülteni* 23: 1-11 (in Turkish).
- Kiyak, S. & Katılmış, Y.** 2010. Oak gallwasp *Dryocosmus mayri* (Hymenoptera, Cynipidae)- new record from Turkey. *Journal of the Entomological Research Society*, 12: 67-70.
- Kiyak, S., Kılıç, T., Katılmış, Y.** 2008. A contribution to the knowledge of the Cynipini (Cynipidae: Hymenoptera) fauna of Turkey. *Munis Entomology & Zoology*, 3: 523-535.
- Koçak, A. Ö. & Kemal, M.** 2012. List of the hitherto recorded pterygot taxa of Turkey (Insecta). *Centre for Entomological Studies*, 6: 1-1649.
- Lotfalizadeh, H., Delvare, G. & Rasplus, J. Y.** 2007. *Eurytoma caninae* sp. n. (Hymenoptera, Eurytomidae), a common species previously overlooked with *E. rosae*. *Zootaxa*, 1640: 55-68.
- Lotfalizadeh, H., Rajabi, M. & Madjzadeh, S. M.** 2012. Parasitoid community of *Diplolepis fructuum* (Rübsaamen) (Hym.: Cynipidae) in Kerman Province, with checklist of associated Hymenoptera fauna in Iran. *North-Western Journal of Zoology*, 8: 125-131.
- Lotfalizadeh, H., Rasplus, J. Y. & Delvare, G.** 2006. Rose gall wasps and their associated fauna (Hymenoptera) in Iran. *Redia*, 89: 73-85.
- Melika, G.** 2006. Gall Wasps of Ukraine: Cynipidae. Vol 1. Schmalhausen Institute of Zoology, Kyiv, Ukraine.
- Melika, G. & Stone, G. N.** 2001. A new species of cynipid gall wasp from Turkey (Hymenoptera: Cynipidae). *Folia Entomologica Hungarica* 62: 127-131.
- Melika, G., Stone, G. N., Sadeghi, S. E. & Pujade-Villar, J.** 2004. New species of cynipid gallwasps from Iran and Turkey (Hymenoptera: Cynipidae: Cynipini). *Acta Zoologica Hungarica*, 50: 139-151.
- Metec, Ö. & Demirsoy, A.** 2012. A preliminary study on the gallwasp fauna of Kemaliye (Erzincan, Turkey) and a new record for Turkey. *Hacettepe Journal of Biology and Chemistry, Special Issue*: 351-363.
- Metec, Ö. & Mergen, Y. O.** 2016. The community members associated with rose gall wasp *Diplolepis fructuum* (Rübsaamen, 1895) (Hymenoptera: Cynipidae) in Tokat province of Turkey. *Turkish Journal of Zoology*, 40: 411-416.
- Metec, Ö. & Mergen, Y. O.** 2017. The community components associated with two common rose gall wasps (Hymenoptera: Cynipidae: Diplolepidini) in Turkey. *Turkish Journal of Zoology*, 41: 696-701.
- Mutun, S. & Dinç, S.** 2011. Contributions to the gallwasp (Hymenoptera: Cynipidae) fauna of Turkey with one new record. *Journal of Applied Biological Sciences*, 5: 83-85.
- Mutun, S. & Dinç, S.** 2015. Twelve oak gall wasp species (Hymenoptera, Cynipidae) new to the Turkish fauna. *Turkish Journal of Zoology*, 39: 962-964.
- Mutun, S., Dinç, S., Bozsó, M. & Melika, G.** 2014. Four new species of *Andricus* Hartig oak gallwasp from Turkey (Hymenoptera: Cynipidae, Cynipini). *Zootaxa*, 3760: 241-259.
- Noyes, J. S.** 2017. Universal Chalcidoidea Database. World Wide Web electronic publication. Available from: <http://www.nhm.ac.uk/chalcidooids/2017>.
- Özbek, H., Güçlü, Ş. & Tozlu, G.** 1999. Erzurum'da kuşburnu (*Rosa canina* L.)'nda zarar yapan *Diplolepis mayri* Schld. (Hymenoptera: Cynipidae)'nin biyolojisi ve doğal düşmanları. *Türkiye Entomoloji Dergisi*, 23: 39-50 (in Turkish).
- Roques, A. & Skrzypczynska, M.** 2003. Seed-infesting chalcids of the genus *Megastigmus* Dalman, 1820 (Hymenoptera: Torymidae) native and introduced to the West Palaearctic region: taxonomy, host specificity and distribution. *Journal of Natural History*, 37: 194-195.
- Shorthouse, J. D., Leggo, J. J., Sliva, M. D. & Lalonde, R. G.** 2005. Has egg location influenced the radiation of *Diplolepis* (Hymenoptera : Cynipidae) gall wasps on wild roses?. *Basic and Applied Ecology*, 6: 423-434.

- Stern, D. L.** 1995. Phylogenetic evidence that aphids rather than plants, determine gall morphology. *Proceedings of the Royal Society of London B*, 260: 85-89.
- Stone, G. N., Cook, J. M.** 1998. The structure of cynipid oak galls: patterns in the evolution of an extended phenotype. *Proceedings of the Royal Society of London B*, 265: 979-988.
- Stone, G. N., Schönrogge, K., Crawley, M. J. & Fraser, S.** 1995. Geographic and between-generation variation in the parasitoid communities associated with an invading gallwasp, *Andricus quercuscalicis* (Hymenoptera: Cynipidae). *Oecologia*, 104: 207-217.
- Yu, D. S. K., Van Achterberg, K. & Horstmann, K.** 2012. World Ichneumonidae 2011. *Taxonomy, Biology, Morphology and Distribution*. Available from <http://www.taxapad.com/2012>.
- Zerova, M. D. & Seryogina, L. Ya.** 1999. A review of Palearctic species of the genus *Glyphomerus* (Hymenoptera, Torymidae) with description of two new species. *Entomological Review*, 79: 977-981.
- Zerova, M. D. & Seryogina, L. Ya.** 2006. A review of the Palearctic species of the genus *Eurytoma*, belonging to the *E. robusta* species-group (Hymenoptera, Eurytomidae), with description of two new species. *Entomological Review*, 86: 695-705.

Table 1. Hymenopteran species associated with some cynipid gall wasps in Istanbul, Turkey.

Gall wasp species	Family	Species
<i>Andricus conglomeratus</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus curvator</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus galeatus</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus gallaearnaeformis</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus glutinosus</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus lucidus</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus mitratus</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Andricus quercustozae</i>	Torymidae	<i>Bootanomyia stigmatizans</i>
<i>Andricus sp.</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Aphelonix cerricola</i>	Ormyridae	<i>Ormyrus nitidulus</i>
<i>Cynips divisa</i>	Torymidae	<i>Torymus notatus</i>
<i>Cynips quercusfolii</i>	Eurytomidae	<i>Sycophila biguttata</i>
	Ormyridae	<i>Ormyrus nitidulus</i>
	Torymidae	<i>Torymus cери</i>
<i>Diplolepis nervosa</i>	Eurytomidae	<i>Eurytoma caninae</i>
<i>Diplolepis rosae</i>	Ichneumonidae	<i>Orthopelma mediator</i>
	Pteromalidae	<i>Pteromalus bedeguaris</i>
	Torymidae	<i>Glyphomerus stigma</i>
		<i>Megastigmus rosae*</i>
		<i>Torymus bedeguaris</i>
<i>Diplolepis spinosissimae</i>	Torymidae	<i>Torymus bedeguaris</i>
<i>Synophrus politus</i>	Torymidae	<i>Bootanomyia almusiensis</i>

*This species is originally a seed-feeder from the superfamily Chalcidoidea (Roques & Skrzypczynska, 2003; Daneshvar et al., 2009).