

Distribution, Phenology and Effects of *Diplolepis* spp. (Hymenoptera: Cynipidae) on *Rosa canina* in the Inland Western Anatolian

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ABSTRACT

In this study, we report *Diplolepis eglanteriae* (Hartig, 1840), *Diplolepis fructuum* (Rübsaamen, 1895), *Diplolepis mayri* (Schlechtendal), 1877, *Diplolepis rosae* (L., 1758) and *Diplolepis spinosissimae* (Giraud), 1859 on *Rosa canina* in the Inland Western Anatolian, Turkey. These species are the first time recorded from this region. We provide details on geographical distribution and phenology. We also discuss their industrial effects on *Rosa* industry.

Key words: Cynipidae, *Diplolepis*, Inland Western Anatolian, *Rosa canina*, Turkey.

INTRODUCTION

The Cynipidae is one of the largest families of the Cynipoidea. About 1400 species are known worldwide (Ronquist 1999). The number of recorded species from Europe and contiguous territories including North Africa and Turkey is about 300 (Dalla-Torre & Kieffer, 1910; Nieves-Aldrey, 2001; Stone *et al.*, 2001). Published studies concern mostly oak gallwasps (tribe Cynipini), either as forest pests in Turkey (Katılmış & Kiyak, 2008) Katılmış and Kiyak (2008) listed 81 gall inducing wasps (Hymenoptera: Cynipidae) with a new record from Turkey. They listed five *Diplolepis* species in this list from Turkey.

In the worldwide about 47 species have been described. 30 species in Nearctic and 17 species in Palearctic were recorded by Shorthouse (1993) and Plantard *et al.* (1998). Pujade -Villar (1993) reported 8 species in Europe. Belizin (1957) and Vyrzhikovskaja (1963) reported 9 species in Asia. Five species of *Diplolepis* have been recorded on *Rosa* sp. in Turkey. These species are *Diplolepis eglanteriae*, *Diplolepis fructuum*, *Diplolepis mayri*, *Diplolepis rosae* and *Diplolepis spinosissimae* (Alkan, 1952; Schimitschek, 1953; Karaca, 1956; Güçlü *et al.*, 2008; Katılmış & Kiyak, 2008). *Diplolepis rosarum* was recorded from Turkey by Bodenheimer (1958). But he did not give locality and this species was not confirmed other researchers.

Özbek *et al.* (1999) reported the biology and natural enemies of *Diplolepis mayri* in Erzurum. A recent study Güçlü *et al.* (2008) reported distribution and parasitoid of

Diplolepis spp. in Turkey. They also described gall structure of *Diplolepis* spp. given previous studies from Turkey. They confirmed as *Diplolepis fructuum* all previous workers who found galls the hip of roses considered the inducer to be *Diplolepis mayri*. It was explained that *Diplolepis mayri* induced galls on the stems and leaves of roses, whereas *Diplolepis fructuum* induced galls within the hips. They also given the map of collection localities of *Diplolepis* spp. in Turkey. In this map which is showing collection localities has no record from *Diplolepis* spp. in the inland Western Anatolian.

In this study our aims is to determine phenology and distribution of *Diplolepis* spp. and their effects on *Rosa canina* in the Inland Western Anatolian which has no record from previous studies. We also aim to contribution to Fauna of Cynipidae of Turkey.

MATERIAL AND METHODS

This study was carried out in 2007, 2008 and 2009 in the Inland Western Anatolian (Afyon, Denizli, Kütahya and Uşak provinces) . The Inland Western Anatolian is between coastal Aegean and middle Anatolian (Fig. 1). This region made up plateau which is 800-1000m altitude. This region have also Emirdağı mountain, Sultan mountain, Akdağ (Sandıklı) mountain, Honaz mountain, Murat mountain and Türkmen mountain which is above 2000m altitude.

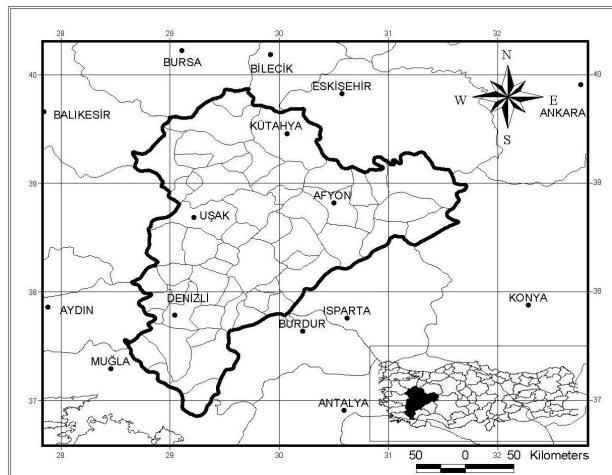


Fig. 1. The map showing the Inland Western Anatolian.

In the study area *Rosa canina* species were examined and found galls were collected. The collected galls were put in jar bags which is one liter capacity and covered with tulle. We also recorded localities and collected time. The specimens were carried on laboratory condition and checked emerging of adult wasps with interval a week. No emerged and intact gall specimens and larvae were preserved in 70% alcohol and emerged adults were dried and pinned. The specimens are deposited in the Zoology Museum of Gazi University. We also recorded the emerged time of the adult wasps. The galls and adult wasps identified according to the literature sources (Dalla-Torre & Kieffer, 1910; Ionescu, 1957; Nieves-Aldrey, 2001).

RESULTS

Distribution and Phenology of *Diplolepis* spp.

Diplolepis eglanteriae (Hartig, 1840)

Material examined: Afyon, Çay, Koçbeyli town, Karakuş mountain, 38°25'K, 30°53'D, 1009m, 10.07.2007; Sandıklı, Karacaören village, 38°29'K, 30°17'D, 1212m, 15.08.2007; Emirdağ, Başkonak village, Topçular place, 38°55'K, 31°06'D, 1207m, 16.08.2008; Sandıklı, Akdağ Mountain, Sorkun mountain pasture, 38°21'K, 30°01'D, 1464m, 20.08.2008; Kütahya, Gediz, Murat Mountain, next to SPA, 38°57'K, 29°37'D, 1469m, 21.06.2007; Tavşanlı, Kuruçay village, surrounding Kuruçay lake, 39°28'K, 29°30'D, 902m, 20.06.2007; Domaniç, Berçin village, 39°46'K, 29°34'D, 861m, 20.06.2007; Frigian valley, Akpınar village, 39°34'K, 30°05'D, 920m, 11.07.2007; Simav, surrounding Gölcük lake, 39°09'K, 29°05'D, 1310m, 12.07.2007; Türkmen mountain Söğüt mountain pasture 39°23'K, 30°19'D, 1378m, 17.08.2008; Türkmen mountain, between Yumaklı village - Kozluca village 1.km 39°25'K, 30°16'D, 1288m, 18.08.2008; Gediz, Murat mountain, above Çukürören village, 38°59'K, 29°41'D, 1180m, 18.08.2008; Uşak, Banaz, Yeşilyurt village, 38°48'K, 29°40'D, 1024m, 23.06.2007; Banaz, Yazitepe village, 38°39'K, 29°48'D, 1005m, 01.07.2008.

Phenology: The gall starts to develop in the middle of June and mature in September. We have not adults wasp from this gall. Only parasitoid wasps emerged in the end of the winter. We estimate that adults wasp emerge in the early spring.

Diplolepis fructuum (Rübsaamen, 1895)

Material examined: Afyon, Sandıklı, Akdağ Mountain, Sorkun mountain pasture, 38°21'K, 30°01'D, 1464m, 20.08.2008; Sandıklı, Akdağ Mountain, between Sorkun mountain pasture – fire tower 2.km, 38°20'K, 29°59'D, 1793m, 20.08.2008; Sandıklı, Akdağ Mountain, between Sorkun mountain pasture – fire tower 4.km, 38°20'K, 29°59'D, 1808m, 20.08.2008; Denizli, Serinhisar, Ayaz village 37°34'K, 29°20'D, 1100m, 03.03.2009; Serinhisar, Yatağan town 37°35'K, 29°23'D, 1046m; Kütahya, Simav, surrounding Gölcük lake, 39°09'K, 29°05'D, 1310m, 12.07.2007; Altıntaş, between Altıntaş-Gediz 24.km above Oysu village, 38°58'K, 29°53'D, 1121m, 21.04.2008; Gediz, between Altıntaş-Gediz 42.km, Çukürören village, 38°59'K, 29°42'D, 1189m, 21.04.2008; Türkmen mountain, Söğüt mountain pasture 39°23'K, 30°19'D, 1378m, 17.08.2008, 27.04.2009; Türkmen mountain, above Güllüdere village 39°25'K, 30°21'D, 1523m, 17.08.2008; Türkmen mountain, between Söğüt mountain pasture - Yumaklı village, 39°23'K, 30°18'D, 1492m, 18.08.2008; Gediz, Murat mountain above Çukürören village, 38°59'K, 29°41'D, 1180m, 18.08.2008, Simav, Örenli village, surrounding Örenli lake, 39°11'K, 28°53'D, 832m, 01.03.2009.

Phenology: The gall develop in the middle of July and mature in September. The larvae emerged after a few weeks from the collected galls in the September. Only parasitoid wasps emerged in the end of the winter. We estimate that adults wasp emerge in the early spring.

Diplolepis mayri (Schlechtendal), 1877

Material examined: Afyon, Dinar, below Tatarlı village, 38°16'K, 30°35'D, 1141m, 27.06.2007; Kütahya, Altıntaş, Genişler village, 38°58'K, 30°06'D, 1064m, 24.04.2007, 1 female, 20.04.2008 1 male; Gediz, Murat Mountain, next to SPA, 38°57'K, 29°37'D, 1469m, 21.06.2007; Simav, surrounding Gölcük lake, 39°09'K, 29°05'D, 1310m, 12.07.2007.

Phenology: The gall develop throughout the summer and mature in September or October. We collected the this gall inducing from previous year in 24.04.2007 and 20.04.2008. Adults wasps emerged in 28.04.2007 and 02.05.2008. we also observed that adults wasp emerged before we collected in the same area. It is possibility that adults wasps start to emerge in the early spring.

Diplolepis rosae (L., 1758)

Material examined: Afyon, Emirdağ, below Çatalı village, 38°55'K, 31°08'D, 1235m 19.05.2007; Bayat, surrounding Bayat lake 38°58'K, 30°54'D, 1110m, 09.09.2007, Sandıklı, Karacaören village, 38°29'K, 30°17'D, 1212m, 15.08.2007; Sinanpaşa, Tınaztepe town, 38°43'K, 30°23'D, 1135m, 15.08.2007, Sultandağı, Sultan mountain, above Dereçine town, 38°28'K, 31°14'D, 1148m, 11.06.2008; Sandıklı, Akdağ Mountain, Sorkun mountain pasture, 38°21'K, 30°01'D, 1464m, 20.08.2008, Sandıklı, Akdağ Mountain, between Sorkun mountain pasture – fire tower 2.km, 38°20'K, 29°59'D, 1793m, 20.08.2008; Sandıklı, Akdağ Mountain, between Sorkun mountain pasture – fire tower 4.km, 38°20'K, 29°59'D, 1808m, 20.08.2008; Denizli, Honaz mountain national park, 37°39'K, 29°14'D, 1207m, 26.06.2007; Serinhisar, Kefe mountain pasture, 37°37'K, 29°22'D, 1353m, 12.08.2007; Serinhisar, above Karaçay town, 37°41'K, 29°24'D, 1353m, 12.08.2007; Çivril, Akdağ, mountain, above Cumalar village, Sığır kuyruğu place, 38°20'K, 29°58'D, 1710m, 20.08.2008; Kütahya, Domaniç, Berçin village, 39°46'K, 29°34'D, 861m, 20.06.2007; Çavdarhisarı, surrounding Çavdarhisarı lake, 39°10'K, 29°35'D, 1023m, 20.06.2007; Simav, surrounding Gölçük lake, 39°09'K, 29°05'D, 1310m, 12.07.2007, 28.04.2009; Altıntaş, between Altıntaş-Gediz 24.km above Oysu village, 38°58'K, 29°53'D, 1121m, 21.04.2008; Gediz, between Altıntaş-Gediz 42.km Çukurören village, 38°59'K, 29°42'D, 1189m, 21.04.2008; Türkmen mountain, above Yumaklı village, 39°25'K, 30°16'D, 1305m, 04.05.2008, 4 female; Türkmen mountain, Söğüt mountain pasture 39°23'K, 30°19'D, 1378m, 17.08.2008; Türkmen mountain, above Güllüdere village 39°25'K, 30°21'D, 1523m, 17.08.2008; Türkmen mountain, between Söğüt mountain pasture - Yumaklı village 2.km, 39°23'K, 30°18'D, 1492m, 18.08.2008; Türkmen mountain, between Yumaklı village - Kozluca village 2.km arası 39°25'K, 30°16'D, 1288m, 18.08.2008; Gediz, Murat mountain, above Çukurören village, 38°59'K, 29°41'D, 1180m, 18.08.2008; Uşak, Banaz, Yeşilyurt village, 38°48'K, 29°40'D, 1024m, 23.06.2007; Banaz, Yazıtepe village, 38°39'K, 29°48'D, 1005m; Mesudiye village surrounding Mesudiye lake, 38°43'K, 29°30'D, 930m, 17.09.2008.

Phenology: The gall develop throughout the summer and mature in september and october. We collected the this gall inducing from previous year in 04.05.2008. Adults wasps emerged in 13.05.2008, 27.05.2008 and 06.06.2008.

Diplolepis spinosissima (Giraud), 1859

Material examined: Afyon, Hocalar, Devlethan village, 38°31'K, 29°58'D, 1011m, 24.05.2007; Bayat, surrounding Bayat lake, 38°58'K, 30°54'D, 1110m, 09.09.2007, 15.09.2008; Emirdağı, Kemerkaya town, 38°54'K, 31°07'D, 1232m, 10.06.2008; Sandıklı, Akdağ mountain, Sorkun mountain pasture, 38°21'K, 30°01'D, 1464m, 20.08.2008; Sandıklı, Akdağ Mountain, between Sorkun mountain pasture – fire watching tower 4.km, 38°20'K, 29°59'D, 1808m, 20.08.2008; Denizli, Serinhisar, Karaçay town, 37°41'K, 29°24'D, 1092m, 12.08.2007; Kütahya, Tavşanlı, Kuruçay village, surrounding Kuruçay lake, 39°28'K, 29°30'D, 902m, 20.06.2007; Domaniç, Berçin village, 39°46'K, 29°34'D, 861m, 20.06.2007; Gediz, Murat Mountain, next to SPA 38°57'K, 29°37'D, 1469m, 21.06.2007; Simav, surrounding Gölçük lake, 39°09'K, 29°05'D, 1310m, 12.07.2007; Türkmen mountain, Söğüt mountain pasture 39°23'K, 30°19'D, 1378m, 17.08.2008; Türkmen mountain, between Yumaklı village - Kozluca village 1.km, 39°25'K, 30°16'D, 1288m, 18.08.2008; Gediz, Murat mountain, above Çukurören village, 38°59'K, 29°41'D, 1180m, 18.08.2008; Uşak, Banaz, Yazıtepe village, 38°39'K, 29°48'D, 1005m, 23.06.2007; Banaz, Yeşilyurt village, 38°48'K, 29°40'D, 1024m, 23.06.2007; Karahallı, Beki village, 38°19'K, 29°26'D, 1053m, 13.07.2007, Mesudiye village surrounding Mesudiye lake 38°43'K, 29°30'D, 930m, 17.09.2008, 1 female.

Phenology: The gall develop throughout the summer and mature in september. We collected the this gall in 17.09.2008. Adults wasps emerged in 21.04.2009.

DISCUSSION

Diplolepis eglanteriae in Eskişehir and Ankara (Karaca, 1956; Bayram *et al.*, 1998), *Diplolepis fructuum* in eastern Anatolian and northeastern Anatolian (Güçlü *et al.*, 2008), *Diplolepis mayri* in eastern Anatolian (Özbek *et al.*, 1998) and in the middle

Anatolian (Güçlü *et al.*, 2008), *Diplolepis rosae* in Ankara, Artvin, Bayburt, Çankırı, Erzincan, Erzurum, Eskişehir, İstanbul, Konya and Niğde (Alkan, 1952; Schmitschek, 1953; Karaca, 1956; Özbek *et al.*, 1996) and *Diplolepis spinosissimae* in Eskişehir and Ankara (Karaca, 1956) were recorded. In this study this 5 species are recorded first time in the inland western Anatolian. We observed the *Diplolepis eglanteriae* in Kemaliye district (Erzincan province) (unpublished data).

Rosa canina is important plant due to their hip used for making marmalade, tea and medicine in Turkey. This plant densely populated in the most of inland western Anatolian. So their pest must be studied. Güçlü *et al.* (2008) reported that in some areas up to 90% of the hips were infested by *Diplolepis fructuum*. They also estimated that *Diplolepis fructuum* is considered a pest of the *Rosa* industry for completely destroyed the hips. However *Diplolepis eglanteriae*, *Diplolepis mayri*, *Diplolepis rosae* and *Diplolepis spinosissimae* is not considered pest for induce galls on the leaves. In our study this 4 species were found on leaves and stem of *Rosa canina*. But *Diplolepis fructuum* was found the hip of *Rosa canina* and this species is important pest for hips. The other species may be physiologically threat for plant, but no effects for *Rosa* industry.

Shorthouse (2001) reported that roses exported from Europe to North America in the past galls were present. Güçlü *et al.* (2008) indicated that roses shipped from Turkey to other region care must be taken no galls were present on the host plants. In this point we support their view, therefore if roses export from Turkey to other country the plant galls must be checked.

ACKNOWLEDGEMENTS

We thanks to Gazi University Scientific Research Project Unit (Project No: BAP-05/2007-40) for financial support of this work.

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Received: July 14, 2009

Accepted: December 17, 2009