The Wasps Associated with Seeds and Galls of *Rosa Canina* in Iran

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**ABSTRACT**

The complex of wasps associated with hips and galls of dog rose (*Rosa canina* Linnaeus) was studied in Tehran, Tabriz and Urmieh, Iran. The hips and galls of dog rose was collected irregularly during 2002 and 2003 and kept in laboratory condition until the wasps were emerged. As a result of this study, two seed wasp species, *Megastigmus aculeatus* (Swederus) and *Megastigmus rosae* Bouček, 1971 (Him.: Torymidae); one seed gall wasp species, *Diplolepis mayri* (Schlechtendal) (Hymenoptera: Cynipidae) and eight parasitoid species of gall wasp consisted of *Pteromalus bedeguaris* (Thomson) (Hym.: Pteromalidae), *Glyphomerus stigma* (Fabricius) and *Torymus bedeguaris* (Linnaeus) (Hym.: Torymidae), *Eurytoma pistaciae* Rondani and *Eurytoma rosae* Nees (Hym.: Eurytomidae), *Eupelmus urozonus* Dalman (Hym.: Eupelmidae), *Exeristes robustor* (Fabricius) and *Orthopelem mediator* Thunberg (Hym.: Ichneumonidae) were determined. Brief information on parasitoid diversity and frequency of each parasitoid species of *D. mayri* are given.

**Key words:** Gall wasps, Seed wasps, Parasitoid wasps, Tehran, North-Western of Iran

**Introduction**

Galls occur on many different plants. This malformed growth may be caused by insects, fungi, bacteria, or nematodes, but insect galls are the most common[16]. The ability to form galls represents an important and widespread life style among insects. The galling habit has evolved several times, and over 13000 species of gallers have been described[22].

Galling insects are usually not considered as pests. Most of them are harmless and just look interesting. However, certain species can physically and aesthetically damage high value plants by reducing photosynthesis and seed production, discoloring foliage, causing defoliation, branch dieback and rarely, plant death[16].

Gall wasps mainly belong to the family Cynipidae that attack herbaceous and tree species in the Palearctic and Nearctic regions[6]. Among cynipids, the genus *Diplolepis* include major gall wasp species. *Diplolepis* wasps are restricted to wild roses[40]. One of the species *Diplolepis mayri*, which is widely distributed, induces gall on wild roses such as dog rose (*Rosa canina* L.)[10,21,35,68]. *D. mayri* has been reported by Farahbakhsh [23] from Chahar mahal-Bakhtiari in Iran.

Gall wasps have a complex of specific natural enemies such as parasitoid wasps that help suppress their population. These parasitoid wasps belong to the two great superfamilies: Chalcidoidea[10.68] and lechenunmoidea[9,38,58]. Many chalcidoid species of the families Pteromalidae [31.36], Eulophidae, Eurytomidae, Ormyridae, Torymidae [31], Eupelmidae[13,19] and some species of lechenunmoidea [30,53] are important parasitoids of gall wasps.

Among chalcidoids, the most phytophagous torymids belong to the subfamily Megastigmiae, which includes one genus *Megastigmus* [31]. The larvae of some species feed on tissue in developing...
adv. environ. biol., 3(1): 61-68, 2009

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seeds of Rosa canina [60]. The objective of this study was to determine seed wasps and parasitoids of gall wasp, D. mayri on R. canina in Iran.

Simpson diversity indices (D and Eo) and Shannon diversity indices (H and En) provide important information about rarity and commonness of species in a community. Also these indices are important tools for biologists trying to understand community structure[11].

Materials and Methods

The studies on seed feeders, gall wasps and parasitoids of gall wasps on dog rose was carried out from April to November 2002 in Tehran province (Shahrestanak, Aghashht) and also February to June 2003 in Tabriz (campus of college of Agriculture, Tabriz University) and Uromieh (Nazlou).

The gall of dog rose were collected irregularly from field and transferred to the laboratory. The materials were placed in petri-dishes, covered with a layer of filter paper. The petri dishes were kept in room condition. The emerged wasps were collected daily using an aspirator and stored in 75% ethyl alcohol for future works. The wasp species were identified by experts.

Simpson diversity indices (D and Eo) were calculated by the following equations:

\[ D = \frac{1}{s} \sum_{i=1}^{s} p_i^2 \]

\[ E_D = \frac{D}{D_{\text{max}}} = \frac{1}{s} \sum_{i=1}^{s} p_i^2 \]

where \( D \) is the Simpson's diversity index, \( p_i \) is the proportion of species \( i \) relative to the total number of species, \( S \) is the total number of species in the community and \( E_D \) is the equitability or evenness [11].

Shannon's diversity indices (H and En) is another indices that is commonly used to characterize species diversity in a community:

\[ H = -\sum_{i=1}^{s} p_i \ln p_i \]

\[ E_H = \frac{H}{H_{\text{max}}} = \frac{H}{\ln S} \]

where \( H \) is the Shannon's diversity index, \( E_H \) is the Shannon's equitability and \( H_{\text{max}} \) is equal to \( \ln S \), other characters are like Simpson's indices [11].

Result and Discussion

Eleven species of wasps were recorded in our investigations. Among the wasps associated with R. canina, two species, Megastigmus aculeatus (Swederus) and Megastigmus roseae Bouček (Hym: Torymidae) were recorded as seed feeders. The species, Diplolepis mayri (Schlechtendal) was the only gall wasp on hips of R. canina in all studied regions and years.

A total of eight species of parasitoids from the superfamilies Chalcidoidea and Ichneumonoidea were reared from D. mayri on Rosa Canina. These belong to five families: Torymidae, Eupelmidae, Eulophidae and Ichneumonidae. Torymus bedeguaris (Linnaeus), Glyphomerus stigma (Fabricius), Eurytoma pistaciae Rondani, E. roseae Nees, Pteromalus bedeguaris (Thomson), Eupelminus urozonus Dalman belong to Chalcidoidea, Esterites roborator (Fabricius) and Orthopelma mediator Thunberg belong to ichneumonidae that Esterites roborator was newly recorded from D. mayri.

The total number of each parasitoid species and their relative frequency in the examined samples are given in table 1. In Tehran, Pteromalus bedeguaris was found to be the most common parasitoid (33.17 %) followed by E. roase (31.77%). P. bedeguaris was also found to be the dominant species (37.79%), followed by O. mediator (19.85 %) in Tabriz. Also in Uromieh, P. bedeguaris was the most common species (60.86 %), followed by E. roseae (13.04 %). The other species were less abundant.

Diversity indices provide more information than simply the number of species in a given area. The present study has also revealed that D. mayri had the highest parasitoid diversity in Tehran (Shannon's \( H = 1.590 \), Simpson's \( D = 4.175 \)), in comparison to Tabriz and Uromieh. For a given richness (e.g. Tehran and Uromieh, \( S=6 \)), D and H increase as equitability increases. Equitability is greatest when species are equally abundant (Table 2).

Rose Gall wasp
Family: Cynipidae
Diplolepis mayri (Schlechtendal, 1877)

Material examined


In this research, D. mayri was collected from Tabriz and Uromieh regions on R. canina. This species has also been reported by Farahbakhsh [23] from Iran on
Table 1: Frequency of parasitoid species reared from D. mayri in three locations of Iran.

<table>
<thead>
<tr>
<th>Parasitoid species</th>
<th>Number and Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Family: Torymidae</td>
<td></td>
</tr>
<tr>
<td>Torymus bedeguaris (Linnaeus)</td>
<td>20</td>
</tr>
<tr>
<td>Glyphomerus stigma (Fabricius)</td>
<td>21</td>
</tr>
<tr>
<td>Family: Eurytomidae</td>
<td></td>
</tr>
<tr>
<td>Eurytoma pustulosa (Rondani)</td>
<td>19</td>
</tr>
<tr>
<td>Eurytoma rosea Nees</td>
<td>68</td>
</tr>
<tr>
<td>Family: Pteromalidae</td>
<td></td>
</tr>
<tr>
<td>Pteromalus bedeguaris (Thomson)</td>
<td>71</td>
</tr>
<tr>
<td>Family: Eupeplidae</td>
<td></td>
</tr>
<tr>
<td>Eupeplus urozonus Dalman</td>
<td>16</td>
</tr>
<tr>
<td>Family: Ichneumonidae</td>
<td></td>
</tr>
<tr>
<td>Exeristes robator (Fabricius)</td>
<td>0</td>
</tr>
<tr>
<td>Orthopehma mediator Thunberg</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Parasitoid diversity of D. mayri in three locations of Iran.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tehran</th>
<th>Tabriz</th>
<th>Uromieh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simpson's diversity index (D)</td>
<td>4.175</td>
<td>3.537</td>
<td>1.847</td>
</tr>
<tr>
<td>Simpson's equitability (E_d)</td>
<td>0.696</td>
<td>0.442</td>
<td>0.308</td>
</tr>
<tr>
<td>Shannon's diversity index (H)</td>
<td>1.590</td>
<td>1.563</td>
<td>0.970</td>
</tr>
<tr>
<td>Shannon's equitability (E_H)</td>
<td>0.889</td>
<td>0.752</td>
<td>0.541</td>
</tr>
</tbody>
</table>

Rosas sp. It is widely distributed in Sweden [59], Spain [67], Romania[64].

D. mayri induces large, complex and multi-chambered galls in the hips of several species roses including Rosa canina, Rosa rubiginosa, Rosa villosa and Rosa majalis or Rosa rugosa [58,5,10,68,35,33,21].

A complex of parasitoid species of D. mayri on R. canina were identified. These include Eurytoma rosaee Nees , E. pustulosa Rond., Torymus bedeguaris (L.), Glyphomerus stigma (F.), Pteromalus bedeguaris (Thoms.), Eupeplus urozonus Dalman, Exeristes robator (Fabricius) and Orthopehma mediator Thunberg.

Rose seed wasps
Family: Torymidae
Subfamily: Megastigminae
Megastigmus aculeatus (Swederus, 1795)

Material examined


M. aculeatus is a phytophagous species. The larvae consume the entire contents of seeds of Rosa multiflora [44-46] and R. canina[39]. It is also reported from Rosa rubiginosa, [60], R. gallica, R. palustris and R. virginiana [51]. Gorlenko et al. [26] mentioned M. aculeatus as one of the pests of rose under field and glasshouse conditions.

In this study numerous M. aculeatus were found in Shahrestanak and Aghasht and one from Tabriz.

Rakhsani et al[54] was reported M. aculeatus on R. canina from Tehran. This wasp also has been recorded from Armenia, Austria, Bosnia and Herzegovina, China, Croatia, France, England, Japan, Kazakhstan, Moldova, New Zealand, Poland, Romania, Russia, Slovakia, Somalia, Yugoslavia, Sweden, Tajikistan, Turkmenistan, Ukraine and USA [48].

A complex of parasitoid species of D. mayri on dog rose in Turkey as a phytophagous (seed feeder) species. This wasp has been also recorded from R. arvensis, R. ferruginea, R. pendulina, R. rubiginosa, R. tshatyrdag and R. turkestanica[55].

This wasp has been collected from Tehran province. It has been recorded from Armenia, Austria, Azerbaijan, Caucasus, Switzerland, Czech Republic, Germany, Georgia, Kazakhstan, Rissia, Tajikistan, Turkmenistan Turkey and Ukriane [48].
Material examined


The species T. bedeguaris has association with gall insects, especially cynipids. T. bedeguaris has previously been reported by Shodjai [56] as a parasitoid of D. mayri. Zerova and D’yakonchuk [68] and Bayram et al.[10] has also reared this species from D. mayri. This parasitoid wasp has been also recorded from D. bicolor [27], D. centifoliae[32], D. ignota [51,27], D. rosae [14,32,50], D. multispinosa[32,51], D. spinosissimae [32] and D. tuberculatix [27].

In this study T. bedeguaris was found in the galls collected from Shahrestanak, Tabriz and Nazlou. It has been reported by Shodjai [56] as a parasitoid of D. mayri from Tehran and East Azerbaijan. It has been also reported from Armenia, Austria, Canada, Caucasus, Croatia, Switzerland, Czech Republic, Germany, Spain, France, England, Hungary, Ireland (North and South), Italy, Netherland, Romania, Slovakia, U S A, USSR, Sweden, Turkey, Kazakhstan and Ukraine[48].

Material examined


G. stigma is one of the parasitoid of gall inducing cynipids that are mostly found in the complex of other parasitoids. Tachikawa [61] reared G. stigma, from Diplolepis fakudae (Shinji) on R. rugosa. This species has also been reported as parasitoid of D. mayri (Schlechtendal) on R. canina [68]. Bayram et al. [10] found G. stigma as parasitoid of Diplolepis mayri and Diplolepis rosae on dog rose in Turkey. It has been also recorded from D. centifoliae, D. eglanteariae, [28], D. multispinosa, D. opaca, D. polita [54] and D. spinosissimae [32].

Other distribution regions include Austria, Canada, Switzerland, Croatia, England, Japan, Romania, Russia, Slovakia, Yugoslavia, USSR, Spain, Sweden, Czech Republic, Germany and Turkey [48].

Family: Eurytomidae
Subfamily: Eurytominae
Eurytoma pistaicae Rondani, 1877

Material examined


E. rosae has been reported as parasitoid of D. mayri on R. canina [10,68] and also galls of R. pippinellifoliae [49]. Bayram et al., [10] has recorded this species on D. rosae and D. eglanteariae from Turkey. It has been also recorded on D. spinosissimae, D. rosarum, D. nervosa and D. centifoliae [49,32].

E. rosae have parasitic activity on some other cynipids such as chestnut gall wasp Dryocosmus kuriphilus [41,34].

Other distribution regions include Argentina, Armenia, Austria, Belgium, Caucasus, Switzerland, Peoples’ republic of China, Czech Republic, Czech Republic, Germany, Spain, Finland, France, England, Greece, Hungary, Ireland (North and South), Italy, Kazakhstan, Malaysia, North Africa, Netherlands, Poland, Romania, Slovakia, Yugoslavia, USSR (European and Central Asia), Sweden and Turkey [48].

Members of the genus Eurytoma can be entomophagous, phytophagous or both. Entomophagous forms are documented to parasite a wide variety of insect orders, including members of
the Coleoptera, Lepidoptera, Hymenoptera, Homoptera and Diptera as well as Araneae [20].

Some of them are external parasite of the immature stages of hymenopterous, particularly gall-cynipids, others parasitize larvae of other gall insects. Phytophagous forms are known from at least six plant families and most often attack seeds and stems (borders or galls) or live as inquilines in galls formed by other insects. Many species of *Eurytoma* are ectoparasitic on the larvae of gall-making Tephritidae as well [17]. On the other hand some species of *Eurytoma* are gall inducing [65,2].

Family: Pteromalidae
Subfamily: Pteromalinae

*Pteromalus bedeguaris* (Thomson, 1878)

**Material examined**


In this research *P. bedeguaris* has been recorded from *D. mayri*. Also, *D. rosae* [68,50,32,24], *D. eglanteriae*, *D. rosarum* and *D. spinosisimae* [32] are the other hosts of this wasp.

During study, this wasp was collected from Karaj, Tabriz and Uromieh. Other distribution regions include Austria, Canada, Switzerland, Czech Republic, Germany, Spain, France, England, Hungary, the Netherlands, Romania, Russia, Kazakhstan, Slovakia, Yugoslavia, Sweden, USA, Sweden, Serbia, Caucasus and Turkey [48].

*Pteromalus bedeguaris* (Thomson) has previously been reared from galls induced by *Diplolepis mayri* on *R. canina* [10].

Family: Eupelmidae
Subfamily: Eupelminae

*Eupelminus urozonus* Dalman, 1820

**Material examined**


In this research *E. urozonus* was recorded from *D. mayri*. It has been also reared from *D. centifoliae*, *D. eglanteriae*, *D. spinosisimae* [32] and *D. rosae* [50,8]. A good account of the biology of *Eupelminus urozonus* Dalman found parasitic on the cynipid galls of oak is available [4]. *E. urozonus* often parasitised gall insects specially cynipids and cecidomyiids. *E. urozonus* is one of the most important natural enemies of chestnut gall wasp, *Dryocosmus kuriphilus* in China [(34,41,29). This species reared as parasitoid of some other gall insects [25], such as *Dasineura gleditchiae* (O.S.)[12]. *Janeti a cerris* and *Dryomyia cercinnans* [7] (Diptera, Cecidomyiidae). *Eupelminus urozonus* has also found with Bruchidius chloroticus on seeds of *Sesbania aculeata* (Leguminosae)[66]. There is an interesting report from *E. urozonus* as an egg parasitoid of *Dendrolimus pin L* (Lepidoptera: Lasiocampidae) in Hungary [18]. Thuorey [62] recorded *E. urozonus* as parasitoid of several species of gracillariids in Hungary.

Other distribution regions include Afghanistan, Andorra, Armenia, Australia, Austria, Algeria, Bulgaria, Bosnia Herzegovina, Egypt, Switzerland, Peoples' republic of China, Canary Islands, Croatia, Cyprus, Czech Republic, Germany, Spain, France, England, Greece, Hungary, India, Israel, Ireland (North and South), Italy, North Africa, Netherlands, Poland, Romania, Slovakia, Jordan, Japan, South Korea, Korea, Kazakhstan, Lebanon, Morocco, Moldova, Norway, Pakistan, Yugoslavia, USSR (European and Central Asia), Russia, Slovenia, Sweden, Syria, USA, Transcaucusus (Zakavkaz), Sweden and Turkey[48].

Several species are reported from the galls of plants and some are supposed to be gall inducer. Among the various genera of Euplomidae, the genus *Eupelminus* includes a majority of species associated with plant galls [47]. Some species of Euplomidae such as *E. urozonus* have parasitic activity on gall insects mainly on Cynipidae. *E. urozonus* has been reported as parasitoid of olive fly, *Daucus oleae* (Dip. Tephritidae) [19,13].

Family: Ichneumonidae
Subfamily: Pimplinae

*Exoristes roborator* (Fabricius, 1793)

**Material examined**

Tabriz, 28.IV.2003, 8 females, 14 males; 7.V.2003, 6 females, 10 males.

*E. roborator* has been known as the parasitoid of Coleoptera and Lepidoptera. In this study it was recorded from *D. mayri* which is the first record on cynipids. The lepidopteran hosts include *Ostrinia kasmirica* [30,1] and *Rhynciona buoliana* [63] and it has also recorded from *Larinus saussureae* [30] and *L. obtusus* [52] as coleopteran hosts. The size of the Parasitoid wasps collected from *D. mayri* is smaller in comparison with the other hosts. Maybe gall wasps are not considered as favorite hosts for this parasitoid.

This Parasitoid wasp was recorded from Tabriz-Iran for the first time during 2003. It has already been reported from India (Uttar Pradesh and
Kashmir), Taiwan, Pakistan, Europe, China, Micronesia [30], Romania [52], Bulgaria [63] and Egypt [1].

Subfamily: Orthopelmatinae
Orthopelma mediator Thunberg, 1822

Material examined

The host-plant affinities and allozyme variation of cynipid Diplolepis mayri in southern Sweden were investigated. Orthopelma mediator was found in galls [59]. In addition this wasp also attack D. rosea, D. eglanteriae, D. spinosissimae and D. rosarum [58,24]. This Parasitoid is recorded here for the first time from Tabriz, Iran. It has been also recorded from Canada [57], Sweden [58,59] and Romania [64]. In southern Sweden, Parasitoid pressure was found to be high, causing D. rosea an estimated average larval loss of approximately 75%, mainly due to the attack of the ichneumonid wasp Orthopelma mediator[58].

In conclusion, the results of this study contribute to the knowledge of parasitoid-host relationships on R. canina. This study confirmed that the most parasitoids that attack cynipid rose gall wasp are members of the superfamily Chalcidoidea. Also the most parasitoids of gall wasps attack a wide range of gall wasp species.

Acknowledgements
We are most grateful to Prof. K. Horstmann (University of Wuerzburg, Germany) and Prof. C. Thurocy (Systematic Parasitoid Laboratory, Koszeg, Hungary) for the identification of wasps, which were the key background of our studies.

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