



Andricus synophri (Hymenoptera: Cynipidae), a new species of oak gallwasp from Iran

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ABSTRACT. A new species of oak gallwasp, *Andricus synophri* (Hymenoptera: Cynipidae: Cynipini) is described from Iran. This species is known only from asexual females and induces galls on the twigs of *Quercus brantii* and *Q. libani*. Galls are multilocular, develop on lateral buds of young branches. According to its morphology, *Andricus synophri* belongs to a large group of 12 *Andricus* species, the “*Adleria non-kollari*” group. Data on the diagnosis, distribution and biology of the new species are given.

Key words: Cynipini, *Andricus*, taxonomy, Iran, distribution, new species

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Introduction

Iran is a very peculiar country from the faunistic point of view, with its location on the border of the Western and Eastern Palaearctic regions. The Irano-Turanian centre of endemism covers the interior of Turkey, extending eastwards from the beginning of the Central Anatolian Plateau into northwestern Iran. A number of widespread oak gallwasps show their greatest genetic diversity in the eastern mediterranean, suggesting that the Irano-Turanian region may have acted as a major centre of speciation in this group in the past (Rokas *et al.* 2003; Stone *et al.* 2001). It

remains unclear, however, how much Iranian forests lie within the true centre of this diversity, or whether they represent an eastern limit to the distributions of taxa otherwise found further west. About 20 new species of oak gallwasps has been described in the last decade from Iran and majority of them being until now endemics for this region (Azizkhani *et al.* 2006; Tavakoli *et al.* 2008; Péntzes *et al.* 2009; Melika *et al.* 2004, 2011).

Some other species described from Syria (Melika 2006) and Turkey (Melika and Stone 2001) has been collected recently in Iran also. Currently 77 species of oak

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gallwasps are listed for Iran which from 49 species belongs to the large genus *Andricus* Hartig (Chodjai 1980; Sadeghi *et al.* 2010; Melika *et al.* 2011).

This paper reports a new species, *Andricus synophri* **sp. n.**, which induces galls on the twigs of *Quercus brantii* Lindley and *Q. libani* G. Olivier (Fagaceae). Data on the distribution and biology of the new species are given. The galls of this species resemble those of *Synophus olivieri* Kieffer and were thought to be galls of *Synophrus* till adult wasps were reared.

Materials and Methods

Current terminology of morphological structures follows Liljeblad and Ronquist (1998) and Melika (2006). Forewing venation abbreviations follow Ronquist and Nordlander (1989), and cuticular surface terminology follows Harris (1979). Measurements and abbreviations used here include: F1-F12: first and subsequent flagellomeres; POL, post-ocellar distance, the distance between the inner margins of the posterior ocelli; OOL, ocellar-ocular distance, the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; and LOL, the distance between lateral and frontal ocelli. The width of the forewing radial cell is measured from the margin of the wing to the Rs vein.

Scanning electron microscope (SEM) images were taken with the Stereoscan Leica-360 at low voltage (700V) and without coating, in order to preserve the specimens. The forewing of the adult were photographed directly from the binocular microscope with a Canon digital camera (Power Shot, SX210 IS). The type material is deposited in the following institutions:

AMNH: American Museum of Natural History, New York, USA (curator J.M. Carpenter).

NHML: Natural History Museum (British Museum), London, UK (curator D. Notton)

CAS: California Academy of Sciences, San Francisco, USA (curator R. Zuparko)

PHMB: Plant Health and Molecular Biology Laboratory, Budapest, Hungary (curator G. Melika).

RIFR: Research Institute of Forest and Rangelands, Tehran, Iran (curator S.E. Sadeghi).

UB: Universitat de Barcelona, Catalunya (curator J. Pujade-Villar).

USNM: U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (curator M. Buffington).

Results

Andricus synophri Pujade-Villar, Tavakoli & Melika **sp. n.**

(Figs. 1–16)

Type locality. Dorood (Lorestan, Iran), collected from *Quercus brantii* galls.

Type material. Holotype asexual female, deposited in UB (J.P-V col.) with the following labels: "Dorud (Lorestan, Iran), Code 2, *Q. brantii*, (gall col. viii.2011), em. xi.2011, M.Tavakoli col." (white label), "Holotype of *Andricus synophri* Pujade-Villar, Tavakoli & Melika n. sp., design, JP-V 2014" (red label). Paratypes (105 asexual females) with the same labels as the holotype (30 deposited in UB JP-V col., 10 in AMNH, 10 in NHML, 10 in CAS, 20 in RIFR, 10 in USNM, 15 in PHMB).

Other material examined. Same data of Holotype: 63 asexual females; Marivan (Kordestan, Iran), Code 1, *Q. brantii*, (viii-2011) xi-2011: 97 asexual females; Oshtran-Kohe (Lorestan, Iran), Code 3, *Q. brantii*, (viii-2011) xi-2011: 171 asexual females; Kaka-reza (Lorestan, Iran), Code 4, *Q. brantii*, (viii-2011) xi-2011: 63 asexual females; Bane (Kordestan, Iran), code 5, *Q. libani*, (viii-2011) xi-2011: 33 asexual females.

Diagnosis. All metasomal tergites with dense white setae laterally and dorsally, the anterior surface of fore tibia with long oblique setae and antennae with 12 flagellomeres put this species into the "*Adleria-non kollari*" group of

Andricus species (Melika, 2006). The median mesoscutal line is absent or very short; the mesoscutum coriaceous almost reticulate, the prominent part of the ventral spine of the hypopygium is needle-like, quite long. *Andricus synophri* **sp. n.** most closely resembles *Andricus conificus* (Hartig), *A. truncicolus* (Giraud) and *A. megatruncicolus* Melika, however, it is easily distinguishable from the closely related species by its smaller size (around 3.0 mm) and by the presence of micropunctures on the metasomal tergites, while other three species are more robust, around 4.0 mm and the metasomal tergites without micropunctures. In *A. synophri* **sp. n.** F1 slightly shorter than F2, while in *A. conificus* and *A. truncicolus* F1 is longer than F2, and F1 equal to F2 in *A. megatruncicolus*; the body of *A. conificus* and *A. megatruncicolus* predominantly is reddish brown, while in *A. synophri* **sp. n.** and *A. truncicolus* are black. The shape of the galls of these four species is quite different and all the four species can be easily identified based on the galls they induce.

Description. Only asexual female is known.

Length. Body length: 2.0–3.2 mm (n = 60).

Colour. Black. Mandibles (except tooth) and frons in some specimens brown. Antenna dark, scapus and pedicel black. Legs chestnut brown to black, apex of femura light brown, tarsi brownish. Metasoma laterally in some specimens brown, hypopygium brown. Forewing veins brown.

Head (Figs. 1–2). Coriaceous, with uniformly very dense long white setae. 2.4 times as wide as long from above, 1.2 times as wide as high in anterior view and as wide as width of mesosoma. Gena coriaceous, broadened behind eye, narrower than cross diameter of eye (2:7), visible in anterior view behind eye. Malar space coriaceous, without striae and malar sulcus, 0.25 times as long as height of eye. POL: OOL: LOL = 5.5: 4.0: 3.0 diameter of ocellus 2.0, ocelli rounded, equal in size and shape. Transfacial distance 1.2 times as long as height of eye and 1.9 times as long as height of lower face (distance between antennal rim

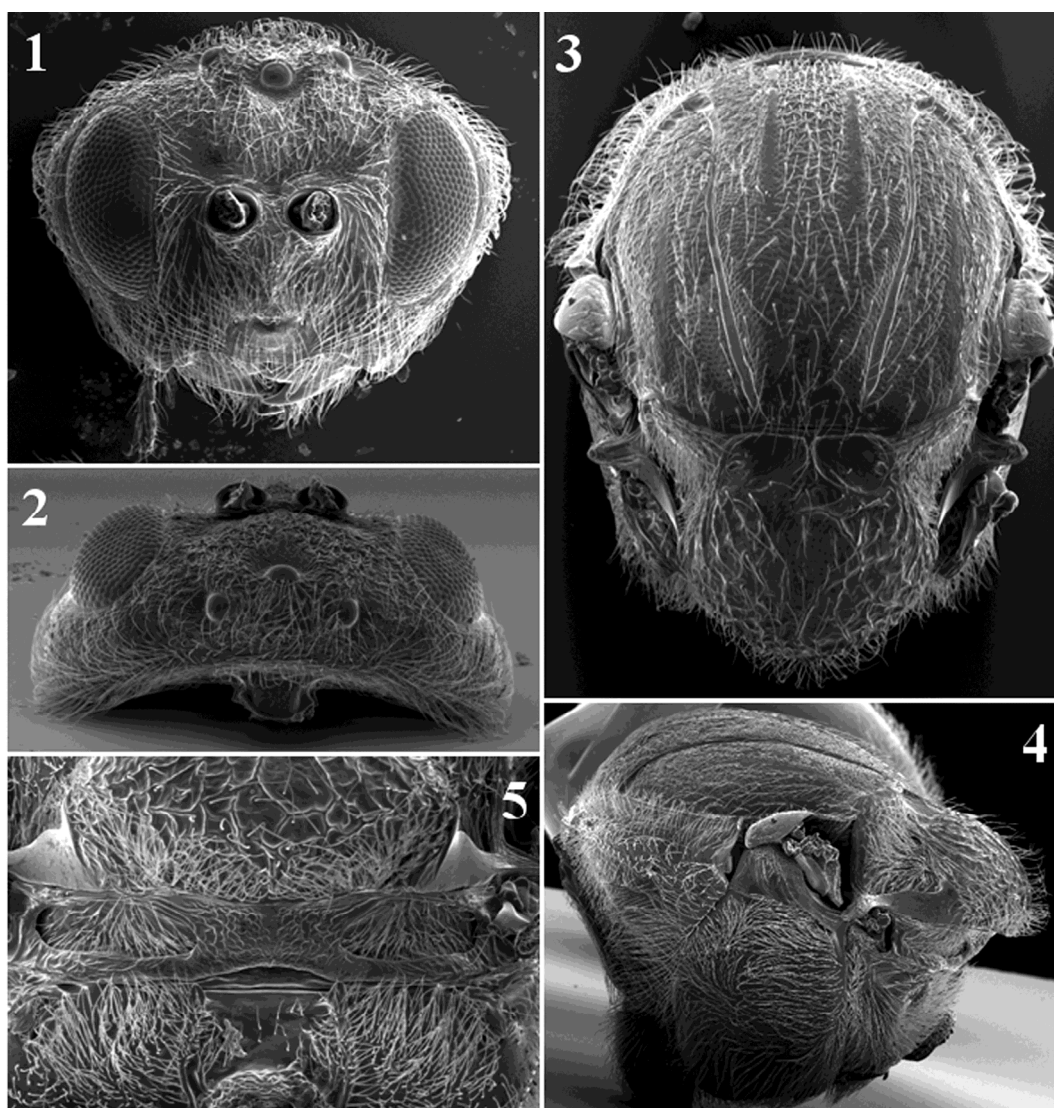
and ventral margin of clypeus); diameter of antennal torulus larger than distance between them, distance between torulus and eye margin as long as diameter of torulus. Lower face coriaceous, with elevated median area. Clypeus trapezoid, broader than long with diverging sides, alutaceous, impressed, with elevated median superior area, ventrally emarginate and weakly incised medially, with distinct deep anterior tentorial pits, distinct epistomal sulcus and clypeo-pleurostomal line. Frons coriaceous, with impressions above antennal sockets. Vertex and occiput coriaceous; interocellar area slightly elevated, rugoso-coriaceous. Post-occiput around occipital foramen impressed, with numerous delicate striae extending to postgenal bridge; occipital carina present.

Antenna (Fig. 8). Slightly longer than head + mesosoma, 14-segmented; scape around 2.2 times as long as pedicel; pedicel longer than broad, F1 more than 2.0 times as long as pedicel, shorter than F2 and slightly curved and slightly broadened distally; F11 and F12 sometimes indistinctly separated; antennal formula: 6.5, 3(x2), 7(x2), 8, 7, 6, 5, 5, 4, 3, 3, 3, 5.5, 3. Placoid sensilla on F4–F12.

Mesosoma (Figs. 3–5). Slightly higher than long in lateral view, with uniform dense white setae. Pronotum uniformly alutaceous, with uniform dense white setae. Anterior rim of pronotum narrow, emarginate; propleuron alutaceous, shiny, with white setae, straight in mediocentral part. Mesoscutum strongly coriaceous, almost reticulate, slightly longer than broad (width measured across base of tegulae); notauli distinct, complete, reaching pronotum, well impressed; median mesoscutal line absent; anterior parallel lines distinct, extending to 2/5 length of mesoscutum; parapsidal line present extending to 2/3 length of mesoscutum. Mesoscutellum uniformly delicately coriaceous, as broad as long, convex, overhanging metanotum. Scutellar foveae subsquared, with coriaceous glabrous bottom, separated by distinct median carina.

Mesopleuron, including speculum, uniformly alutaceous, with dense white setae; mesopleural triangle with weak carinae, pubescent. Metapleural sulcus distinct, delimiting area with very dense white setae, reach mesopleuron in upper 1/2; pre-axilla alutaceous; lateral axillar area coriaceous, without parallel wrinkles, setose; axillar carina broad, smooth, shiny; axillula triangular, with very dense white setae, its sculpture hidden; subaxillular bar smooth, shiny, black, in most posterior end higher than height of metanotal trough; metanotal trough with very dense

long white setae, its sculpture hidden, ventral bar with delicate parallel wrinkles. Meta-scutellum strongly coriaceous, slightly curved ventrally, higher than height of ventral impressed area. Lateral propodeal carinae slightly curved, central area smooth, sometimes with few delicate irregular wrinkles basally, with only few white setae along lateral propodeal carinae; lateral propodeal area uniformly alutaceous, with very dense white setae; nucha short, coriaceous.

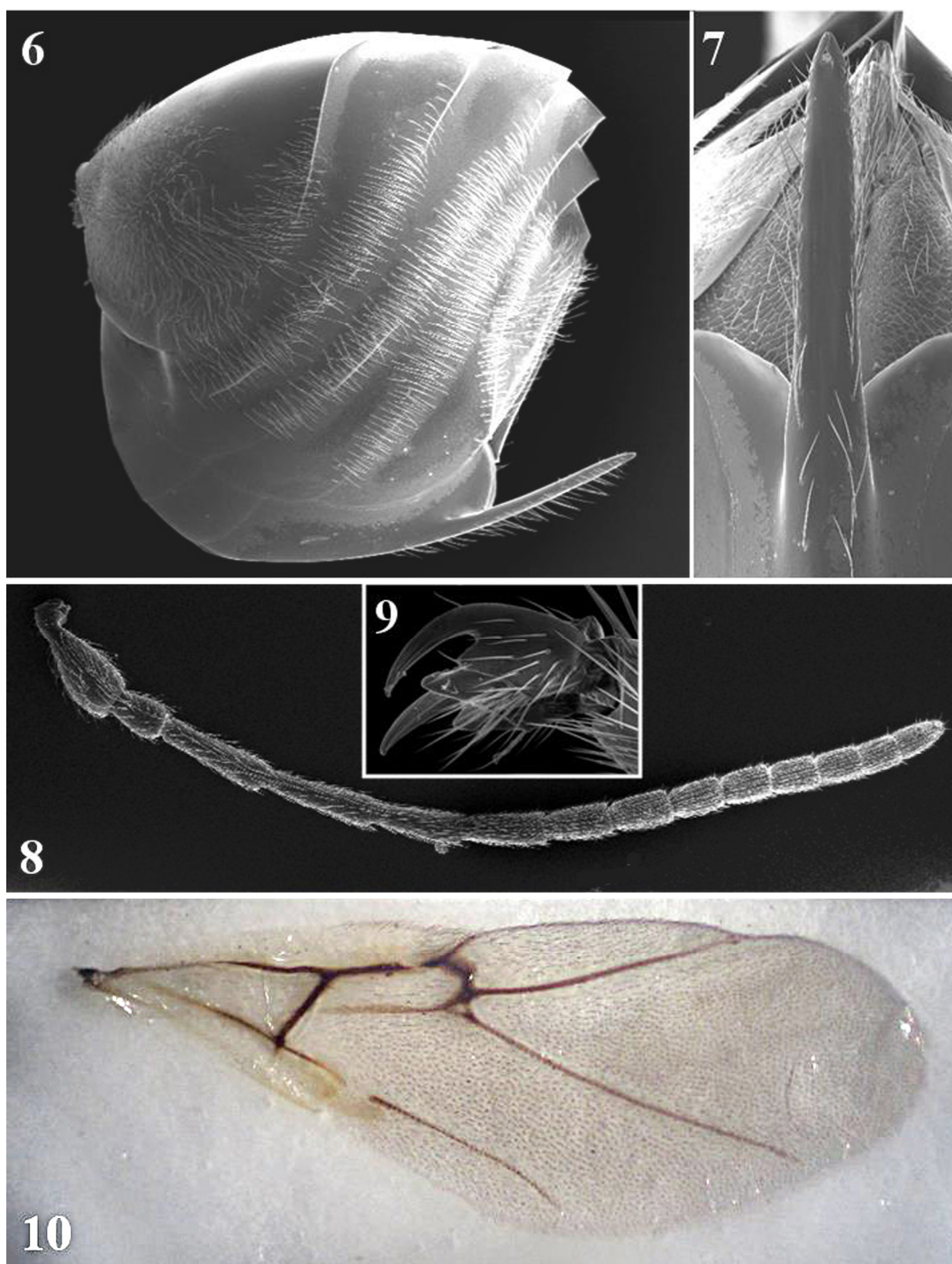


Figures 1–5. *Andricus synophri* Pujade-Villar, Tavakoli & Melika **sp. n.** female paratype: **1.** Head in front view, **2.** Head in dorsal view, **3.** Mesosoma in dorsal view, **4.** Mesosoma in lateral view, **5.** Propodeum.

Forewing (Fig. 10). Longer than body, margin with dense short cilia; radial cell 4.6 times as long as broad, R1 and Rs nearly reaching wing margin; Rs + M distinct, its projection reaching basalis at half height;

areolet small, triangular, well-delimited or collapsed.

Legs. Anterior surface of foretibia with long, oblique setae. Tarsal claws with strong acute, deep basal lobe (Fig. 9).



Figures 6–10. *Andricus synophri* Pujade-Villar, Tavakoli & Melika **sp. n.** female paratype: 6. Metasoma in lateral view, 7. Prominent part of ventral spine of hypopygium in ventral view, 8. Antenna, 9. Tarsal claws, 10. Forewing.

Metasoma (Figs. 6–7). Slightly shorter than head+mesosoma, as high as long in lateral view, smooth. Second metasomal tergite occupying less than half length of metasoma, densely setose laterally, without setae dorsally; all subsequent tergites with a band of dense white setae posteriorly; micro-punctures present from 3rd metasomal tergite; prominent part of ventral spine of hypopygium long, needle-like, 7.5 times as long as broad, with short sparse white setae ventrally, which not extend beyond apex of spine.

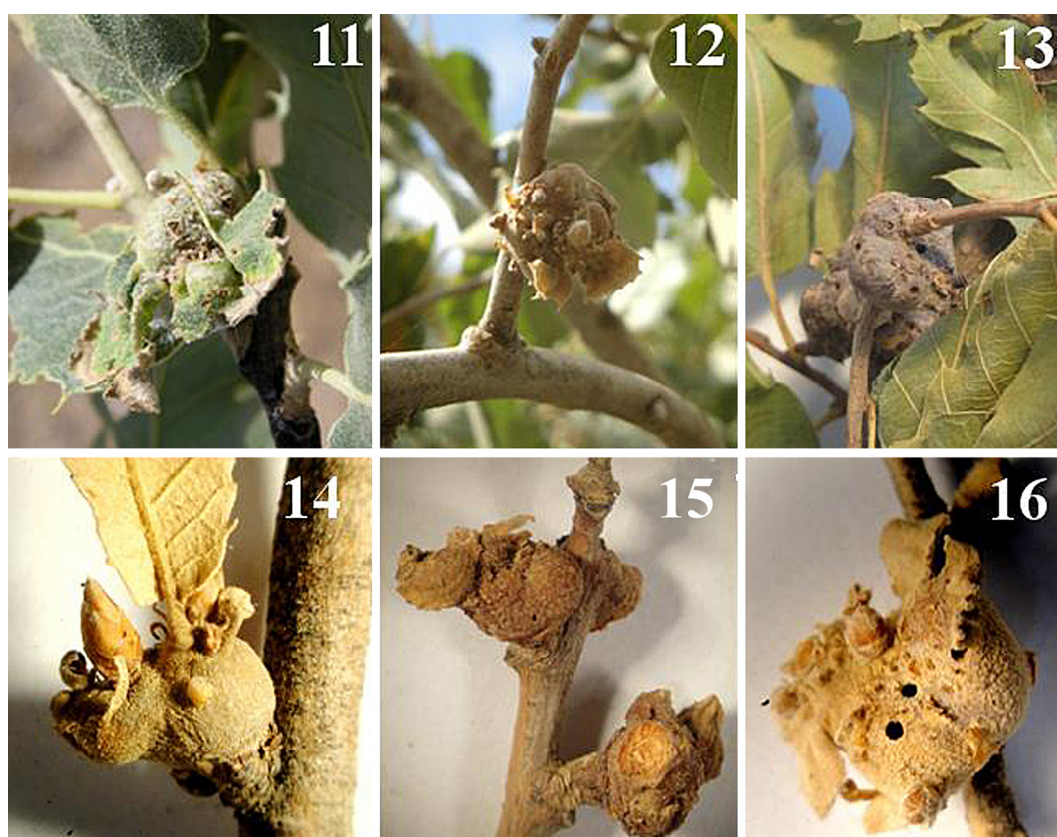
Gall (Figs. 11–16). Galls are multilocular, develop on lateral buds of young branches. The gall is irregular in shape but approximately spherical, 5–20 mm in diameter and sometimes in partially fused agglomerations, like the galls of *Synophrus olivieri*. It is green when developing and growing, turns greyish like the bark when mature. It is not strongly lignified and can be easily cutted like a cheese ven when the gall is mature. The larval chambers are scattered inside the gall. The gall remains on the tree for several years.

Biology. Only the asexual females are known to induce galls on *Quercus brantii* and *Q. libani* (both species belong to the *Cerris* section of *Quercus* L.). The galls develop through the summer and mature in November. Adult wasps overwinter in the gall and probably emerge in the following spring. In the laboratory conditions the wasps emerged in late autumn. Quite strong population fluctuations were observed by one of the authors (MT): in some years galls are very abandoned and then next year galls nearly disappear and can be found very rarely.

Etymology. The name refers to the genus *Synophrus*, galls of *S. oliveiri* from Iran can be easily confused with the galls of *A. synophri* **sp. n.**

Distribution. Currently known only from Iran (Lorestan and Kordestan provinces).

Comments. The shape and size of *Andricus synophri* galls are closely resemble the galls which are induced by an inquiline, *Synophrus olivieri*, a species also known from Iran and which associates with the same oak hosts (Pénzes *et al.* 2009). Only a single oak gallwasp host is known till now for the inquiline species of the genus *Synophrus*: *Andricus burgundus* Giraud (Cynipidae: Cynipini) known to be attack by *Synophrus hispanicus* Pujade-Villar (Cynipidae: Synergini) (Pujade-Villar *et al.* 2003). In this case, the *Andricus* galls are completely modified and it is impossible to recognize the gall of *A. burgundus*. It is possible that the galls of *A. synophri* could be attacked by *S. olivieri* and in this case the original gall is only moderately modified. This could be the reason while the twigs with *A. synophri* and/or *S. olivieri* are identical in shape and size. However, a recent unpublished research done by one of the co-authors (JP-V), showed that what we assign to *S. olivieri* from Iran is not *S. olivieri* known from North Africa, the origin site where from the species was described. It is definitely a distinct species, differs from *S. olivieri* in some peculiarities of morphology, biology and phylogeny and it was already briefly mentioned (Pujade-Villar *et al.* 2010).



Figures 11–16. Galls of *Andricus synophri* Pujade-Villar, Tavakoli & Melika **sp. n.**: **11, 12, 13, and 14** on *Quercus brantii*, **15 and 16** on *Quercus libani*.

Discussion

According to its morphology, *Andricus synophri* belongs to a large group of 12 *Andricus* species, the “*Adleria non-kollari*” group, which possess two peculiar characters: the mesoscutum coriaceous, without punctures and the prominent part of the ventral spine of the hypopygium is needle-like and very long: *A. assarehi* (Melika & Sadeghi 2008), *A. caputmedusae* (Hartig, 1843), *A. conificus* (Hartig, 1843), *A. coronatus* (Giraud, 1859), *A. dentimitratus* (Retjö, 1887), *A. hartigi* (Hartig, 1843), *A. hungaricus* (Hartig, 1843), *A. megatruncicolus* Melika, 2008, *A. mitratus* (Mayr, 1870), *A. quercustozae* (Bosc, 1792), *A. tomentosus* (Trotter, 1901) and *A. truncicolus* (Giraud, 1859). Six of them unknown for Iran: *A. conificus*, *A. coronatus*, *A. hartigi*, *A. hungaricus*, *A. mitratus* and *A. truncicolus* (Sadeghi, 2010).

Only three species (e.g. *A. conificus*, *A. megatruncicolus* and *A. truncicolus*) and *A. synophri* **sp. n.** have the mesoscutum strongly coriaceous, almost reticulate, while in the rest of the mentioned species, the mesoscutum is coriaceous or coriaceous-granulose, sometimes with some short carinae (rugae) (Melika 2006). Some other characters also accurately differentiate the new species from the other species mentioned, for example, in *A. synophri* **sp. n.** the median mesoscutal line is absent, while in *A. assarehi*, *A. caputmedusae*, *A. dentimitratus*, *A. hartigi*, *A. mitratus*, *A. quercustozae* and *A. tomentosus* the median mesoscutal line always present, distinct, more or less long. The newly described species differs from *A. coronatus* and *A. hungaricus* in the length of antennal F1 which is shorter than F2 in the new species and longer than F2 in other

two species. The differences between *A. synophri* sp. n. and the three most closely resemble species, *A. conificus*, *A. megatruncicolus*, and *A. truncicolus*, are mentioned in the diagnosis section above. Punctures on metasomal tergites are present in the newly described species and only in three species of “*Adleria non-kollari*” group, *A. conificus*, *A. hartigi* and *A. hungaricus*.

Finally, the shape of *A. synophri* galls is very special and cannot be mismatched with galls induced by other species of this *Andricus* species-group, more of that, *A. synophri* galls is the only multilocular gall in the group.

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Andricus synophri (Hymenoptera: Cynipidae) گونه جدید زنبور گالزا از ایران

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چکیده: گونه جدیدی از زنبورهای گالزای بلوط به نام *Andricus synophri* (Hymenoptera: Cynipidae: Cynipini) از ایران توصیف گردید. این گونه بر اساس ماده‌های غیر جنسی و گال‌های ایجاد شده روی شاخه‌های دو گونه بلوط شامل *Quercus brantii* و *Q. libani* توصیف شد. گال‌ها به صورت چند خانه‌ای و روی جوانه‌های جانبی شاخه‌های جوان قرار داشتند. بر اساس ویژگی‌های مرفولوژیک گونه *Andricus synophri* متعلق به یک گروه بزرگ شامل ۱۲ گونه تحت عنوان گروه "*Alderia non kollari*" می باشد. اطلاعات مربوط به ویژگی‌های افتراقی، انتشار جغرافیایی و بیولوژی گونه جدید ارائه شده است.

واژگان کلیدی: *Andricus*, Cynipini، رده‌بندی، ایران، انتشار، گونه جدید.

