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A NEW GENUS OF OAK GALLWASP, *KOKKOCYNIPS* PUJADE-VILLAR & MELIKA GEN. N., WITH A DESCRIPTION OF A NEW SPECIES FROM MEXICO (HYMENOPTERA, CYNIPIDAE)

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ABSTRACT. A new genus of oak gallwasp, *Kokkocynips* Pujade-Villar & Melika gen. n., is described from Mexico. Diagnostic characters and generic limits of the new genus are discussed in detail. Galls were found on branches of *Quercus acutifolia* Née. Diagnostic characters, distribution and biology of the new species are described and illustrated.

Key words: Cynipidae, gallwasp, *Kokkocynips doctorrosae*, taxonomy, morphology, distribution, biology.

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RESUMEN. Se describe un nuevo género de cinípido agallícola, *Kokkocynips* Pujade-Villar & Melika n. gen. (Hymenoptera: Cynipidae: Cynipini) de México. Se discuten en detalle los caracteres diagnósticos y los límites genéricos de este nuevo género. Las agallas se encuentran en las ramas de *Quercus acutifolia* Née. Se describen e ilustran los caracteres diagnósticos, su distribución y la biología de la nueva especie.

Palabras clave: Cynipidae, agallícola, *Kokkocynips doctorrosae*, taxonomía, morfología, distribución, biología.

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INTRODUCTION

The known fauna of Cynipidae is the richest in the Nearctic Region, with *ca*. 700 species belonging in 22 genera (Melika & Abrahamson 2002); about 154 species are known from Mexico and Central America, trophically associated with more than 30 oak species (Pujade-Villar *et al.* 2009); approximately 150 species of *Quercus* are known from Mexico (Valencia 2004) and 86 of them are considered endemic (Nixon 1998; Zavala-Chávez 1998; Valencia 2004).

After a summarizing review on Mexican oak gallwasps (Pujade-Villar *et al.* 2009), one new genus (Pujade-Villar *et al*. 2010) and 6 new species (Melika *et al*. 2009, 2011; Pujade-Villar *et al*. 2010, 2011a, b) were described; one species earlier known only from USA was found (Pujade-Villar *et al*. 2012a) and the first gall morphotype on *Q. resinosa* Liebm. has been commented for Mexico (Pujade-Villar *et al*. 2012b). A total of 11 oak gallwasp genera have been mentioned for Mexico (Pujade-Villar *et al.* 2009, 2010).

Herein we use morphological data to support the description of a new genus of oak gallwasp from Mexico, *Kokkocynips* Pujade-Villar & Melika, consisting of one new species, *K. doctorrosae*, associated with *Quercus acutifolia* Née (Section Lobatae of *Quercus*; red oaks).

MATERIAL AND METHODS

Examined material was reared from galls collected on *Quercus acutifolia* by Equihua Martínez and Estrada Venegas (details below).

Terminology used to describe gallwasp morphology follows other recent cynipid studies (Melika 2006; Liljeblad *et al.* 2008). Abbreviations for fore wing venation follow Ronquist & Nordlander (1989), and cuticular surface terminology follows Harris (1979). Measurements and abbreviations used here include: F1–F12 for the 1st and subsequent flagellomeres; POL (post-ocellar distance) for the distance between the inner margins of the posterior ocelli; OOL (ocellar-ocular distance) for the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; and LOL (lateral-frontal ocelli distance) for 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.

SEM photographs were taken with a Stereoscan Leica-360 (Cambridge Instruments) by Palmira Ros-Farré (Universitat de Barcelona) at a low voltage (10kV) with gold coating. Pictures of the wing and galls were taken by a digital camera Canon PowerShot SX210 15 by J. Pujade-Villar. Images will be available from the "morphbank.com" databank.

Type material is deposited in the following institutions:

UB Universitat de Barcelona, Spain (J. Pujade-Villar collection);

BPDL Budapest Plant Pest Diagnostic Laboratory, National Food Chain Safety Office, Budapest, Hungary (G. Melika collection);

CP Collection, "Instituto de Fitosanidad, Colegio de Postgraduados", Montecillo, Texcoco, Estado de México.

DESCRIPTION

Kokkocynips Pujade-Villar & Melika gen. n.

Type species. *Kokkocynips doctorrosae* Pujade-Villar by present designation.

Diagnosis. *Kokkocynips* most closely resembles a group of *Andricus* species (*A. nievesaldreyi* Pujade-Villar, 2011 = *A. mexicanus* Kinsey, 1920; *A. georgei* Pujade-Villar, 2011) with striate and reticulate metasomal tergites. In *Kokkocynips*, tarsal claws are simple, without basal lobe, the prominent part of the ventral spine of the hypopygium 3.0–3.3 times longer than broad, the head is transverse in front view, broader than high, the length of antennae nearly equal to length of head+mesosoma, F2 and subsequent flagellomeres are stout, short, F1 2.0 times longer than F2, lateral propodeal carinae toward distal part of propodeum gradually curved outwards, the central propodeal and lateral propodeal areas dull rugose; all tergites uniformly reticulate, 2nd metasomal tergite with sparse lateral hairs, induce rounded detachbale soft unilocular twig galls. In *A. nievesaldreyi* and *A. georgei*, tarsal claws with distinct strong basal lobe, the prominent part of the ventral spine of the hypopygium 1.5–1.8 times longer than broad, head rounded in front view, nearly as broad as high, the length of antennae nearly equal to length of the body, F2 and subsequent flagellomeres are thin, longer, F1 1.2–1.3 times longer than F2, lateral propodeal carinae curved outwards in the middle, the central propodeal area smooth, shiny, lateral propodeal area coriaceous; 2nd metasomal tergite with large and dense patch of setae laterally, striated in the posterior half at least, all subsequent tergites reticulate, induce detachable multilocular leaf galls.

Description. Asexual female of medium size with reticulate head, mesosoma and metasoma. Head transverse, broader than high in front view, with strongly broadened genae behind eyes, malar sulcus absent. Antenna with 12 flagellomeres. Tarsal claws simple, without basal lobe. Mesoscutum uniformly reticulate, notauli complete, parapsides glabrous. Mesoscutellum uniformly coriaceous, with transverse depression anteriorly, scutellar foveae separated by median carina (in some paratypes median carina absent). Propodeum uniformly rugose, lateral propodeal carinae strongly diverge toward posterior end of propodeum, central and lateral propodeal areas rugose. 2nd metasomal tergite with sparse white setae laterally, reticulate in posterior 1/2–1/3,

all subsequent tergites uniformly and entirely reticulate. Prominent part of ventral spine of hypopygium needle-like, 3.0–3.3 times longer than broad, with sparse short subapical setae laterally which not form apical tuft.

Etymology. The generic name refers to the shape and the inner structure of the growing galls which are similar to the shape of a kernel or seed (Greek *kokkos* (*κόκκος*)) and its assignment to the oak gallwasp tribe Cynipini.

Gender: masculine.

***Kokkocynips doctorrosae* Pujade-Villar sp. n.**
(Figs. 1–4)

Description (Figs. 1–3): asexual form.

Length. Female 1.8–2.0 mm (n=10).

Coloration. Head uniformly brown-testaceous, mesosoma predominantly brown-testaceous with dark brown or black scutellar fovea, metascutellum, propodeum and

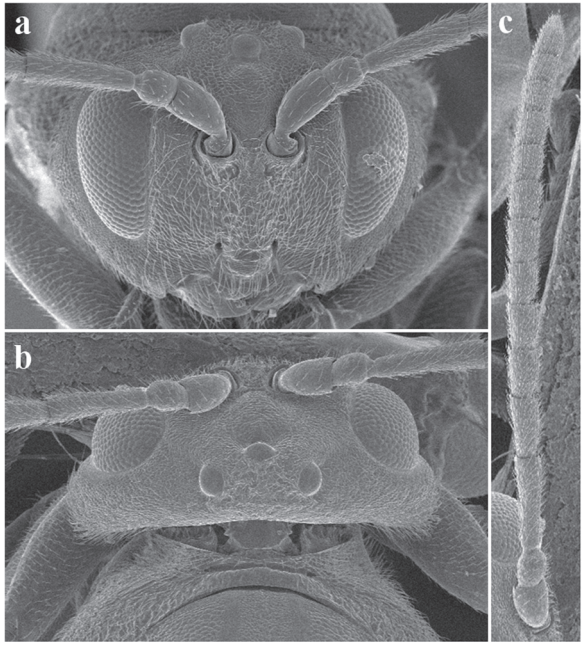

Fig. 1. *Kokkocynips doctorrosae*: (a) head, front view, (b) head, dorsal view, (c) antenna.

metapectal complex; mesoscutum with longitudinal dark brown to black stripes along anterior median lines and parapsides; metasoma lighter anteriorly, red-testaceous to black posteriorly.

Head (Figs. 1a–b). Uniformly and strongly coriaceous; covered with short sparse white setae, narrower than mesosoma, transverse, 1.2 times as broad as high in front view; gena broadened behind eye, around 0.4 times as broad as diameter of eye, measuring along transfacial line; malar space around 0.4 times as long as height of eye, coriaceous, without radiating striae and malar sulcus. POL:OOL:LOL=8:5:3, diameter of lateral ocellus 2.0; head 2.1 times as broad as long in dorsal view; lower face and frons without carinae. Clypeus impressed, smooth and shiny, rounded ventrally, medially not incised, anterior tentorial pits distinct; epistomal sulcus invisible, clypeo-pleurostomal line distinctly impressed.

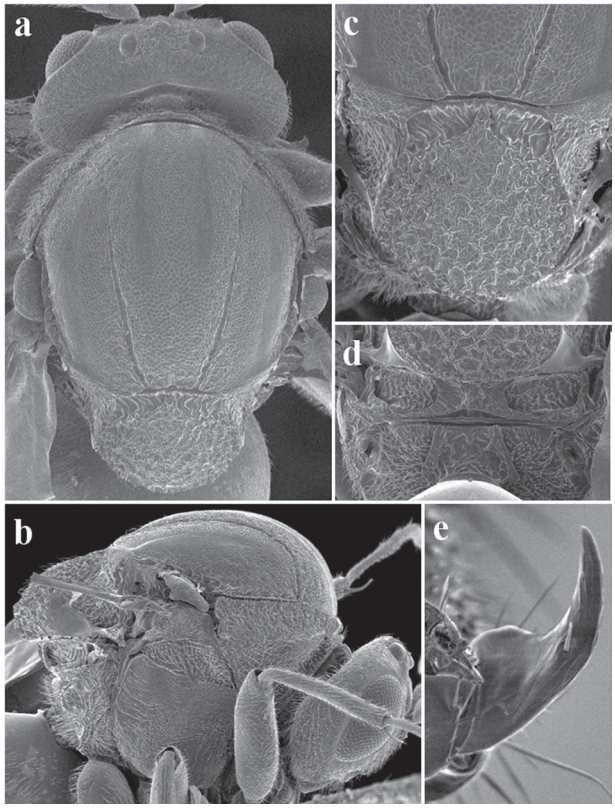

Fig. 2. *Kokkocynips doctorrosae*: (a) mesosoma, dorsal view, (b) mesosoma, lateral view, (c) mesoscutellum, dorsal view, (d) propodeum, posterodorsal view, (e) tarsal claw.

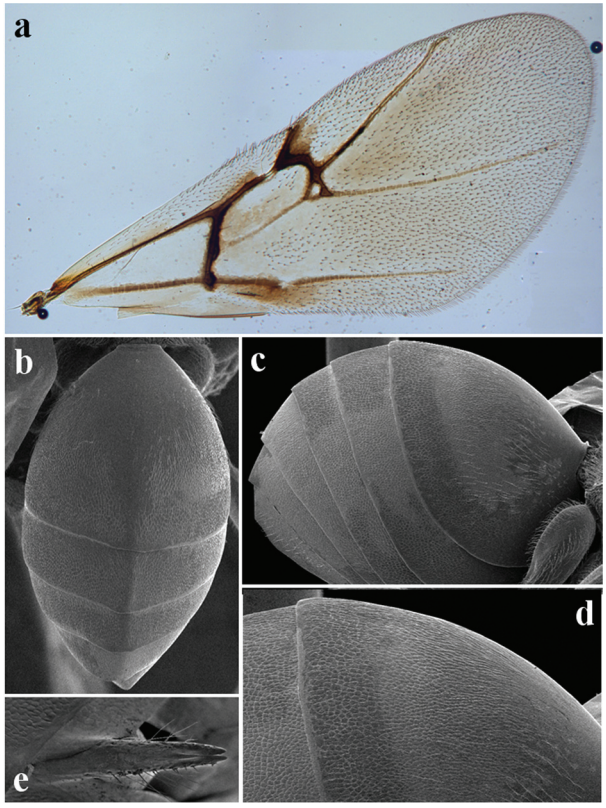

Fig. 3. *Kokkocynips doctorrosae*: (a) forewing, (b) metasoma, dorsal view, (c) metasoma, lateral view, (d) sculpture of 2nd and 3rd metasomal tergites, (e) ventral spine of hypopygium, ventral view.

Antenna (Fig. 1c). 12 flagellomeres; F1 2.0 times longer than F2, F1 slightly broader distally; subsequent flagellomeres progressively shortened, F12 longer than F11. Antennal formula: 6: 2.75: 11: 6: 4.5: 4.5: 4: 4: 3.5: 3.5: 3: 3: 3: 5.5. Placodeal sensilla on F3-F12.

Mesosoma (Figs. 2a–d). Slightly longer than high, concave in lateral view. Sides of pronotum rugose, with carinae in upper latero-posterior part, antero-lateral rim of pronotum weakly differenciated. Mesoscutum slightly broader than long in dorsal view; notauli complete, deep, straight, converging posteriorly, less impressed anterior 1/4 of mesoscutum, median mesoscutal line absent; parapsidal lines and anterior parallel lines differentiated by smooth and shiny areas. Mesoscutum microreticulate, with some delicate rugae posteriorly, aside from notauli. Mesopleuron reticulate, with sparse setae. Mesoscutellum as long as broad, slightly broadened in posterior third,

Fig. 4. Galls of *Kokkocynips doctorrosae* (photo by E. G. Estrada-Venegas).

uniformly rugose; scutellar foveae indistinctly differentiated, almost confluent, with longitudinal carinae on shiny bottom, median carina absent or inconspicuous. Propodeum laterally weakly and uniformly rugose and pubescent, lateral propodeal carinae strongly diverge toward posterior end of propodeum, central propodeal area rugose and glabrous. Metascutellum subrectangular, coriaceous. Ventral bar of metanotal trough coriaceous-rugose; metanotal trough rugose, with short and sparse setae.

Forewing (Fig. 3a). 1.25 times longer than body, weakly brown-infuscated, pubescent, with cilia on margins; radial cell opened, around 3.1 times as long as broad; veins dark brown; areolet small or absent.

Legs (Fig. 2e). Base of tarsal claws slightly broadened, thus tarsal claw simple.

Metasoma (Figs. 3b–e). Longer than head+mesosoma, longer than high. 2nd metasomal tergite with sparse white setae laterally, reticulate in posterior 1/2–1/3, all subsequent tergites uniformly and entirely reticulate. Prominent part of ventral spine of hypopygium needle-like, 3.0–3.3 times longer than broad, with sparse short subapical setae laterally which not form apical tuft.

Type material. HOLOTYPE. Female (deposited in the collection J.P-V, UB), labeled as "MEX, Michoacán, Carretera Federal Maravatío-Morelia, 19º54'22.91''N 100º34'28.35''W, 2391 m" (white label), "Ex. *Q. acutifolia*, (08.xii.2011), 21.xii.2011" (white label); "Holotype *Kokkocynips doctorrosae* desig. JP-V 2012" (red label), "*Kokkocynips doctorrosae* JP-V det., asexual gen." (white label). PARATYPES (15 females): same data of holotype (8 paratypes are deposited in the collection of UB; 3 paratypes in the collection of BPDL; 4 paratypes in the CP collection).

Gall (Fig. 4)**.** A unilocular twig gall, nearly spherical, 8–10 mm in diameter, slightly flattened basally, with smooth surface, lacking pubescence, yellowish with concentric circular red-brown lines, apically reddish-pink. The gall stays soft when mature, but not fragile. Larval chamber ovate, 1.4 × 1.8 mm, with thin walls (0.16 mm), surrounded by a spongy-like tissue, located in the centre of the gall. Exit hole usually located laterally. There is always a longitudinal crack in the bark where the gall was inserted.

Host plant. *Quercus acutifolia* (Section Lobatae of *Quercus*; red oaks), distributed in Mexico (states of Chiapas, Guerrero, Jalisco, Mexico, Michoacan, Oaxaca and Puebla), Guatemala, Belize and Honduras (Romero-Rangel 2006). This species inhabits mixed pine-oak forests, mesophylous and tropical deciduous forest at altitudes of 600-2440 m, characteristics of which are given in Romero-Rangel (2006). This is the first record of a cynipid gallwasp from this oak species.

Distribution. Currently known only from Mexico (State of Michoacán). Galls were collected between Maravatío and Morelia.

Biology. Only the asexual (parthenogenetic) females are known. Galls develop in the rainy season, mature in November, and adults start to emerge in December.

Etymology. The species name refers to "Doctor", first family name of Dr. Assumpta Ros Vergara (see acknowledgments).

DISCUSSION

The peculiar surface sculpture of *Kokkocynips* metasoma makes this genus quite unique among all other genera of Cynipini. Nearly all known oak gallwasp genera have metasoma shiny, smooth, without surface sculpture. Exceptions are some species of *Amphibolips* Reinhard, the metasoma of which is partially reticulate or with some indistinct striation. However, all representatives of *Amphibolips* are robust specimens, with a strong acute basal lobe on the tarsal claws and with a very dull rugose head, mesoscutum and mesoscutellum. Only two species of *Andricus* Hartig, *A. nievesaldreyi* and *A. georgei*, present such a unique character as the striated or reticulated metasoma (Kinsey 1920, Pujade-Villar *et al*. 2011b) and they might well represent a distinct genus from *Andricus* (Pujade-Villar *et al*. 2011b).

Kokkocynips was found in the limit of the Nearctic and has never been detected north of it, in spite of earlier cynipid research done in Mexico by Kinsey (1936, 1937a, b, 1938) and other researchers. It is also absent from USA and Canada (Burks 1979). It is possible that *Kokkocynips* is distributed also in the Neotropics. Further research is necessary to establish the real distribution of the genus.

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