Amyris conzattii Standl. (Rutaceae), a case of false identity

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Abstract: A new combination in Rutaceae is published: ***Megastigma conzattii***, which was erroneously described as an *Amyris, A. conzattii*. The species is described, illustrated, and compared with *M. skinnerii* and *M. chiangii*, both species with similar morphological characteristics. A comparative table and an identification key of these species are included.

Keywords: *Megastigma*, new combination, Oaxaca, Rutoideae, Toddalioideae.

Resumen: Se publica una nueva combinación en Rutaceae: ***Megastigma conzattii***, la cual fue erróneamente descrita como un *Amyris*, *A. conzattii.* La especie se describe, ilustra y compara con *M. skinnerii* y *M. chiangii*, taxones con características morfológicas similares. Se incluye un cuadro comparativo así como una clave de identificación de las tres especies mencionadas.

Rutaceae is a cosmopolitan family mainly distributed in tropical and subtropical regions of the world (Groppo et al., 2008; Kubitzki et al., 2011). It comprises 150 to 170 genera and nearly 2040 species (Kubitzki et al., 2011; Morton & Telmer, 2014). Engler (1931) divided the family into seven subfamilies, amongst them Rutoideae, which includes the tribe Xanthoxyleae with five subtribes: Evodiinae, Lunasiinae, Choisyinae, Pitaviinae, and Decatropidinae. Decatropidinae comprises three genera: *Decatropis* Hook. f., *Polyaster* Hook. f., and *Megastigma* Hook. f. On the other hand, *Amyris* P. Browne was included in the subtribe Amyridinae (subfamily Toddalioideae, tribe Toddalieae) with two other genera: *Stauranthus* Liebm. (distributed in America) and *Vepris* Comm. ex A. Juss. (Africa, Arabia, Madagascar, and India).

Amyris is an American genus with ca. 40 species distributed from the southern United States to northern South America. It is characterized by tree or shrub habit, imparipinnate or rarely unifoliolate leaves, lateral or terminal cymose inflorescences, stamens twice as many as the petals with a gland on the connective, a meloniform to lobulate (never conical) nectariferous disk, a unilocular ovary, and fleshy fruits with abundant glands and only one seed (Gereau, 1991; Rebman & Chiang, 2005; Hernández-Barón, 2016).

Megastigma is also an American genus and comprises five species distributed in Mexico, Guatemala, Honduras, and Nicaragua. Members of the genus are trees or shrubs with imparipinnate leaves, paniculate to umbellate, terminal, subterminal and/or lateral inflorescences, stamens twice as many as the petals and without a gland on the connective, a conical nectariferous disk, a bilocular, bilobed, didymous ovary (Hooker, 1862), a gynobasic style with a globose and conspicuous stigma, and a fleshy, didymous, fruit with one seed per locule; frequently with only one carpel ripening and the undeveloped carpel deciduous or sometimes persistent on the disk (Pool, 2001; Kubitzki et al., 2011; Jiménez Ramírez & Cruz Durán, 2015 Cuevas-Guzmán et al., 2016).

Megastigma differs from *Amyris* by having a conical nectariferous disk, a bicarpelar, bilobed, bilocular, didymous ovary with a gynobasic style and a globose and conspicuous stigma, the

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stamen's connective without a gland, and a fleshy, didymous fruit frequently with only one carpel ripening and the undeveloped one deciduous or persistent on the disk.

As part of our ongoing taxonomic and floristic investigation of the Mexican members of *Amyris*, we discovered that *A. conzattii* Standl. differs from the other members of the genus by some traits of the ovary and fruit. A meticulous examination of the original descriptions and type material of all species of *Amyris* allowed us to determine that *A. conzattii* actually belongs to *Megastigma*, which we discuss below.

For a long time, *Amyris conzattii* was known only from the type specimen, kept at the United States National Herbarium (US), which has only fruits (Fig. 1). This specimen was described as a member of *Amyris* due to its possession of several characters of that genus, such as imparipinnate leaves and a fleshy, apparently unicarpellate fruit.

When Conzatti collected the type material, he also collected seeds, which he grew to maturity and from which he prepared, in May of 1935, herbarium specimens with flowers (Fig. 2). Eighty years later, in 2015, a duplicate of the same gathering was deposited at the Herbario Nacional de México (MEXU 1390680) (Fig. 2A). Meticulous examination of the flowers of the specimen revealed the presence of a bilobed, bilocular and didymous ovary with a gynobasic style, a globose and conspicuous stigma (Fig. 2E), and an eglandular anther connective (Fig. 2D). Therefore, we concluded that *A. conzattii* actually represents a species of *Megastigma* and therefore we make the necessary new combination here.

Taxonomic treatment

Megastigma conzattii (Standl.) Hern.-Barón, Espejo & López-Ferr., **comb. nov.** *Amyris conzattii* Standl., J. Wash. Acad. Sci. 13:6. 1923. Type: Mexico, Oaxaca: Los Sabinos,

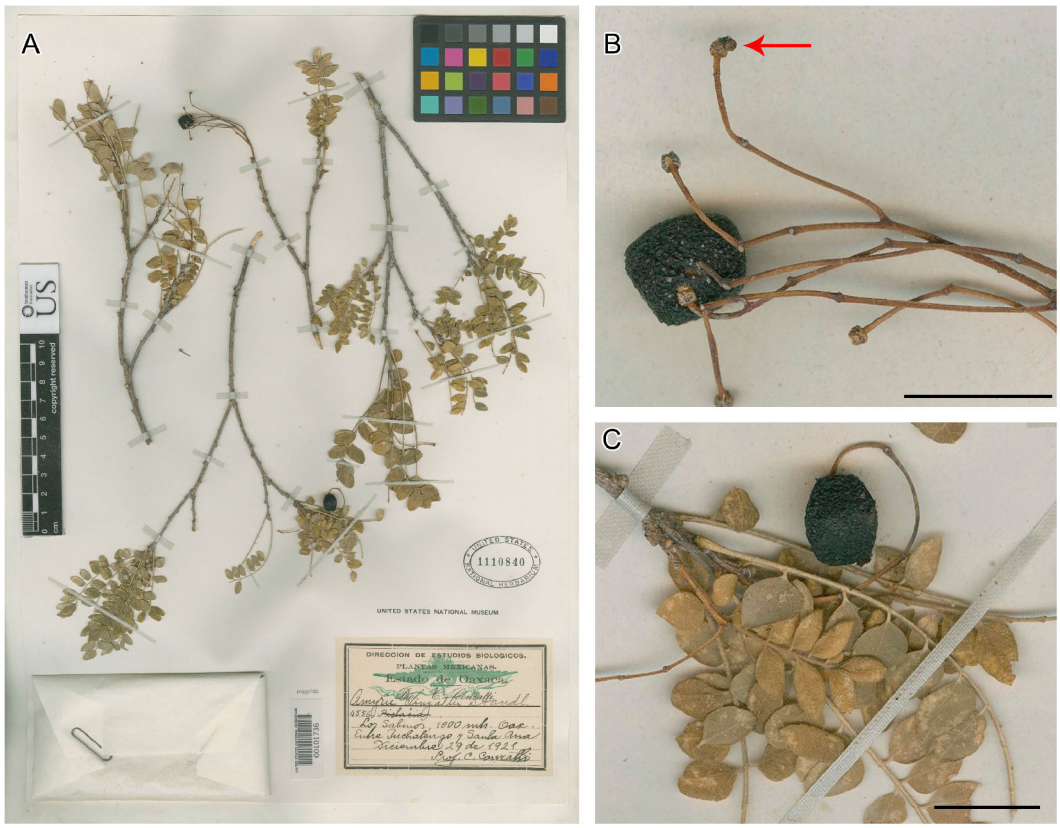

Fig. 1. **A**. Holotype of *Amyris conzattii*. **B**. Apex of inflorescence showing a mature fruit and (at red arrow) an undeveloped carpel of a bilobed, bilocular, didymous ovary. **C**. Apex of leafy twig with mature fruit. (From *C. Conzatti 4556*, US; scales = 1 cm.)

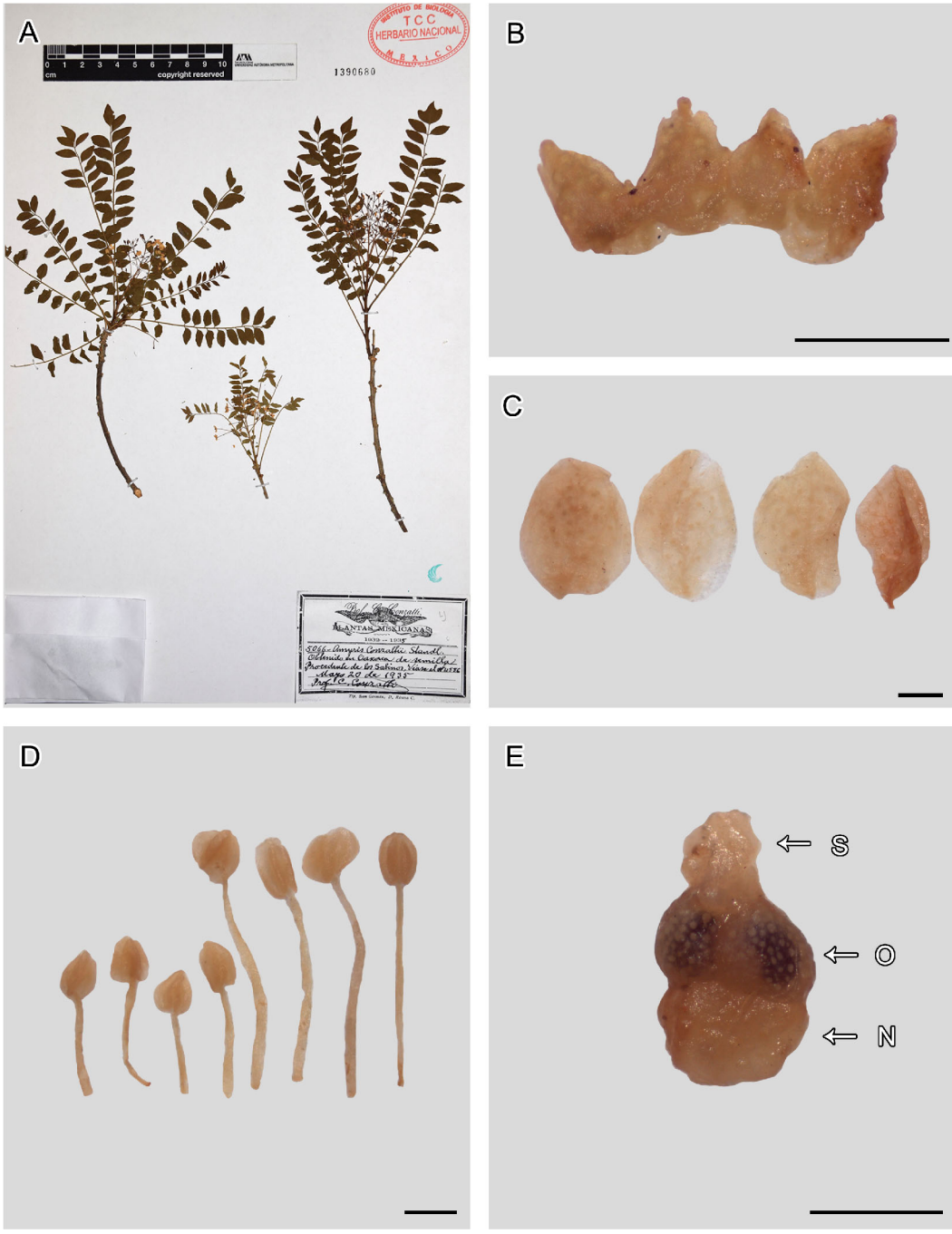

Fig. 2. *Megastigma conzattii*. **A**. Specimen made from a cultivated plant grown from seeds of the original collection. **B-F**. Floral dissection. **B**. Sepals. **C**. Petals. **D**. Stamens. **E** & **F**. Didymous ovary, the arrows indicates the stigma (S), ovary (O) and nectariferous disk (N). (From *C. Conzatti 5066*, MEXU; scales = 1 mm.)

entre [San Pedro] Juchatengo y Santa Ana, 1000 m, 29 Dec 1921 [fr], *C. Conzatti 4556* (holotype: US Herb. #1110840 (Bar code # US101736!)).

Tree or shrub with thin, greyish, glabrous branches. Leaves imparipinnate, alternate, 5–12.5 cm long; petioles 4–10 mm long, rachis thin and finely pubescent, blades 4.5–11.5 cm long; pubescent; petiolules 0.3–1.2 mm long, pubescent; leaflets 21 to 29, coriaceous, rhombic to ovate-rhombic, 5–13.2 mm long, 3.5–8 mm wide, obtuse to rounded at apex, oblique at the base, entire or inconspicuously crenulate, glabrous or sometimes sparsely puberulent on the adaxial surface, with numerous glands. Inflorescences lax terminal pauciflorous panicles, 2.4–4.4 cm long. Flowers < 20, tetramerous, rarely pentamerous; sepals 0.6–1 mm long, 0.2–0.4 mm wide, apiculate, connate at the base; petals 1.7–3.5 mm long, 1.2–2.6 mm wide, ovate; stamens twice as many as the petals, the filaments inserted below the nectariferous disc, 1.3–4.5 mm long, the anthers 0.60–0.90 × 0.44–0.59 mm; the nectariferous disc slightly conical and lobed; pistil up to 1.5 mm long, the ovary bicarpelar, bilobed, bilocular, didymous, 0.3–0.5 mm long, each lobe 0.5 mm in diameter, the style gynobasic, ca. 0.3 mm long, the stigma 0.5 mm long × 0.5 mm in diameter. Fruit drupaceous, didymous, black, frequently with only one carpel developed ca. 10 mm long, 0.7 mm wide.

Distribution.—*Megastigma conzattii* is known only from the type locality.

Phenology.—The flowering collection was gathered in May, the fruiting collection in December.

Additional specimen examined. MEXICO. Oaxaca: Obtenido en Oaxaca de semilla procedente de los Sabinos, veáse el #4556, 20 May 1935 [fl], *C. Conzatti 5066* (MEXU Herb. # 1390680).

Megastigma conzattii is most similar to *M. chiangii* J. Jiménez Ram. & Cruz Durán, and to *M. skinneri* Hook. f. because the three species exhibit imparipinnate leaves with over 15 leaflets. With *M. chiangii* it also shares glabrous branches and coriaceous leaflets. However, *M. chiangii* has the petioles and rachis glabrous and the inflorescences racemose to paniculate with more than 40 flowers; whereas *M. conzattii* has the petioles and rachis pubescent and the inflorescences paniculate with less than 20 flowers.

Megastigma conzattii and *M. skinneri* both have the petioles and rachis pubescent and the flowers tetramerous. However, *M. skinneri* has 15 to 21 membranaceous leaflets and umbellate inflorescences with less than 12 flowers; while *M. conzattii* has 21 to 29 coriaceous leaflets and paniculate inflorescences with less than 20 flowers. There are clear differences in the vegetative and reproductive characteristics of these three species, which are compared in Table 1.

With the new combination made here, *Megastigma* comprises six species: *M. balsense* Chiang & Jiménez Ram., *M. conzattii*, *M. galeottii* Baillon, *M. chiangii*, *M. morenoi* Cuevas & Guzmán-Hern., and *M. skinneri*. The first five are endemic to Mexico, and the last one is distributed from Chiapas to Nicaragua.

TABLE 1. COMPARATIVE CHARACTERS OF *MEGASTIGMA CONZATTII*, *M. CHIANGII*, AND *M. SKINNERI*.

	M. conzattii	*M. chiangii*	*M. skinneri*
Branches	glabrous	glabrous	pubescent
Leaves	5–12.5 cm long	14–21(−22.5) cm long	2.7–4.8 cm long
Leaflets	21–29, coriaceous	15–19, coriaceous	15–21, membranaceous
Petiole	4.3–10 mm long, pubescent	25–35 mm long, glabrous	3.6–4 mm long, pubescent
Rachis	7.1–9.2 cm long, pubescent	(8–)11–14.5 cm long, glabrous	1.9–3.5 cm long, pubescent
Petiolule	0.3–1.2 mm long	3–5 mm long	0.3–1 mm long
Leaflets	5–13.2 × 3–5.8 mm	18–37(−42) × (5–)9–17 mm	8.8–11.3 × 2.4–4.8 mm
Inflorescence	Paniculate, < 20 flowers	Racemose to paniculate, > 40 flowers	Umbellate, < 12 flowers
Flower	4-merous (rarely 5-merous)	5-merous	4-merous

Key for the identification of the species of *Megastigma*

1. Leaflets 5–7.
2. Leaves 1–2.5 cm long; leaflets 0.45–1 × 0.5–0.9 cm; rachis of young leaves narrowly winged; inflorescence umbellate; ovary 2-carpelar (valley of Tehuacán-Cuicatlán, Puebla and Oaxaca, Mexico).....*M. galeottii*

2. Leaves 3.5–9 cm long; leaflets 3.3–3.6 × 1.2–2.6 cm; rachis of young leaves unwinged; inflorescence racemose, rarely paniculate; ovary 2(−4)-carpelar (oriental basin of Balsas river, Guerrero, Mexico).....*M. balsense*

1. Leaflets 9–29.

3. Flower pentamerous; petioles 25–35 mm long; leaflets 1.8–3.7(−4.2) × (0.5–)0.9–1.7 cm; inflorescences 6–8.5 cm long, with more than 40 flowers.....*M. chiangii*

3. Flowers tetramerous, rarely pentamerous; petioles 4–12 mm long; leaflets 0.3–2.7 × 0.25–1.5 cm; inflorescences 2–4.4 cm long, with 3–16 flowers.

4. Inflorescences umbellate; petioles up to 0.5 mm long; leaflets membranaceous..... *M. skinneri*

4. Inflorescences racemose to paniculate; petioles 4–12 mm long; leaflets coriaceous.

5. Leaflets (9-)11–15 (Colima, Mexico).....*M. morenoi*

5. Leaflets 21–29 (Oaxaca; Mexico).....*M. conzattii*

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