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NEW SPECIES AND TRANSFERS INTO  
*JUSTICIA* (ACANTHACEAE)

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ABSTRACT

*Justicia medrani* and *J. zopilotesensis* are described as new species while *Anisacanthus gonzalezii* is transferred into *Justicia*. The triad all have floral venation similar to red, tubular-flowered species of *Justicia*, though they differ from most *Justicia* in their tricolporate pollen with distinct pseudocolpi. In pollen and anther characters they are similar to *Anisacanthus* and *Carlowrightia*, but they differ from these in corolla vascularization and anther presentation and from *Carlowrightia* in corolla size. As the three taxa do not appear to represent a monophyletic group, and as Stearn has placed taxa with similar pollen into what has become a holding genus, *Justicia*, we include these in *Justicia* by default until further studies can decipher relationships within the genus.

Key words: Acanthaceae, *Justicia*, *Anisacanthus*, plant taxonomy.

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INTRODUCTION

Field and herbarium studies have revealed three species of shrubby, tubular-, red-flowered, Mexican Acanthaceae that overall resemble *Justicia* L. (tribe Justiceae, subtribe Justiciinae) in floral characters but have anther and pollen characteristics in common with genera included in the subtribe Odontonemineae (*Anisacanthus* Nees, *Carlowrightia* A. Gray). These three species, two heretofore undescribed, have proven difficult to relate to or place into established genera in the family.

The taxa concerned are in the subfamily Acanthoideae (*sensu* Lindau 1895) [=Acanthaceae of Bremekamp (1965)] having fruit with elastically dehiscent capsules, and seeds flattened, borne on retinaculæ; subfamily Ruellioideae [*sensu* Bremekamp (1965)] with shoots articulate, leaves with cystoliths, pollen porate or colporate, and stamens 4 or 2 with 2-1 thecae; tribe Justiceae [*sensu* Bremekamp (1965)] with corollas zygomorphic, 2-lipped, ovules 2 per carpel, seeds plano-compressed, and capsules stipitate. Placement of these taxa in the subtribes proposed by Bremekamp (1965), however, is difficult. The new taxa share characteristics of both subtribes Justiciinae and Odontonemineae.

The subtribes Justiciinae and Odontonemineae have been redefined by Breme-

kamp (1965) on the basis of several features but they incorporate certain unique pollen differences that were emphasized by Lindau (1895).

The subtribe Justiciinae is characterized by "Knötchenpollen" (Lindau 1895) that are 2 (rarely 3) porate (or slightly colporate), prolate in outline, dorsi-ventrally flattened (when biporate), with the mesocolpia reticulately sculptured and the ora flanked by 1 to 3 rows of discrete islands or insulae of sexinous sculpturing (Knötchen) (Fig. 1f). In addition members of the subtribe have only two stamens, their anthers have 2 (occasionally 1) thecae that are usually unequally inserted on the filament with broadened, sometimes oblique connectives, and one or both thecae are usually apiculate or variously mucous at the base. The corollas typically have distinct rugulae (paired ridges along the inner posterior portion of the corolla tube that partially surround the style). This subtribe includes such Mexican genera as *Justicia* (now including *Beloperone* Nees, and *Jacobinia* Moric.), *Chaetothylax* Moric., and others.

The subtribe Odontoneminae, in contrast, is characterized by unique "Spangenpollen" that are tricolporate, rarely biporate, prolate in outline, with each colpus bordered by two linear "pseudocolpi" separated from the colpus by narrow strands of sculptured sexine that typically join with the similarly sculptured mesocolpia near the poles (Fig. 1a-c). In addition the subtribe, as defined by Bremekamp, may have either 4 stamens, or 2 stamens and 2 staminodia, with 2(-1) anther thecae that when paired are inserted at the same height. Representative genera include *Odontonema* Nees, *Dicliptera* Juss., *Ecbolium* Kurz., *Yeatsea* Small, *Schaueria* Nees, and also would include the genera Daniel (1981, 1982, 1983), and Lott, Jaramillo, and Rzedowski (1984) placed here that agree in characters given above but have two stamens and no staminodia and subequal or equal anther thecae (*Carlowrightia*, *Anisacanthus*, *Mexacanthus* Daniel, *Mirandea* Rzedowski, *Tetramerium* Nees and *Gypsacanthus* Lott, Jaramillo & Rzedowski).

The three taxa considered here clearly have "Spangpollen" of a type typical of the Odontoneminae. They have two stamens, no staminodia, their anthers each have two thecae that are nearly equally placed on the filaments and their thecae are basally rounded as in the Odontoneminae. Their calyces have five subulate lobes; corollas are 2-lipped, relatively large, red to orange-red, with long slightly ampliate tubes, one posterior, emarginate lobe and three smaller anterior lobes. Their anthers are borne just below the upper corolla lip near the style. One of the new taxa, however, has a rugula that partially encloses the style that Bremekamp notes is characteristic of the Justiciinae; the other two taxa do not.

In keys of Lindau (1895), Standley (1926), Shreve and Wiggins (1964) and others the three taxa key to the Odontonimeae, and because of their anther theca number, orientation, and rounded bases, and corolla size, color, and lobing, they key to the genus *Anisacanthus*. One of the species, in fact, is presently included in that genus (Hagen 1941).

While the three taxa agree completely with North American *Anisacanthus* in the technical pollen (Fig. 1e) and anther characteristics, they differ markedly in pollen presentation. In *Anisacanthus* filaments extend directly from the lower margins of the corolla throat and contact potential visitors on the lower sides (Henrickson and Lott 1982; Fig. 2a, b). In the three taxa under consideration here filaments separate from the corolla throat, curve upward and present the anthers directly under the upper corolla lobe in a dorsal position relative to a visitor (Fig.

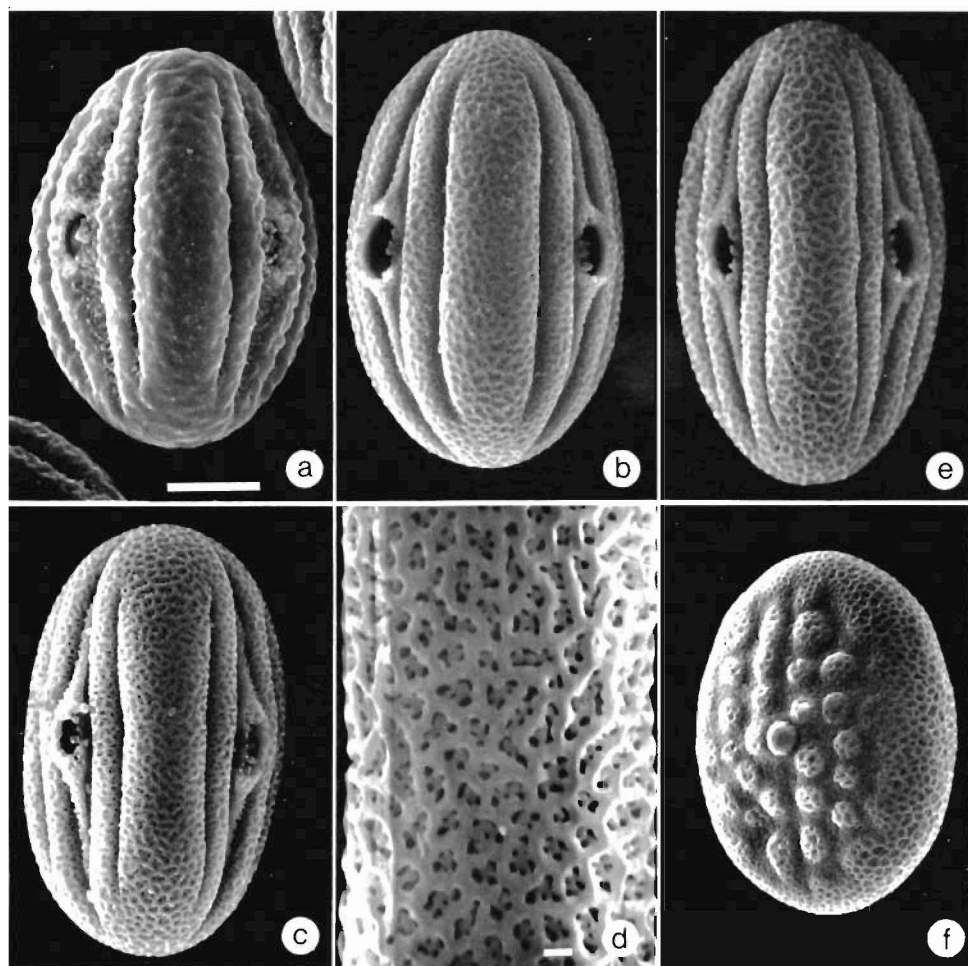


Fig. 1. Pollen of *Justicia* and *Anisacanthus*.—a–d. Pollen of the newly described species is “Spangenpollen” with two sculptured ridges paralleling aperture.—a. *J. medrani* pollen differs in having scrobiculate sculpturing the tectum (Hiriart 157).—b. *J. zopilotesensis* pollen is structurally similar to that of *J. medrani* but has a distinct reticulate sculpturing pattern (Breedlove 35988).—c–d. *J. gonzalezii* (Breedlove 35915).—c. Pollen of *J. gonzalezii* is identical to that of *J. zopilotesensis*, and *Anisacanthus*.—d. Mesocolpal area at higher magnification showing complex reticulation pattern.—e. *Anisacanthus wrightii* var. *wrightii*. Pollen of *Anisacanthus* is also of “Spangenpollen” structure and is basically identical in structure and sculpturing to that of *J. zopilotesensis* and *J. gonzalezii* (Henrickson 18540).—f. *Justicia sonora* Wasshausen has “Knötchenpollen” here with two rows of “Knötchen” or insulae bordering apertures. This pollen type is characteristic of most of *Justicia* and *Jacobinia* (R. Engard s.n.) (Scale in a = 10  $\mu$ m and holds for a–c, f; scale in d = 1  $\mu$ m.)

2c, d). The corolla lobes in these three taxa also are not elongate and strap-shaped as in *Anisacanthus*. In pollen presentation and corolla lobing they are more like some species of *Justicia* that similarly have shorter, non-strap-shaped lobes. In species of *Justicia* with red, tubular lowers, as well as our three taxa, filaments separate very near the corolla throat and at that point the vascular traces that go to the lower, lateral petal lobes that are situated above the stamen traces make

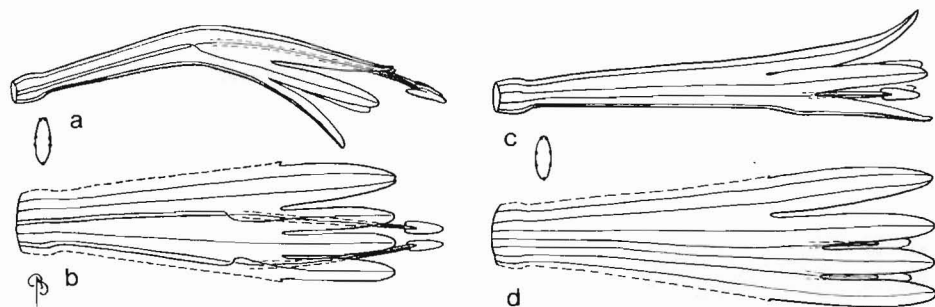


Fig. 2. Comparison of corolla vascularization between most *Justicia* and the taxa described herein (a–b) and *Anisacanthus* (c–d). Both corollas receive seven vascular traces, five petal, two stamen traces with stamen traces situated below the lateral anterior petal traces. In *Justicia* and the taxa treated here, the lower lateral petal traces abruptly move around the stamen traces causing a distinct “pucker” in the outer corolla and the anthers are exerted at the top of the corolla (a–b). In *Anisacanthus* filament and lower, lateral petal traces do not cross and anthers are borne laterally and ventrally (c–d).

an abrupt outward and downward shift around the stamen traces before continuing to the petal lobes (Fig. 2c, d, 3c, 4b, 5b). This is very evident externally as a distinct and abrupt ridge bordered by depressed areas and is also seen in corollas of most taxa previously recognized as *Jacobinia* and *Beloperone*.

The basic vascularization of all these corollas is the same, consisting of seven vascular traces, five petal traces, and two stamen traces located one on each side of the anterior (lower)-most trace often in close association with the lateral anterior petal traces (Fig. 2). It must be noted that not all species of *Justicia* show such abrupt trace shifts with associated external “puckers” in the corolla, for it appears to be in relation to the point of separation of the filament at the corolla throat. When filaments separate well below the throat there seems to be ample room for the lateral anterior trace to gradually turn towards the lobe. This is seen in taxa with short corollas as *Justicia americana* (L.) Vahl but also to some degree in taxa as *Justicia* (*Jacobinia*) *candicans* (Nees) L. Benson.

As noted above, pollen of the three new taxa is tricolporate with distinct narrow ridges separated from mesocolpal areas by pseudocolpi (Spangpollen *sensu* Lindau 1895), a type characteristic of the subtribe Odontoneminae.

The use of pollen characteristics in the separation of Odontoneminae from Justiciinae, however, has been criticized, as intermediate grains exist in some taxa. While most taxa in the Justiciinae have pollen with 2 pores, some genera (e.g., *Drejerella* Nees) have 3-pored pollen, and the number of rows of Knötchen or insulae bordering the pores varies from one to three. Lindau (1895) considered the number of rows of insulae to be characteristic of certain genera (one row in *Justicia*, two rows in *Beloperone*, two or three rows in *Jacobinia*), but the pattern is not so consistent. In some taxa with only single rows of insulae bordering the pores, the insulae are poorly separated, sometimes uniting into single linear rows similar to the distinct bands of sexinous material bordering the pseudocolpi in Spangpollen. Raj (1961) and Stearn (1971) reported that pollen of *Justicia hyssopifolia* L. is 2-porate with an entire band of sexinous material flanking both sides of the pores. It appears that this band is formed from the fusion of adjacent insulae. Similar united insulae are noted in two species of *Drejerella* (Stearn 1971)

and in *Siphonoglossa durangensis* Henrickson & Hilsenbeck by Hilsenbeck (1983). But overall, intermediate pollen types are rare. Fusion of rows of insulae bordering the pores or the separation of lines into such rows may account for the evolution of these distinctive pollen types. Generic limits in the tribe Justiceae have varied greatly in the past two decades with the inclusion of *Jacobinia*, *Beloperone*, *Drejerella* and *Dianthera* L. into *Justicia* by Leonard (1958), Gibson (1973), Stearn (1971), and the inclusion of a portion of *Siphonoglossa* Oerst. into *Justicia* by Hilsenbeck (1983). On the other hand, new genera have been erected such as *Mirandea* (Rzedowski 1959), *Mexacanthus* (Daniel 1981) and *Gypsacanthus* (Lott, Jaramillo, and Rzedowski 1984).

In these processes we seem to have two opposing concepts. Leonard (1958) and Gibson (1973) considered the anther characters used to separate *Jacobinia*, *Beloperone* and *Dianthera* from *Justicia* to be both minor and inconsistent and thus combined the genera, all of which have Knötchenpollen with 1–3 rows of small islands of sexine bordering the ora region. Stearn (1971) went one step further and combined species of *Drejerella* into *Justicia*. Stearn noted that while some species of *Drejerella* have Spangenpollen, in other species the line of sexinous material bordering the ora is divided into 9–12 discrete insulae as in Knötchenpollen. He further noted other variations in pore number (varying from 2 to 3) in species of *Justicia* and other instances of intermediacy between Lindau's Spangenpollen and Knötchenpollen, and he combines taxa with Spangenpollen into *Justicia*, which is usually considered to only have Knötchenpollen. The result is a large, and highly variable *Justicia* that has become a holding place for miscellaneous Justiceae. Stearn (1971) also noted that the genus could be split up into many small genera, with *Justicia* s.s. encompassing only 10 species allied with the type, *J. adhatoda* Nees, a group that has been often incorrectly recognized as the genus *Adhatoda* Miller.

We have considered placing these three taxa into a new genus in the Odontoneminae based on (1) 3-colporate Spangenpollen; (2) anther thecae nearly equally placed on filament, without basal spurs or apiculations; (3) anthers borne in a posterior position; and (4) lateral anterior petal traces abruptly shifting around stamen traces.

It is evident, however, that the three taxa presented here do not represent a monophyletic group. The proposed taxon "medrani" differs from the two other taxa in having a rugula (posterior corolla ridges that contain the style)—a feature noted by Bremekamp (1965) as restricted to the Justiciinae, its seed margins have distinct curled processes (Fig. 3f) that are lacking in the other taxa and in most *Justicia*, and the pollen sexine is scrobiculate rather than reticulate as in the other taxa. In addition, continued searches through herbarium specimens have uncovered other *Justicia*, or more correctly *Jacobinia*-like taxa with the combination of "Spangenpollen" and anther thecae equally inserted, without basal spurs or apiculations having widely different inflorescences implying that this combination of characters has arisen more than once. The presence of the combination of the Spangenpollen, and equally inserted anther thecae with rounded bases in these plants, however, is puzzling. Thus, we feel it is more justifiable to place these taxa into what has become the holding genus *Justicia*, rather than erecting what would be a new holding genus for them at this time. This further diminishes the differences between the Justiciinae and Odontoneminae but this, as noted

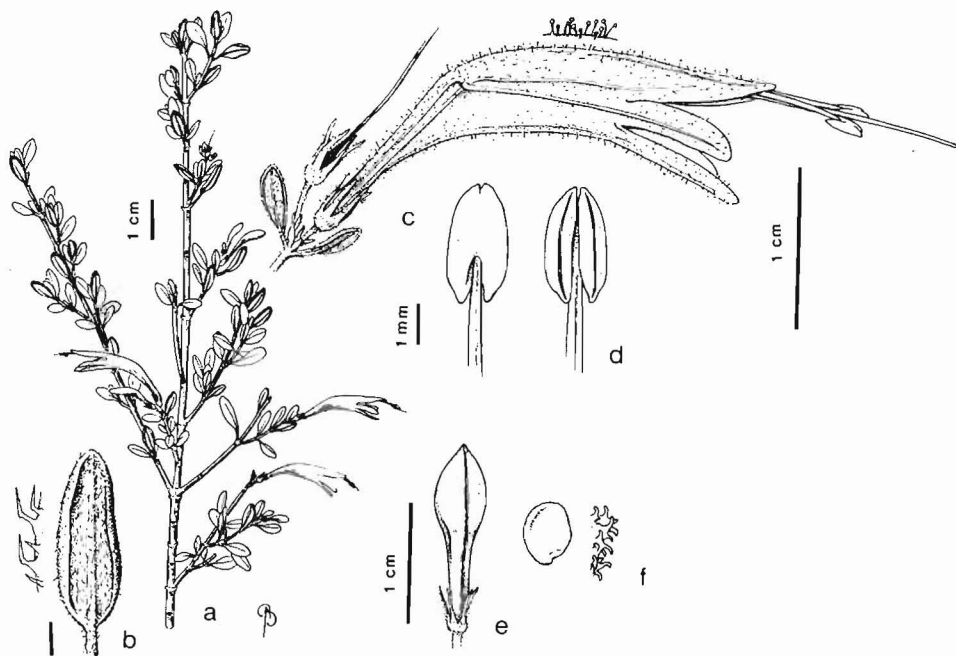


Fig. 3. *Justicia medrani* Henrickson & Hiriart. —a. Stem with terminal flowers. —b. Leaf, adaxial view showing revolute margins; offset shows geniculate vestiture. —c. Inflorescence with bracts, and flower. Note corolla trace to anterior lateral lobe abruptly passes over stamen trace. Offset shows external glandular corolla vestiture. —d. Anther, posterior (left) and anterior (right) views. —e. Capsule with calyx. —f. Seed, offset shows distinctive curved marginal trichomes. All from Hiriart, González-Medrano and Chiang 157. (Magnifications as indicated; scale in e holds for f.)

above, is a process already started by Stearn (1971). We therefore name our three taxa as species of *Justicia*.

#### TAXONOMY

***Justicia medrani* Henrickson & Hiriart, sp. nov.**

Fig. 1a, 3, 6a–c

Frutices; caules juvenes arcte hirtelli et strigosi trichomatibus geniculatis; folia petiolatis obovatis, 5–20 mm longis, 2–10 mm latis, ad apicem obtusi-rotundatis ad basim cuneati, superne strigosa infra villosa usque strigosa, margines integri revoluti; flores in fasciculis terminalibus dichasis; bracteolae redactae; calyces 3–5 mm longae, lobi 5, lanceolati-attenuati hirtelli; corollae aurantiaco-rubrae, 22–27 mm longae ampliatae, lobi 6–8.5 mm longi, lobus posticus rectus, lobus infernus medius distalis lobum superum 0.8–1.5 mm separatus; stamina 2, tubo adnata 8–12 supra basim, fila libera 17–23 mm longa, exserta; antherae 2.1–2.3 mm longae, thecae aequales subparallelae non calcaratae, connectivum redactum; pollen Spangenpollen, sexinus inaequalis tectatus; capsulae glabrae.

Branched, erect shrubs 1.2–2.5 m tall; young stems erect with internodes (2–)8–20(–31) mm long, hirtellous and strigose with erect, tapering, short trichomes 0.08–0.15 mm long with a scattered overstory of geniculate trichomes (0.1–)0.2–0.4(–0.6) mm long, these once (–twice) bent above an erect basal cell; older stems with reddish brown to gray, nonexfoliating periderm. Leaves obovate, oblong-obovate to elliptical, (5–)7–20 mm long, 2–10 mm wide, obtuse, rounded or apiculate by incurled margins at tip, cuneate at base, at margins entire, revolute,



often undulate, dark green, sparsely hirtellous and strigose with geniculate trichomes 0.1–0.2 mm long; midvein impressed above, midvein and lateral veins more gray-green, moderately to densely strigulose to villous with lower series of short appressed trichomes and an overstory of geniculate, straight or curled trichomes 0.3–1.0(–1.5) mm long, raised beneath; lamina moderately lineolate with rod-shaped cystoliths 0.1–0.3 mm long; petioles 2–4(–7) mm long, vestitured as young stems. Flowers borne in dichasial clusters of 1–3 in axils of terminal leaves of branches; bracts leafy; bracteoles subulate, 0.5–2.0 mm long, puberulent, often caducous; pedicels 0.5–2.5 mm long; calyces 3–5 mm long, lobes 5, lanceolate, attenuate, 1.8–3.5 mm long to 0.5–0.8 mm wide at base, tube campanulate, 1.0–1.8 mm long; calyces and bracteoles hirtellous-hispidulous with erect and geniculate trichomes 0.2–0.3 mm long; corollas red, orange-red, yellow at base and inside tube, sparsely stipitate glandular with erect, slender trichomes 0.1–0.4 mm long outside, with retrorse trichomes in basal tube, otherwise glabrous inside, 21–27 mm long, tube-throat 13–18 mm long, tube cylindrical, expanded at base, slightly ampliate, to 4 mm broad (vertically) at narrow throat, slightly bent at junction with throat, lobes 4, upper lobe 6–8.5 mm long, 4–5 mm wide at base, tapering to an acute-rounded tip, margins straight, lower 3 lobes 6–8 mm long, 1.7–2 mm wide, rounded at tips, spreading, lower medial lobe separating 0.5–1.0 mm below (proximal to) upper lobe; stamens 2, adnate to corolla tube 8–12 mm above base, 7–9 mm below separation of upper and lower corolla lobes; filaments 17–23 mm long, exserted beyond upper lobe by 3–5 mm, glabrous, yellowish in tube, red where exposed, anthers 2.1–2.3 mm long (dried), glabrous, anther sacs equally inserted, subparallel, acute, not spurred at bases, connective not expanded; styles 31–33 mm long, glabrous, style lobes 0.2–0.3 mm long. Capsules 14–16 mm long, sparsely stipitate glandular, glabrate, broad basal stipe 6 mm long, head obovate, 10 mm long; seeds 4(–2), 5.5 mm long, 4–4.5 mm wide, 0.5 mm thick, obliquely notched at base, muricate on faces, margins thickened with bands of distally curled trichomes.

*Type.*—MEXICO. HIDALGO: Barranca de Metztitlán, Cañada del Salitre, arbusto 2.5 m, Matorral alto subinierme, 1400 m, 3 Jun 1982, *P. Hiriart con F. González-Medrano, F. Chiang 157* (holotype: MEXU; isotype: TEX).

*Additional collections.*—MEXICO. HIDALGO: Barranca de Venados, 1300 m, 2 Nov 1953, *D. B. Gold 564* (ENCB); ca. 45 air km N of Pachuca, 3 km SE of Metztitlán in Cañada de Salitre, limestone ridge ca. 1 km E of highway, near 20°24'N lat, 98°44'W long, 25 Jul 1982, *J. Henrickson and P. Hiriart 18988* (MEXU, TEX), and *19000* (TEX).

The species is characterized by the following features: (1) geniculate trichomes on the young stems (Fig. 6a); (2) small, crowded, revolute-margined, obovate leaves that are mostly hirtellous above and hirtellous with long, geniculate, straight or distally curved trichomes on veins beneath (Fig. 3b, 6b, c); (3) relatively short, bent corollas with rugulae (small ridges) surrounding the style and with medial lower corolla lobes separating below (proximal to) the point of separation of upper and lower lobes (Fig. 3c); (4) stipitate glands on external corolla surfaces (Fig. 3c); (5) exserted anthers; (6) scrobiculate (not reticulate) sculpturing on pollen grain ectosexine (Fig. 1a); (7) terminal position of flowers in groups of 1(–3) at each stem tip; and (8) seed margins thickened with distally curled trichomes (Fig. 3f).

Like other species described here *J. medrani* exhibits the characteristics of Spangpollen, nearly equally inserted, subparallel, nonspurred anther sacs and



stamen traces closely associated with the lower, lateral corolla lobe traces that abruptly extend around the stamen trace, leaving a distinctive external ridge on the outer corolla surface.

The species is known only from limestone slopes in the Cañada del Salitre area in the Barranca de Venados in west-central Hidalgo just south of Mezquitlán where it occurs in matorral alto subsericeum with species such as *Acacia berlandieri* Benth., *Aralia regeliana* Marchal, *Ayenia rotundifolia* Hemsl., *Bernardia* aff. *mexicana* (Hook. & Arn.) Muell. Arg., *Senna wislizeni* (Gray) Irwin & Barneby, *Celtis pallida* Torr., *Cnidoscolus* sp., *Colubrina ehrenbergii* Schlecht., *Croton* sp., *Decatropis bicolor* (Zucc.) Radlk., *Helietta parvifolia* (Gray) Benth., *Karwinskia humboldtiana* (R. & S.) Zucc., *Krameria cytisoides* Cav., *Leucaena* sp., *Montanoa* sp., *Prosopis* sp., *Portlandia mexicana* (Zucc. & Mart.) Hemsl., and *Rzedowskia tolantonguensis* Medrano, etc.

While known populations of this species are small, variation was observed in development of vestiture on lower leaf surfaces where hairs may be only 0.2–0.4, or up to 1.5 mm in length. When longer, the bent trichomes are often curved at the tips. Corollas appear orange-red in color, but portions that are shaded are more yellowish.

***Justicia zopilotensis* Henrickson & Hiriart, sp. nov.**

Fig. 1b, 4, 6d

Frutices; caules juvenes pannosi; folia petiolatis lanceolata usque ovata, 8–65 mm longa, 5–22 mm lata, ad apicem attenuata usque acuta, ad basim cuneata usque rotundata, glabrata, margines integra; flores in racemis cylindricis spiciformibus valde bracteatis; bractee et bracteolae lineari-lanceolatae usque ovatae glandulosae ascendentes, arcte villosae, longi-ciliatae; calyces 10–19 mm longae, lobi 5, subulati; corollae aurantiaco-rubrae, 35–42 mm longae parum ampliatae, lobi 14–16 mm longi, lobus superus rectus, lobus inferus medius infra lobum superum 6.5–7.5 mm separatus; stamina 2, tubo adnata 16–19 mm supra basim, fila libera 12–18 mm longae, antherae 2.2–3.5 mm longae, thecae aequales subparallelae noncalcaratae, connectivum redactum; pollen Spangpollen, mesocolpi reticulati; capsulae glabrae.

Branched, erect, rounded shrubs 1–2 m tall; young stems erect with internodes (1)–2–3.5(–6) cm long, 1.2–3 mm in diameter, densely, closely panose with whitish, antrorsely bent to appressed, tapering trichomes 0.05–0.1(–0.2) mm long. Leaves lanceolate, elliptical-lanceolate (more ovate when small), (8)–23–65 mm long, (5.5)–10–22 mm wide, tapering to acute, apiculate tips, broadly cuneate to nearly rounded at bases, entire to somewhat undulate at margins, green above, more yellow-green beneath, strongly lineolate with rodlike cystoliths 0.1–0.3 mm long when dry, sparsely villous with geniculate or simple trichomes 0.05–0.15 mm long, soon glabrate except along midrib and lower margins; midrib impressed above; midrib and lateral veins raised, yellow beneath; petioles (0.5)–3–8 mm long, canaliculate, canescent above, more panose as stems near base. Flowers crowded in decussate groups of 3 in terminal, strongly bracted, spicate-racemes 20–45(–55) mm long, 17–25 mm wide (pressed), with internodes 3–7 mm long; bracts linear-lanceolate, oblong-lanceolate to ovate, (12)–18–24 mm long, 1–3(–5) mm wide, acuminate to attenuate at tips, cuneate at broad bases, green, entire, obscurely stipitate glandular and closely villous on both faces, often with conspicuous marginal, uniseriate, multicellular trichomes (0.6)–1–1.5 mm long; paired bracteoles similar but shorter, narrower, 10–18 mm long, 0.8–1.5(–2.3) mm wide, long attenuate; pedicels 0.5–2 mm long; calyces (9)–13–19 mm long, tube cylindrical-campanulate, 1.2–2(–3) mm long, lobes 5, linear-lanceolate, subulate, (7.5)–

11–16.5 mm long, mostly 0.3–0.5(–1.2) mm wide at base, narrowly attenuate, stipitate glandular and closely villous, sometimes ciliate as bracts; corollas orange-red to red, with recurved, somewhat geniculate trichomes 0.1–0.2 mm long where exposed in bud, with retrorse trichomes 0.1–0.3 mm long inside basal tube, otherwise glabrous inside, 35–42 mm long, tube 21–26 mm long, constricted above base, slightly ampliate to 4–6.2 mm wide (vertically) at narrow throat, lobes 4, upper lobe 14–16 mm long, 5–6 mm wide at base, tapering to an emarginate or rounded tip, margins straight; lower 3 lobes 14–16 mm long, lower medial lobe separating 6–8 mm above (distal to) upper lobe, medial lobe oblong, 5–7 mm long, 1.7–2(–2.7) mm wide, rounded, cupped at tip; stamens 2, adnate to corolla tube 16–21 mm above base, 3.2–6 mm below separation of upper and lower corolla lobes; filaments 12–18(–20) mm long, not extended beyond upper lobe, glabrous; anthers 2.2–3.5 mm long (dried), glabrous, anther sacs equally inserted, subparallel, acute, not spurred at bases, connective not expanded; styles 35–41 mm long, glabrous except at basal 2–3 mm, style lobes 0.1–0.2 mm long. Capsules 14–16 mm long, glabrous, broad basal stipes 6–7 mm long, heads 8–9 mm long; seeds 2(–4).

*Type*.—MEXICO. GUERRERO: Cañada Zopilote, Oct 1947, *F. Miranda 4311* (Holotype: MEXU sheet no. 71003; isotype: MEXU sheet no. 72581).

*Additional collections*.—MEXICO. PUEBLA: 20–25 km SE of Acatlán, calcareous rocky hills, 1500 m, 27 Sep 1967, *R. McVaugh 23998* (MICH, *fide* T. F. Daniel).—OAXACA: Entre Petaltzingo y Huajuapán, en bosques bajos xerofíticos, 15 Aug 1958, *L. Paray 2731* (MEXU).—GUERRERO: Cañada del Zopilote, cerca de Venta Vieja, en barranca, 18 Jan 1960, *F. Miranda 9262* (MEXU); Km 276 on Hwy near Chilpancingo, on bank of stream, 21 Oct 1943, *C. L. Lundell 12605* (LL, LL-D 2 sheets); road above Zopilote Canyon, 8 km E of Xochipala on way to Filo de Caballo from Milpillas, 850 m, 9 Nov 1973, *D. Breedlove 35988* (CAS, MEXU); Zopilote Cañón, road to Filo de Caballo, 0.6 mi W of jct of Hwy 95, dry thorn forest with columnar cacti, 700–800 m, 20 Oct 1978, *T. F. Daniel 1192* (ASU).

The species is characterized by the following features: (1) terminal, spicate racemes with many, crowded, usually linear-lanceolate (rarely ovate) bracts and bracteoles typically with conspicuous, multicellular ciliae (Fig. 4a); (2) long attenuate bracts, bracteoles and calyx lobes (Fig. 4c, d); (3) orange-red, externally strigose and pubescent corollas (Fig. 4b); (4) stamens adnate to the corolla tube-throat to within 3.2–6 mm of the separation of the upper and lower lobes; and (5) included anthers (Fig. 4b).

As in other species of the genus it has Spangenpollen (Fig. 1b), equally inserted, subparallel, nonspurred anther sacs without expanded connectives (Fig. 4e) and lateral corolla lobe traces that abruptly extend around the adjacent stamen traces. Similar geniculate trichomes are found on outer corolla surfaces in species of *Anisacanthus* such as *A. quadrifidus* (Vahl) Nees var. *wrightii* (Torr.) Henrickson and *A. linearis* (Hagen) Henrickson & Lott.

Five of the seven known collections of this species are from Zopilote Cañón near the Río Balsas north of Chilpancingo in central Guerrero. These collections are relatively uniform in characteristics, exhibiting variation in size of bracts that range from narrowly linear-lanceolate to more oblong. The Paray collection from Oaxaca differs in several features. The leaves are slightly smaller [(0.8–)2–4 cm long], the bracts are ovate, shorter (10–14 mm long) and broader (3.5–5 mm wide), and calyces are slighter shorter (9.5–12 mm long), with shorter lobes (7.5–9 mm long). While this collection exhibits recognizable quantitative differences,

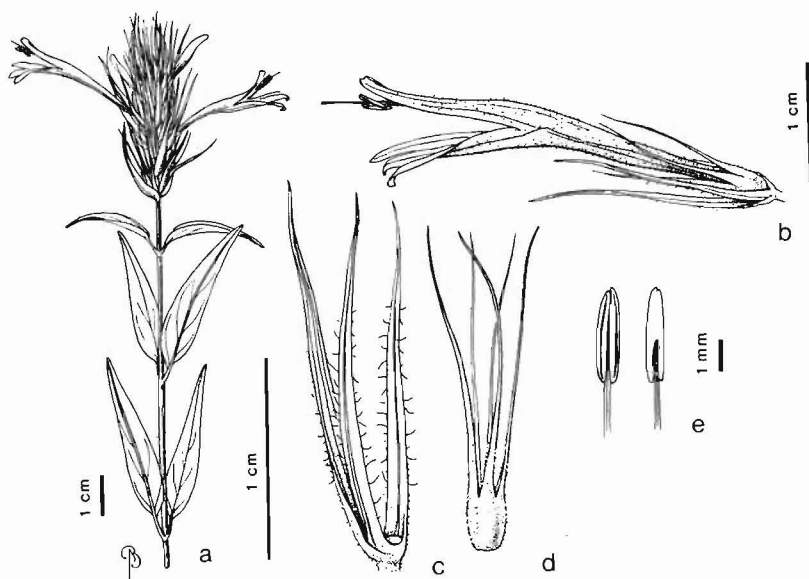


Fig. 4. *Justicia zopilotensis* Henrickson & Hiriart. —a. Stem with terminal inflorescence and flowers. —b. Mature flower showing bracts, bracteoles, and flower. —c. Bracts and bracteoles. Note long marginal trichomes. —d. Calyx showing short tube, long slender lobes. —e. Anther, posterior (right), anterior (left) views. a–d from *Miranda 3411*, e from *Paray 2731*. (Magnifications as indicated; scale in c holds for d.)

these differences are easily incorporated into the overall variation of the species. The Oaxacan and Guerreran populations of this taxon are separated by about 190 km. of poorly explored habitat. Additional collections from this area may well fill the gap in the differences between these two populations.

***Justicia gonzalezii* (Greenm.) Henrickson & Hiriart, comb. nov.**

Fig. 1c, d, 5, 6e

*Anisacanthus gonzalezii* Greenm. Proc. Amer. Acad. Arts. 39:89. 1903.

Branched shrubs 1–1.5 m tall; young stems erect with internodes (1–)2–6.2 cm long, 1.2–2.2 mm in diameter, sparsely to moderately strigulose-villous with appressed to spreading, antrorsely bent trichomes 0.1–0.2(–0.4) mm long, soon or tardily partially glabrate, with or without sessile glands, green or with yellow striae; older stems with tan to gray, nonpeeling periderm. Leaves ovate, lanceolate to narrowly lanceolate, (2–)3–5(–6.7) cm long, (2.5–)5–22(–35) mm wide with uppermost leaves reduced, narrower, acute to acuminate or tapering to a narrow, rounded tip, rounded to broadly cuneate, sometimes oblique at base, entire, slightly undulate at thickened, somewhat revolute margins, green sparsely strigose to glabrate, with impressed, yellow mid and lateral veins above, more gray-green with elongate, ascending, straight to recurved hairs 0.2–0.6 mm long along raised, yellowish veins and their axils beneath, obscurely lineolate with rodlike cystoliths 0.2–0.3 mm long; petioles (3–)4–7(–10) mm long, canaliculate, yellowish, antrorsely strigose. Flowers ascending in glomerate dichasia in clusters of 1–3(–7) in axils of upper, slightly reduced leaves and often continuing into more crowded

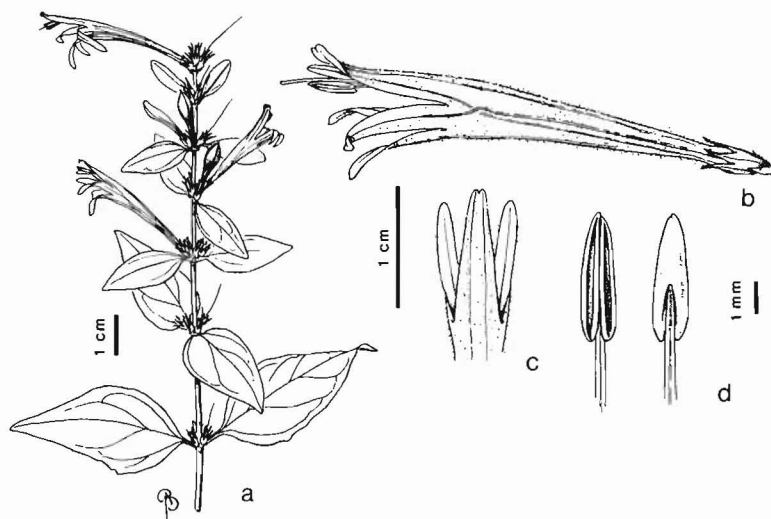


Fig. 5. *Justicia gonzalezii* (Greenm.) Henrickson & Hiriart.—a. Stem with inflorescences and flowers.—b. Flower showing calyx with long tube, corolla and anther and style position.—c. View of corolla lobes as seen from above, showing venation.—d. Anther, posterior (right), anterior (left) views. All from *Breedlove 35915*. (Magnifications as indicated; scale in c holds for b.)

inflorescences with shorter internodes and strongly reduced, more linear leafy-bracts or bracts 5.5–20 mm long, 1–2.5 mm wide, bracteoles lance-subulate, 2.3–5(–7.5) mm long to 0.4–0.8(–1.1) mm wide at base, somewhat keeled along base, tertiary bracteoles similar but smaller, 1.7–2.5 mm long, bracts-bracteoles green, glabrous or nearly so except for dense ciliae to 0.1–0.2 mm long in lower two-thirds; bracteoles commonly caducous leaving conspicuous bases; calyces (4.2–)5–8(–11) mm long at anthesis (to 7–12 mm long in fruit), lobes 5, attenuate, (2.4–)3–5(–6.5) mm long to 0.9–1.2 mm wide at base, tube campanulate-cylindrical, 2–3.5(–5) mm long, lobes and tube yellow-green, lineolate, glabrous except for slender upcurved ciliae 0.1–0.2 mm long on lobes; corollas orange-red, red, with spreading to slightly retrosely declined, geniculate-based trichomes 0.1–0.25 mm long outside, glabrous inside except for retrorse, geniculate hairs at base inside, 35–43 mm long, tube 24–27 mm long, constricted above base, slightly ampliate to 4–6 mm broad (vertically, pressed) at narrow throat, lobes 4, upper lobe 10–16 mm long, to 4.5–5.5 mm wide at base, tapering to an emarginate tip, margins straight, lower 3 lobes separating 0.5–1.2 mm above (distal to) upper lobe, 9–13.5 mm long, 2.2–3.5 mm wide, rounded at tips, spreading; stamens 2, adnate to corolla tube 18–23 mm above base, 4.2–6 mm below separation of upper and lower corolla lobes; free filaments 9–17 mm long, not extended beyond posterior lobe, glabrous; anthers 3.3–4.3 mm long (dry), glabrous, yellowish to reddish; anther sacs equally inserted, subparallel, acute, not spurred at bases, connective not expanded; pollen Spangpollen; styles 28–38 mm long, glabrous, style lobes 0.1–0.2 mm long. Capsules 14–16 mm long, glabrous, broad basal stipe 5–6 mm long, head ovate, 8–9 mm long; seeds 2(–4), notched at base, 3.7–4 mm long, distal margins strongly erose (immature).

*Type*.—MEXICO. OAXACA: Near Oaxaca City, Jun 1900, *Conzatti and Gonzalez 1231*; lectotype here designated: GH!

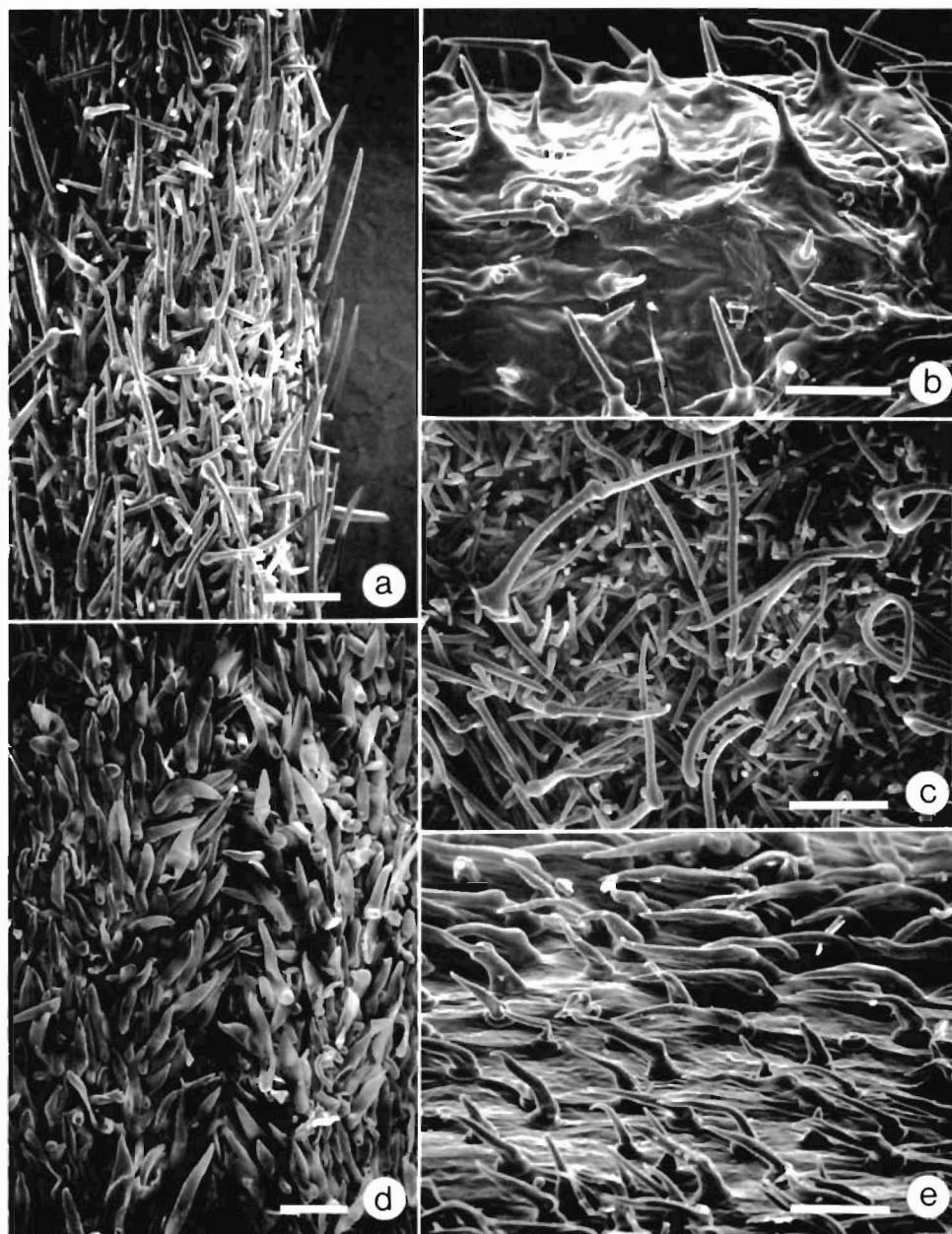


Fig. 6. Leaf and stem vestiture of *Justicia medrani*, *J. zopilensis*, *J. gonzalezii*.—a–c. *J. medrani* (Henrickson and Hiriart 18988).—a. Young stem vestiture consists of a dense covering of geniculate, antrorse hairs.—b. Upper leaf surface contains a more open vestiture of geniculate hairs.—c. Lower leaf surface contains a dense vestiture of geniculate hairs. Note distinctive swelling at joint between cells.—d. *J. zopilensis* Young stems have a dense pannose vestiture of appressed ascending hairs. Leaves are nearly glabrous (T. F. Daniel 1192).—e. *J. gonzalezii*. Vestiture on petal surface consists of geniculate trichomes (Parry 2731). (All scales = 0.1 mm or 100  $\mu$ m.)

*Additional collections.*—MEXICO. PUEBLA: Along Hwy 125 between Tehuacán and Huajuapán de León, 1.3 mi S of Texcala, rocky hillside in arid scrub, ca. 5200 ft, 21 Aug 1984, *T. F. Daniel and M. Baker* 3779 (ASU, TEX).—OAXACA: Las Naranjas, Aug 1908, *Purpus* 3018 (C?), and 3041 (F, MO, NY); N of Jayacatlán along road towards Nacaltepec, 1600 m, 4 Nov 1973, *D. Breedlove* 35915 (CAS, MEXU); Along Hwy between Oaxaca and Tehuacán, 5.1–9.1 mi S of Dominguito, tropical deciduous forest, 20 Aug 1984, *T. F. Daniel and M. Baker* 3767 (ASU, TEX).

The species is characterized by the following features: (1) calyces with long campanulate-cylindrical tubes nearly as long as the attenuate lobes (Fig. 5b); (2) calyces glabrous except for dense ciliae along lower lobe margins; (3) medial lower corolla lobes separate from the two adjacent lateral lower corolla lobes only 1–1.2 mm above (distal to) their separation from the upper corolla lobe (Fig. 5b); (4) stamens adnate to corolla tube-throat to within 4.2–6 mm of the separation of the upper and lower corolla lobes; (5) included anthers; and (6) flowers produced in axillary dichasia on upper leafy shoots in axils of reduced leaves but with these leaves progressively reduced to narrow, bracteole-like bracts in uppermost nodes (Fig. 5a).

As with other species described here anther sacs are subparallel, without expanded connectives, they lack basal spurs and are equally inserted on the filaments (Fig. 5d), pollen is of the Spangpollen type (Fig. 1c, d) and lateral corolla lobe traces abruptly extend above the adjacent upper stamen traces. *Justicia gonzalezii* may be related to *J. zopilotensis*, with which it shares similar vestiture on the outer corolla surfaces, stems, and identical pollen sculpturing. Hagen (1941) placed this taxon in *Anisacanthus* but it was immediately distinguished from all other North American species by its glabrous calyces with distinctly ciliate lobes and by its distinctive floral venation.

Considerable variation was noted among the specimens of *Justicia gonzalezii*. *Breedlove* 35915 has much larger, more ovate, nearly glabrous leaves with conspicuous corneous margins and nearly glabrous stems. *Daniel and Baker* 3767 has stems that are very strongly strigose to villous with longer, upwardly bent-curved hairs to 0.4 mm long, smaller, more ovate-lanceolate leaves, and calyces are much larger than in other collections, measuring 8–10.5 mm in length in flower to 12 mm in fruit with calyx tubes 3.5–5 mm long. *Daniel and Baker* 3779 is distinguished by narrowly lanceolate to linear-lanceolate leaves not exceeding 25 mm in length, 7 mm in width.

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