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Source: Novon: A Journal for Botanical Nomenclature, 18(3):397-404. 2008.
Published By: Missouri Botanical Garden
DOI: http://dx.doi.org/10.3417/2006096
URL: http://www.bioone.org/doi/full/10.3417/2006096

A Distinctive New Species of *Ouratea* (Ochnaceae) from the Jalapão Region, Tocantins, Brazil

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Abstract. *Ouratea acicularis* R. Chacon & K. Yamamoto (Ochnaceae), a new species from the recently created Estação Ecológica Serra Geral do Tocantins, Jalapão region, Brazil, is described. *Ouratea acicularis* appears to be most closely allied to *O. oleifolia* (A. Saint-Hilaire) Engler. Both species share a pubescent indumentum on the young branches, leaf surfaces, inflorescence axes, and outer surface of the flower buds, as well as revolute leaves and acute flower buds. *Ouratea acicularis* is unique in the genus in its aciculate leaf blade, at least 4 times narrower than in *O. oleifolia*, with a strongly revolute margin that conceals the abaxial leaf surface except for the midrib, as well as its inconspicuous secondary venation and narrower flower buds. Anatomically, *O. acicularis* differs from other previously studied species of *Ouratea* Aublet in that the cells of the adaxial epidermis have an hourglass-shaped lumen, pluricellular forked hairs fused at the base, an unusually large cap of fibers and sclereids above the collateral vascular bundles, and in the predominantly 2-layered chlorenchyma. The stems of *O. acicularis* are noteworthy for the conspicuous secretory cavities of the cortex and secondary xylem, in which fibers and vessel members predominate.

Resumo. Este trabalho descreve *Ouratea acicularis* R. Chacon & K. Yamamoto (Ochnaceae), espécie nova da recentemente criada Estação Ecológica Serra Geral do Tocantins, Região do Jalapão, Tocantins, Brasil. *Ouratea acicularis* se assemelha mais a *O. oleifolia* (A. Saint-Hilaire) Engler. Ambas as espécies apresentam indumento pubescente nos ramos jovens, em ambas as faces foliares, nos eixos da inflorescência e na superfície externa dos botões florais, bem como folhas revolutas e botões florais agudos. *Ouratea acicularis* é a única espécie do gênero que possui lâminas foliares aciculares, ca. quatro vezes mais estreitas do que em *O. oleifolia*, com margens foliares fortemente revolutas que escondem a face abaxial da folha exceto a nervura mediana, bem como pela venação secundária inconspícua e botões florais mais estreitos. Anatomicamente, *O. acicularis* difere das outras espécies já estudadas por apresentar células da epiderme adaxial com lúmen em forma de ampulheta, tricomas pluricelulares fundidos na base, uma capa excepcionalmente desenvolvida de fibras e esclereídeos sobre os feixes vasculares colaterais, e clorênquima predominantemente bi-estratificado. Os ramos de *O. acicularis* são dignos de nota pela presença de cavidades secretoras conspícuas no córtex e pelo predomínio das fibras e dos elementos de vaso e xilema secundário.

Key words: Brazil, IUCN Red List, Ochnaceae, *Ouratea*, South America.

doi: 10.3417/2006096 Novon 18: 397–404. Published on 2 September 2008.

The Central Brazilian Highlands are in the core area of the cerrado biome, a poorly protected biodiversity hotspot (Mittermeier et al., 1999). The Jalapão region, in eastern Tocantins, is one of the most underpopulated areas of this biome and, until recently, has remained virtually unknown to botanists. The biological importance of this region has been highlighted by several scientific expeditions (Proença et al., 2002; Reis et al., 2002; Scariot et al., 2002), and the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) has created a biological reserve in the area, the Estação Ecológica Serra Geral do Tocantins (Arruda & von Behr, 2002), which encompasses the smaller Parque Estadual do Jalapão. The Estação Ecológica Serra Geral do Tocantins constitutes the largest continuous reserve (716,306 ha.) that is entirely within the cerrado biome in Brazil.

Preliminary collections in the Estação Ecológica Serra Geral do Tocantins resulted in six taxa suspected of being new in Asteraceae, Bignoniaceae, Ebenaceae, Ochnaceae, Rutaceae, and Vochysiaceae (Proença et al., 2002), of which the Bignoniaceae has since been described as a new variety (Proença et al., 2007). This paper describes a new species of *Ouratea* Aublet (Ochnaceae). The new *Ouratea* was first collected by both James Ratter (E) and Rosana Farias Singer (UB) on the same expedition in 1998; the Ratter specimen at UB was chosen as the holotype because it is a representative collection in mature fruit, which is duplicated at E. Additional sets of material of this species have been collected in the same region during three scientific expeditions in 2001 and 2002 and distributed to Brazilian herbaria in the Distrito Federal, Goiás, and Tocantins.

The Neotropical genus *Ouratea*, distributed from Central to South America (Engler, 1876), comprises shrubs and trees that grow in lowland or highland forests or savannas, and sometimes in maritime thickets. The genus has a remarkable pseudo-apocarpic gynoecium with a gynobasic style and a gynophore that develops, in the ripe fruit, into a reddish carpophore that displays black mericarps derived from fertilized 1-ovulate units (Baum, 1951; Guédès & Sastre, 1981; Spujt, 1994; Barroso et al., 1999). *Ouratea* comprises nearly 300 binomials, but the number of valid species is not yet well established. It is important to note that more than 20% of these names were only recently described in regional floras of northern South America (e.g., Sastre, 1988, 2001; Maguire & Steyermark, 1989) and Central America (Whitefoord, 1992). This has increased the number of species known in the genus that have been poorly understood because of their limited distribution in undercollected regions. Although species circumscription in *Ouratea* is usually difficult as the genus includes many confusing species complexes (Yamamoto, 1989), some endemic species do have outstanding diagnostic features that make them sharply distinct. This appears to be the case of this new species described here.

Ouratea acicularis R. Chacon & K. Yamamoto, sp. nov. TYPE: Brazil. [Tocantins:] Mun. Mateiros, 53 km from Ponte Alta on rd. to Mateiros, 10°30′S, 47°11′W, 400 m, 16 Nov. 1998, *J. Ratter*, *S. Bridgewater*, *J. Fonsêca Filho & R. Farias 8115* (holotype, UB; isotype, E). Figure 1.

Frutex caespitosus 1–1.5 m; stipulae in foliis juvenilibus persistentes; *rami* juniores brevissime puberuli, internodiis 2–10 mm; folia erecto-patentia, petiolo brevi crasso suffulta, lamina lineari vel aciculari, 1.6–9 × 0.1–0.2 cm, chartacea, pungentia, margine forte revoluta, integerrima, supra paullum puberula demum glabra, subtus dense puberula, nervis lateralibus ubique inconspicuis. *Panicula* thyrsoidea, terminalis vel subterminalis, angusta, puberula, bracteolis persistentibus, pedicellis florum 6–8.5 mm, tenuibus. *Alabastrum* 4–5 × 2.5–3 mm, ovoideum, puberulum, apice acutum; sepalis 5, ca. 6 × 3 mm, ovatis, caducis; petalis 5, flavis; staminibus 10, transverse rugulosis; carpidiis 5, gynophoro columnari-cylindrico, apicem versus pentagono. *Monades* carpicae fertiles oblongae, carpophoro 2.5–5 × 4–7 mm, salmoneo, base angustato, recurvato, sursum expanso apicem versum pyriformi; mericarpia 1 ad 2, erecta vel obliqua; semen ca. 0.5 × 0.3 cm, testa membranacea; embryo planoconvexus, hypocotylo perpendiculari, loriformi. A specie simili *O. oleifolia* (A. Saint-Hilaire) Engler foliis laminis carentibus, linearibus, marginibus revolutis et venis inconspicuis secundariis, 1.6–9 × 0.1–0.2 cm differt.

Shrub 1–1.5 m tall, caespitose, probably a hemicryptophyte; stems erect or sometimes decumbent in fruiting plants, branches cylindrical, striate when young, puberulous; hairs minute, patent to weakly curved, pale golden. *Leaves* congested at the terminal branches; internodes 2–10 mm; stipules 2 per leaf node, persistent at least in younger leaves, 1.5–3 × 0.2–0.5 mm, triangular, with a dark (glandular?) basal spot, the margins sometimes revolute; petiole to 1 × 1.25 mm, stout; leaf blade 1.6–9 × 0.1–0.2 cm (rolled), chartaceous, linear or aciculate, apex pungent, base truncate, margins entire, strongly revolute and hiding nearly all the abaxial surface except for the midvein; adaxial surface puberulous when young, glabrescent with age, the midvein sulcate; abaxial surface puberulous, the midvein prominent; secondary veins inconspicuous on both surfaces. *Panicles* thyrsoid, terminal or subterminal at the distal leaf axils, narrow, isolated or in clusters of 2 or more; main axis 6.5–13 cm, lateral axes to 8.5 mm, cymules 1- to 3-flowered, shortly pedunculate, peduncles to 5 mm; bracts congested at bases of major axes, or isolated at bases of cymules, 2.25–3 × 0.5–0.8 mm, triangular,

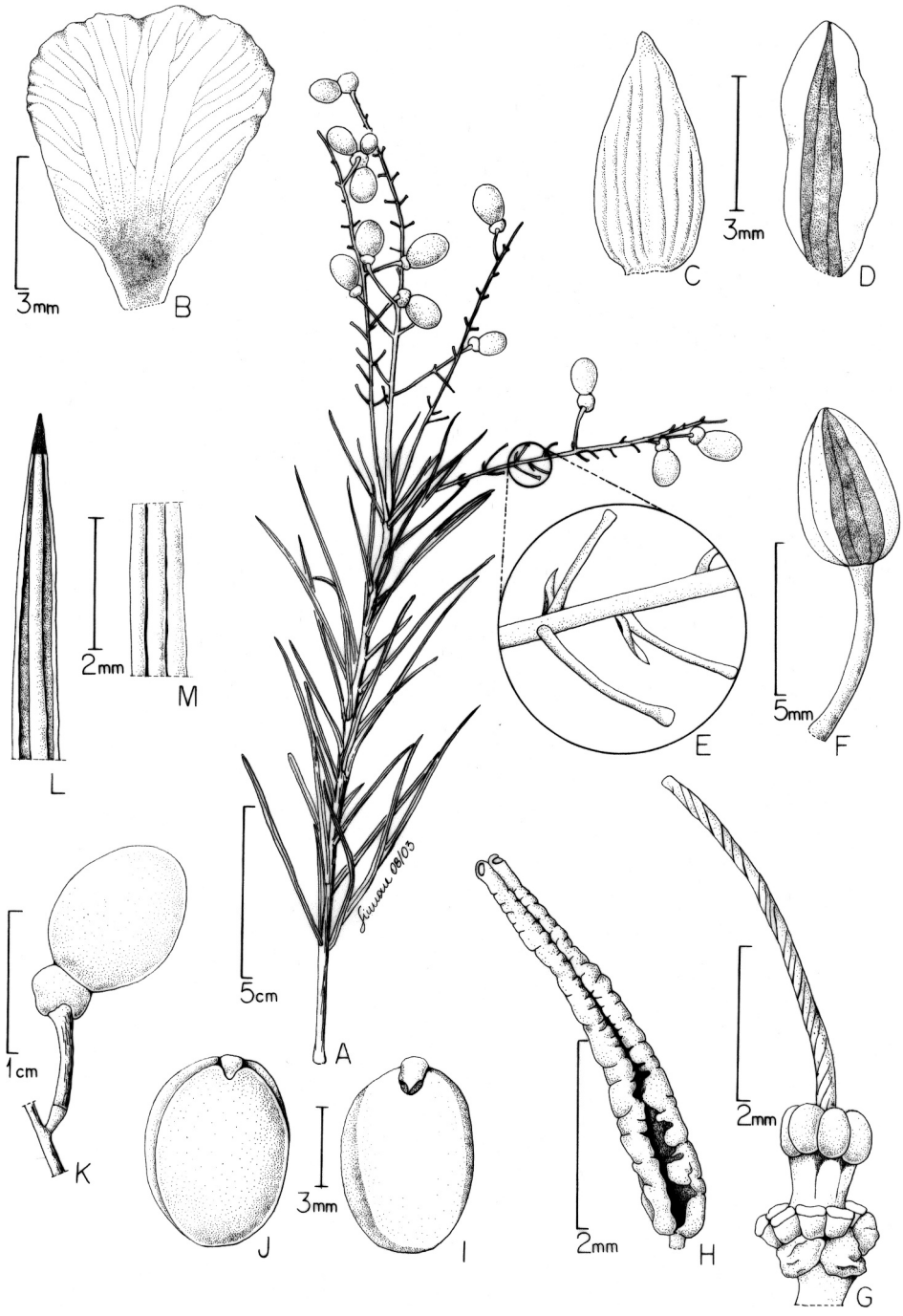

Figure 1. *Ouratea acicularis* R. Chacon & K. Yamamoto. —A. Habit. —B. Petal. —C. Internal sepal. —D. External sepal. —E. Bracts. —F. Flower bud. —G. Gynoecium. —H. Stamen. —I. Inner view of cotyledon. —J. Embryo. —K. Fruit. —L. Abaxial leaf surface. —M. Detail of abaxial leaf surface. A, I–M from *Ratter et al. 8115* (UB); B–H from *Cavalcanti et al. 2757* (CEN).

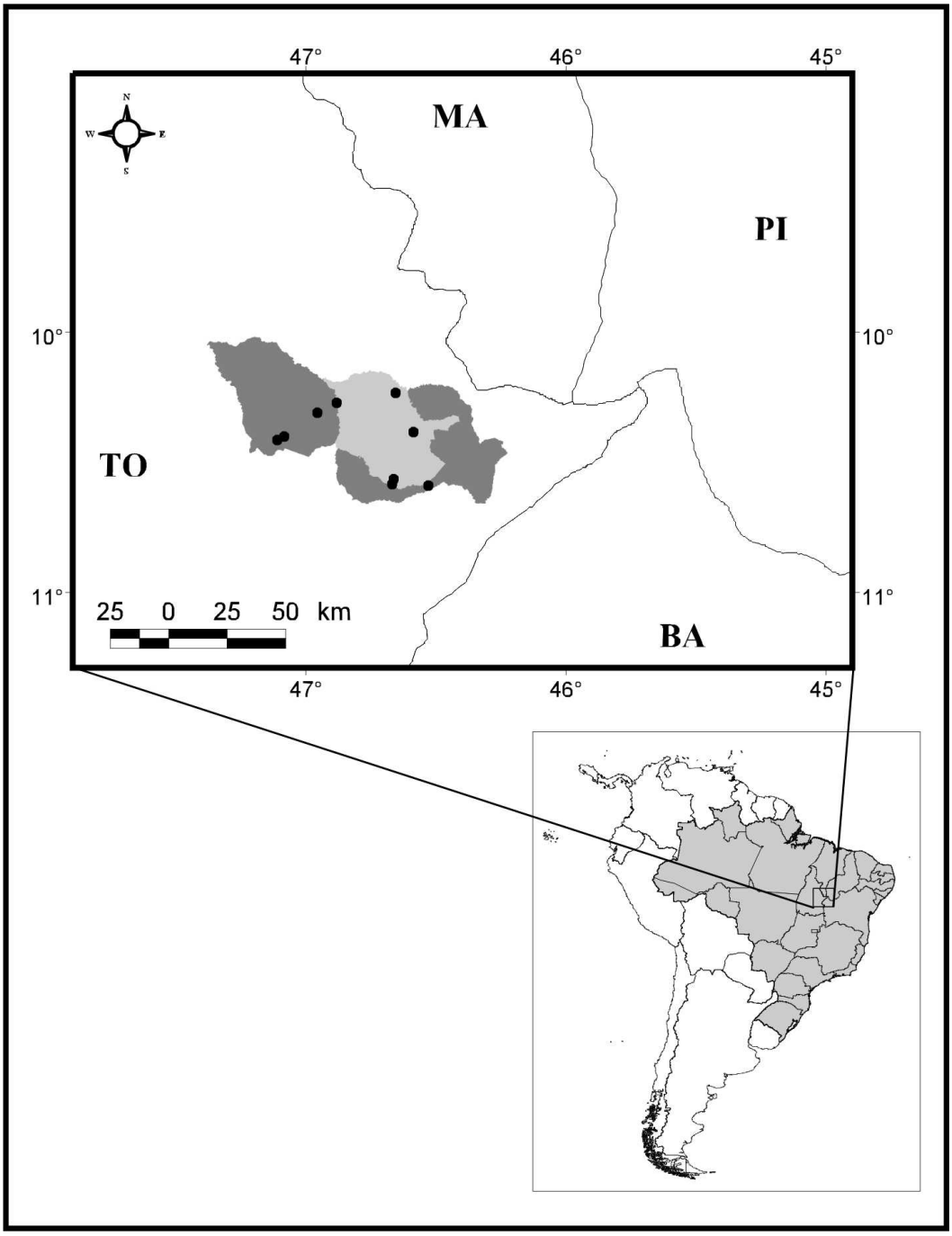

Figure 2. Geographic distribution of *Ouratea acicularis* R. Chacon & K. Yamamoto. Dark gray shading denotes Estação Ecológica Serra Geral do Tocantins; light gray shading denotes Parque Estadual do Jalapão. BA = Bahia, MA = Maranhão, PI = Piauí, TO = Tocantins.

concave, striate, acute; bracteoles to 1.5 × 0.5 mm, linear, isolated or in pairs, persistent; pedicel 6–8.5 mm, straight, puberulous, regularly slender in bud and flower, broadened at the base of the carpophore to 0.7–1 mm in ripe fruit. *Flower* bud 4–5 × 2.5–3 mm, ovoid, apex acute, base obtuse, puberulous; sepals 5, ca. 6 × 3 mm, ovate, abaxial surface puberulous, early caducous; petals 5, 6–8.5 × 4.5–5 mm, yellow, obovate to orbicular-flabellate, asymmetric, base unguiculate; stamens 10, straight, anthers subsessile, ca. 5 × 0.5 mm, subulate, transversely rugulose, poricidal; gynoecium superior, 5-carpellate, the columnar gynophore 0.5–1 mm, cylindrical to pentagonal near apex, fertile units 5, oblong, 0.5–1 × 1.1–1.2 mm; style ca. 4 mm, filiform; stigma punctiform, yellow. *Carpophore* 2.5–5 × 4–7 mm, salmon pink in the ripe fruit, mostly with a narrow and frequently curled basal portion expanding rather abruptly to a pyriform head; mericarps 1 or 2, erect or obliquely disposed on carpophore head, inflated, 1.1–1.6 × 0.7–1.2 cm, ellipsoid, opaque; pericarp thin; seed ca. 0.5 × 0.3 cm, testa membranaceous, slightly rugose, embryo ellipsoid, cotyledons plano-convex, hypocotyl strap-shaped, perpendicular to the cotyledon.

Distribution, ecology, and phenology. *Ouratea acicularis* is apparently a narrow endemic of the Jalapão region in the state of Tocantins, Brazil, growing between 400 and 500 m.s.m. (Fig. 2). It was collected in rocky or sandy-soiled cerrado, i.e., grassy fields with scattered low trees and shrubs to 2 m tall. Flowers have been collected in May and June, and immature fruits in June and November.

IUCN Red List category. *Ouratea acicularis* is a narrow endemic occurring in specialized habitats of the Jalapão region, with a geographic distribution estimated as less than 7000 km² and populations known to exist as no more than 10 isolated mature individuals. Based on this information and following IUCN Red List categories and criteria (IUCN, 2001), this species is assessed as Vulnerable (VU). However, it should be mentioned that all populations found are within the Estação Ecológica Serra Geral do Tocantins.

Discussion. Anatomical stem and leaf features that have not yet been recorded in the genus *Ouratea*, or in the family Ochnaceae, were found in *O. acicularis*. The anatomical characters of the new species were compared with *O. miersii* (Planchon) Engler, *O. multiflora* (Pohl) Engler, and *O. parviflora* Engler, based on a study by Yamamoto (1995). Because the anatomical characters of *O. acicularis* appear to be useful in distinguishing it from these congeneric species, the most outstanding of these features are described in Table 1.

Table 1. Comparison of anatomical characteristics of *Ouratea acicularis* with three other species of *Ouratea* studied by Yamamoto (1995).

	O. acicularis	*O. miersii*	*O. multiflora*	*O. parviflora*
Stem				
Epidermis cells	rectangular	rectangular or papillose	rectangular	rectangular
Indumentum	thick cuticle and unicellular hairs	glabrous or papillose hairs	—	—
Peridermis cells	5-layered, rectangular with all walls thickened	10-layered or more	—	—
Cortex	conspicuous secretory cavities present	secretory cavities absent	secretory cavities absent	secretory cavities absent
Leaf				
Stomata	hypostomatic	hypostomatic	hypostomatic	hypostomatic
Adaxial surface	thick cuticle, few hairs	thick cuticle, glabrous	thin cuticle, glabrous	glabrous
Adaxial epidermis cells	rectangular, uniformly thick-walled cells with hourglass-shaped lumen	cell walls not thickened, lumen cell-shaped	cell walls not thickened, lumen cell-shaped	cell walls not thickened, lumen cell-shaped
Abaxial surface	thin cuticle, many pluricellular hairs, papillose cells	thin cuticle	thin cuticle, glabrous	—
Abaxial epidermis cells	rectangular	pyriform or rounded	variable	variable
Cristarque cells	scarce	abundant	scarce	abundant

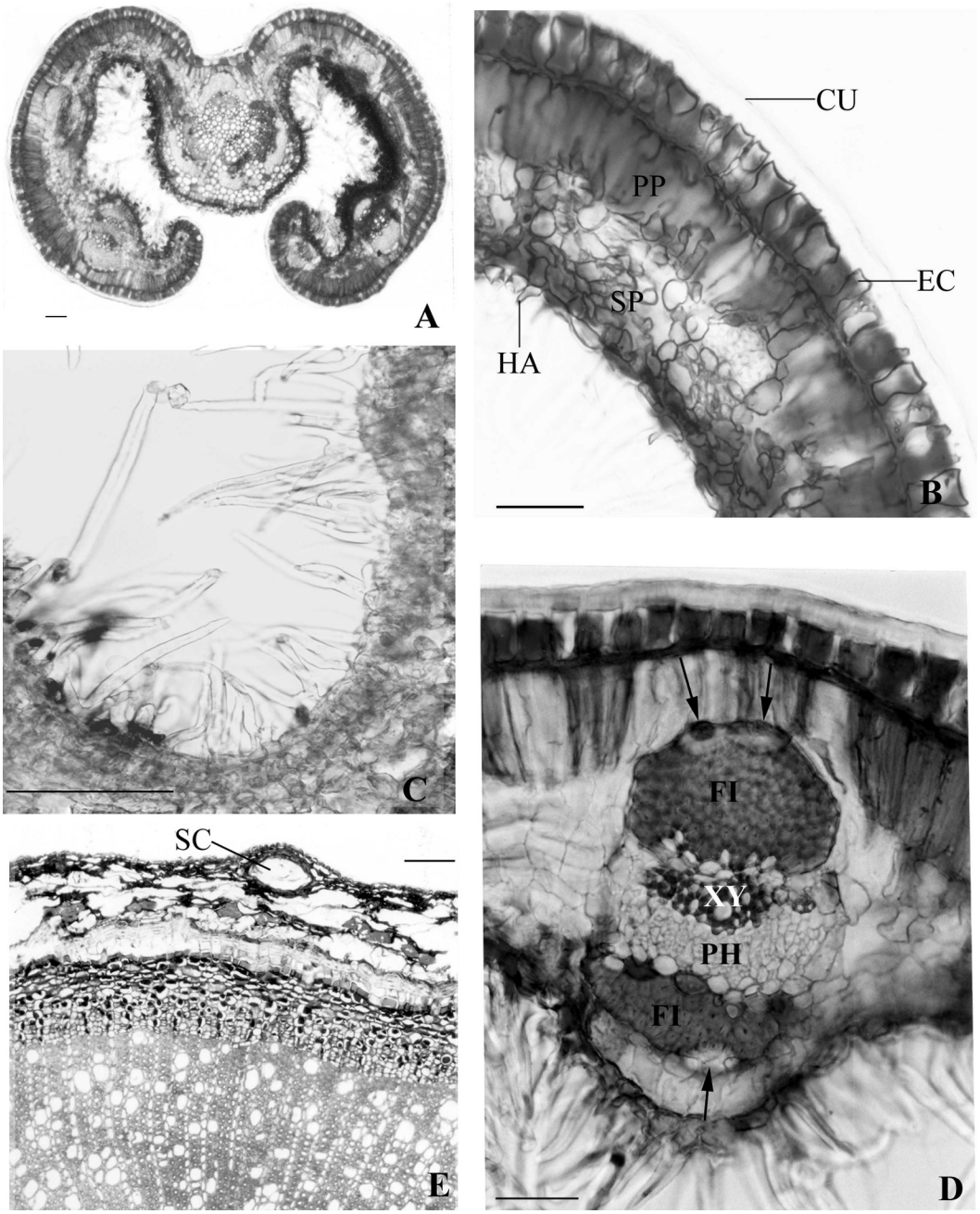

Figure 3. Leaf and stem anatomy of *Ouratea acicularis* R. Chacon & K. Yamamoto. —A. Cross section of leaf. —B. Detail of leaf cross section. —C. Abaxial leaf surface showing pluricellular forked hairs. —D. Cross section of vascular bundles. —E. Cross section of stem secondary growth. CU = cuticle, EC = epidermal cells, FI = fibers, HA = hairs, PH = phloem, PP = palisade parenchyma, SC = secretory cavities, SP = spongy parenchyma, XY = xylem. Arrows signify cristarque cells. Scale bars = 50 μm.

Ouratea acicularis also appears to be anatomically unique in the genus (Fig. 3). Although the leaves of this species are hypostomatic with paracytic stomata, as is common in *Ouratea*, *O. acicularis* has the adaxial epidermis composed of cells with an hourglass-shaped lumen, here described for the first time in the genus, as well as the leaf indumentum with pluricellular forked hairs fused at the base. Until now, only unicellular

Table 2. Morphological comparison of similarities and differences between *Ouratea acicularis* and *O. oleifolia*.

	O. acicularis	*O. oleifolia*
Leaf blade shape	ca. 1.6–9 × 0.1–0.2 cm (rolled); margins entire, revolute (only the midvein uncovered)	ca. 5–8 × 1–2.5 cm; margins entire, revolute (almost all the abaxial surface uncovered)
Lateral leaf veins	immersed, inconspicuous	immersed, the secondary ones sharply discernible, the intersecondary veins inconspicuous
Indumentum	puberulous, covering the young branches, the midvein on both faces, the inflorescence axes and the flower bud (lower surface of the sepals)	puberulous, covering the young branches, the inflorescence axes and the flower bud (lower surface of the sepals), and subvelutinous indument covering both leaf blade surfaces, mostly the abaxial one
Internode	2–10 mm long	≥ 7 mm long at distal nodes; leaves usually sparser basally
Flower bud	4–5 × 2.5–3 mm, ovoid, apex acute, base obtuse, puberulous	4–6 × 3–5 mm, ovoid, apex acute, base obtuse, puberulous
Habitat	rocky cerrados or grassy fields with scattered low trees and shrubs to 2 m tall on red sandy soil	savannas or similar sclerophyllous vegetation with small trees on sandy soil
Distribution	state of Tocantins, apparently endemic to the Jalapão region	states of Bahia, Goiás, Minas Gerais, Pernambuco, and Tocantins

hairs fused at the base and free pluricellular hairs had been described in *Ouratea* (see Solereder, 1908). The high degree of development of the cap of fibers and sclereids above the collateral vascular bundles is also unsurpassed in the genus. The most noteworthy anatomical novelty found in *O. acicularis* is the conspicuous secretory cavities in the stem cortex. The secondary xylem axial system is also outstanding due to the dominance of fibers and vessel members, with hardly any parenchyma. Unfortunately, *O. oleifolia*, which seems to be the most morphologically similar species, has not been studied anatomically.

The acicular leaf blade of *Ouratea acicularis* has margins so strongly revolute that they conceal the abaxial surface, leaving only the midrib uncovered (Figs. 1, 3); this kind of leaf is apparently unique to this species within the genus *Ouratea*. Most species of *Ouratea* have elliptic, oblong, ovate, cordate, or obovate leaves with regularly flattened surfaces and only rarely revolute margins, which never conceal the entire abaxial leaf surface. Also, on the adaxial surface the lateral veins are immersed and inconspicuous in *O. acicularis*, while in most species of *Ouratea* the lateral veins are clearly visible, especially the secondary ones that are characteristically curved upward, with most ending at the margins or occasionally forming anastomosing loops (see descriptions in Engler, 1876; Maguire & Steyermark, 1989).

Morphological, ecological, and geographical similarities suggest that *Ouratea acicularis* belongs to the taxon *O. oleifolia* sensu Engler (1876) and is most closely related to that species. *Ouratea oleifolia* is distributed in the more arid savannas of northern Minas Gerais and Bahia to Pernambuco, Piauí, and eastern Tocantins (former Goiás); this distribution area is much wider than but overlaps with that of *O. acicularis*. Thus, ecological and geographical features corroborate the relationship that morphological characters suggest between *O. acicularis* and *O. oleifolia*.

Although the wide circumscription of *Ouratea oleifolia* proposed by Engler (1876) is adopted in this paper, this is not a consensus, as Engler's circumscription was rejected by Tieghem (1902). Engler (1876) united several taxa that are treated as distinct by previous or later taxonomists as varieties of *O. oleifolia* based on slight differences in indumentum density (Tieghem, 1902).

Regardless of the classification accepted for this complex, *Ouratea acicularis* is sharply distinct from *O. oleifolia* sensu Engler (1876) by its linear-aciculate leaf blade that is at least four times narrower than in *O. oleifolia*, with a strongly revolute margin that conceals the abaxial leaf surface except for the midrib, and inconspicuous secondary venation on the adaxial surface, as well as by its narrower flower buds (see Table 2 for a detailed comparison).

Paratypes. BRAZIL. **Tocantins**: Mun. Mateiros, 10°24′S, 47°05′W, *R. Farias, J. Fonsêca Filho, S. Bridgewater & J. A. Ratter 157* (UB); Mun. Mateiros, Dunas, 10°35′S, 46°40′W, *A. B. Sampaio, P. L. Simpson Jr., R. Farias & L. C. Milhomens 545* (UB); 15 km from Mateiros on rd. Mateiros–Ponte Alta, 10°35′19″S, 46°31′42″W, *T. B. Cavalcanti, A. O. Scariot, A. C. Sevilha, G. Pereira-Silva & A. B. Sampaio 2757* (CEN, UEC).

Acknowledgments. The authors thank Simone Sousa e Silva for the illustration, Moacir Arruda and Miguel von Behr (IBAMA) for organizing the 2001 Jalapão scientific expedition and for their great dedication to conservation in the region, S. A. Harris for commenting on the manuscript, and C. Sastre for helpful suggestions that improved the final manu-

script. We are indebted to the Conservação e Manejo da Biodiversidade do Bioma Cerrado Project (Department for International Development/Empresa Brasileira de Pesquisa Agropecuária [Embrapa]/IBAMA), Embrapa Recursos Genéticos e Biotecnologia, PEQUI—Pesquisa e Conservação em Cerrado, and Conservation International Brazil for financial and logistical support for fieldwork.

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