

# OCOTEA BATATA (LAURACEAE), A NEW SPECIES FROM BRAZIL

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**Abstract.** *Ocotea batata*, a new species from the Brazilian Atlantic rain forest of Bahia and Espírito Santo States is described and illustrated. Its relationships within the genus are discussed.

**Resumo.** *Ocotea batata*, uma espécie nova da Mata Atlântica brasileira dos estados da Bahia e Espírito Santo é descrita e ilustrada. Suas relações dentro do gênero são discutidas.

**Keywords:** Lauraceae, *Ocotea*, new species, Bahia, Espírito Santo, Brazil

In the course of preparing the treatments of Lauraceae for the Flora of Bahia and for the Reserva Natural Vale, Linhares, Espírito Santo, Brazil, an undescribed species of *Ocotea* Aubl. was encountered. Its description and illustrations are presented below.

*Ocotea* is the largest genus of Lauraceae in the Neotropics found from Mexico to Argentina. Rohwer (1993) estimated the existence of about 350 species, most of them occurring in tropical and subtropical America and about 50 in Madagascar, seven in Africa, and one in the Canary Islands. More recently, van der Werff (2011) estimated the existence of 350 to 400 species, but an additional 44 species have been described since then by several authors (Brotto and Baitello, 2012; van der Werff, 2012, 2013a, b, 2014; Assis and Santos, 2013), and another 21 will be published soon (H. van der Werff, pers. comm.). In Brazil, there are about 170 species recognized to date (156 in Quinet et al., 2010): at least 48 occur in Bahia, and 32 in Reserva Natural Vale, Espírito Santo. The genus is characterized by having paniculate-cymose inflorescences, flowers with

nine 4-celled stamens with the locelli arranged in two superposed pairs and the fruits seated in a cupule (van der Werff, 2009). The genus is likely polyphyletic (Chanderbali et al., 2001) and in need of a revision. However, the large size of the genus makes a revision of the entire group difficult to accomplish, being beyond the scope of most botanists (van der Werff, 2014). The last revision of *Ocotea* sensu Kostermans (1957), including *Nectandra* Rol. ex Rottb. and *Pleurothyrium* Nees, dates back to the *Lauraceae Americanae* of Mez (1889). Rohwer (1986) published a synopsis of the genus *Ocotea*, proposing subdivision into smaller informal entities, which encompassed 29 groups of species sharing morphological affinities, and 54 species treated singly. No subsequent monographic treatments of such groups have been published, except for the study of the *Ocotea indecora* (Schott) Mez group undertaken by Assis and Mello-Silva (2010). A synopsis of the Central American species was published (van der Werff, 2002), but the South American species are still less well known (Moraes and van der Werff, 2011).

## MATERIAL AND METHODS

This study was based on literature review and morphological analysis of specimens deposited in the following herbaria: ALCB, B, BAH, BHCB, BR, C, CEN, CEPEC, CVRD, E, ESA, F, G, G-DC, GOET, GZU, HAL, HB, HBG, HRB, HRCB, HUEFS, HUESBVC, HUNEB, IAN, IBGE, INPA, IPA, K, KIEL, L, LE, LISU, M, MBM, MBML, MEL, MG, MO, NY, OXF, P, PEUFR, R, RB, SP, SPF, SPSF, TUB, U, UB, UEC, UESC, UFP, and VIES (acronyms according to Thiers, continuously updated). Photographs of flower structures were obtained with a stereomicroscope (Leica, M80) equipped with a camera (Leica, IC80 HD), using the software LAS (Leica Application Suite) Interactive Measurements.

Photographs of leaves were obtained with a digital equipment Faxitron X-ray (model LX-60 number 120807305) coupled to a computer with the software Faxitron DX version 1.0, where the images were captured by using an X-ray exposure time of 19 seconds at a voltage of 30 kV. Photographs of leaf areoles were obtained with a light microscope (Leica, M500) equipped with camera and software LAS. Leaf diaphanization was done according to Moraes and Paoli (1999). Descriptive terminology of leaf venation follows Hickey (1973) and Coe-Teixeira (1980). Abbreviations used in the text are as follows: fl. = flower; fr. = fruit; immat. fr. = immature fruit; ster. = sterile.

We thank the curators and staff of the herbaria we consulted (see list below) and of those that sent loans and gifts to HRCB. Our sincere gratitude to Mario Tomazello Filho (ESALQ/USP) for making available the X-Ray equipment, to Henrique L. Ribeiro for producing the map, to Geovane S. Siqueira for all support and help during field work in Reserva Natural Vale, and to Isabel C. L. da Cruz for the diaphanization of leaves. The senior author thanks CAPES for the grant 0781/2014 (Proc. 88881.030430/2013-01), and CNPq for the grant PQ2 (Proc. 304985/2012-0). The junior author thanks CNPq and CAPES for the M. Sc. scholarships.

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## NOMENCLATURE

**Ocotea batata** P.L.R.Moraes & Vergne, *sp. nov.* TYPE: BRAZIL. Espírito Santo: Linhares, Reserva Natural Vale, 19°11'11.1"S, 39°54'40.6"W, 12 December 2012, bud, fl. ♂, P. L. R. de Moraes & G. S. Siqueira 3528 (Holotype: HRCB [59814]; Isotypes: CVRD, HBG). Fig. 1.

*Ocotea batata* is remarkable among the Brazilian species of the genus and can be separated from them by a combination of a peculiar fissured, yellowish bark, twigs with lenticels, glabrous leaves above, pubescent below, with barbellate-foveolate domatia in the axils of the primary and secondary veins, very short, axillary, pubescent, few-flowered inflorescences, fruit ellipsoid seated on a shallow, infundibuliform cupule.

*Trees* up to 7 m. *Twigs* terete, angular when young, glabrous to glabrescent at the base, dense to sparse pubescent or sericeous near the tip, with long, straight and appressed trichomes, lenticelled; terminal buds pubescent, with yellowish trichomes. *Leaves* alternate, 3.5–16.8 × 1.2–6.2 cm, elliptic to ovate to obovate, chartaceous, glabrous above, except for some sparse trichomes on midrib, papillose, pubescent below, with ± short, straight, appressed trichomes, papillose, the base acute, short cuneate, asymmetric, the margin sclerified, flat, the apex shortly to long acuminate; venation pinnate, eucamptodromous to weak brochidodromous, areole development incomplete, randomly arranged, with branched veinlets; midrib and secondary veins impressed above, raised below, secondary veins 3–5 on each side of the midrib; barbellate-foveolate domatia in the axils of secondary veins; petioles 0.4–1.4 cm long, semiterete, flat to slightly canaliculate above, glabrescent in older leaves, densely pubescent in young ones. *Inflorescences* pubescent, tyrsoid, much shorter than leaves, 0.5–1.5 cm long, few-flowered, mainly in the axils of distal leaves, peduncle short. *Flowers* unisexual, white in live material, tube shallow, urceolate, with very short pedicels, sparsely pubescent, with long, appressed, straight to curled trichomes; *male flowers*: inside pubescent, pedicels 1.0–1.3 × 0.7–0.8 mm, fertile stamens 9 (whorls I, II and III) exerted, all 4-celled, 2.2–2.4 × 3.1–4.4 (–5.0) mm, the filaments equal to shorter than the anthers, the outer six with the locelli introrse, the inner three with the locelli extrorse-lateral and 2 globose glands at the base; tepals 6, equal, spreading in anthesis, about 1.7–2.7 × 1.3–1.8 mm, elliptic to ovate, outside pubescent, with straight, appressed, short to long trichomes, inside glabrous to slightly pubescent, the trichomes as the ones on outside, tip roundish, obtuse, papillose; stamens of whorl I glabrous, 1.5–2.0 mm long, anthers ovate, tip truncate, subemarginate, 0.9–1.0 × 0.9–1.0 mm, filaments slender, slightly pilose at the base, 0.6–1.0 mm long; stamens of whorl II equal to the whorl I, slightly shorter, 1.3–1.8 mm long, anthers 0.9–1.0 × 0.7–0.8 mm, filaments 0.6–0.9 mm long; stamens of whorl III clavate, glabrous, 1.7–1.9 mm long, anthers rectangular, tip truncate, subemarginate, papillose, 0.8–0.9 × 0.6–0.7 mm, filaments slender, 0.8–0.9 mm long, glands globose, slightly shorter than the filaments, 0.5–0.7 × 0.6–0.8 mm, stalk 0.2–0.3 mm long; stamimodia of whorl IV liguliform, densely pubescent, 0.4 mm long; pistillode glabrous, 1.8–2.0 mm long, stipitiform, stigma discoid, well-developed; *female*

*flowers*: equal in shape to male flowers, larger, 2.8–2.9 × 2.8–3.6 mm, subsessile; tube deeper, inside pubescent; tepals 6, equal, spreading in anthesis, elliptic to ovate, about 1.7–2.1 × 1.1–1.3 mm, tip obtuse, roundish, rarely acute, papillose, outside pubescent, inside slightly pubescent; staminodia 12 (whorls I, II, III, and IV), equal in shape to the stamens of male flowers, but smaller, clavate, glabrous, pilose at the base; whorl I 0.7–0.8 mm long; whorl II 0.7–0.8 mm long; whorl III 0.8–1.3 mm long, glands globose, 0.3–0.4 × 0.4–0.6 mm, stalk 0.1–0.3 mm long; whorl IV liguliform, densely pubescent, 0.6 mm long; pistil glabrous, 1.2–1.7 mm long, style cylindrical, robust, twisted, 0.6 mm long, ovary urceolate, 0.9–1.0 × 0.7–0.9 mm, stigma discoid, large. *Fruits* dark purple in live material, 1.3–1.7 × 1.1–1.3 cm, ellipsoid, subglobose, exerted from the shallow, 0.7–0.9 × 0.5–0.9 cm, infundibuliform cupule (red in live material); the pedicel swollen, but shrunken in dried material. Figs. 2–4.

**Phenology:** Flowers collected from December to April. Immature fruits collected from September to December; mature fruits collected in December.

**Etymology:** The common name of the new species has been coined by Domingos Folli as “canela-batata,” in allusion to the color of the bark of the trunk that resembles the color of the peel of potato tubers (*Solanum tuberosum* L.), which is called “batata” in Portuguese. We propose the specific epithet name *batata*, based on its common name, here used as a noun in apposition, thus in reference to the peculiar color of the bark of the trunk, which is unusual for the known Brazilian species of *Ocotea*.

**Distribution and habitat:** *Ocotea batata* is known only from few locations of the Atlantic rain forest domain (Fig. 5). It is relatively abundant in the understory of the tabuleiro forest (lowland ombrophilous dense forest) of Reserva Natural Vale, Linhares, Espírito Santo, in an altitudinal range of 28–65 m. It has been also collected in montane ombrophilous dense forest in Santa Lúcia Biological Station, Santa Teresa, Espírito Santo, at 650 m, and in the region of Arataca, southern Bahia, in an altitudinal range of 500–800 m. It is also registered from small fragments of submontane ombrophilous dense forest in the region of Itamaraju, at about 115 m.

**Additional specimens examined:** BRAZIL. Bahia: Arataca, Rod. Arataca/Una, Serra do Peito de Moça, RPPN Palmeiras/IESB, trilha que leva ao topo da serra, 15°10'27"S, 39°20'22"W, 500–800 m, 18 December 2005, immat. fr., J. G. Jardim *et al.* 4869 (CEPEC, NY, RB); Itamaraju, Fibra, 3 December 2014, fl. ♀, fr., P. L. R. de Moraes *et al.* 4328 (HRCB, MO). Espírito Santo: Linhares, Reserva Natural Vale, estrada Paraju km 0.15, 5 October 1982, immat. fr., D. A. Folli 401 (CVRD, ESA, MO, SPSF); idem, BR 101 km 1.2, próximo ao Córrego Pau Atravessado, 3 April 1999, fl. bud, D. A. Folli 3390 (CVRD, HRCB, HUEFS, MO); idem, estrada Gávea, RFL-01/80 Bloco D Trat-5, 23 February 2004, fl. bud, D. A. Folli 5033 (CVRD, ESA, HRCB, HUEFS, RB); idem, estrada Alameda 03, 3 March 2005, fl. ♂, D. A. Folli 5035 (CVRD, HRCB, HUEFS); idem, estrada Peroba Amarela, 19°09'45.5"S, 40°04'11.5"W, 16 November 2006, immat. fr., A. Quinet 1051 (CVRD,

FIGURE 1. Holotype of *Ocotea batata* P.L.R. Moraes & Vergne (Moraes 3528, HRCB).

HRCB); idem, estrada Louro, 12 April 2010, fl. ♂, *G. S. Siqueira 541* (CVRD, HRCB); idem, estrada Ipê Amarelo, 12 February 2011, fl. ♂, *D. A. Folli 6765* (CVRD, HRCB); idem, 6 September 2011, ster., *P. L. R. de Moraes et al. 3175* (HRCB); idem, 19°07'01.6"S, 39°55'05.3"W, 11 December 2012, fl. ♀, *P. L. R. de Moraes & G. S. Siqueira 3530* (CVRD, HBG, HRCB); idem, estrada Jueirana Vermelha, 10 September 2015, immat. fr., *P. L. R. de Moraes & M. C. Vergne 4957* (HRCB); Santa Teresa, Estação Biológica de Santa Lúcia, Valsugana Velha, 650 m, 19 March 1999,

fl., *L. Kollmann & E. Bausen 2193* (MBML, SPF, UEC); Sooretama, Reserva Natural Vale, estrada Jueirana Facão, 3 October 2014, immat. fr., *G. S. Siqueira 1010* (CVRD, HRCB, RB); idem, Reserva Biológica de Sooretama, área da sede, 14 March 1972, fl., *D. Sucre 8693* (MO, RB).

Given the combination of morphological characters found in *Ocotea batata* (Table 1), it is difficult to place the new species in any of the informal groups of species with unisexual flowers proposed by Rohwer (1986). It appears to fit best in the *Ocotea dispersa* group, which includes

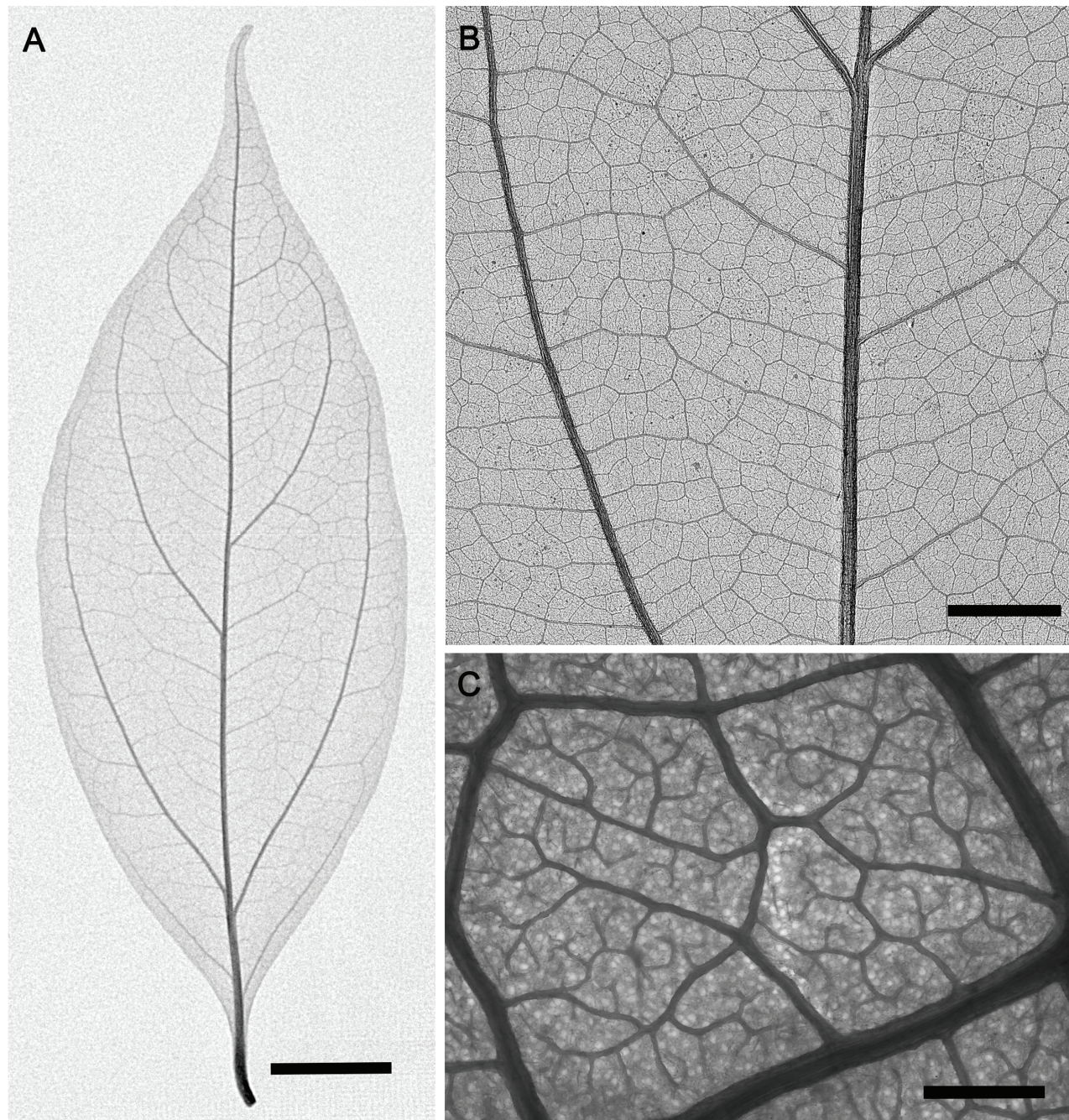


FIGURE 2. Leaf venation of *Ocotea batata* P.L.R. Moraes & Vergne (*Moraes 3528*). **A**, mature leaf, pinnate, weak brochidodromous; **B**, detail of reticulation, areoles incomplete, randomly arranged; **C**, detail of areoles incomplete, with branched veinlets. Bars = 1 cm (A); 0.33 cm (B); 0.5 mm (C).



FIGURE 3. *Ocotea batata* P.L.R. Moraes & Vergne. **A**, trunk showing the peculiar yellowish bark; **B**, branch with inflorescences (*Moraes* 3528); **C**, female flower (*Moraes* 3530); **D**, immature fruit (*Moraes* 4957); **E**, mature fruit (*Moraes* 4328).

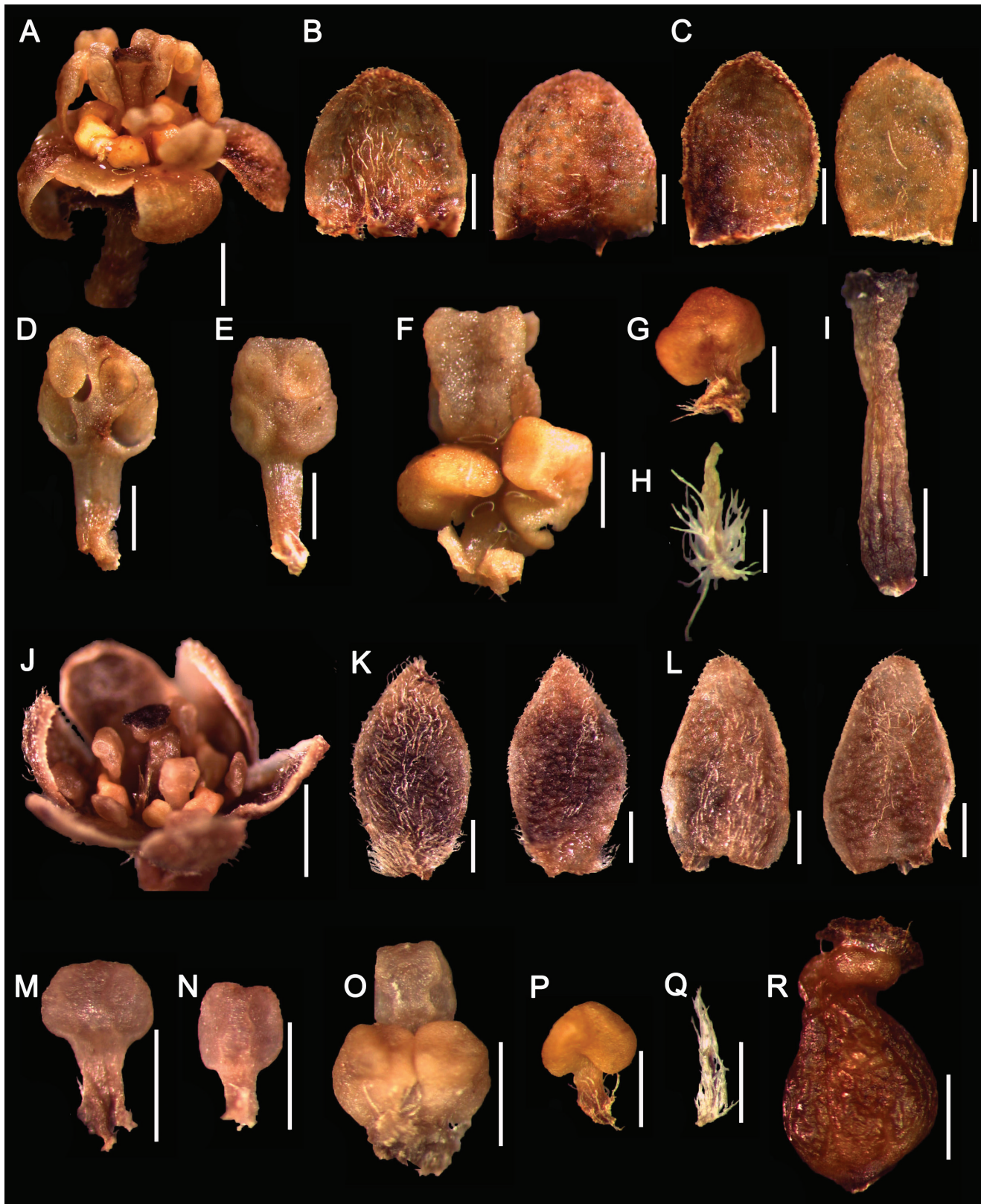


FIGURE 4. *Ocotea batata* P.L.R. Moraes & Vergne. A–I. Male flower from Moraes 3528 (HRCB). A, flower; B, outer tepals, abaxial and adaxial surfaces; C, inner tepals, abaxial and adaxial surfaces; D, stamen of whorl I; E, stamen of whorl II; F, stamen of whorl III; G, gland; H, staminode of whorl IV; I, pistillode. J–R. Female flower from Moraes 3530 (HRCB). J, flower; K, outer tepals, abaxial and adaxial surfaces; L, inner tepals, abaxial and adaxial surfaces; M, staminode of whorl I; N, staminode of whorl II; O, staminode of whorl III; P, gland; Q, staminode of whorl IV; R, pistil. Bars = 1 mm (A, J); 0.5 mm (B, C, D, E, F, G, I, K, L, M, N, O, Q, R); 0.2 mm (H, P).

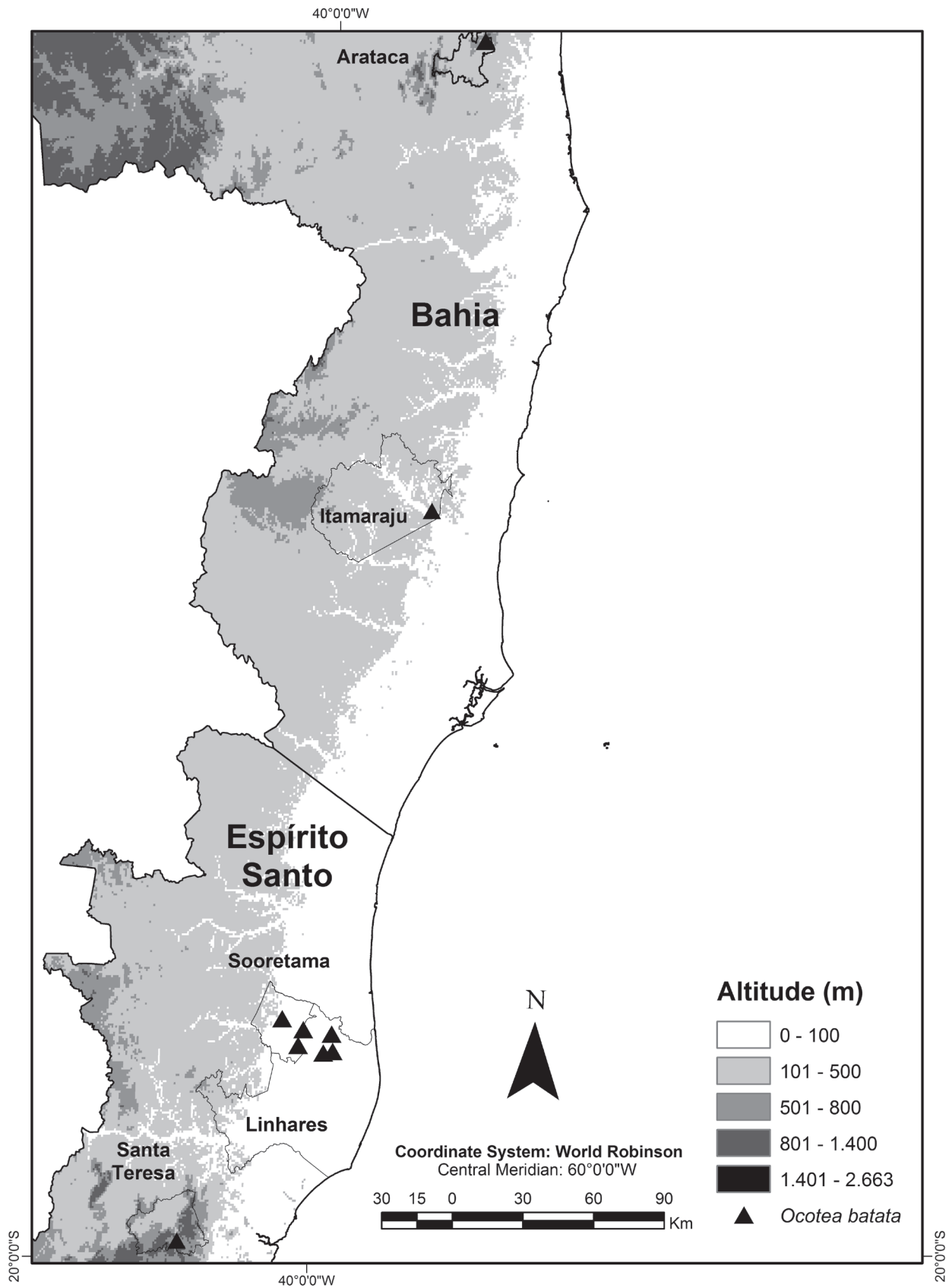


FIGURE 5. Geographic distribution of *Ocotea batata* P.L.R. Moraes & Vergne.

TABLE 1. Comparative morphology and geographic distribution of *Ocotea batata* and putative related species (States of Brazil: AM = Amazonas, AP = Amapá, BA = Bahia, ES = Espírito Santo, MG = Minas Gerais, PA = Pará, PR = Paraná, RJ = Rio de Janeiro, SC = Santa Catarina, SP = São Paulo).

CHARACTERS	<i>O. BATATA</i>	<i>O. DISPERSA</i>	<i>O. DIVARICATA</i>	<i>O. PERCURRENS</i>
Habit	Tree (7 m)	Tree (16 m)	Tree (18 m)	Tree (35 m)
Twig indument	Dense to sparsely pubescent at the tip, glabrous to glabrescent at the base	Pubescent at the tip, glabrescent at the base	Glabrous to sparsely pubescent or pubescent	Pubescent
Twig lenticels	Present	Present	Present at the base	Absent
Phyllotaxy	Alternate	Alternate to subopposite at tip	Alternate	Alternate
Leaf form	Elliptic to ovate to obovate	Elliptic to obovate	Wide-elliptic to obovate	Elliptic
Leaf size (cm)	3.5–16.8 × 1.2–6.2	3.5–13.4 × 1.7–5.2	2–20 × 1.6–15	4.8–13.7 × 2.3–5.1
Leaf indument	Glabrous above, pubescent below	Glabrous to glabrescent above, sparsely to dense pubescent below	Glabrous above, glabrescent below	Glabrous above, glabrescent to pubescent below
Domatia	With trichomes and pit	With trichomes and pit	With trichomes and pit	With trichomes
Petiole length (cm)	0.4–1.4	0.6–1.1	0.4–1.8	0.5–1.2
Petiole-cross section	Slightly canaliculate	Canaliculate	Slightly canaliculate	Non-canaliculate
Petiole indument	Glabrescent	Glabrescent to pubescent	Glabrous	Pubescent
Inflorescence indument	Pubescent	Pubescent	Glabrous	Pubescent
Inflorescence size (cm)	0.5–1.5	2–3	5–10	4–7.2
Flower indument	Sparsely pubescent	Dense to sparsely pubescent	Glabrescent	Pubescent
Flower size (mm) ♂	2.2–2.4 × 3.1–4.4(–5.0)	2–4 × 2–3	2.1–2.4 × 2–2.8	3.0–3.7 × 2.5–3
Tepal size (mm) ♂	1.7–2.7 × 1.3–1.9	0.9–1.1 × 0.5–0.8	1.3–2 × 1–2	1.0–1.7 × 0.6–1.1



TABLE 1 CONT. Comparative morphology and geographic distribution of *Ocotea batata* and putative related species (States of Brazil: AM = Amazonas, AP = Amapá, BA = Bahia, ES = Espírito Santo, MG = Minas Gerais, PA = Pará, PR = Paraná, RJ = Rio de Janeiro, SC = Santa Catarina, SP = São Paulo).

CHARACTERS	<i>O. BATATA</i>	<i>O. DISPERSA</i>	<i>O. DIVARICATA</i>	<i>O. PERCURRENS</i>
Outer stamens length (mm) ♂	1.3–2.0	1–1.5	1.1–1.3	0.6–1.2
Inner stamens length (mm) ♂	1.7–1.9	1.0–1.6	1.1–1.2	0.8–1.3
Pistillode (mm) ♂	1.8	Absent to vestigial	Absent to present: 0.3–0.4	1.1–1.8
Flower size (mm) ♀	2.8–2.9 × 2.8–3.6	2.1–3 × 2.1–2.2	1.9–2.2 × 1.9–2	2.8–3.7 × 2.9–3.4
Tepal size (mm) ♀	1.7–2.1 × 1.1–1.3	0.9–1.4 × 0.6–1.1	1.2–1.3 × 0.9–1.2	0.9–1.2 × 0.6–0.8
Outer staminodia length (mm) ♀	0.7–0.8	0.6–0.8	0.7–0.8	0.4–0.5
Inner staminodia length (mm) ♀	0.8–1.3	0.7–0.8	0.7–0.9	0.5–0.6
Pistil ♀	Glabrous	Glabrous	Glabrous	Glabrous or nearly so
Pistil length (mm) ♀	1.2–1.7	1.6	1–1.1	1.5–1.6
Style length (mm) ♀	0.6	0.5–0.6	0.04–0.09	0.5–0.7
Ovary length (mm) ♀	0.9–1.0	0.8–0.9	0.8–1.2	0.6–0.8
Fruit size (cm)	1.3–1.7 × 1.1–1.3	0.9–1.2 × 0.6–0.8	0.7–2 × 0.6–2.5	0.9–1.5 × 0.5–0.8
Habitat	Understory of lowland, submontane and montane ombrophilous dense forests	Understory of lowland and montane ombrophilous dense forests, and in montane ombrophilous mixed forest	Submontane and montane ombrophilous dense forests, in semideciduous forests, and in restinga	Northeastern part of the Amazon Basin, with disjunct distribution in the Atlantic forest in Bahia
Geographical distribution	BA, ES	ES, MG, PR, RJ, SC, SP	BA, ES, MG, RJ, SP	Brazil: AM, AP, BA, PA; French Guiana; Suriname

*O. dispersa* (Nees & Mart.) Mez, *O. nutans* (Nees) Mez, and *O. glauca* (Nees & Mart.) Mez, which are essentially Brazilian species. Characteristic of this group are the relatively small trees (up to 16 m), leaves about 5–15 cm long, shape varying from  $\pm$  elliptic, ovate-elliptic to oblanceolate, inflorescences shorter than the leaves and only slightly branched, flower diameter about 3–4 mm, pistillode varying from relatively well developed (stipitiform) to completely reduced (vestigial), pubescent or glabrous, fruit elliptic seated on a cup-shaped to almost hemispherical cupule, which usually keeps remnants of tepals on the single rim. Actually, *O. batata* resembles *O. dispersa* in the general vegetative aspect and some herbarium specimens have been wrongly determined as the latter (Kollmann 2193; Sucre 8693). Both species share features like twigs with lenticels, leaves of almost same shape and size, barbellate-foveolate domatia in the axils of secondary veins, short inflorescences, pubescent, and flowers short pedicelled. However, they differ in the different indument of twigs and leaves: the trichomes of *O. dispersa* are longer, usually denser, and ascending, while in *O. batata* they are appressed. Additionally, the trunk of *O. batata* has the bark fissured and yellowish vs. smooth and greyish in *O. dispersa*, and flowers relatively wider, fruits larger, cupule infundibuliform, shallow, smooth, enclosing only the base of the fruit vs. cup-shaped, usually 6-lobed, warty, enclosing about 1/3 of the fruit in the latter. The male flowers of *O. dispersa* have smaller stamens, stout filaments, absent or liguliform staminodia, and vestigial or absent pistillode, while in *O. batata* the filaments are relatively slender, the liguliform staminodia are always present, and the pistillode is stipitiform.

The fruit specimen collected by *Jardim 4869* in Arataca, Bahia was identified by A. Amorim (CEPEC) and by L. Assis (RB) as allied to *Ocotea divaricata* (Nees) Mez, a species that belongs to the *Ocotea cernua* (Nees) Mez group proposed by Rohwer (1986). Although the leaves and fruits of that specimen at first glance generally would resemble those of *O. divaricata* in shape and size, a detailed examination of the exsiccate shows that the indument on the twigs, leaves and petioles, presence of barbellate-foveolate domatia, and the axillary, short pedicelled fruits, developed from no peduncle, closely match the other known specimens of *O. batata*. Since *O. divaricata* has inflorescences relatively large, often with an axis in zigzag, many-branched, many-flowered, usually glabrous to sparsely pubescent, its fruits usually have relatively long pedicels developed from the branches of former inflorescences, thus not straight from the axils of leaves or bracts like in *O. batata*. Moreover, *O. batata* could not be closely related to *O. divaricata* because their floral parts are quite distinct.

*Ocotea batata* could also be confounded at first glance with *O. percurrens* Vicentini, a species with a disjunct distribution between the Amazon and Atlantic forest domains. Their leaves can be similar in shape and size and in the general aspect of the dried material. However, *O. percurrens* is a tall tree and also differs in the indument covering the terminal buds and twigs, by erect and crisped trichomes, petioles non canaliculate, barbellate domatia, smaller filaments of stamens of male flowers, pistillode with stigma inconspicuous, and female flowers with tube glabrous inside, for instance.

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